Atlantic Fleet Training and Testing Draft Environmental Impact Statement/ Overseas Environmental Impact Statement

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Draft
Supplemental Environmental Impact Statement/ Overseas Environmental Impact Statement
Atlantic Fleet Training and Testing

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EXECUTIVE SUMMARY

ES.1 INTRODUCTION

The United States (U.S.) Department of the Navy (including both the U.S. Navy and the U.S. Marine Corps) in cooperation with the U.S. Coast Guard as a Joint Lead Agency (hereinafter jointly referred to as the Action Proponents) have prepared this Supplement to the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas (EIS/OEIS) Environmental Impact Statement* (U.S. Department of the Navy, 2018) (hereinafter referred to as the "2018 Final EIS/OEIS") pursuant to 40 Code of Federal Regulations section 1502.9(d)(2). The Action Proponents propose to conduct training activities and research, development, testing, and evaluation (hereinafter referred to as "testing") activities in the Atlantic Fleet Training and Testing Study Area (Figure ES-1). Training and testing activities, also referred to as "military readiness activities," prepare the Action Proponents to fulfill their mission to protect and defend the United States and its allies, but have the potential to affect the environment. The Study Area includes areas of the western Atlantic Ocean along the east coast of North America, Gulf of Mexico, and portions of the Caribbean Sea. It also includes Navy and Coast Guard pierside locations and port transit channels, bays, harbors, inshore waterways, and civilian ports where training and testing activities occur as well as transits between homeports and operating areas.

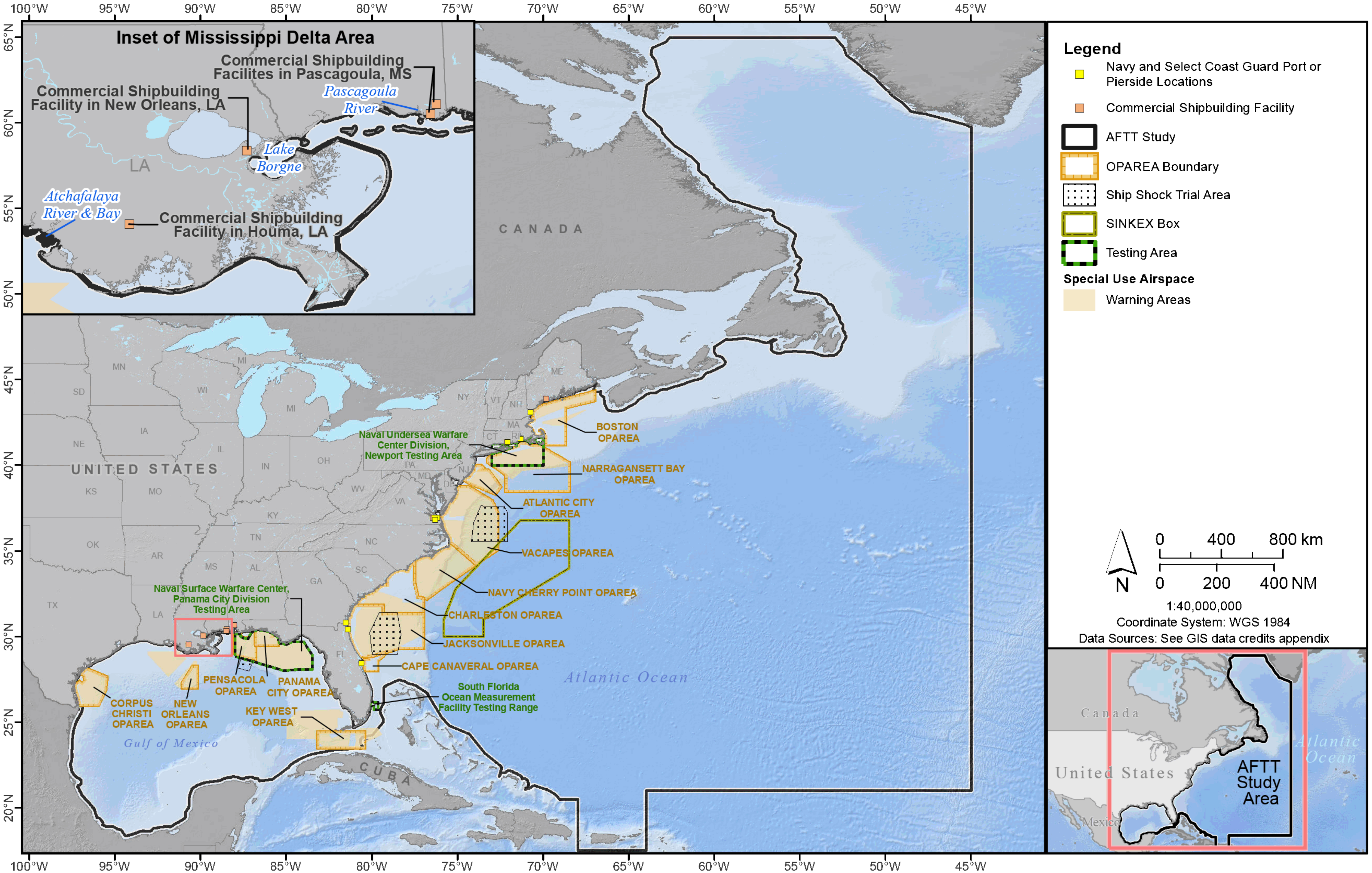
ES.2 PURPOSE AND NEED

The Action Proponents and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) (as cooperating agencies under the provisions of the National Environmental Policy Act [NEPA]) have coordinated from the outset and have developed this document to meet each agency's separate and distinct obligations and to support the independent decision making of all agencies. The purpose of the Proposed Action is to ensure the U.S. Naval Services, including the Coast Guard, are able to organize, train, and equip service members and personnel to meet their respective national defense missions as prescribed by Congress. This mission is achieved in part by conducting military readiness activities within the Study Area in accordance with established Department of the Navy military readiness requirements.

The Action Proponents will request authorization to "take" marine mammals incidental to conducting training and testing activities in the Study Area to comply with the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA). NMFS's purpose is to evaluate the Proposed Action pursuant to its authority under the MMPA, and to make a determination whether to issue incidental take authorizations and Letters of Authorization, including any conditions necessary to meet the statutory mandates of the MMPA.

ES.3 SCOPE AND CONTENT

In this Supplemental EIS/OEIS, the Action Proponents have analyzed military readiness activities that could potentially affect human and natural resources, especially marine mammals, sea turtles, and other marine resources. Since the completion of the 2018 Final EIS/OEIS, the best available science has been updated, the regulatory environment has changed, the Study Area has changed, and the Proposed Action has been refined. All of this has been incorporated into this Supplemental EIS/OEIS analysis.



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Figure ES-1: Atlantic Fleet Training and Testing Study Area

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NMFS is a cooperating agency because the Proposed Action and alternatives involve activities that have the potential to affect protected resources under the agency's jurisdiction and for which they have special expertise, including marine mammals, threatened and endangered species, and essential fish habitat. NMFS special expertise and authorities are based on their responsibilities under section 101(a)(5)(A) of the MMPA and section 7 of the ESA. Additionally, NMFS is a cooperating agency because the Proposed Action and alternatives involve activities that have the potential to affect protected resources under the agency's jurisdiction and for which they have special expertise, including marine mammals, and threatened and endangered species. In accordance with 40 Code of Federal Regulations sections 1506.3 and 1505.2, NMFS plans to adopt this Supplemental EIS/OEIS and issue a separate Record of Decision associated with its decision on whether to grant the Action Proponents' request for incidental take authorizations.

ES.4 Proposed Action and Alternatives

Proposed activities in this Supplemental EIS/OEIS are consistent with those analyzed in the 2018 Final EIS/OEIS and are representative of the activities that the Action Proponents have been conducting in the Study Area for decades.

The range of alternatives considered in this Supplemental EIS/OEIS includes the No Action Alternative and two alternatives to the Proposed Action. This Supplemental EIS/OEIS updates the 2018 analysis of direct, indirect, and cumulative impacts that may result from the Proposed Action. Activities that comprise the Proposed Action are necessary to meet military readiness requirements beyond 2025 and into the reasonably foreseeable future. These activities are analyzed for their potential effects on the environment in the following chapters of this Supplemental EIS/OEIS. The type and level of activities analyzed in this Supplemental EIS/OEIS are described in Appendix A (Activity Descriptions). In accordance with the MMPA, the Action Proponents have submitted an application to NMFS requesting authorization for the take of marine mammals incidental to military readiness activities described in this Supplemental EIS/OEIS. NMFS's Proposed Action will be a direct outcome of responding to the Navy's request for an incidental take authorization pursuant to the MMPA.

ES.4.1 No Action Alternative

Under the No Action Alternative analyzed in this Supplemental EIS/OEIS, the Action Proponents would not conduct the proposed military readiness activities in the Study Area. Consequently, the No Action Alternative of not conducting the proposed live, at-sea training and testing in the Study Area is inherently unreasonable in that it does not meet the Action Proponents' purpose and need (see Section 1.4, Purpose and Need). For NMFS, denial of the Navy's application for incidental take authorizations constitutes the NMFS No Action Alternative, which is consistent with NMFS' statutory obligation under the MMPA to grant or deny requests for take incidental to specified activities. Therefore, the analysis associated with the No Action Alternative is carried forward for analysis.

ES.4.2 Alternative 1

Alternative 1 is the Action Proponents' Preferred Alternative as well as the environmentally preferable Action Alternative. It reflects a representative year of training and testing to account for the natural fluctuations of training cycles, testing programs, and deployment schedules that generally limit the maximum level of training and testing that could occur in the reasonably foreseeable future.

ES.4.2.1 Training

Under this alternative, the Action Proponents propose to conduct training into the reasonably foreseeable future, as necessary to meet current and future readiness requirements. These training activities include one new activity as well as activities subject to previous analysis that are currently ongoing and have historically occurred in the Study Area. The requirements for the types of activities to be conducted, as well as the intensity at which they need to occur, have been validated by senior Action Proponent leadership. The numbers and locations of all proposed training activities are provided in Table 2.2-1 (Current and Proposed Navy and Marine Corps Training Activities) and Table 2.2-2 (Current and Proposed U.S. Coast Guard Training Activities).

Alternative 1 reflects a representative year of training that (1) accounts for the natural fluctuation of training cycles and deployment schedules that influence the number of Composite Training Unit Exercises that would occur in any 7-year period, and (2) assumes that some unit-level training requirements are met during integrated, coordinated, and major training exercises vice discrete unit-level training events.

Using a representative level of activity rather than a maximum level of training activity in every year reduces the amount of hull-mounted mid-frequency active sonar estimated to be necessary to meet training requirements. But by using this framework, the Action Proponents also accept a degree of risk that if global events necessitated a rapid expansion of military training, they may not have sufficient capacity in their MMPA and ESA authorizations to carry out those training requirements.

ES.4.2.2 Testing

Under Alternative 1, the Action Proponents propose an annual level of testing that reflects the fluctuations in testing programs by recognizing that the maximum level of testing will not be conducted each year. This alternative includes the testing of new platforms, systems, and related equipment that will be introduced after November 2025. The majority of testing activities that would be conducted under this alternative are similar to those conducted currently or in the past. This alternative includes the testing of some new systems using new technologies and takes into account inherent uncertainties in this type of testing. The numbers and locations of all proposed testing activities are listed in Table 2.2-3 (Naval Air Systems Command Current and Proposed Testing Activities), Table 2.2-4 (Naval Sea Systems Command Current and Proposed Testing Activities), and Table 2.2-5 (Office of Naval Research Current and Proposed Testing Activities).

ES.4.3 Alternative 2

ES.4.3.1 Training

Under Alternative 2, the Action Proponents propose to conduct military readiness activities to meet current and future readiness requirements by (1) conducting a total of four carrier strike group Composite Training Unit Exercises every year, and (2) meeting all unit-level training requirements using dedicated, discrete training events, instead of achieving them in conjunction with integrated, coordinated, and major training exercises as described for Alternative 1. The numbers and locations of all proposed training activities are listed in Table 2.2-1 (Current and Proposed Navy and Marine Corps Training Activities) and Table 2.2-2 (Current and Proposed U.S. Coast Guard Training Activities).

Alternative 2 reflects the maximum number of training activities that could occur within a given year and assumes that the maximum level of activity would occur every year over any 7-year period. This allows for the greatest capacity for the Action Proponents to maintain readiness when considering potential changes in the national security environment, fluctuations in training and deployment schedules, and potential in-theater demands. Both unit-level training and major training exercises are assumed to occur at a maximum level every year.

ES.4.3.2 Testing

Like Alternative 1, Alternative 2 entails a level of testing activities to be conducted into the reasonably foreseeable future and includes the testing of new platforms, systems, and related equipment that will be introduced beginning in November 2025. The majority of testing activities that would be conducted under this alternative are the same as or similar to those conducted currently or in the past.

Alternative 2 would include the testing of some new systems using new technologies and includes the contingency for augmenting some weapon systems tests in response to potential increased world conflicts. The numbers and locations of all proposed testing activities are listed in Table 2.2 3 (Naval Air Systems Command Current and Proposed Testing Activities), Table 2.2 4 (Naval Sea Systems Command Current and Proposed Testing Activities), and Table 2.2 5 (Office of Naval Research Current and Proposed Testing Activities).

ES.5 Summary of Environmental Effects

Environmental effects from the Proposed Action and alternatives have been analyzed for potential impacts to air quality, sediments and water quality, habitats, vegetation, invertebrates, fishes, marine mammals, reptiles, and birds and bats. Cultural resources, socioeconomics, and public health and safety were not carried forward for detailed analysis. See Section 3.0.3.2 (Resources and Issues Eliminated from Further Consideration) for additional information. Table ES.5-1 provides a summary of the environmental impacts for each alternative.

The majority of platforms, weapons, and systems that use sonar and explosives for training and testing are the same or very similar to those analyzed in the 2018 Final EIS/OEIS. Some platforms, weapons, and systems will increase under the current Proposed Action, while others will decrease. Overall, for training, the Action Proponents project a net decrease in the use of sonar and a slight net increase in the use of explosives. For testing, the Action Proponents project a net increase in the use of sonar and a significant net decrease in the use of explosives.

Table ES.5-1: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2

Resource Category	*Summary of Impacts*
All Resources	**No Action Alternative:** • Under the No Action Alternative, training and testing activities associated with the Proposed Action will not be conducted within the Study Area. Under this alternative, there would be no potential for impacts for any resource.
Section 3.1, Air Quality and Climate Change	**Alternative 1 (Preferred Alternative):** • Military readiness activities associated with Alternative 1 would not contribute to an exceedance of an ambient air quality standard or interfere with the attainment of the National Ambient Air Quality Standards at any location within the Study Area. **Alternative 2:** • Military readiness activities associated with Alternative 2 would not contribute to an exceedance of an ambient air quality standard or interfere with the attainment of the National Ambient Air Quality Standards at any location within the Study Area.
Section 3.2, Sediment and Water Quality	**Alternative 1 (Preferred Alternative):** • Explosives and explosives byproducts: Chemical and physical changes to sediment and water quality, as measured by the concentrations of explosives byproduct compounds, would not result in harmful effects on biological resources and habitats. • Metals: The effects of releases from expended material or munitions to sediment and water quality may be measurable within the area adjacent to the metal object, but concentrations would be below applicable regulatory standards or guidelines for adverse effects' levels on biological resources and habitats. • Chemicals and other materials not associated with explosives: Chemical and physical changes to sediment and water quality, as measured by the concentrations of contaminants associated with the expended material, would likely be indistinguishable from conditions at reference locations. **Alternative 2:** • Explosives and explosives byproducts: Impacts to sediment and water quality from releases of explosives and explosives byproducts to the marine environment during training activities under Alternative 2 would be similar to Alternative 1. • Metals: Impacts to sediment and water quality from metals releases to the marine environment during training activities under Alternative 2 would be similar to Alternative 1. • Chemicals and other military not associated with explosives: Impacts to sediment and water quality from releases of chemicals other than explosives and other materials to the marine environment during training activities under Alternative 2 would be similar to Alternative 1.
Section 3.3, Habitats	**Alternative 1 (Preferred Alternative):** • Explosives: Based on the relative footprint and location of underwater explosives use and impacts, the effects of explosives on abiotic habitats would not result in significant changes in bottom habitat. • Physical disturbance and strike: Based on the relative amount and location of vessels and in-water devices and the general description of impacts, there would be (1) avoidance of artificial structures and hard bottom habitats; (2) quick recovery of soft bottom habitats that would likely be impacted; and (3) the short-term and localized disturbances of the water column (suspended sediment) and substrate (scarring) in very shallow water. Impacts would be negligible. The total bottom area affected by all military

Table ES.5-1: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	*Summary of Impacts*
	expended materials in all training areas would be about 72 and 77 acres annually for training and testing, respectively, representing less than one-thousandth of one percent of available bottom habitat in any range complex. Pile driving impacts would be extremely limited since the number of piles is relatively small and the duration is short term. The activity would also occur in a highly disturbed estuarine habitat with mostly artificial shoreline. The Action Proponents will implement mitigation tailored to reducing the impact of physical disturbance and strike on sensitive habitats. **Alternative 2:** • Explosives: Impacts from explosives in water under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Physical disturbance and strikes: Impacts from vessels and in-water device activities, military expended materials, seafloor devices, and pile driving under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. The increase in bottom area affected from Alternative 1 to 2 for military expended materials is only 0.026 acres.
Section 3.4, Vegetation	**Alternative 1 (Preferred Alternative):** • Explosives: The effects of explosives under Alternative 1 on marine vegetation are not expected to result in detectable changes in growth, survival, or propagation, or result in population-level impacts. • Physical disturbance and strikes: The Action Proponents will implement mitigation tailored to reducing the impact of physical disturbance and strike on sensitive habitats that feature vegetation. The mitigation area restrictions for vegetation are mapped in Section 3.3 (Habitats) because they primarily address impacts on the seafloor habitat of vegetation and other biological resources. **Alternative 2:** • Explosives: Impacts from explosives in water under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Physical disturbance and strikes: Impacts from physical disturbance and strike (vessels and in-water device activities, military expended materials, seafloor devices, and pile driving) on sensitive habitats under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing.
Section 3.5, Invertebrates	**Alternative 1 (Preferred Alternative):** • Acoustics: Expected impact of noise would be mostly limited to offshore surface layers of the water column where zooplankton, squid, and jellyfish are prevalent at night when training and testing occur less frequently. Invertebrate populations are typically lower offshore, where most training and testing occurs, due to the scarcity of habitat structure and comparatively lower nutrient levels. At nearshore and Study Area inshore locations where occasional pierside sonar, air gun, or pile driving actions occur, the invertebrate communities are relatively resilient and occupy soft bottom or artificial substrate communities. Because the number of individuals affected would be small relative to population numbers, population-level impacts are unlikely. • Explosives: Explosives produce pressure waves that can harm invertebrates. Most explosives occur in offshore surface waters where zooplankton, squid, and jellyfish are most prevalent at night, which is when training and testing with explosives does not

Table ES.5-1: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	*Summary of Impacts*
	typically occur. Invertebrate populations are generally less abundant offshore than inshore due to the scarcity of habitat structure and comparatively lower nutrient levels. Exceptions occur where explosives are used on the bottom within nearshore or inshore waters on or near sensitive live hard bottom communities that are not mapped or otherwise protected. Soft bottom communities are resilient to occasional disturbances. Due to the relatively small number of individuals affected, population-level impacts are unlikely. • Energy: The proposed activities would produce electromagnetic energy that briefly affects a very limited area of water, based on the relatively weak magnetic fields and mobile nature of the stressors. Whereas some invertebrate species can detect magnetic fields, the effect has only been documented at much higher field strength than what the proposed activities generate. High-energy lasers can damage invertebrates. However, the effects are limited to surface waters where relatively few invertebrate species occur (zooplankton, squid, jellyfish) and mostly at night when actions do not typically occur. Additionally, high-energy lasers have an automatic cutoff safety feature that shuts down the laser if the target is lost. Due to the relatively small number of individuals that may be affected, population-level impacts are unlikely. • Physical disturbance and strikes: Invertebrates could experience physical disturbance and strike impacts from vessels and in-water devices, military expended materials, seafloor devices, and pile driving. The most risk occurs offshore (where invertebrates are less abundant) and near the surface where relatively few invertebrates occur during the day when actions are typically occurring. Impacts on the bottom may also occur to relatively sparse deep-sea corals and sponges from military expended materials. Relatively few expended materials are used in nearshore and inshore bottom areas where invertebrates are the most abundant. Exceptions occur for actions taking place within inshore and nearshore waters over primarily soft bottom communities, such as vessel transits, inshore and nearshore vessel training, nearshore explosive ordnance disposal training, operation of bottom-crawling seafloor devices, and pile driving. Invertebrate communities in affected soft bottom areas are naturally resilient to occasional disturbances. Accordingly, population-level impacts are unlikely. • Entanglement: Invertebrates could be entangled by various expended materials (wires, cables, decelerators/parachutes). Most entanglement risk occurs in offshore areas where invertebrates are relatively less abundant. The risk of entangling invertebrates is minimized by the typically linear and rigid nature of the expended structures (wires, cables), although decelerators/parachutes have mesh that could pose a risk to those invertebrates that are large and slow enough to be entangled (jellyfish). Accordingly, population-level impacts are unlikely. • Ingestion: Small, expended materials and material fragments pose an ingestion risk to some invertebrates. However, most military expended materials are too large to be ingested, and many invertebrate species are unlikely to consume an item that does not visually or chemically resemble its natural food. Exceptions occur for materials fragmented by explosive charges or weathering, which could be ingested by filter- or deposit-feeding invertebrates. Ingestion of such materials would likely occur infrequently, and only invertebrates located very close to the fragmented materials would potentially be affected. Accordingly, population-level impacts are unlikely.

Table ES.5-1: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	*Summary of Impacts*
	Alternative 2: • Acoustics: Impacts from acoustics under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Explosives: Impacts from explosives in water under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Energy: Impacts from energy (in-water electromagnetic devices and high-energy lasers) under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Physical disturbance and strikes: Impacts from physical disturbance and strikes (vessels and in-water device activities, military expended materials, seafloor devices, and pile driving) under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. There would be no pile driving associated with testing activities under this alternative. • Entanglement: Impacts from entanglement (wires and cables, decelerators/parachutes, and biodegradable polymers) under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Ingestion: Impacts from ingestion (military expended materials – munitions and military expended materials other than munitions) under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing.
Section 3.6, Fishes	**Alternative 1 (Preferred Alternative):** • Acoustics: The use of each acoustic substressor (sonar and other transducers, air guns, pile driving, vessel noise, aircraft noise, and weapons noise) could result in impacts on fishes. Some sonars, vessel and weapons noise could result in masking, physiological responses, or behavioral reactions. Aircraft noise would not likely result in impacts other than brief, mild behavioral responses in fishes that are close to the surface. Each of these substressors would be unlikely to result in temporary threshold shift. Air guns and pile driving have the potential to result in mortality, injury, or hearing loss at very short ranges (tens of meters) in addition to the effects listed above. Most impacts are expected to be temporary and infrequent as most activities involving acoustic stressors would be temporary, localized, and infrequent resulting in short-term, and mild to moderate impacts. More severe impacts (mortality) could lead to permanent effects for individuals but, overall, long-term consequences for fish populations are not expected. • Explosives: The use of explosives could result in impacts on fishes within the Study Area. Sound and energy from explosions can cause mortality, injury, hearing loss, masking, physiological stress, or behavioral responses. The time scale of individual explosions is very limited, and military readiness activities involving explosions are dispersed in space and time, therefore, repeated exposure of individuals is unlikely. Most effects such as hearing loss or behavioral responses are expected to be short term and localized. More severe impacts (mortality) could lead to permanent effects for individuals but, overall, long-term consequences for fish populations are not expected.

Table ES.5-1: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	*Summary of Impacts*
	• Energy: The use of electromagnetic devices may elicit brief behavioral or physiological stress responses only in those exposed fishes that are able to detect electromagnetic properties. The impacts are expected to be temporary, minor, and limited to highly localized areas. Population-level impacts are unlikely. Exposure to energy stressors from military readiness activities would not result in significant impacts to fish. In-air electromagnetic devices are not applicable to fishes because of the lack of transmission of electromagnetic radiation across the air/water interface and the typical distance between fishes and in-air sources. • Physical disturbance and strikes: The use of vessels, in-water devices, military expended materials, and seafloor devices present a risk for collision, stress response, or impacts caused by sediment disturbance, particularly near coastal areas and bathymetric features where fish densities are higher. Most fishes are mobile and have sensory capabilities that enable them to detect and avoid vessels and other items. Behavioral and stress responses would be temporary. Exposure to physical disturbance and strike stressors from military readiness activities would not result in significant impacts to fish. • Entanglement: Fishes could be exposed to multiple entanglement stressors. The potential for impacts is dependent on the physical properties of the expended materials and the likelihood that a fish would encounter a potential entanglement stressor and then become entangled in it. Physical characteristics of wires and cables, decelerators/parachutes, and biodegradable polymers, combined with the sparse distribution of these items throughout the Study Area, suggests a low potential for fishes to encounter and become entangled in them. Because of the low numbers of fish potentially impacted by entanglement stressors, population-level impacts are unlikely. Exposure to entanglement stressors from military readiness activities would not result in significant impacts to fish. • Ingestion: Military expended materials from munitions, military expended materials other than munitions, and biodegradable polymers present an ingestion risk to fishes that forage at the surface, in the water column, and on the seafloor. The likelihood that expended items would be ingested and cause an adverse effect would depend on the size and feeding habits of a fish, the rate at which a fish would encounter items, and the composition and physical characteristics of the item. Because of the low numbers of fish potentially impacted by ingestion stressors, population-level impacts are unlikely. Exposure to ingestions stressors from military readiness activities would not result in significant impacts to fish. **Alternative 2:** • Acoustics: Impacts from acoustics (sonar and other transducers, air guns, pile driving, vessel noise, aircraft noise, and weapons noise) under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Explosives: Impacts from explosives in water under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Energy: Impacts from energy (in-water electromagnetic devices and high-energy lasers) under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing.

Table ES.5-1: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	*Summary of Impacts*
	• Physical disturbance and strikes: Impacts from physical disturbance and strikes (vessels and in-water device activities, military expended materials, seafloor devices, and pile driving) under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Entanglement: Impacts from entanglement (wires and cables, decelerators/parachutes, and biodegradable polymers) under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions are the same for both training and testing. There would be no use of biodegradable polymers associated with training activities under this alternative. • Ingestion: Impacts from ingestion (military expended materials – munitions and military expended materials other than munitions) under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions are the same for both training and testing.
Section 3.7, Marine Mammals	**Alternative 1 (Preferred Alternative):** • Acoustics: Marine mammals may be exposed to multiple acoustic stressors, including sonars and other transducers (hereafter called sonars), air guns, pile driving, vessel noise, aircraft noise, and weapons noise. The potential for exposure varies for each marine mammal population present in the Study Area. Exposures to sound-producing activities may cause auditory masking, physiological stress, or minor behavioral responses. Exposure to some sonars, air guns, and pile driving may also affect hearing (temporary threshold shift [TTS] or auditory injury [AINJ]) and cause significant behavioral reactions. The number of auditory and significant behavioral impacts are estimated for each stock. Susceptibility to these impacts differs among marine mammal auditory and behavioral groups. Although individual marine mammals would be impacted, no impacts to marine mammal populations are anticipated. • Explosives: The potential for exposure to explosives (in the water or near the water surface) varies for each marine mammal population present in the Study Area. The impulsive, broadband sounds introduced into the marine environment may cause auditory effects (TTS or AINJ), auditory masking, physiological stress, and behavioral responses. Explosions in the water or near the water's surface present a risk to marine mammals located near the explosion, because the resulting shock waves can injure or kill an animal. The number of auditory (TTS and AINJ), non-auditory injury (injury and mortality), and significant behavioral impacts are estimated for each stock. Susceptibility to these impacts differs among marine mammal species and auditory groups. Although individual marine mammals would be impacted, no impacts to marine mammal populations are anticipated. • Energy: Based on the relatively weak strength of the electromagnetic field created by Navy activities, a marine mammal would have to be in close proximity for there to be any effect and impacts on marine mammal migrating behaviors and navigational patterns are not anticipated. Potential impacts from high-energy lasers would only result for marine mammals directly struck by the laser beam. Our analysis demonstrates with a high level of certainty that no marine mammals would be struck by a high-energy laser. Energy stressors are temporary and localized in nature and based on patchy distribution of animals, no impacts to individual marine mammals and marine mammal populations are anticipated. • Physical disturbance and strikes: Historical data on Action Proponents' ship strike records demonstrate a low occurrence of interactions with marine mammals over the last 15 years. Since the Action Proponents do not anticipate a higher level of vessel use

Table ES.5-1: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	*Summary of Impacts*
	compared to the last decade, the potential for striking a marine mammal remains low. Physical disturbance of marine mammals due to vessel movement and in-water decides may also occur, but any stress response of avoidance behavior would not be severe enough to have long-term fitness consequences for individual marine mammals. Results for each of these physical disturbance and strike stressors suggest a very low potential for marine mammals to be struck by any of these items. Long-term consequences to marine mammal populations from physical disturbance and strike stressors associated with miliary readiness activities are not anticipated. • Entanglement: Physical characteristics of wires and cables, decelerators/parachutes, and biodegradable polymers combined with the sparse distribution of these items throughout the Study Area indicate a very low potential for marine mammals to encounter and become entangled in them. Long-term impacts to individual marine mammals and marine mammal populations from entanglement stressors associated with training and testing activities are not anticipated. • Ingestion: Adverse impacts from ingestion of military expended materials would be limited to the unlikely event that a marine mammal would be harmed by ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system. The likelihood that a marine mammal would encounter and subsequently ingest a military expended item associated with military readiness activities is considered low. Long-term consequences to marine mammal populations from ingestion stressors associated with military readiness activities are not anticipated. **Alternative 2:** • Acoustics: Impacts from acoustics are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. The only difference in sonar and other transducer uses between Alternatives 1 and 2 is that the number of sonar hours used would be greater under Alternative 2. • Explosives: Under Alternative 2, there would be an increase in use of some explosive bins compared to Alternative 1. This would increase impacts to some stocks. Still, impacts from explosives in water under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions are the same for both training and testing. • Energy: Impacts under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Physical disturbance and strikes: Impacts from vessels and in-water device activities, military expended materials, and seafloor device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Entanglement: Impacts from wires and cables, decelerators/parachutes, and biodegradable polymers under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Ingestion: Impacts from military expended materials – munitions and military expended materials other than munitions under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing.

Table ES.5-1: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Section 3.8, Reptiles	**Alternative 1 (Preferred Alternative):** • Acoustics: Training and testing activities have the potential to expose reptiles to multiple types of acoustic stressors, including sonars, other transducers, air guns, pile driving, and vessel, aircraft, and weapons noise. Reptiles could be affected by only a limited portion of acoustic stressors because reptiles have limited hearing abilities. Exposures to sound-producing activities present risks that could range from hearing loss, auditory masking, physiological stress, and changes in behavior, while non-auditory injury, and mortality are unlikely to occur under realistic conditions. Sea turtles would be exposed to acoustic stressors in the nearshore and offshore portions of the Study Area, while crocodilians and terrapins would be exposed at inshore locations. • Explosives: Explosions in the water or near the water's surface present a risk to reptiles located in close proximity to the explosion, because the shock waves produced by explosives could cause injury or result in the death. If further away from the explosion, impulsive, broadband sounds introduced into the marine environment may cause hearing loss, masking, physiological stress, or changes in behavior. Sea turtles would be exposed to explosive stressors in the nearshore and offshore portions of the Study Area, while crocodilians and terrapins would be exposed to explosive stressors at inshore locations. • Energy: All life stages of some sea turtles have been documented to orient to Earth's magnetic field for directional swimming, positioning within ocean currents, and imprinting on the magnetic field of their natal beaches when hatchlings for when they return to nest at maturity. Crocodilians and terrapins can also detect electromagnetic fields but these species stay predominantly inshore during their lifetime compared to sea turtles. Crocodilian and terrapin directional orientation and natal nesting grounds are likely more reliant on environmental cues (visual, shoreline shape, currents). Use of in-water electromagnetic devices has the potential to mask navigation of reptiles. Because use of these devices would be away from nearshore waters where crocodilians and terrapins may be present, masking is more likely to be a risk for sea turtles. The magnetic fields generated by electromagnetic devices used in military readiness activities are of relatively miniscule strength. Fields and electrical pulses may include no reaction, avoidance, habituation, changes in activity level, or attraction, but the range of effects would be small and only occur near the source. High-energy lasers are directed at surface targets and would only impact reptiles very near the surface if the laser missed its target. Because high-energy lasers would only be used in open ocean areas, this stressor is not anticipated to impact crocodilians and terrapins as they would not occur where high-energy lasers are used. The potential for a sea turtle to be struck by a high-energy laser is low because laser platforms are typically helicopters and ships and sea turtles at sea would likely move away or submerge in response to other stressors, such as ship or aircraft noise. It is expected that some sea turtles would not exhibit a response to an oncoming vessel or aircraft, increasing the risk of contact with the laser beam if the target was missed for those individual animals. Due to the relatively small number of individuals that may be affected, population-level impacts are unlikely. • Physical disturbance and strikes: Vessels, in-water devices, military expended materials, and seafloor devices present a risk for collision with reptiles, particularly where densities are higher. Foraging behavior of sea turtle species such as Kemp's ridley and loggerheads that spend extended periods foraging at depth, limit surface time when they would be at most risk of a vessel strike. However, all sea turtles spend time basking and resting on the surface so there is a potential risk of a strike to all sea turtle species. Crocodilians demonstrate avoidance behaviors of vessels in nearshore waters but are at increased risk within narrow channels where avoidance is restricted. Terrapins have been observed to not react at all to approaching vessels which increases their risk of a vessel strike. Most in-water devices, such as unmanned underwater vehicles, move slowly or are closely monitored by observers. However, detecting the presence of reptiles is more difficult than larger marine wildlife. Strike potential by expended materials is statistically

Table ES.5-1: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

	small. Materials will slow in their velocity as they approach the bottom of the water so reptiles are likely to avoid the falling material or if awoken, would startle away with a negligible risk of injury. Strike and disturbance of reptiles from seafloor devices is possible but unlikely as they would encounter the seafloor device and avoid it. Because of the low numbers of reptiles potentially impacted by activities that may potentially cause a physical disturbance and strike, population-level effects are unlikely. Further, visual observation mitigation would help reduce the potential for impacts from physical disturbance and strike stressors on reptiles. • <u>Entanglement</u>: Sea turtles could be exposed to multiple entanglement stressors within the inshore and offshore training and testing locations. Entanglement stressors are not anticipated to impact crocodilians or terrapins because activities that expend materials that present a potential entanglement risk would not occur within crocodilian or terrapin habitats. The potential for impacts to sea turtles is dependent on the physical properties of the expended materials and the likelihood that a sea turtle would encounter a potential stressor and then become entangled in it. Physical characteristics of wires and cables, decelerators/parachutes, and biodegradable polymers combined with the sparse distribution of these items throughout the Study Area indicates a very low potential for sea turtles to encounter and become entangled in them. Long-term impacts on individual reptiles and reptile populations from entanglement stressors associated with military readiness activities are not anticipated. • <u>Ingestion</u>: Military readiness activities have the potential to expose reptiles to multiple ingestion stressors and associated impacts within the inshore and offshore training and testing locations. The type of impact depends on the area of operation as well as the military expended items and reptile behaviors, particularly feeding behavior. Sea turtles have been documented to ingest materials such as plastics while foraging and leatherbacks, for example, have been observed mistaking materials like plastic bags for possibly prey species (jellyfish). Crocodilians have the potential to ingest military expended materials and/or military expended materials other than munitions, but ingestion of non-prey items is generally not a concern for these species. Diamondback terrapins, specifically larger mature females, have been documented ingesting non-prey items and thus would be at risk. Adverse impacts from ingestion of military expended materials would be limited to the unlikely event that a reptile would be harmed by ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system. There are also various ingestion pathways other than direct consumption of materials. This could be through small materials floating in the water, adherence to aquatic vegetation, or trophic transfer by consuming contaminated filter-feeding prey. The likelihood that a reptile would encounter and subsequently ingest a military expended item associated with military readiness activities is considered low and long-term consequences to reptile populations are not anticipated. **<u>Alternative 2</u>:** • <u>Acoustics</u>: Impacts from acoustics are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. The only difference in sonar use between Alternatives 1 and 2 is that the number of sonar hours used would be greater under Alternative 2. • <u>Explosives</u>: Impacts from explosives under Alternative 2 would increase for reptiles but are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • <u>Energy:</u> Impacts from in-water electromagnetic devices and high-energy lasers under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • <u>Physical disturbance and strikes</u>: Impacts from physical disturbance and strike under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing.

Table ES.5-1: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	*Summary of Impacts*
	• Entanglement: Impacts from wires and cables, decelerators/parachutes, and biodegradable polymer under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Ingestion: Impacts from military expended materials – munitions and military expended materials other than munitions under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing.
Section 3.9, Birds and Bats	**Alternative 1 (Preferred Alternative):** • Acoustics: Unless very close to an intense sound source, responses by birds to acoustic stressors would likely be limited to short-term behavioral responses. Some birds may be temporarily displaced and there may be temporary increases in stress levels. Although individual birds may be impacted, population-level impacts would not occur. Unlike other mammals, bats are not susceptible to temporary and permanent threshold shifts. Though bats are less likely than birds to be exposed to noise from the proposed activities, because of their infrequent presence above open water, they too may be temporarily displaced during foraging but would return shortly after the noise ceases. Although individual bats may be impacted, population-level impacts would not occur. • Explosives: Birds and bats could be exposed to in-air explosions. Sounds generated by most small underwater explosions are unlikely to disturb birds or bats above the water surface. However, if a detonation is sufficiently large or is near the water surface, birds and bats above the water surface could be injured or killed. Detonations in air could injure birds or bats while either in flight or birds at the water surface; however, detonations in air during anti-air warfare training and testing would typically occur at much higher altitudes where seabirds, migrating birds, and bats are less likely to be present. Detonations can result in fish kills, which may attract birds. If this occurred during training or testing where multiple detonations take place, bird mortalities or injuries are possible. An explosive detonation would likely cause a startle reaction, as the exposure would be brief, and any reactions are expected to be short term. Although a few individuals may experience long-term impacts and potential mortality, population-level impacts would not occur. • Energy: The impact of energy stressors on birds and bats is expected to be negligible based on (1) the limited geographic area in which they are used, (2) the rare chance that an individual bird or bat would be exposed to these devices while in use, and (3) the tendency of birds and bats to temporarily avoid areas of activity when and where the devices are in use. The impacts of energy stressors would be limited to individual cases where a bird or bat might become temporarily disoriented or be injured. Although a small number of individuals may be impacted, no population-level impacts would occur. • Physical disturbance and strikes: There are potential for individual birds to be injured or killed by physical disturbance and strikes during training and testing. However, there would not be long-term species or population-level impacts due to the vast area over which training and testing activities occur and the small size of birds and their ability to flee disturbance. Impacts to bats would be similar to, but less than, those described for birds since bats rarely occur in the Study Area compared to birds and because bats are most active from dusk through dawn when training and testing is limited.

Table ES.5-1: Summary of Environmental Impacts for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Resource Category	*Summary of Impacts*
	• Entanglement: Entanglement stressors have the potential to impact birds. However, the likelihood would be low because the relatively small quantities of materials that could cause entanglement would be dispersed over very wide areas, often in locations or depth zones outside the range or foraging abilities of most birds. A small number of individuals may be impacted, but no effects at the population level would occur. Since bats do not occur in the water column and rarely occur at the water surface in the Study Area, no impacts to bats are anticipated from entanglement stressors. • Ingestion: It is possible that persistent expended materials could be accidentally ingested by birds while they were foraging for natural prey items, though the probability of this event is low as (1) foraging depths of diving birds is generally restricted to the surface of the water or shallow depths, (2) the material is unlikely to be mistaken for prey, and (3) most of the material remains at or near the sea surface for a short length of time. No population-level effect to any bird species would occur. Since bats do not occur in the water column and rarely feed at the water surface in the Study Area, no impacts to bats are anticipated from ingestion stressors. **Alternative 2:** • Acoustics: Impacts under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Explosives: Impacts under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Energy: Impacts under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Physical disturbance and strikes: Impacts under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Entanglement: Impacts under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing. • Ingestion: Impacts under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing.

Notes: AINJ = auditory injury; TTS = temporary threshold shift

ES.6 Mitigation

The Navy has been mitigating impacts from military readiness activities on environmental and cultural resources throughout areas where it trains and tests for more than two decades. In coordination with the appropriate regulatory agencies, the Action Proponents developed mitigation measures to avoid or reduce potential impacts under whichever action alternative is selected. Chapter 5 (Mitigation) presents full descriptions of the visual observation and geographic mitigation requirements, descriptions of the development and assessment processes, and discussions of measures considered but eliminated. Figure ES-2 displays the geographic mitigation areas in the Study Area. Additional information on mitigation areas is presented in Section 5.7 (Geographic Mitigation).

ES.7 Public Involvement

The Navy published a Notice of Intent for this Supplemental EIS/OEIS in the *Federal Register* and several newspapers on November 17, 2023. In addition, Notice of Intent and Scoping Notification letters were distributed to federal, state, and local elected officials and government agencies. The Notice of Intent provided an overview of the Proposed Action and the scope of the Supplemental EIS/OEIS, and initiated the scoping process.

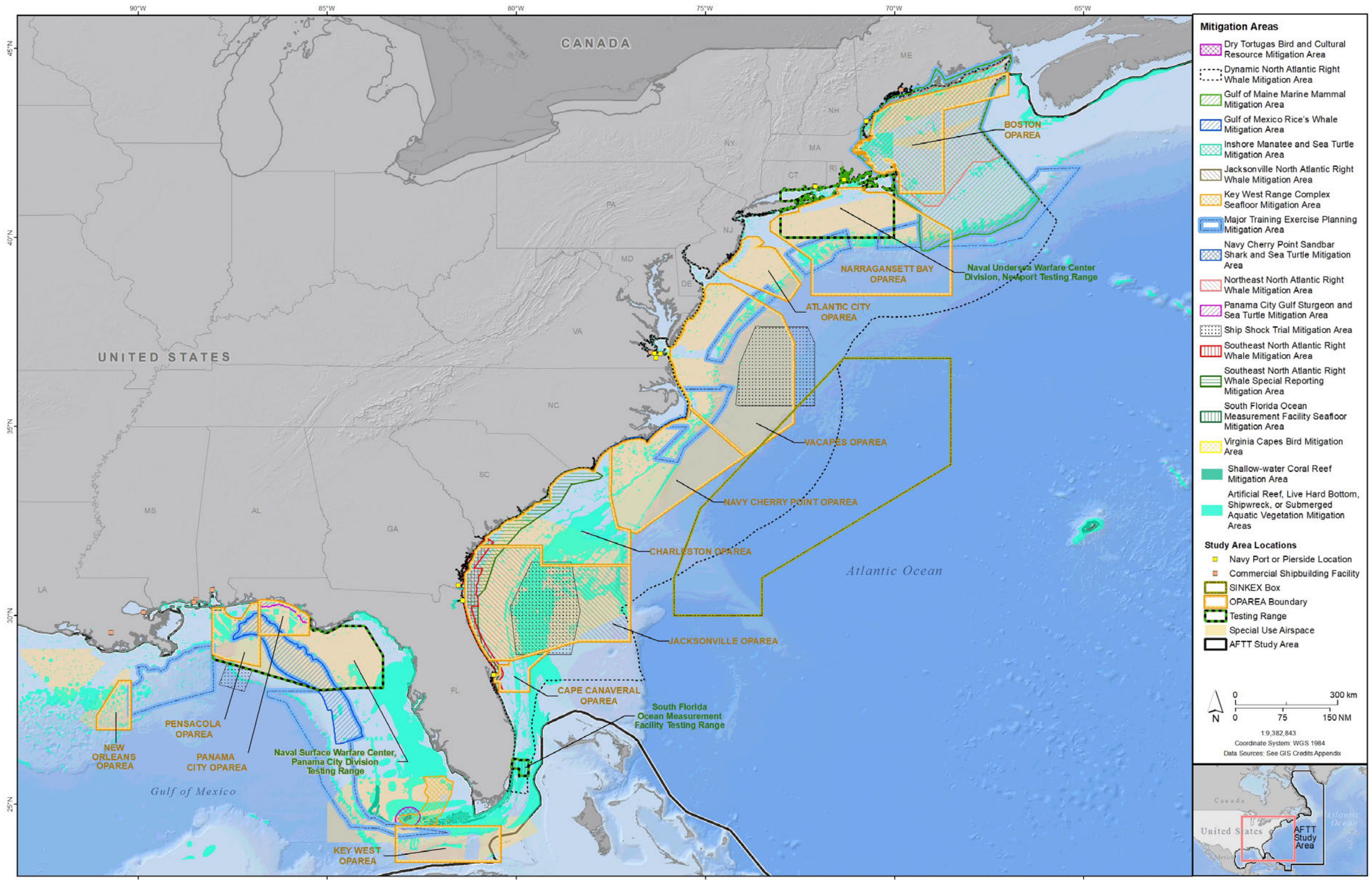
ES.7.1 Scoping Process

Notice of Intent and Scoping Notification letters were distributed at the beginning of the scoping period (November 17, 2023) to federally recognized tribes; state-elected officials; and federal, regional, and state agencies. On the same day, emails were sent to recipients on the project mailing list, including individuals, non-profit organizations, and for-profit organizations. The email provided information on the Proposed Action, methods for commenting, and the project website address to obtain more information.

To announce the scoping period, advertisements were placed in 23 newspapers throughout the Study Area. The advertisements included a description of the Proposed Action, the address of the project website, the duration of the comment period, and information on how to provide comments.

ES.7.2 Scoping Comments

The Action Proponents received comments from federal agencies, state agencies, non-governmental organizations, and individuals. A total of 15 scoping comments were received. The comments provided agency input, urged consideration of protected species, and provided general support for the Proposed Action.



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise

Figure ES-2: Mitigation Areas in the Study Area

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References

U.S. Department of the Navy. (2018). *Atlantic Fleet Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement*. Norfolk, VA: Naval Facilities Engineering Command Atlantic.

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ABBREVIATIONS AND ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
AFTT	Atlantic Fleet Training and Testing
AINJ	auditory injury
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
dB	decibel
dB re 1 µPa	decibels referenced to 1 micropascal
EIS	Environmental Impact Statement
ESA	Endangered Species Act
GHG	greenhouse gas
Hz	Hertz
kHz	kilohertz
lb.	pounds
L_{max}	maximum sound level
m	meters
MMPA	Marine Mammal Protection Act
Navy	U.S. Department of the Navy
NEPA	National Environmental Policy Act
NEW	net explosive weight
NM	nautical miles
NMFS	National Marine Fisheries Service
OEIS	Overseas Environmental Impact Statement
OPAREA	operating area
PTS	permanent threshold shift
SC-GHG	social cost of GHG
SEL	sound exposure level
SINKEX	Sinking Exercise
SPL	sound pressure level
TTS	temporary threshold shift
U.S.C.	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

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1 PURPOSE AND NEED

1.1 INTRODUCTION

The United States (U.S.) Department of the Navy (including both the U.S. Navy and the U.S. Marine Corps) and the U.S. Coast Guard as a Joint Lead Agency (hereinafter jointly referred to as the Action Proponents or Naval Services) have prepared this Supplement to the *2018 Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (EIS/OEIS) (U.S. Department of the Navy, 2018) (hereinafter referred to as the 2018 Final EIS/OEIS) pursuant to 40 Code of Federal Regulations (CFR) section 1502.9(d)(2). The Action Proponents propose to conduct training activities and research, development, testing, and evaluation (hereinafter referred to as "testing") activities in the Atlantic Fleet Training and Testing (AFTT) Study Area (Figure 1.4-1). The Study Area includes areas of the western Atlantic Ocean along the east coast of North America, Gulf of Mexico, and portions of the Caribbean Sea. It also includes Navy pierside locations and port transit channels, bays, harbors, inshore waterways, and civilian ports where training and testing activities occur as well as transits between homeports and operating areas. Training and testing activities, also referred to as "military readiness activities," prepare the Action Proponents to fulfill their mission to protect and defend the United States and its allies but have the potential to affect the environment. The Action Proponents prepared this Supplemental EIS/OEIS to comply with the National Environmental Policy Act (NEPA) and Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*, by assessing the potential environmental impacts associated with the proposed military readiness activities to be conducted within the Study Area.

This Supplemental EIS/OEIS was prepared to update the Navy's assessment of the potential environmental impacts associated with proposed military readiness activities to be conducted in the Study Area. This Supplemental EIS/OEIS will analyze some modifications to the Proposed Action as well as to incorporate the continuing maturation of the science. It was prepared, using the best available science, to update the Navy's assessment of the potential environmental impacts associated with proposed new and changed military readiness activities to be conducted in the Study Area. Additionally, this Supplemental EIS/OEIS analysis of impacts on the marine environment has resulted in different impacts from the previous EIS. Finally, this Supplemental EIS/OEIS also supports the regulatory reauthorization under various environmental statutes, to include the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). These proposed activities are generally consistent with those analyzed in the 2018 Final EIS/OEIS and are representative of military readiness activities that the Action Proponents have been conducting in the Study Area for decades. These military readiness activities include the use of active sonar and other acoustic sources, as well as the use of explosives.

Meanwhile, the world is quickly transitioning into a new age of warfare, one in which the integration of information, technology, and artificial intelligence will promote or degrade deterrence and determine victory in conflict. As the world has seen in recent conflicts, inexpensive dual-use and commercial off-the-shelf products and component parts are being increasingly utilized to destroy far more costly and advanced military systems, while small, armed groups have been able to credibly threaten international maritime shipping and global trade.

In this new era, the United States must always be ready to defend our national interests anywhere, anytime. Combat-ready naval services—forward-deployed and integrated with all elements of national power—remains our nation's most potent, flexible, and versatile instruments of military influence and deterrence against malign actors. As the United States responds to this changing security environment, our naval forces will forward deploy with a ready, capable, combat-credible fleet. The Action Proponents will conduct military readiness activities to maintain and advance our maritime dominance in the defense of our nation; train our Sailors, Marines, and Coast Guardsmen; and strengthen our strategic partnerships across the globe. "Flanked by two oceans, the United States is and has always been a maritime nation. Our economy, like the world's economy, flows through the sea. Ninety percent of global trade travels by sea. Ninety-five percent of international communications and roughly 10 trillion dollars in financial transactions each day transit via undersea fiber-optic cables. In the U.S., seaborne trade carries more tonnage and value than any other mode of transportation, generating 5.4 trillion dollars in annual commerce and supporting 31 million American jobs. There is no doubt: the seas are the lifeblood of our economy, our national security, and our way of life."[1]

1.2 The Navy's Environmental Compliance and At-Sea Policy

The Navy instituted the "At-Sea Policy" in 2000 to ensure compliance with applicable environmental regulations and policies and preserve the flexibility necessary for the Navy and Marine Corps to train and test at sea. This policy directed, in part, that Fleet Commanders develop a programmatic approach to environmental compliance at sea for ranges and operating areas within their respective geographic areas of responsibility (U.S. Department of the Navy, 2000).

The Navy is currently in the fourth phase of implementing this programmatic approach, which covers similar types of Navy, Marine Corps, and Coast Guard military readiness activities in essentially the same Study Area analyzed in the 2018 Final EIS/OEIS. For further discussion of the first three phases, please see the 2018 Final EIS/OEIS Section 1.2 (The Navy's Environmental Compliance and At-Sea Policy).

1.3 Proposed Action

The Proposed Action is to conduct military readiness activities in the Study Area (Figure 1.4-1). These proposed activities are generally consistent with those analyzed in the 2018 Final EIS/OEIS and are representative of the activities the Action Proponents have been conducting in the Study Area for decades. A detailed description of the Proposed Action is provided in Chapter 2 (Description of Proposed Action and Alternatives).

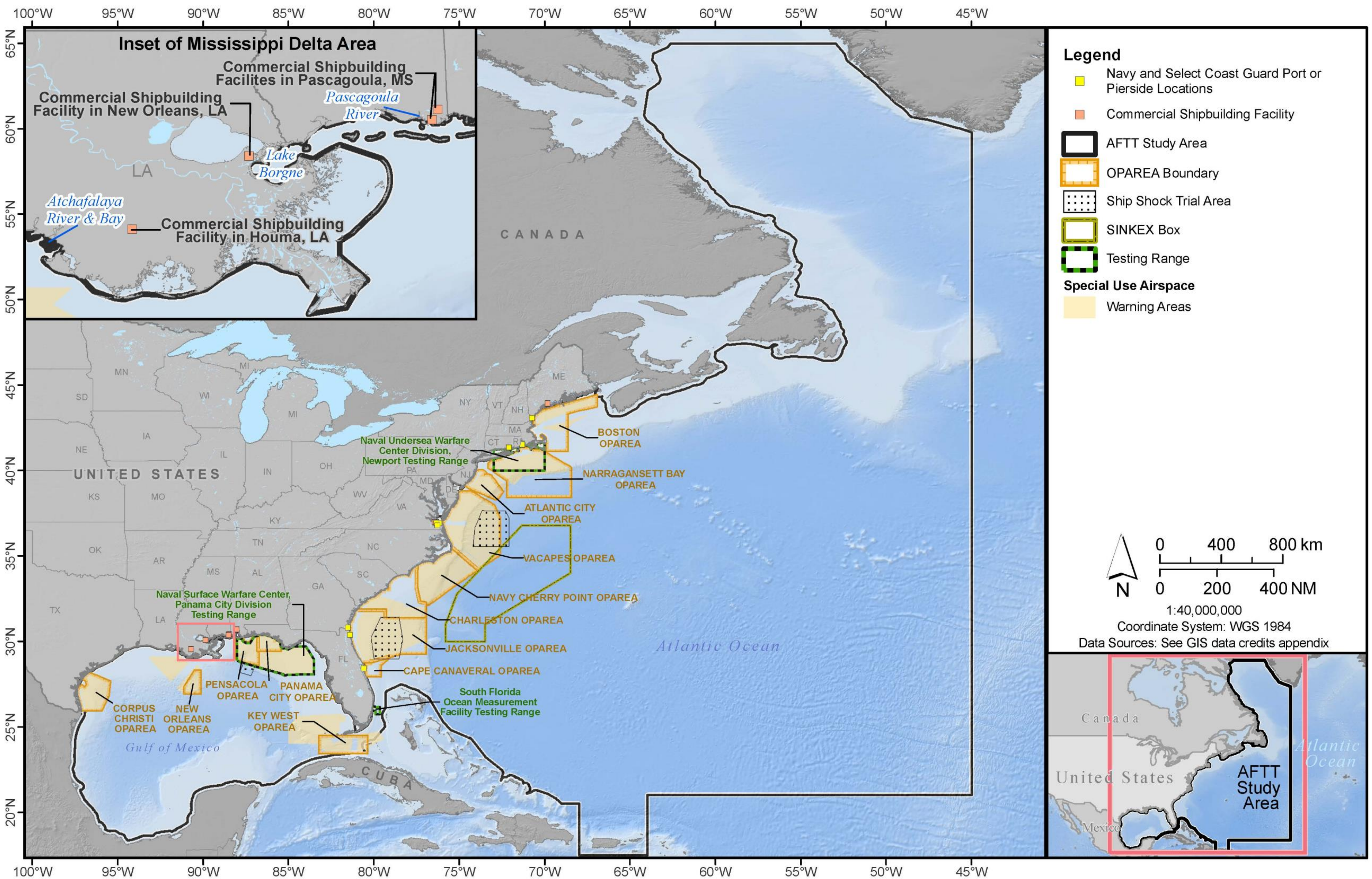
1.4 Purpose and Need

The Action Proponents and the National Marine Fisheries Service (NMFS) (as a cooperating agency under the provisions of NEPA) have coordinated from the outset and have developed this document to meet each agency's separate and distinct obligations and to support the independent decision making of all agencies. The purpose of the Proposed Action is to ensure the Action Proponents are able to organize, train, and equip service members and personnel to meet their respective national defense missions in accordance with their Congressionally mandated requirements.[2] These missions are achieved in part by conducting military readiness activities within the Study Area in accordance with established Department of the Navy military readiness requirements.

The U.S. Coast Guard's purpose for the Proposed Action is to ensure Coast Guard personnel can qualify and train jointly with, and independently of, the Navy and other services in the effective and safe operational use of Coast Guard vessels, aircraft, and weapons under realistic conditions. These activities help ensure that the Coast Guard can safely protect our nation's maritime safety, security, and natural resources in accordance with its national defense mission under the authority of 14 United States Code (U.S.C.) section 102.

[1] Admiral Lisa Franchetti, 33rd Chief of Naval Operations on the posture of the U.S. Navy before the House Committee on Appropriations, April 10, 2024

[2] See Title 10, sections 8062 (Navy), 8063 (U.S. Marine Corps), and Title 14, sections 101 and 102 U.S.C. (U.S. Coast Guard)



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA: operating area; SINKEX: Sinking Exercise; VACAPES: Virginia Capes

Figure 1.4-1: Atlantic Fleet Training and Testing Study Area

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The Action Proponents will request authorization to "take" marine mammals incidental to conducting military readiness activities in the Study Area. Take under the MMPA is defined in 16 U.S.C. section 1362 as "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." For military readiness activities, harassment is defined under this section as "(i) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment] or (ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered [Level B harassment]."

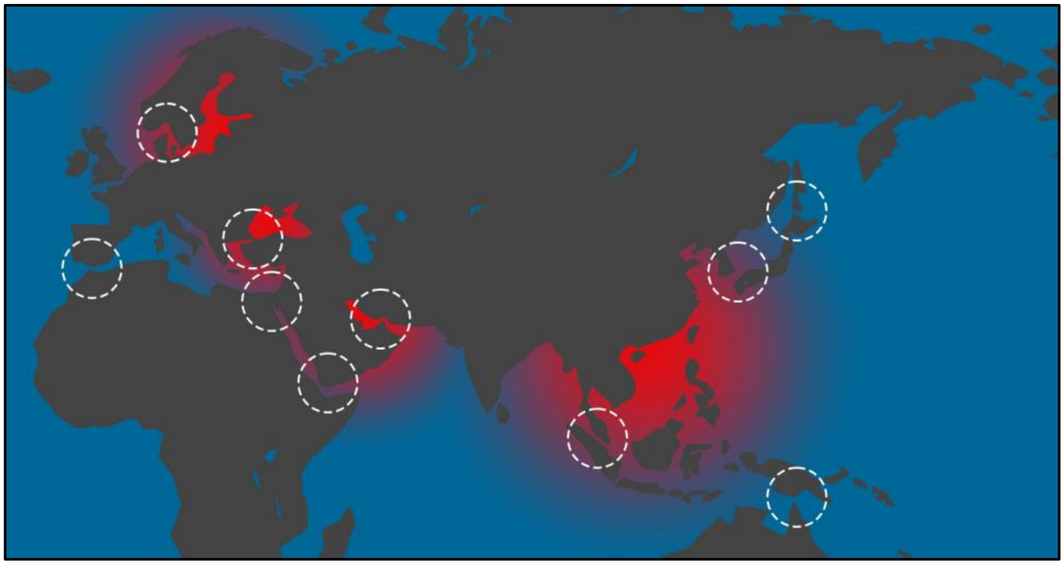
Incidental take authorizations provide an exception to the take prohibition in the MMPA and ensure that the Proposed Action complies with the MMPA and implementing regulations. Incidental take authorizations may be issued as regulations and associated Letters of Authorization under section 101(a)(5)(A) of the MMPA. The Action Proponents are requesting a rulemaking and the issuance of Letters of Authorization for the Proposed Action.

NMFS's purpose is to evaluate the Action Proponents' Proposed Action pursuant to its authority under the MMPA, and to make a determination whether to issue incidental take authorizations and Letters of Authorization, including any conditions necessary to meet the statutory mandates of the MMPA. To issue an incidental take authorization, NMFS must evaluate the best available scientific information and find that the take will have a negligible impact on the affected marine mammal species or stocks and will not have an unmitigable impact on their availability for taking for subsistence uses (the latter finding is not relevant for this Proposed Action). NMFS cannot issue an incidental take authorization unless it can make the required findings. NMFS must also prescribe permissible methods of taking, other "means of affecting the least practicable adverse impact" on the affected species or stocks and their habitat, and monitoring and reporting requirements. The need for NMFS's action is to consider the impacts of the Proposed Action on marine mammals and meet NMFS's obligations under the MMPA. This Supplemental EIS/OEIS analyzes the environmental impacts associated with issuance of the requested incidental take authorizations for military readiness activities within the Study Area. The analysis of mitigation measures considers benefits to species or stocks and their habitat and also analyzes the practicability and efficacy of each measure. This analysis of mitigation measures was used to support requirements pertaining to mitigation, monitoring, and reporting that would be specified in final MMPA regulations and subsequent Letters of Authorization.

1.4.1 Why the Navy Trains

As stated in the Chief of Naval Operations Navigation Plan (U.S. Department of the Navy, 2022), "America remains a global leader with global interests. Households and businesses throughout the United States benefit from the steady flow of resources and goods across the oceans. Our modern economy depends on access to the internet, which rides upon undersea fiber-optic cables. As we look to the future, our economic and national security will continue to rely upon unrestricted seaborne trade, unimpeded access to markets, and a free and open rules-based order." The Navy is statutorily mandated to promote the national security interests and prosperity of the United States and be prepared for prompt and sustained combat incident to operations at sea. These operations are critical in protecting U.S. national interests as 70 percent of Earth is covered in water, 80 percent of the planet's population lives within close proximity to coastal areas, and 90 percent of global commerce is conducted by sea.

The Navy's continuous presence on the world's oceans allows it to respond to a wide variety of situations. On any given day, over one-third of the Navy's ships, submarines, and aircraft are deployed to overseas locations such as those illustrated in Figure 1.4-2. Before deploying, Sailors and Marines train to develop an extensive range of capabilities to respond to threats, from full-scale armed conflict in a variety of different geographic areas and environmental conditions to humanitarian assistance and disaster relief efforts. Training prepares Sailors and Marines to be proficient in operating and maintaining the equipment, weapons, and systems they will use to accomplish their assigned missions. Further, the Marine Corps is undergoing a sweeping transformation to fulfill its role as the nation's expeditionary force-in-readiness that can meet current and future threats while simultaneously modernizing to ensure it can respond to any crisis, anywhere in accordance with the operating environment described in the National Defense Strategy (U.S. Department of Defense, 2022) and the tri-Service maritime strategy (U.S. Department of the Navy, 2020). Refer to 2018 Final EIS/OEIS Chapter 1, Section 1.4.1 (Why the Navy Trains) and Section 1.4.2 (Optimized Fleet Response Plan) for additional information on Navy training.



Source: (U.S. Department of Defense, 2022)

Figure 1.4-2: Key Maritime Regions and Geographic Choke Points under Increased Threat

1.4.2 Why the Navy Tests

The Navy's research and acquisition community, including research organizations, laboratory facilities, and systems commands, provides weapons, systems, and platforms to the Action Proponents to support its missions and give it a technological advantage over the United States' potential adversaries. This community is at the forefront of researching, developing, testing, evaluating, acquiring, and delivering modern platforms, combat systems, and related equipment to meet Fleet capability and readiness requirements. The Navy's research organizations and laboratories concentrate primarily on the development of new science and technology to conduct the initial testing of concepts that are relevant to the Navy of the future. As a result, systems commands develop ship, aircraft, and weapons systems that support all Naval platforms throughout their life cycles, from acquisition through sustainment to end of life. Refer to 2018 Final EIS/OEIS Chapter 1, Section 1.4.3 (Why the Navy Tests) for additional information on Navy testing.

The Action Proponents' research, acquisition, and testing community includes the following:

- Naval Air Systems Command, which develops, acquires, delivers, and sustains manned and unmanned naval aviation aircraft, weapons, and systems with proven capability and reliability to ensure Sailors and Marines achieve mission success.

- Naval Sea Systems Command, which develops, acquires, delivers, and maintains surface ships, submarines, unmanned vehicles, and weapon systems platforms to ensure Sailors and Marines achieve mission success.
- Office of Naval Research, which plans, fosters, encourages, and conducts a broad program of scientific research (at universities, industry, small businesses, etc.) that promotes future naval sea power, enhances national security, and meets the complex technological challenges of today's world. The Office of Naval Research is also a parent command for the Naval Research Laboratory, which operates as the Navy's corporate research laboratory and conducts a multidisciplinary program of scientific research.

The Navy's acquisition community also tests ships and systems that will be added to the Coast Guard's inventory. The U.S. Coast Guard uses the same systems and weapons as the Navy.

1.4.3 Why the United States Coast Guard Trains

The Coast Guard has broad, multifaceted, jurisdictional authority for management of activities over all waters subject to the jurisdiction of the United States. The Coast Guard's law enforcement and national defense mission authority is based in 14 U.S.C. section 102 (7), requiring the Coast Guard to "maintain a readiness to assist in the defense of the United States, including when functioning as a specialized service in the Navy pursuant to section 103." The Coast Guard successfully achieves its missions in part by conducting training within the Study Area to develop, sharpen, and maintain tactics, coordination, and personnel readiness. This Supplemental EIS/OEIS studies the potential impacts caused by Coast Guard training activities in support of their various Department of Defense statutory mission requirements. The Coast Guard activities are discussed in detail in Appendix C (U.S. Coast Guard Supporting Information).

1.5 Overview and Strategic Importance of Existing Range Complexes and Testing Ranges

The range complexes and testing ranges analyzed in this Supplemental EIS/OEIS have existed for decades, many dating back to the 1940s. Range use and infrastructure have evolved over time as military readiness requirements in support of modern warfare have evolved. The Study Area for this Supplemental EIS/OEIS is nearly the same as that covered in the 2018 Final EIS/OEIS with the addition of some inshore waters and pierside testing locations adjacent to the Gulf of Mexico.

Proximity of the AFTT range complexes to Navy, Marine Corps, and Coast Guard homeports and air stations creates efficiencies in the utilization of government resources as well as safe conditions in which forces may train and test. Action Proponents' homeports and air stations are equipped with robust search and rescue capabilities, medical facilities, and alternate airfields, all of which are necessary components of safety for military readiness activities. Proximity of ranges to homeports provides fuel savings, exposes equipment to less wear and tear, and ensures that Sailors, Marines, and Coast Guardsmen do not spend unnecessary time away from their families during the training cycle. Less time away from home is an important factor in military readiness, morale, and retention. The proximate availability of the AFTT range complexes is critical to the Action Proponents' efforts in these areas.

Systems commands and the Office of Naval Research also require access to realistic environments to conduct testing. The systems commands frequently conduct tests on Fleet range complexes and use Fleet assets to support the testing. The Study Area must provide the flexibility to meet diverse testing requirements, given the wide range of advanced platforms, systems, and capabilities that the Fleet and systems commands must demonstrate before certification for utilization by the Fleet. This is important because testing in controlled conditions similar to those in which technology could be employed enhances combat readiness.

1.6 The Environmental Planning Process

NEPA and Executive Order 12114 require federal agencies to examine the applicable environmental impacts of their proposed actions within and outside the United States and its territories. An EIS/OEIS is a detailed public document that assesses the potential effects that a major federal action might have on the environment (including the natural and biological environment). The Navy undertakes environmental planning for Navy military readiness activities in accordance with applicable laws, regulations, and Executive Orders, including Executive Order 12114.

A Supplemental EIS is prepared when the agency makes substantial changes to the proposed action that are relevant to environmental concerns (40 CFR section 1502.9(d)(1)(i)), or there are substantial new circumstances or information about the significance of adverse effects that bear on the analysis (40 CFR section 1502.9(d)(1)(ii)). An agency may also supplement a Final EIS when the agency determines that the purpose of NEPA will be furthered by doing so (40 CFR section 1502.9(d)(2)).

New information specifically addressed in this Supplemental EIS/OEIS includes updates to military readiness activities and current best available science to include an updated Navy Acoustic Effects Model; updated marine mammal density estimates developed by the Navy in cooperation with NMFS; updated Criteria and Thresholds for Acoustic and Explosive Effects Analysis developed by the Navy in cooperation with NMFS; and changes to the Study Area. Using this updated information, the Action Proponents requested the reissuance of federal regulatory permits and authorizations under the MMPA and ESA as well as other environmental compliance documents to support military readiness activity requirements within the Study Area after the current authorizations and consultations expire in 2025.

The Action Proponents must comply with all applicable federal environmental laws, regulations, and Executive Orders as discussed in the 2018 Final EIS/OEIS. Further information can be found in Chapter 6 (Regulatory Considerations) of this Supplemental EIS/OEIS.

1.7 Scope and Content

In this Supplemental EIS/OEIS, the Action Proponents have analyzed military readiness activities that could potentially affect human and natural resources, especially marine mammals, sea turtles, and other marine resources. Since the completion of the 2018 Final EIS/OEIS, the best available science has been updated, the regulatory environment has changed, the Study Area has been slightly modified, and what we know about our impacts has been refined. All of this has been incorporated into this Supplemental EIS/OEIS analysis. The range of alternatives includes the No Action Alternative and two action alternatives to the Proposed Action that are considered in this Supplemental EIS/OEIS. This Supplemental EIS/OEIS updates the 2018 analysis of direct, indirect, and cumulative impacts that may result from the Proposed Action. The U.S. Department of the Navy, in cooperation with the U.S. Coast Guard as Joint Lead Agency, is responsible for the scope and content of this Supplemental EIS/OEIS.

NMFS is a cooperating agency because the scope of the Proposed Action and alternatives involve activities that have the potential to affect protected resources under the agency's jurisdiction and for which they have special expertise, including marine mammals, threatened and endangered species, and essential fish habitat. NMFS' special expertise and authorities are based on statutory responsibilities under the MMPA, as amended (16 U.S.C. section 1361 et seq.), the ESA (16 U.S.C. section 1531 et seq.), and the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. section 1801 et seq.).

1.8 Organization of this Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement

The organization of this Supplemental EIS/OEIS is shown in Table 1.8-1.

Table 1.8-1. Organization of this Supplemental Environmental Impact Statement/ Overseas Environmental Impact Statement

Chapter/ Appendix	*Title*	*Description*
Chapter 1	Purpose and Need	Purpose of and need for the Proposed Action
Chapter 2	Description of the Proposed Action and Alternatives	Proposed Action, alternatives considered but eliminated in this Supplemental EIS/OEIS, and alternatives to be carried forward for analysis in this Supplemental EIS/OEIS
Chapter 3	Affected Environment and Environmental Consequences	Existing conditions of the affected environment and analysis of the potential impacts of the proposed military readiness activities for each alternative
Chapter 4	Cumulative Impacts	Analysis of cumulative impacts, which are the impacts of the Proposed Action when added to past, present, and reasonably foreseeable future actions
Chapter 5	Mitigation	Describes the mitigation measures that will be implemented to avoid or reduce potential impacts
Chapter 6	Regulatory Considerations	Considerations required under NEPA and description of how the Action Proponents comply with other federal, state, and local plans, policies, and regulations
Appendix A	Activity Descriptions	A description of the proposed military readiness activities
Appendix B	Activity Stressor Matrices	Relationship between stressors associated with the proposed military readiness activities and the environmental resources analyzed
Appendix C	U.S. Coast Guard Supporting Information	Additional information on U.S. Coast Guard assets and missions
Appendix D	Acoustic and Explosive Impacts Supporting Information	Background information on the acoustic and explosive energy, propagation, and methods used to determine how biological resources may be impacted
Appendix E	Acoustic and Explosives Impacts Analysis	The analysis of how biological resources are potentially impacted by acoustic and explosive energy in the water
Appendix F	Biological Resources Supplemental Information	Background and affected environment information on the biological resources found in the Study Area
Appendix G	Non-Acoustic Impacts Supporting Information	Information and methods used to determine how biological resources may be impacted by non-acoustic stressors
Appendix H	Air Quality Emissions Calculations	Background information, emission factor development, and calculations for the analysis of potential impacts to air quality
Appendix I	Military Expended Materials and Direct Strike Impact Analysis	The methods, calculations, and results for quantifying the impacts to bottom substrate from explosions, the potential for military expended materials to strike a

Table 1.8-1. Organization of this Supplemental Environmental Impact Statement/ Overseas Environmental Impact Statement (continued)

Chapter/ Appendix	*Title*	*Description*
		marine mammal or sea turtle, and the probability of a vessel strike to a marine mammal
Appendix J	Cumulative Impacts Supporting Information	Additional information to support the Chapter 4 Cumulative Impacts discussion
Appendix K	Activity Impact Determinations	The methods and significance determinations about activity level impacts to resources
Appendix L	Agency Correspondence	Copies of correspondence between the Action Proponents and federal or state agencies with respect to cooperating agency status and regulatory compliance
Appendix M	Public Involvement and Distribution	The Action Proponents' public scoping process, including copies of public notices, a list of stakeholders who were engaged via letter or email, and comments received by the Navy either via mail or electronic submittal.
Appendix N	Federal Register Notices	Documents (notices, proposed rules, final rules) published to the *Federal Register* by the Action Proponents
Appendix O	Geographic Information System Data Sources	A list of the Geographic Information System Data Sources used in the analysis by feature/layer
Appendix P	List of Preparers	The key authors and reviewers of this Supplemental EIS/OEIS

Notes: AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; NEPA = National Environmental Policy Act; OEIS = Overseas Environmental Impact Statement

References

U.S. Department of Defense. (2022). *2022 National Defense Strategy of the United States of America. Including the 2022 Nuclear Posture Review and the 2022 Missile Defense Review*. Washington, DC: U.S. Department of Defense.

U.S. Department of the Navy. (2000). *Compliance with Environmental Requirements in the Conduct of Naval Exercises or Training at Sea*. Washington, DC: The Under Secretary of the Navy.

U.S. Department of the Navy. (2018). *Atlantic Fleet Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement*. Norfolk, VA: Naval Facilities Engineering Command Atlantic.

U.S. Department of the Navy. (2020). *Advantage at Sea: Prevailing with Integrated All-Domain Naval Power (the Tri-Service Maritime Strategy)*. Washington, DC: U.S. Department of the Navy.

U.S. Department of the Navy. (2022). *Chief of Naval Operations Navigation Plan 2022*. Washington, DC: U.S. Department of the Navy.

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Supplemental Environmental Impact Statement/ Overseas Environmental Impact Statement Atlantic Fleet Training and Testing

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2 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

Proposed activities in this Supplemental Environmental Impact Statement (EIS)/Overseas EIS (OEIS) (hereinafter referred to as the "Supplemental EIS/OEIS") are consistent with those analyzed in the September 2018 Final EIS/OEIS, and are representative of the activities that the Action Proponents have been conducting in the Study Area for decades.

Modern military actions require teamwork among hundreds or thousands of people, across vast geographic areas, and the coordinated use of various equipment, ships, aircraft, and vehicles (e.g., unmanned aerial systems) to achieve success. Personnel increase in skill level by completing basic and specialized individual military training, then they advance to intermediate (e.g., unit-level training) and larger exercise training events, which culminate in advanced, integrated training composed of large groups of personnel and, in some instances, joint or combined exercises.[1]

This chapter builds upon the purpose and need as described in Chapter 1 (Purpose and Need). It describes the Study Area and identifies the primary mission areas under which these military readiness activities are conducted. Each Naval warfare community (e.g., aviation, surface, submarine, and expeditionary) conducts activities that contribute to its success in a primary mission area. Each primary mission area requires unique skills, sensors, weapons, and technologies to accomplish the mission. For example, under the anti-submarine warfare primary mission area, the surface, submarine, and aviation warfare communities each utilize different skills, sensors, and weapons to detect, locate, track, and eliminate submarine threats. The testing community contributes to the success of military readiness by anticipating and identifying technologies and systems that respond to the needs of the warfare communities.

Also included in this chapter are descriptions of activities that comprise the Proposed Action, which are necessary to meet military readiness requirements beyond 2025 and into the reasonably foreseeable future. These activities are then analyzed for their potential effects on the environment in the following chapters of this Supplemental EIS/OEIS. The type and level of activities analyzed in this Supplemental EIS/OEIS are described in Appendix A (Activity Descriptions) and Appendix C (U.S. Coast Guard Supporting Information). In accordance with the Marine Mammal Protection Act (MMPA), the Action Proponents have submitted to the National Marine Fisheries Service (NMFS) a Letter of Authorization request for the take of marine mammals incidental to military readiness activities described in this Supplemental EIS/OEIS. NMFS's proposed action will be a direct outcome of responding to the Navy's request for an incidental take authorization pursuant to the MMPA.

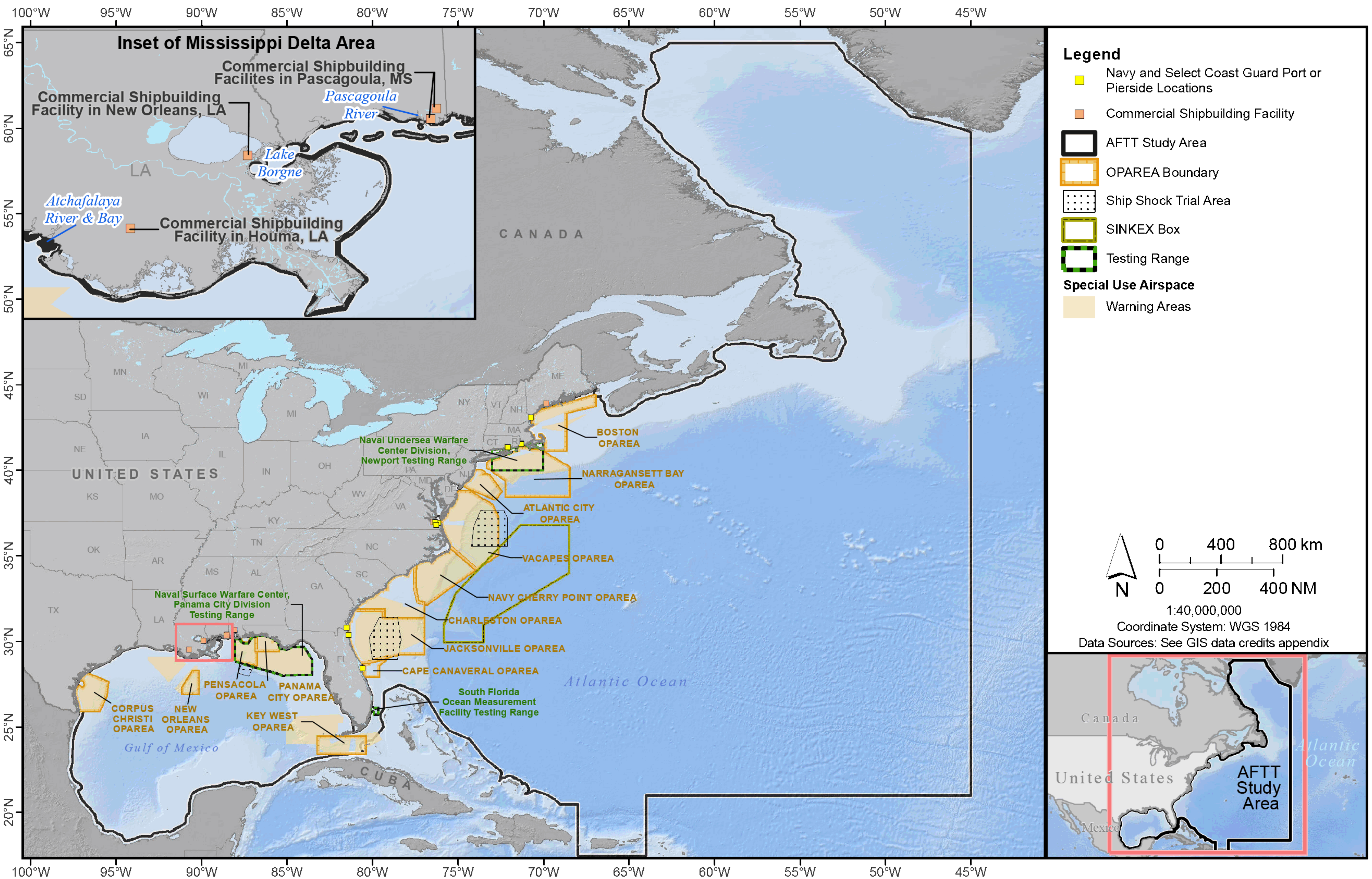
2.1 Description of the Atlantic Fleet Training and Testing Study Area

The Study Area (Figure 2.1-1) for this Supplemental EIS/OEIS is similar to the Study Area described in Section 2.1 (Description of the Atlantic Fleet Training and Testing Study Area) of the 2018 Final EIS/OEIS (U.S. Department of the Navy, 2018) and includes areas of the western Atlantic Ocean along the east coast of North America, the Gulf of Mexico, and portions of the Caribbean Sea. A Navy range complex, where training and testing of military platforms, tactics, munitions, explosives, and electronic warfare systems occur, covers a geographic area that encompasses a water component (on and below the surface), an airspace component, and, in some cases, a land component. Range complexes include

[1] Large group exercises may include carrier strike groups, expeditionary strike groups, other U.S. services, and other nations.

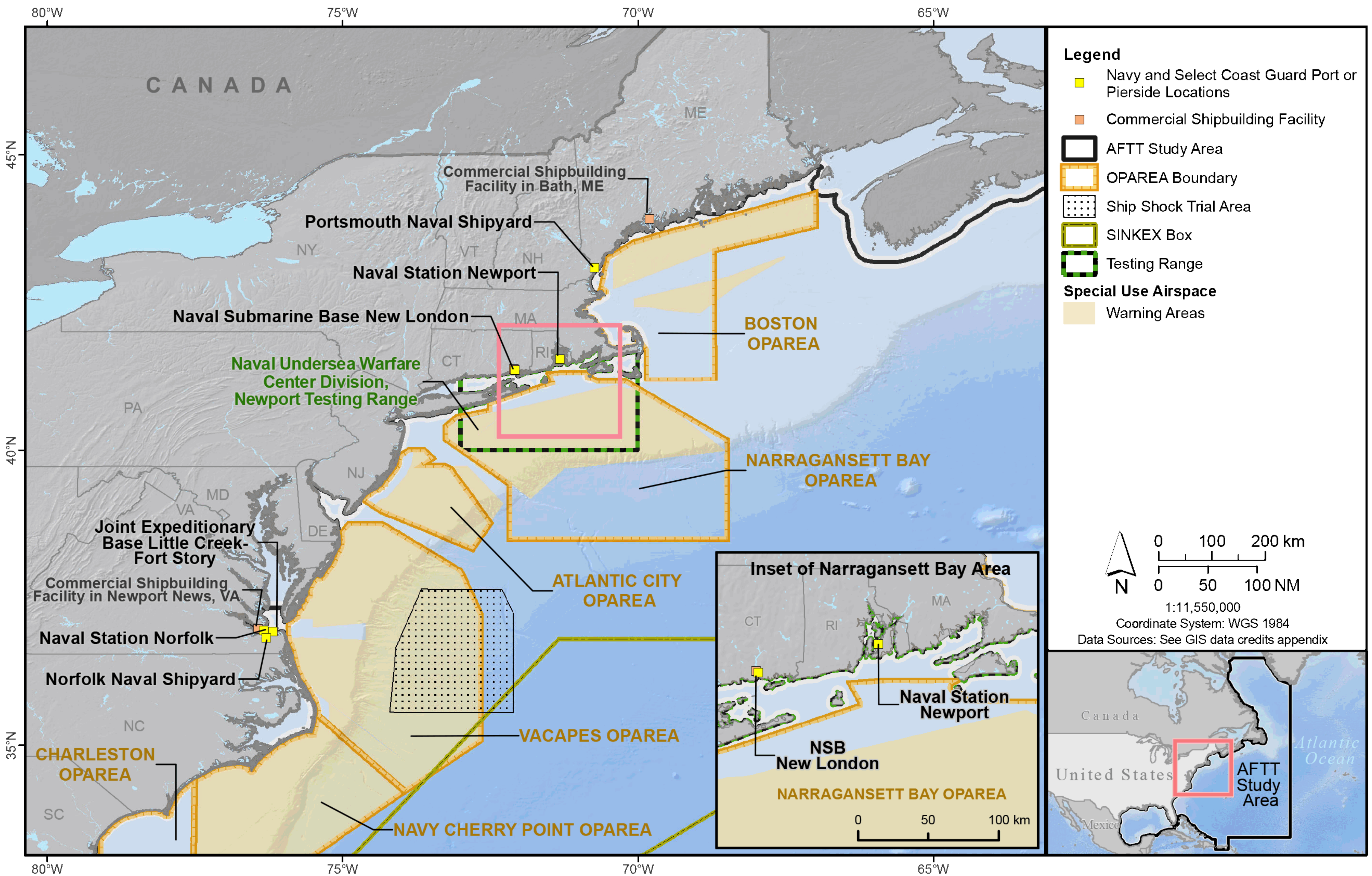
established operating areas (OPAREAs) and special use airspace, which may be further divided to provide better control of the area for safety reasons. Land components associated with the range complexes and testing ranges are not included in the Study Area and no activities on these land areas are included as part of the Proposed Action. The Study Area begins at the mean high tide line along the United States (U.S.) coast and extends east to the 45-degree west longitude line, north to the 65-degree north latitude line, and south to approximately the 20-degree north latitude line. It also includes Navy and U.S. Coast Guard pierside locations and port transit channels, bays, harbors, inshore waterways, and civilian ports where military readiness activities occur as well as vessel and aircraft transit routes over water between homeports and OPAREAs (2018 Final EIS/OEIS Section 2.1). New to the Study Area for this Supplemental EIS/OEIS are inshore waters and pierside testing locations adjacent to the Gulf of Mexico, and changes to ship shock trial areas. The Gulf of Mexico ship shock trial area was moved to the south to avoid Rice's whale core habitat, the Jacksonville ship shock area expanded, and the Key West ship shock trial area was removed. Regional maps contained in Figure 2.1-2 through Figure 2.1-7 show additional detail of the range complexes[2] and testing ranges, which are described in Table 2.1-1 and Table 2.1-2. The vast majority of military readiness activities occur within designated range complexes and testing ranges that fall within the confines of the Study Area. Updates to naming conventions and data collection methods from the 2018 Final EIS/OEIS may result in activities showing in new locations in this Supplemental EIS/OEIS. Inshore waters are defined as bays, tributaries, and inlets where the Action Proponents conduct military readiness activities, and as shown in Table 2.1-2.

[2] A Navy range complex, where training and testing of military platforms, tactics, munitions, explosives, and electronic warfare systems occur, covers a geographic area that encompass a water component (on and below the surface), an airspace component, and, in some cases, a land component. Range complexes include established OPAREAs and special use airspace, which may be further divided to provide better control of the area for safety reasons.



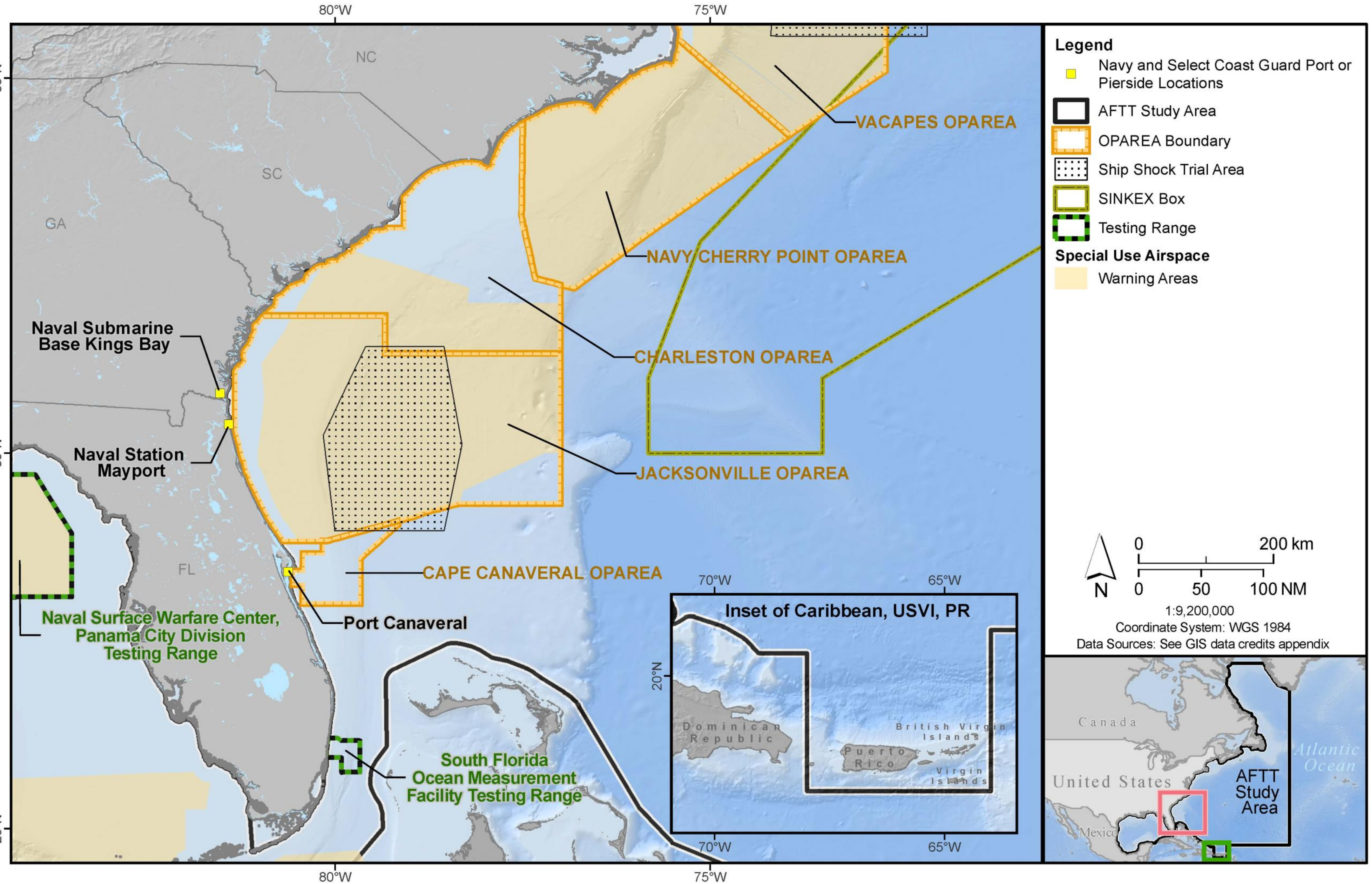
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Figure 2.1-1: Atlantic Fleet Training and Testing Study Area



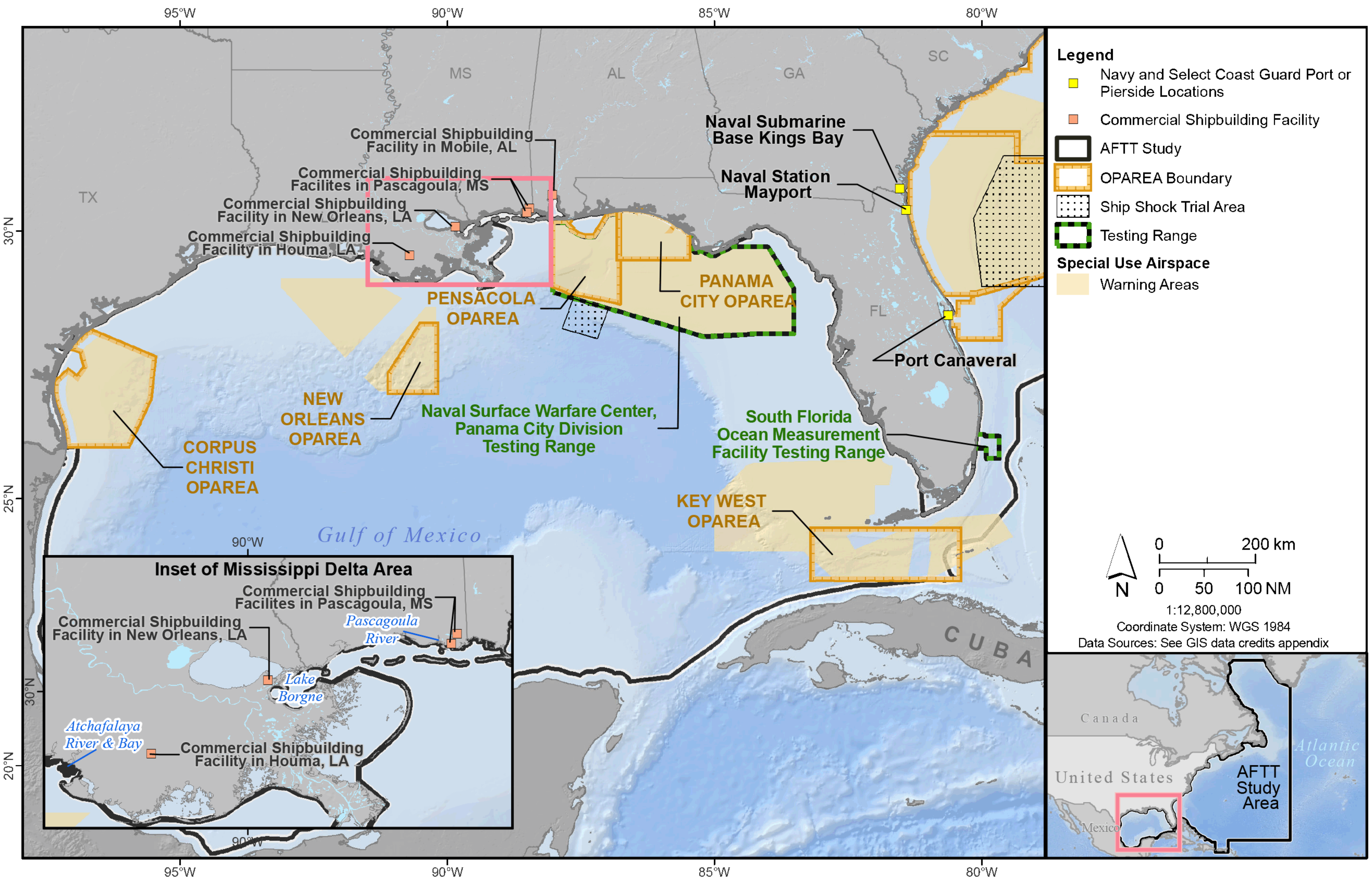
Notes: AFTT = Atlantic Fleet Training and Testing; NSB = Naval Submarine Base; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 2.1-2: Atlantic Fleet Training and Testing Study Area – Northeast and Mid-Atlantic Region



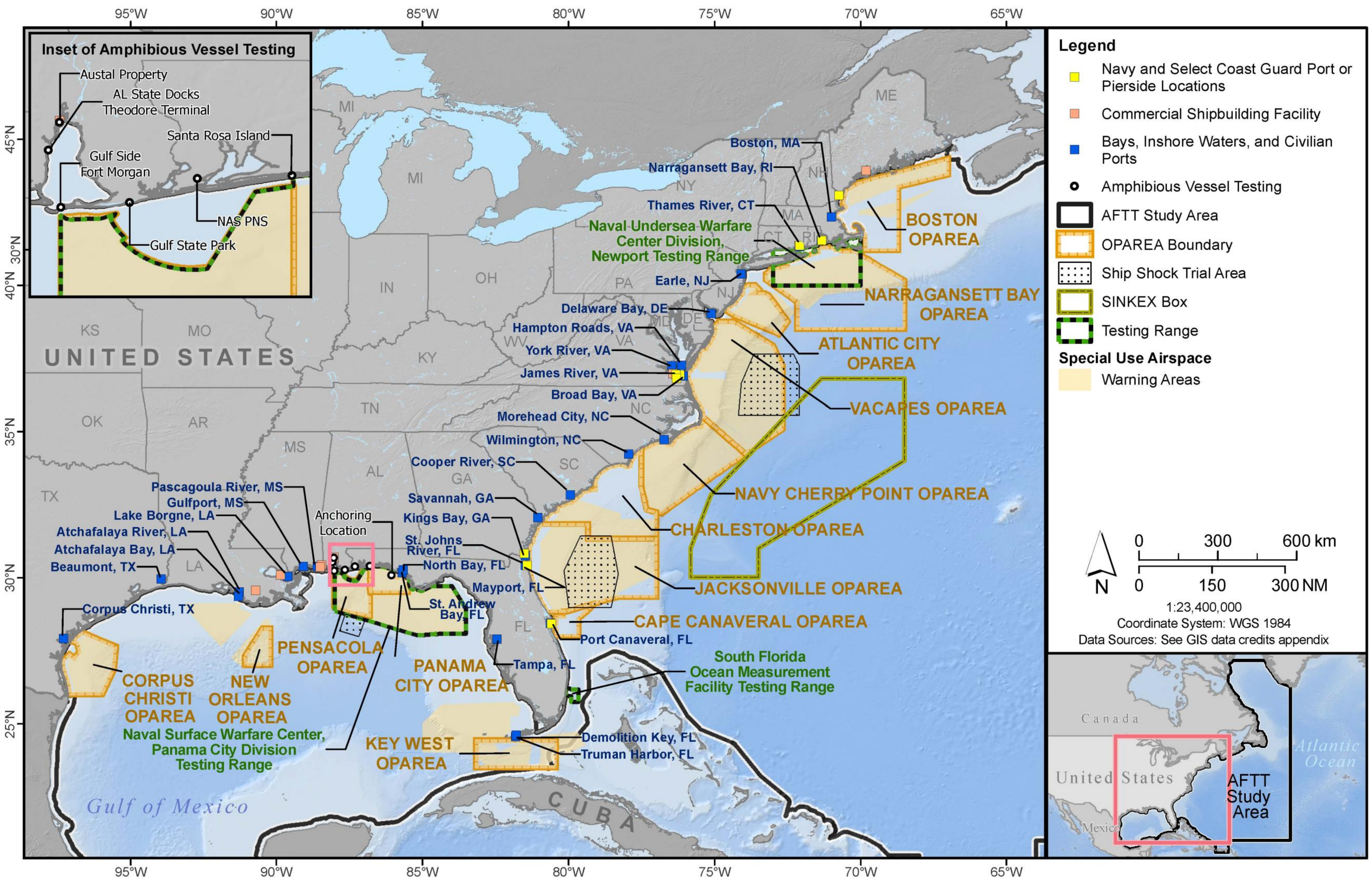
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; PR = Puerto Rico; SINKEX = Sinking Exercise; USVI = U.S. Virgin Islands; VACAPES = Virginia Capes

Figure 2.1-3: Atlantic Fleet Training and Testing Study Area – Southeast Region and Caribbean Sea



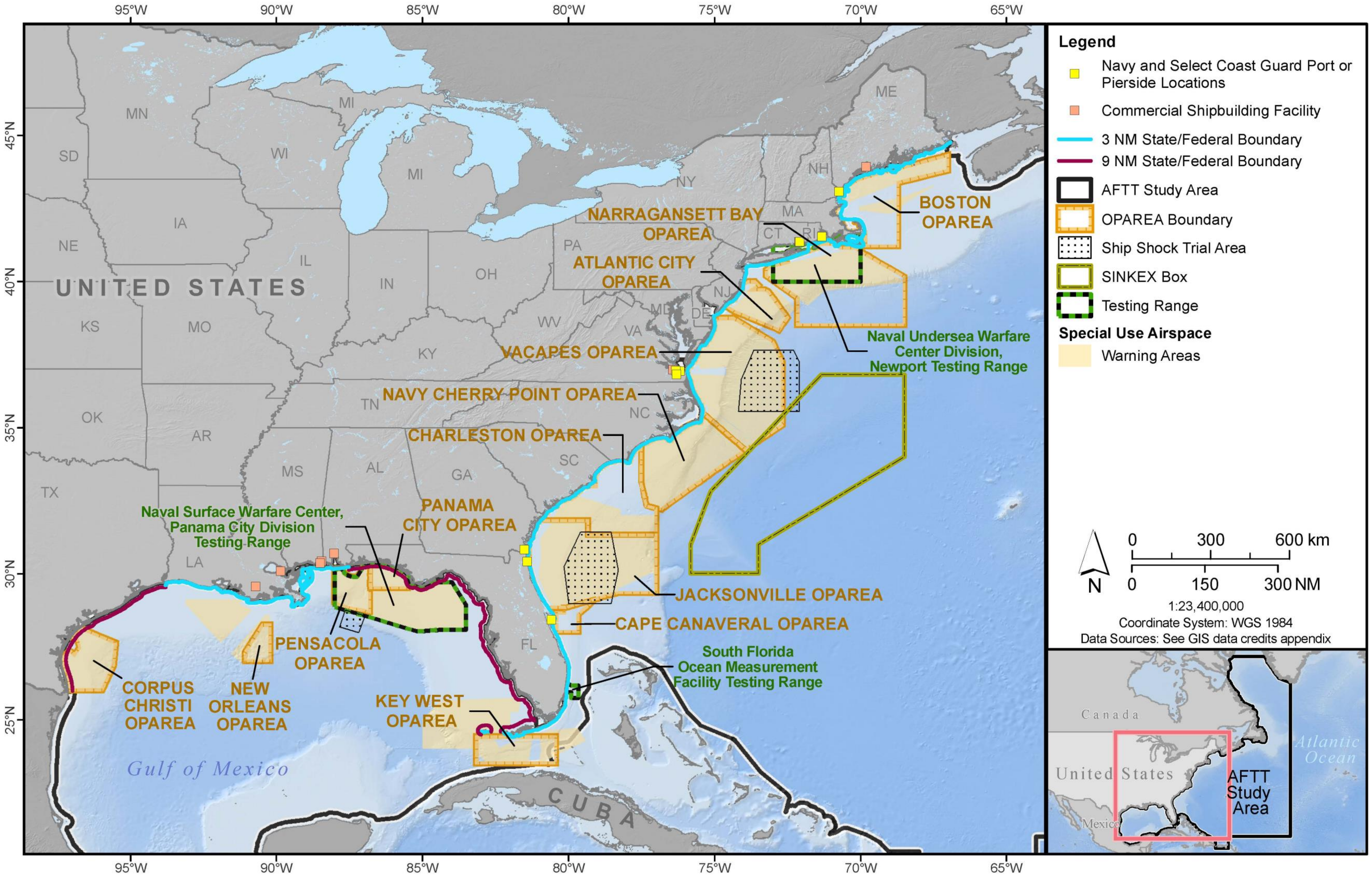
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 2.1-4: Atlantic Fleet Training and Testing Study Area – Gulf of Mexico Region



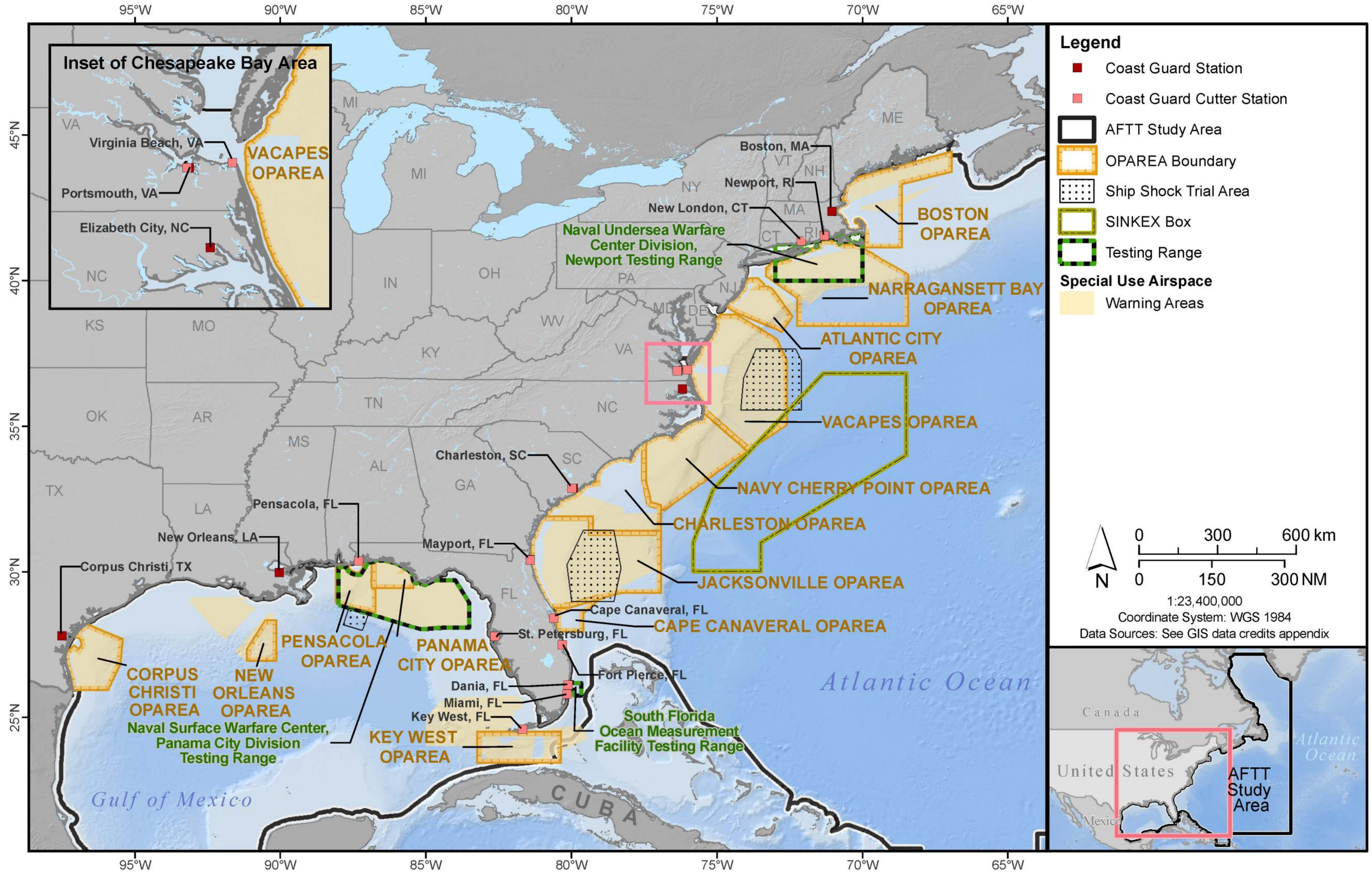
Notes: AFTT = Atlantic Fleet Training and Testing; NAS PNS = Naval Air Station Pensacola; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Figure 2.1-5: Atlantic Fleet Training and Testing Study Area – Inshore Locations



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Figure 2.1-6: Atlantic Fleet Training and Testing Study Area – Coastal Zones and Designated Ship Shock Trial and Sinking Exercise Areas



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Figure 2.1-7: Representative U.S. Coast Guard Stations in the Study Area

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2.1.1 AFTT Range Complexes

A summary of the Atlantic Fleet Training and Testing (AFTT) Range Complexes, Inshore Areas, and Ports are provided in Table 2.1-1, Table 2.1-2, and Table 2.1-3. See the 2018 Final EIS/OEIS Section 2.1 (Description of the Atlantic Fleet Training and Testing Study Area) for detailed descriptions of the Range Complexes.

Table 2.1-1: Study Area – Training and Testing Ranges[1]

Name	Basic Location	Sea and Undersea Space	Air Space
Northeast Range Complexes	750 miles along the coast from Maine to New Jersey	46,000 NM^2 of sea and undersea space Includes three OPAREAs: Boston, Narragansett Bay, and Atlantic City	29,000 NM^2 of special use airspace
Naval Undersea Warfare Center Division, Newport Testing Range	Includes the waters of Narragansett Bay, Rhode Island Sound, Block Island Sound	11,000 NM^2 of sea and undersea space Includes three restricted areas: Coddington Cove, Narraganset Bay, and Rhode Island Sound	6,800 NM^2 of special use airspace
Virginia Capes Range Complex (VACAPES RC)	250 miles along the coast from Delaware to North Carolina, from the shoreline to 150 NM seaward	30,000 NM^2 of sea and undersea space Includes one OPAREA: Virginia Capes	30,000 NM^2 of special use airspace
Navy Cherry Point Range Complex	Off the coast of North and South Carolina, from the shoreline to 120 NM seaward	19,000 NM^2 of sea and undersea space Includes one OPAREA: Cherry Point	19,000 NM^2 of special use airspace
Jacksonville Range Complex (JAX RC)	520 miles along the coast from North Carolina to Florida, from the shoreline to roughly 250 NM seaward	50,000 NM^2 of sea and undersea space. Includes three OPAREAs: Charleston, Jacksonville, and Cape Canaveral Includes the Undersea Warfare Training Range	64,000 NM^2 of special use airspace
Naval Surface Warfare Center, Carderock Division, South Florida Ocean Measurement Facility Testing Range (SFOMF)	Located adjacent to the Port Everglades entrance channel in Fort Lauderdale, Florida; out to roughly 25 NM from shore	500 NM^2 of sea and undersea space	No associated special use airspace
Key West Range Complex	Off the southwestern coast of mainland Florida and along the southern Florida Keys, extending into the Gulf of Mexico and the Straits of Florida	8,000 NM^2 of sea and undersea space south of Key West. Includes one OPAREA: Key West	23,000 NM^2 of special use airspace

Table 2.1-1: Study Area – Training and Testing Ranges (continued)

Name	Basic Location	Sea and Undersea Space	Air Space
Naval Surface Warfare Center, Panama City Division Testing Range	Off the panhandle of Florida and Alabama, extending from the shoreline roughly 120 NM seaward and includes St. Andrew Bay	23,000 NM^2 of sea and undersea space Includes two OPAREAs: Panama City and Pensacola	23,000 NM^2 of special use airspace
Gulf of Mexico Range Complex (GOMEX RC)	Includes geographically separated areas throughout the Gulf of Mexico	20,000 NM^2 of sea and undersea space Includes four OPAREAs: Panama City, Pensacola, New Orleans, and Corpus Christi	43,000 NM^2 of special use airspace

[1] Areas and distances of locations, sea and undersea space, and airspace are approximations.

Notes: GOMEX = Gulf of Mexico; NM = nautical miles; NM^2 = square nautical miles; NSWC = Naval Surface Warfare Center; OPAREA = operating area; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility Testing Range; VACAPES = Virginia Capes

Table 2.1-2: Study Area – Inshore Locations

Name	Associated Inshore Waters
Northeast Range Complexes Inshore	Thames River Narragansett Bay Rhode Island Sound Block Island Sound
Virginia Capes Range Complex (VACAPES RC) Inshore	Lower Chesapeake Bay James River and tributaries Broad Bay York River
Jacksonville Range Complex (JAX RC) Inshore	Blount's Island Southeast Kings Bay Cooper River St. Johns River Port Canaveral
Key West Range Complex Inshore	Truman Harbor Demolition Key
Gulf of Mexico Range Complex (GOMEX RC) Inshore	St. Andrew Bay Mobile Bay Atchafalaya Bay* Atchafalaya River* Lake Borgne* Pascagoula River*

* New areas added since the 2018 Final EIS/OEIS analysis

Notes: EIS = Environmental Impact Statement; GOMEX = Gulf of Mexico; JAX = Jacksonville; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; VACAPES = Virginia Capes

Table 2.1-3: Study Area – Ports and Piers

Pierside Locations	*Civilian Ports*	*Coast Guard Stations*
Portsmouth Naval Shipyard Naval Submarine Base New London Naval Station Newport Naval Station Norfolk JEB Little Creek Fort Story Norfolk Naval Shipyard Naval Submarine Base Kings Bay Naval Station Mayport Port Canaveral	Bath, ME Boston, MA Earle, NJ Delaware Bay, DE Hampton Roads, VA Morehead City, NC Wilmington, NC Kings Bay, GA Savannah, GA Mayport, FL Port Canaveral, FL Tampa, FL Pascagoula, MS Gulfport, MS* Beaumont, TX Corpus Christi, TX	Southwest Harbor, ME Boston, MA New London, CT[1] Newport, RI[1] Montauk, NY Atlantic City, NJ Virginia Beach, VA[1] Portsmouth, VA[1] Elizabeth City, NC Charleston, SC[1] Mayport, FL[1] Cape Canaveral, FL[1] Fort Pierce, FL[1] Dania, FL[1] Miami, FL[1] Key West, FL[1] St. Petersburg, FL[1] Pensacola, FL[1] New Orleans, LA Corpus Christi, TX

* New areas added since the 2018 Final EIS/OEIS analysis
[1] Coast Guard cutter stations
Notes: CT = Connecticut; DE = Delaware; EIS = Environmental Impact Statement; FL = Florida; GA = Georgia; JEB = Joint Expeditionary Base; LA = Louisiana; MA = Massachusetts; ME = Maine; MS = Mississippi; NC = North Carolina; NJ = New Jersey; NY = New York; OEIS = Overseas Environmental Impact Statement; RI = Rhode Island; SC = South Carolina; TX = Texas; VA = Virginia; VACAPES = Virginia Capes

The Action Proponents categorize their functional warfare activities into seven primary mission areas:

- air warfare
- amphibious warfare
- anti-submarine warfare
- electronic warfare
- expeditionary warfare
- mine warfare
- surface warfare

Most activities addressed in this Supplemental EIS/OEIS are categorized under one of these primary mission areas (including proposed U.S. Coast Guard activities); the testing community has three additional categories of activities for vessel evaluation, unmanned systems, and acoustic and oceanographic science and technology. Activities that do not fall within these areas are listed as "other activities." Each warfare community (surface, subsurface, aviation, and special warfare) may train in some or all of these primary mission areas. The research and acquisition community also categorizes most, but not all, of its testing activities under these primary mission areas. A description of the sonar, munitions, targets, systems, and other material used during military readiness activities within these primary mission areas is provided in Appendix A (Activity Descriptions).

2.1.2 Air Warfare

The mission of air warfare is to destroy or reduce enemy air and missile threats (including unmanned airborne threats) and serves two purposes: to protect U.S. forces from attacks from the air and to gain air superiority. Air warfare provides U.S. forces with adequate attack warnings, while denying hostile forces the ability to gather intelligence about U.S. forces.

Aircraft conduct air warfare through radar search, detection, identification, and engagement of airborne threats. Surface ships conduct air warfare through an array of modern anti-aircraft weapon systems such as aircraft detecting radar, naval guns linked to radar-directed fire-control systems, surface-to-air missile systems, and radar-controlled cannons for close-in point defense.

Testing of air warfare systems is required to ensure the equipment is fully functional under the conditions in which it will be used. Tests may be conducted on radar and other early warning detection and tracking systems, new guns or gun rounds, and missiles. Testing of these systems may be conducted on new ships and aircraft, and on existing ships and aircraft following maintenance, repair, or modification. For some systems, tests are conducted periodically to assess operability. Additionally, tests may be conducted in support of scientific research to assess new and emerging technologies.

2.1.3 Amphibious Warfare

The mission of amphibious warfare is to project military power from the sea to the shore (i.e., attack a threat on land by a military force embarked on ships) through the use of naval firepower and expeditionary landing forces. Amphibious warfare operations include small unit reconnaissance or raid missions to large-scale amphibious exercises involving multiple ships and aircraft combined into a strike group.

Amphibious warfare training ranges from individual, crew, and small unit events to large task force exercises. Individual and crew training include amphibious vehicles and naval gunfire support training. Such training includes shore assaults, boat raids, airfield or port seizures, reconnaissance, and disaster relief. Large-scale amphibious exercises involve ship-to-shore maneuver, naval fire support, such as shore bombardment, air strikes, and attacks on targets that are in close proximity to friendly forces.

Testing of guns, munitions, aircraft, ships, and amphibious vessels and vehicles used in amphibious warfare are often integrated into training activities and, in most cases, the systems are used in the same manner in which they are used for training activities. Amphibious warfare tests, when integrated with training activities or conducted separately as full operational evaluations on existing amphibious vessels and vehicles following maintenance, repair, or modernization, may be conducted independently or in conjunction with other amphibious ship and aircraft activities. Testing is performed to ensure effective ship-to-shore coordination and transport of personnel, equipment, and supplies. Tests may also be conducted periodically on other systems, vessels, and aircraft intended for amphibious operations to assess operability and to investigate efficacy of new technologies.

2.1.4 Anti-Submarine Warfare

The mission of anti-submarine warfare is to locate, neutralize, and defeat hostile submarine forces that threaten Navy forces. Anti-submarine warfare is based on the principle that surveillance and attack aircraft, ships, and submarines all search for hostile submarines. These forces operate together or independently to gain early warning and detection and to localize, track, target, and attack submarine threats.

Anti-submarine warfare training addresses basic skills such as detecting and classifying submarines, as well as evaluating sounds to distinguish between enemy submarines and friendly submarines, ships, and marine life. More advanced training integrates the full spectrum of anti-submarine warfare from detecting and tracking a submarine to attacking a target using either exercise torpedoes (i.e., torpedoes that do not contain a warhead) or simulated weapons. These integrated anti-submarine warfare training exercises are conducted in coordinated, at-sea training events involving submarines, ships, and aircraft.

Testing of anti-submarine warfare systems is conducted to develop new technologies and assess weapon performance and operability with new systems and platforms, such as unmanned systems. Testing uses ships, submarines, and aircraft to demonstrate capabilities of torpedoes, missiles, countermeasure systems, and underwater surveillance and communications systems. Tests may be conducted as part of a large-scale fleet training event involving submarines, ships, fixed-wing aircraft, and helicopters. These integrated training events offer opportunities to conduct research and acquisition activities and to train aircrew in the use of new or newly enhanced systems during a large-scale, complex exercise.

2.1.5 Electronic Warfare

The mission of electronic warfare is to degrade the enemy's ability to use electronic systems, such as communication systems and radar, and to confuse or deny them the ability to defend their forces and assets. Electronic warfare is also used to detect enemy threats and counter their attempts to degrade the electronic capabilities of the Navy.

Typical electronic warfare training activities include threat avoidance, signals analysis for intelligence purposes, and use of airborne and surface electronic jamming devices to defeat tracking and communications systems.

Testing of electronic warfare systems is conducted to improve the capabilities of systems and ensure compatibility with new systems. Testing involves the use of aircraft, surface ships, and submarine crews to evaluate the effectiveness of electronic systems. Similar to training activities, typical electronic warfare testing activities include the use of airborne and surface electronic jamming devices (including testing chaff and flares; see Appendix A, Activity Descriptions, for a description of these devices) to defeat tracking and communications systems. Chaff tests evaluate newly developed or enhanced chaff, chaff dispensing equipment, or modified aircraft systems' use against chaff deployment. Flare tests evaluate deployment performance and crew competency with newly developed or enhanced flares, flare dispensing equipment, or modified aircraft systems' use against flare deployment.

2.1.6 Expeditionary Warfare

The mission of expeditionary warfare is to provide security and surveillance in the littoral (at the shoreline), riparian (along a river), or coastal environments. Expeditionary warfare is wide ranging and includes defense of harbors, operation of remotely operated vehicles, and boarding/seizure operations.

Expeditionary warfare training activities include underwater construction team training, dive and salvage operations, and insertion/extraction via air, surface, and subsurface platforms.

2.1.7 Mine Warfare

The mission of mine warfare is to detect and classify mines, and to deploy countermeasures and neutralize (disable) mines to protect Navy ships and submarines and to maintain free access to ports and shipping lanes. Mine warfare also includes offensive mine laying to gain control of or deny the enemy access to sea space. Naval mines can be laid by ships, submarines, unmanned underwater vehicles, or aircraft.

Mine warfare neutralization training includes exercises in which aircraft, ships, submarines, underwater vehicles, unmanned vehicles, or marine mammal detection systems search for mine shapes. Personnel train to destroy or disable mines by attaching underwater explosives to or near the mine or using remotely operated vehicles to destroy the mine.

Mine warfare testing is similar to training but focuses on the development of mine warfare systems to improve sonar, laser, and magnetic detectors intended to hunt, locate, and record the positions of mines for avoidance or subsequent neutralization. Mine detection and classification testing involves the use of air, surface, and subsurface platforms using a variety of systems to locate and identify objects underwater. Mine countermeasure and neutralization testing includes the use of air, surface, and subsurface platforms to evaluate the effectiveness of tracking devices, countermeasure and neutralization systems, and explosive munitions to neutralize mine threats. Most neutralization tests use mine shapes, or non-explosive practice mines, to evaluate a new or enhanced capability; however, a small percentage require the use of high-explosive mines to evaluate and confirm effectiveness of various systems.

2.1.8 Surface Warfare

The mission of surface warfare is to obtain control of sea space from which naval forces may operate and entails offensive action against other surface and subsurface targets while also defending against enemy forces. In surface warfare, aircraft use cannons, air-launched cruise missiles, or other precision-guided munitions; ships employ torpedoes, naval guns, and surface-to-surface missiles; and submarines attack surface ships using torpedoes or submarine-launched, anti-ship cruise missiles.

Surface warfare training includes surface-to-surface gunnery and missile exercises, air-to-surface gunnery and missile exercises, and submarine missile or torpedo launch events, and other munitions against surface targets.

Testing of weapons used in surface warfare is conducted to develop new technologies and to assess weapon performance and operability with new systems and platforms, such as unmanned systems. Tests include various air-to-surface guns and missiles, surface-to-surface guns and missiles, and bombing tests. Testing events may be integrated into training activities to test aircraft or aircraft systems in the delivery of ordnance on a surface target. In most cases the tested systems are used in the same manner in which they are used for training activities.

2.2 Proposed Activities

The Action Proponents have been conducting military readiness activities in the Study Area for over a century and with active sonar for over 70 years. The tempo and types of military readiness activities have fluctuated due to the introduction of new technologies, evolving nature of international events, advances in warfighting doctrine and procedures, and changes in force structure (e.g., organization of ships, weapons, and personnel). Such developments influence the frequency, duration, intensity, and location of required military readiness activities. This Supplemental EIS/OEIS reflects the most current compilation of military readiness activities deemed necessary to accomplish military readiness requirements. The types and numbers of activities included in the Proposed Action account for fluctuations in training and testing to meet evolving or emergent military readiness requirements. Key factors used to identify and group the exercises are the scale of the exercise, duration of the exercise, and the amount that sonars or other sound sources are used.

For training and testing to be optimally effective, units must be able to safely use their sensors and weapon systems as they are intended to be used in military missions and combat operations. Standard operating procedures applicable to training and testing have been developed through years of experience to provide for safety (including public health and safety) and mission success. Standard operating procedures are part of the Proposed Action and are considered in the Chapter 3 (Affected Environment and Environmental Consequences) environmental analysis for applicable resources. For a detailed discussion of these standard operating procedures, see Appendix A (Activity Descriptions).

In furtherance of national security objectives, foreign militaries may participate in multinational training and testing events in the Study Area. Foreign military participation is not part of the federal action unless the U.S. military exercises substantial control and responsibility over those foreign military activities. Foreign military vessels operate pursuant to their own national authorities and have independent rights under customary international law, embodied in the principle of sovereign immunity, to engage in various activities on the world's oceans and seas.

2.2.1 Proposed Training Activities

A major training exercise is comprised of multiple "unit-level" exercises conducted by several units operating together while commanded and controlled by a single commander (these units are collectively referred to as carrier and expeditionary strike groups). These exercises typically employ an exercise scenario developed to train and evaluate the strike group in tactical naval tasks. In a major training exercise, most of the operations and activities being directed and coordinated by the strike group commander are identical in nature to the operations conducted during individual, crew, and smaller unit-level training events. However, in a major training exercise, these disparate training tasks are conducted in concert rather than in isolation. Some integrated or coordinated anti-submarine warfare exercises are similar in that they are composed of several unit-level exercises but are generally on a smaller scale than a major training exercise, are shorter in duration, use fewer assets, and use fewer hours of hull-mounted sonar per exercise. Coordinated training exercises involve multiple units working together to meet unit-level training requirements, whereas integrated training exercises involve multiple units working together for deployment. Coordinated exercises involving the use of sonar are presented under the category of anti-submarine warfare. The anti-submarine warfare portions of these exercises are considered together in coordinated activities for the sake of acoustic modeling. When other training objectives are being met, those activities are described via unit-level training in each of the relevant primary mission areas below.

The training activities proposed by the Navy are described in Table 2.2-1. This table provides information on all training activities (see Appendix A, Activity Descriptions, for a full description of each), such as the name of the proposed activity, the number of events per year analyzed in the 2018 Final EIS/OEIS, the number of events per year proposed under Alternative 1 and Alternative 2 of this Supplemental EIS/OEIS, and activity locations.

U.S. Coast Guard activities are not as extensive as the Navy activities due to differing mission requirements. As noted in Table 2.2-1, there are some Navy-led activities that the Coast Guard may participate in. Coast Guard-led activities are in Table 2.2-2.

Table 2.2-1: Current and Proposed Navy and Marine Corps Training Activities

Activity Name	*2018 EIS/OEIS*	*Supplemental*		*Location*[3]
	Annual # of Activities	*Annual # of Activities*[2]		
	Alt 1[1]	*Alt 1*	*Alt 2*	
Major Training Exercise - Large Integrated Anti-Submarine Warfare				
Composite Training Unit Exercise*	-	0	1	Gulf of Mexico Range Complex
	2 - 3	2 - 3	3	Jacksonville Range Complex Navy Cherry Point Range Complex Virginia Capes Range Complex
Major Training Exercise - Medium Integrated Anti-Submarine Warfare				
Sustainment/Task Force Exercise	6	2	2	Jacksonville Range Complex Navy Cherry Point Range Complex[4] Virginia Capes Range Complex

Table 2.2-1: Current and Proposed Navy and Marine Corps Training Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities[2] Alt 1	Supplemental Annual # of Activities[2] Alt 2	Location[3]
Small Integrated Anti-Submarine Warfare Training				
Navy Undersea Warfare Training Assessment Course	6	2	2	Jacksonville Range Complex Navy Cherry Point Range Complex Virginia Capes Range Complex
Surface Warfare Advanced Tactical Training	6	2	2	Jacksonville Range Complex Navy Cherry Point Range Complex Virginia Capes Range Complex
Medium Coordinated Anti-Submarine Warfare Training				
Anti-Submarine Warfare Tactical Development Exercise	2	1	1	Jacksonville Range Complex
	1	-	-	Navy Cherry Point Range Complex
	1	1	1	Virginia Capes Range Complex
Small Coordinated Anti-Submarine Warfare Training				
Group Sail	4	5	5	Jacksonville Range Complex
	5	4	4	Navy Cherry Point Range Complex
	5	5	5	Virginia Capes Range Complex
Amphibious Ready Group Marine Expeditionary Unit Composite Training Unit Exercise	-	1	1	Navy Cherry Point Range Complex
Air Warfare				
Air Combat Maneuvers	1,270	1,270	1,270	Jacksonville Range Complex
	6,300	6,300	6,300	Key West Range Complex
	1,155	1,925	1,925	Navy Cherry Point Range Complex
	1,200	1,200	1,200	Virginia Capes Range Complex
Air Defense Exercise	85	85	85	Gulf of Mexico Range Complex
	5,157	938	938	Jacksonville Range Complex
	5,166	1,601	1,601	Navy Cherry Point Range Complex
	3,425	3,425	3,425	Virginia Capes Range Complex
Gunnery Exercise Air-to-Air Medium-Caliber	75	40	40	Jacksonville Range Complex
	70	20	20	Key West Range Complex
	40	40	40	Navy Cherry Point Range Complex
	120	80	80	Virginia Capes Range Complex
Gunnery Exercise Air-to-Air Small-Caliber	-	5	5	Jacksonville Range Complex
	-	5	5	Virginia Capes Range Complex
Gunnery Exercise Surface-to-Air Large-Caliber	7	10	10	Jacksonville Range Complex
	25	25	25	Virginia Capes Range Complex
Gunnery Exercise Surface-to-Air Medium-Caliber	31	20	20	Jacksonville Range Complex
	23	9	9	Navy Cherry Point Range Complex
	10	-	-	Other AFTT Areas[5]
	59	36	36	Virginia Capes Range Complex
Missile Exercise – Man-Portable Air Defense System	5	14	14	Navy Cherry Point Range Complex

Table 2.2-1: Current and Proposed Navy and Marine Corps Training Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities[2] Alt 1	Supplemental Annual # of Activities[2] Alt 2	Location[3]
Missile Exercise Air-to-Air	-	30	30	Gulf of Mexico Range Complex
	48	15	15	Jacksonville Range Complex
	8	16	16	Key West Range Complex
	48	15	15	Navy Cherry Point Range Complex
	40	16	16	Virginia Capes Range Complex
Missile Exercise Surface-to-Air	2	2	2	Gulf of Mexico Range Complex
	5	6	6	Jacksonville Range Complex
	2	2	2	Navy Cherry Point Range Complex
	2	2	2	Northeast Range Complexes
	30	36	36	Virginia Capes Range Complex
Amphibious Warfare				
Amphibious Assault	5	5	5	Navy Cherry Point Range Complex
Amphibious Operations in a Contested Environment	-	45	45	Navy Cherry Point Range Complex
	-	12	12	Virginia Capes Range Complex
Amphibious Raid	20	20	20	Jacksonville Range Complex
	34	34	34	Navy Cherry Point Range Complex
Amphibious Ready Group Marine Expeditionary Unit Exercise	5	1	1	Navy Cherry Point Range Complex
Amphibious Squadron Marine Expeditionary Unit Integration Training	1	1	1	Navy Cherry Point Range Complex
Amphibious Vehicle Maneuvers	2	2	2	Jacksonville Range Complex Inshore
	186	46	46	Virginia Capes Range Complex
	-	256	256	Virginia Capes Range Complex Inshore
Naval Surface Fire Support Exercise – At Sea	4	2	2	Gulf of Mexico Range Complex
	12	6	6	Jacksonville Range Complex
	2	2	2	Navy Cherry Point Range Complex
	38	19	19	Virginia Capes Range Complex
Naval Surface Fire Support Exercise – Land-Based Target	13	13	13	Navy Cherry Point Range Complex
Non-Combat Evacuation Operation*	1	1	1	Navy Cherry Point Range Complex
Anti-Submarine Warfare				
Anti-Submarine Warfare Torpedo Exercise – Helicopter	14	14	14	Jacksonville Range Complex
	4	4	4	Virginia Capes Range Complex
Anti-Submarine Warfare Torpedo Exercise – Maritime Patrol Aircraft	14	14	14	Jacksonville Range Complex
	4	4	4	Virginia Capes Range Complex
Anti-Submarine Warfare Torpedo Exercise – Ship	16	16	16	Jacksonville Range Complex
	5	5	5	Virginia Capes Range Complex

Table 2.2-1: Current and Proposed Navy and Marine Corps Training Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities	Supplemental Annual # of Activities[2]		Location[3]
	Alt 1[1]	Alt 1	Alt 2	
Anti-Submarine Warfare Torpedo Exercise – Submarine	12	12	12	Jacksonville Range Complex
	6	6	6	Northeast Range Complexes
	2	2	2	Virginia Capes Range Complex
Anti-Submarine Warfare Tracking Exercise – Helicopter	-	3	3	Gulf of Mexico Range Complex
	370	370	370	Jacksonville Range Complex
	12	12	12	Navy Cherry Point Range Complex
	24	24	24	Other AFTT Areas[5]
	8	8	8	Virginia Capes Range Complex
Anti-Submarine Warfare Tracking Exercise – Maritime Patrol Aircraft	525	475	475	Jacksonville Range Complex
	46	35	35	Navy Cherry Point Range Complex
	90	80	80	Northeast Range Complexes
	176	155	155	Virginia Capes Range Complex
Anti-Submarine Warfare Tracking Exercise – Ship	5	5	5	Gulf of Mexico Range Complex
	440	290	440	Jacksonville Range Complex
	55	33	55	Navy Cherry Point Range Complex
	5	5	5	Northeast Range Complexes
	110	55	110	Other AFTT Areas[5]
	220	120	220	Virginia Capes Range Complex
Anti-Submarine Warfare Tracking Exercise – Submarine	13	13	13	Jacksonville Range Complex
	1	1	1	Navy Cherry Point Range Complex
	18	18	18	Northeast Range Complexes
	44	44	44	Other AFTT Areas[5]
	-	2	2	SINKEX Box
	6	6	6	Virginia Capes Range Complex
Electronic Warfare				
Counter Targeting Chaff Exercise – Aircraft	18	18	18	Gulf of Mexico Range Complex
	2,990	2,990	2,990	Jacksonville Range Complex
	3,000	3,000	3,000	Key West Range Complex
	1,610	1,610	1,610	Navy Cherry Point Range Complex
	130	130	130	Virginia Capes Range Complex
Counter Targeting Chaff Exercise – Ship	5	5	5	Gulf of Mexico Range Complex
	5	5	5	Jacksonville Range Complex
	5	5	5	Navy Cherry Point Range Complex
	50	10	10	Virginia Capes Range Complex
Counter Targeting Flare Exercise	92	92	92	Gulf of Mexico Range Complex
	1,900	1,900	1,900	Jacksonville Range Complex
	1,550	1,550	1,550	Key West Range Complex
	1,115	1,115	1,115	Navy Cherry Point Range Complex
	50	50	50	Virginia Capes Range Complex
Electronic Warfare Operations	181	21	21	Jacksonville Range Complex
	2,620	370	370	Navy Cherry Point Range Complex
	302	32	32	Virginia Capes Range Complex

Table 2.2-1: Current and Proposed Navy and Marine Corps Training Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities[2] Alt 1	Supplemental Annual # of Activities[2] Alt 2	Location[3]
High-Speed Anti-Radiation Missile Exercise	4	1	1	Jacksonville Range Complex
	10	2	2	Navy Cherry Point Range Complex
	11	3	3	Virginia Capes Range Complex
Expeditionary Warfare				
Dive and Salvage Operations	16	16	16	Gulf of Mexico Range Complex
	60	60	60	NS Mayport
	8	8	8	Key West Range Complex
	16	16	16	Navy Cherry Point Range Complex
	30	145	145	Virginia Capes Range Complex Inshore
Maritime Security Operations – Anti-Swimmer Grenades	2	-	-	Gulf of Mexico Range Complex
	2	-	-	Jacksonville Range Complex
	2	-	-	Navy Cherry Point Range Complex
	4	-	-	Northeast Range Complexes
	5	-	-	Virginia Capes Range Complex
Personnel Insertion/Extraction – Air	-	50	50	Gulf of Mexico Range Complex Inshore
	10	10	10	Jacksonville Range Complex Inshore
	10	-	-	Key West Range Complex
	2,164	74	74	Virginia Capes Range Complex
	-	104	104	Virginia Capes Range Complex Inshore
Personnel Insertion/Extraction – Surface and Subsurface	5	12	12	Gulf of Mexico Range Complex
	1	2	2	Jacksonville Range Complex
	2	-	-	Northeast Range Complexes
	-	48	48	Northeast Range Complexes Inshore
	360	175	175	Virginia Capes Range Complex
	-	216	216	Virginia Capes Range Complex Inshore
Personnel Insertion/Extraction – Swimmer/Diver	42	42	42	Virginia Capes Range Complex Inshore
Port Damage Repair	-	4	4	Gulfport, MS
Underwater Construction Team Training	8	16	16	Gulf of Mexico Range Complex
	-	16	16	Gulfport, MS
	4	8	8	Jacksonville Range Complex Inshore
	4	16	16	Key West Range Complex
	8	-	-	Virginia Capes Range Complex
	-	100	100	Virginia Capes Range Complex Inshore
Mine Warfare				
Airborne Mine Countermeasures – Mine Detection	310	290	290	Gulf of Mexico Range Complex
	317	275	275	Jacksonville Range Complex
	-	187	187	Key West Range Complex
	371	321	321	Navy Cherry Point Range Complex
	1,540	1,420	1,420	Virginia Capes Range Complex

Table 2.2-1: Current and Proposed Navy and Marine Corps Training Activities (continued)

Activity Name	*2018 EIS/OEIS* Annual # of Activities	*Supplemental* Annual # of Activities[2]		*Location[3]*
	Alt 1[1]	*Alt 1*	*Alt 2*	
Airborne Mine Countermeasures – Towed Mine Neutralization	50	30	30	Gulf of Mexico Range Complex
	100	70	70	Jacksonville Range Complex
	-	15	15	Key West Range Complex
	108	96	96	Navy Cherry Point Range Complex
	510	375	375	Virginia Capes Range Complex Inshore
Airborne Mine Laying	1	1	1	Jacksonville Range Complex
	2	2	2	Navy Cherry Point Range Complex
	4	4	4	Virginia Capes Range Complex
Civilian Port Defense – Homeland Security Anti-Terrorism/Force Protection Exercises*	1	0 - 1	0 - 1	Beaumont, TX Boston, MA Corpus Christi, TX Delaware Bay, DE Earle, NJ Hampton Roads, VA Kings Bay, GA Mayport, FL Morehead City, NC Port Canaveral, FL Savannah, GA Tampa, FL Wilmington, NC
Coordinated Unit Level Helicopter Airborne Mine Countermeasures Exercise	2	2	2	Gulf of Mexico Range Complex
	2	2	2	Jacksonville Range Complex
	-	2	2	Key West Range Complex
	2	2	2	Navy Cherry Point Range Complex
	2	2	2	Virginia Capes Range Complex
Installation and Maintenance of Mine Training Areas	-	1	1	Jacksonville Range Complex
	-	1	1	Key West Range Complex
	-	1	1	Navy Cherry Point Range Complex
	-	1	1	Virginia Capes Range Complex
	-	1	1	Virginia Capes Range Complex Inshore
Mine Countermeasures – Mine Neutralization – Remotely Operated Vehicles	132	66	66	Gulf of Mexico Range Complex
	71	36	36	Jacksonville Range Complex
	-	10	10	Key West Range Complex
	71	36	36	Navy Cherry Point Range Complex
	630	315	315	Virginia Capes Range Complex
Mine Countermeasures – Ship Sonar	22	22	22	Gulf of Mexico Range Complex
	53	53	53	Jacksonville Range Complex
	53	53	53	Virginia Capes Range Complex

Table 2.2-1: Current and Proposed Navy and Marine Corps Training Activities (continued)

Activity Name	*2018 EIS/OEIS* Annual # of Activities	*Supplemental* Annual # of Activities[2]		*Location[3]*
	Alt 1[1]	*Alt 1*	*Alt 2*	
Mine Neutralization Explosive Ordnance Disposal	16	96	96	Gulf of Mexico Range Complex
	20	100	100	Jacksonville Range Complex
	17	30	30	Key West Range Complex
	60	176	176	Key West Range Complex Inshore
	16	86	86	Navy Cherry Point Range Complex
	524	325	325	Virginia Capes Range Complex
	6	96	96	Virginia Capes Range Complex Inshore
Submarine Mobile Mine and Mine Laying Exercise	-	2	2	Jacksonville Range Complex
Surface Ship Object Detection	76	76	76	Jacksonville Range Complex
	162	162	162	Virginia Capes Range Complex
Underwater Mine Countermeasure Raise, Tow, Beach and Exploitation Operations	56	24	24	Gulf of Mexico Range Complex
	78	20	20	Jacksonville Range Complex
	-	4	4	Jacksonville Range Complex Inshore
	8	40	40	Key West Range Complex
	24	16	16	Navy Cherry Point Range Complex
	446	20	20	Virginia Capes Range Complex
	-	100	100	Virginia Capes Range Complex Inshore
Surface Warfare				
Bombing Exercise Air-to-Surface	67	47	47	Gulf of Mexico Range Complex
	434	260	260	Jacksonville Range Complex
	108	73	73	Navy Cherry Point Range Complex
	329	272	272	Virginia Capes Range Complex
Gunnery Exercise Air-to-Surface Medium-Caliber	30	30	30	Gulf of Mexico Range Complex
	495	490	490	Jacksonville Range Complex
	395	395	395	Navy Cherry Point Range Complex
	720	720	720	Virginia Capes Range Complex
Gunnery Exercise Air-to-Surface Small-Caliber	200	108	108	Jacksonville Range Complex
	130	71	71	Navy Cherry Point Range Complex
	560	300	300	Virginia Capes Range Complex
Gunnery Exercise Surface-to-Surface Boat Medium-Caliber	6	6	6	Gulf of Mexico Range Complex
	26	26	26	Jacksonville Range Complex
	128	128	128	Navy Cherry Point Range Complex
	2	2	2	Northeast Range Complexes
	260	404	404	Virginia Capes Range Complex
Gunnery Exercise Surface-to-Surface Boat Small-Caliber	67	21	21	Gulf of Mexico Range Complex
	84	25	25	Jacksonville Range Complex
	92	28	28	Navy Cherry Point Range Complex
	18	6	6	Northeast Range Complexes
	330	213	213	Virginia Capes Range Complex

Table 2.2-1: Current and Proposed Navy and Marine Corps Training Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities[2] Alt 1	Supplemental Annual # of Activities[2] Alt 2	Location[3]
Gunnery Exercise Surface-to-Surface Ship Large-Caliber	9	8	8	Gulf of Mexico Range Complex
	51	46	46	Jacksonville Range Complex
	35	34	34	Navy Cherry Point Range Complex
	10	9	9	Other AFTT Areas[5]
	75	63	63	Virginia Capes Range Complex
Gunnery Exercise Surface-to-Surface Ship Medium-Caliber	33	34	34	Gulf of Mexico Range Complex
	161	110	110	Jacksonville Range Complex
	72	70	70	Navy Cherry Point Range Complex
	41	40	40	Other AFTT Areas[5]
	321	319	319	Virginia Capes Range Complex
Gunnery Exercise Surface-to-Surface Ship Small-Caliber	10	4	4	Gulf of Mexico Range Complex
	300	120	120	Jacksonville Range Complex
	20	12	12	Navy Cherry Point Range Complex
	50	20	20	Other AFTT Areas[5]
	450	180	180	Virginia Capes Range Complex
Integrated Live Fire Exercise	2	2	2	Jacksonville Range Complex
	2	2	2	Virginia Capes Range Complex
Laser Targeting – Aircraft	315	330	330	Jacksonville Range Complex
	272	286	286	Virginia Capes Range Complex
Laser Targeting - Ship	4	4	4	Jacksonville Range Complex
	4	4	4	Virginia Capes Range Complex
Long Range Unmanned Surface Vessel Training	-	10	10	Jacksonville Range Complex
	-	10	10	Virginia Capes Range Complex
Maritime Security Operations	59	59	59	Gulf of Mexico Range Complex
	210	165	165	Jacksonville Range Complex
	-	45	45	Jacksonville Range Complex Inshore
	75	75	75	Navy Cherry Point Range Complex
	13	13	13	Northeast Range Complexes Inshore
	895	521	521	Virginia Capes Range Complex
	-	374	374	Virginia Capes Range Complex Inshore
Missile Exercise Air-to-Surface - Rocket	10	10	10	Gulf of Mexico Range Complex
	102	115	115	Jacksonville Range Complex
	10	15	15	Navy Cherry Point Range Complex
	92	100	100	Virginia Capes Range Complex
Missile Exercise Air-to-Surface	102	81	81	Jacksonville Range Complex
	-	8	8	Key West Range Complex
	52	72	72	Navy Cherry Point Range Complex
	88	83	83	Virginia Capes Range Complex
Missile Exercise Surface-to-Surface	16	19	19	Jacksonville Range Complex
	12	15	15	Virginia Capes Range Complex
Sinking Exercise*	1	1	1	SINKEX Box
Small Boat Attack	25	15	15	Jacksonville Range Complex
	25	30	30	Virginia Capes Range Complex

Table 2.2-1: Current and Proposed Navy and Marine Corps Training Activities (continued)

Activity Name	*2018 EIS/OEIS Annual # of Activities*	*Supplemental Annual # of Activities[2]*		*Location[3]*
	Alt 1[1]	*Alt 1*	*Alt 2*	
Other Training Activities				
Elevated Causeway System	1	-	-	Navy Cherry Point Range Complex
	1	-	-	Virginia Capes Range Complex Inshore
Precision Anchoring	9	9	9	Gulf of Mexico Range Complex
	231	231	231	Jacksonville Range Complex
	710	710	710	Virginia Capes Range Complex
Search and Rescue	776	704	704	Jacksonville Range Complex
	-	30	30	Jacksonville Range Complex Inshore
	1176	598	598	Virginia Capes Range Complex
	-	760	760	Virginia Capes Range Complex Inshore
Ship-to-Shore Fuel Transfer System Training	-	1	1	Navy Cherry Point Range Complex Virginia Capes Range Complex Inshore Jacksonville Range Complex
Submarine Navigation	29	29	29	Jacksonville Range Complex
	169	169	169	Northeast Range Complexes
	84	84	84	Virginia Capes Range Complex
Submarine Sonar Maintenance and Systems Checks	9	4	4	Jacksonville Range Complex
	4	2	2	Port Canaveral, FL
	-	2	2	NSB Kings Bay
	13	-	-	Navy Cherry Point Range Complex
	86	66	66	Northeast Range Complexes
	66	66	66	NSB New London
	12	12	12	Other AFTT Areas[5]
	47	34	34	Virginia Capes Range Complex
	34	34	34	NS Norfolk
Submarine Under Ice Certification	3	3	3	Jacksonville Range Complex
	3	3	3	Navy Cherry Point Range Complex
	9	9	9	Northeast Range Complexes
	9	9	9	Virginia Capes Range Complex
Surface Ship Sonar Maintenance and Systems Checks	0 - 18	50	50	Jacksonville Range Complex
	50	50	50	NS Mayport
	120	120	120	Navy Cherry Point Range Complex
	235	175	175	NS Norfolk
	0 - 18	18	18	Other AFTT Areas[5]
	120	175	175	Virginia Capes Range Complex
Unmanned Aerial System Training and Certification	-	50	50	Jacksonville Range Complex
	-	100	100	Navy Cherry Point Range Complex
	-	51	51	Virginia Capes Range Complex

Table 2.2-1: Current and Proposed Navy and Marine Corps Training Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities	Supplemental Annual # of Activities[2]		Location[3]
	Alt 1[1]	Alt 1	Alt 2	
Unmanned Underwater Vehicle Training - Certification and Development	-	10	10	Gulf of Mexico Range Complex
	-	22	22	Jacksonville Range Complex
	-	10	10	Navy Cherry Point Range Complex
	-	12	12	Northeast Range Complexes
	-	32	32	Virginia Capes Range Complex
	-	21	21	Virginia Capes Range Complex Inshore
Waterborne Training	42	42	42	Gulf of Mexico Range Complex
	55	69	69	Jacksonville Range Complex Inshore
	141	185	185	Northeast Range Complexes Inshore
	110	182	182	Virginia Capes Range Complex Inshore

[*] Activities marked with an asterisk are Navy-led activities in which the U.S. Coast Guard may participate.
[1] The Department of the Navy selected Alternative 1, the Preferred Alternative, in the Record of Decision signed October 18, 2018.
[2] For activities where the maximum number of events varies between years, a range is provided to indicate the "representative–maximum" number of events. For activities where no variation is anticipated, only the maximum number of events within a single year is provided.
[3] Locations given are areas where activities typically occur. However, activities could be conducted in other locations within the Study Area. Where multiple locations are provided within a single cell, the number of activities could occur in any of the locations, not in each of the locations.
[4] Location is proposed for this Supplemental EIS/OEIS, but was not proposed for the 2018 AFTT EIS/OEIS
[5] Other AFTT Areas include areas outside of range complexes and testing ranges but still within the AFTT Study Area. Other AFTT Area activities typically refer to those activities that occur while vessels are in transit.
Notes: AFTT = Atlantic Fleet Training and Testing; DE = Delaware; EIS = Environmental Impact Statement; FL = Florida; GA = Georgia; JEB = Joint Expeditionary Base; MA = Massachusetts; MS = Mississippi; NC = North Carolina; NJ = New Jersey; NS = Naval Station; NSB = Naval Submarine Base; OEIS = Overseas Environmental Impact Statement; SINKEX = Sinking Exercise; TX = Texas; VA = Virginia

Table 2.2-2: Current and Proposed U.S. Coast Guard Training Activities

Activity Name	2018 EIS/OEIS Annual # of Activities	Supplemental Annual # of Activities		Location[2]
	Alt 1[1]	Alt 1	Alt 2	
Air Warfare				
Gunnery Exercise Surface-to-Air Large-Caliber	-	5	5	Jacksonville Range Complex
	-	20	20	Virginia Capes Range Complex
Gunnery Exercise Surface-to-Air Medium-Caliber	-	2	2	Jacksonville Range Complex
	-	3	3	Virginia Capes Range Complex
Electronic Warfare				
Counter Targeting Chaff Exercise – Ship	-	3	3	Gulf of Mexico Range Complex
	-	3	3	Jacksonville Range Complex
	-	3	3	Navy Cherry Point Range Complex
	-	5	5	Virginia Capes Range Complex

Table 2.2-2: Current and Proposed U.S. Coast Guard Training Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities	Supplemental Annual # of Activities		Location[2]
	Alt 1[1]	Alt 1	Alt 2	
Surface Warfare				
Gunnery Exercise Air-to-Surface Medium Caliber	-	10	10	Gulf of Mexico Range Complex
	-	30	30	Jacksonville Range Complex
	-	10	10	Navy Cherry Point Range Complex
	-	25	25	Northeast Range Complexes
	-	10	10	Virginia Capes Range Complex
Gunnery Exercise Surface-to-Surface Boat Medium-Caliber	-	7	7	Gulf of Mexico Range Complex
	-	7	7	Jacksonville Range Complex
	-	7	7	Key West Range Complex
	-	7	7	Navy Cherry Point Range Complex
	-	11	11	Northeast Range Complexes
Gunnery Exercise Surface-to-Surface Boat Small-Caliber	-	11	11	Virginia Capes Range Complex
	-	6	6	Jacksonville Range Complex
	-	2	2	Navy Cherry Point Range Complex
	-	20	20	Virginia Capes Range Complex
Gunnery Exercise Surface-to-Surface Ship Large-Caliber	-	29	29	Gulf of Mexico Range Complex
	-	15	15	Jacksonville Range Complex
	-	10	10	Navy Cherry Point Range Complex
	-	15	15	Northeast Range Complexes
	-	20	20	Virginia Capes Range Complex
Gunnery Exercise Surface-to-Surface Ship Medium-Caliber	-	12	12	Gulf of Mexico Range Complex
	-	40	40	Jacksonville Range Complex
	-	20	20	Navy Cherry Point Range Complex
	-	100	100	Virginia Capes Range Complex
Gunnery Exercise Surface-to-Surface Ship Small-Caliber	-	4	4	Gulf of Mexico Range Complex
	-	1	1	Northeast Range Complexes
	-	1	1	Other AFTT Areas
Laser Targeting - Ship	-	4	4	Jacksonville Range Complex
	-	4	4	Virginia Capes Range Complex
Maritime Security Operations	-	89	98	Gulf of Mexico Range Complex
	-	149	164	Jacksonville Range Complex
	-	50	55	Key West Range Complex
	-	116	128	Navy Cherry Point Range Complex
	-	50	55	Northeast Range Complexes
	-	498	548	Virginia Capes Range Complex
Other Training Activities				
Precision Anchoring	-	100	100	Gulf of Mexico Range Complex
	-	200	200	Jacksonville Range Complex
	-	500	500	Virginia Capes Range Complex

Table 2.2-2: Current and Proposed U.S. Coast Guard Training Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities Alt 1	Supplemental Annual # of Activities Alt 2	Location[2]
Search and Rescue	-	100	100	Gulf of Mexico Range Complex
	-	100	100	Jacksonville Range Complex
	-	100	100	Navy Cherry Point Range Complex
	-	100	100	Other AFTT Areas
	-	100	100	Virginia Capes Range Complex
Unmanned Aerial System Training and Certification	-	200	200	Jacksonville Range Complex
	-	200	200	Navy Cherry Point Range Complex
	-	250	250	Virginia Capes Range Complex
Unmanned Underwater Vehicle Training – Certification and Development	-	10	10	Gulf of Mexico Range Complex
	-	10	10	Jacksonville Range Complex
	-	10	10	Navy Cherry Point Range Complex
	-	20	20	Virginia Capes Range Complex
	-	20	20	Virginia Capes Range Complex Inshore
Waterborne Training	-	138	152	Beaumont, TX Gulf of Mexico Range Complex Gulf of Mexico Range Complex Inshore Pascagoula, MS Tampa, FL
	-	60	66	Jacksonville Range Complex Inshore
	-	69	76	Key West Range Complex
	-	185	204	Northeast Range Complexes Northeast Range Complexes Inshore
	-	9	10	NS Mayport
	-	182	200	Virginia Capes Range Complex Inshore

[1] The Department of the Navy selected Alternative 1, the Preferred Alternative, in the Record of Decision signed October 18, 2018.

[2] Locations given are areas where activities typically occur. However, activities could be conducted in other locations within the Study Area. Where multiple locations are provided within a single cell, the number of activities could occur in any of the locations, not in each of the locations.

Notes: AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; FL = Florida; MS = Mississippi; NS = Naval Station; OEIS = Overseas Environmental Impact Statement; TX = Texas; - = Not Applicable

2.2.2 Proposed Testing Activities

As described in the 2018 Final EIS/OEIS, the Navy's research and acquisition community engages in a broad spectrum of testing activities. These activities include, but are not limited to, basic and applied scientific research and technology development; testing, evaluation, and maintenance of systems (e.g., missiles, radar, and sonar) and platforms (e.g., surface ships, submarines, and aircraft); and acquisition of systems and platforms to support Navy missions and give a technological advantage over adversaries. The individual commands within the research and acquisition community included in this Supplemental EIS/OEIS are Naval Air Systems Command, Naval Sea Systems Command, and the Office of Naval Research.

Testing activities proposed by individual commands in this Supplemental EIS/OEIS are described in Table 2.2-3, Table 2.2-4, and Table 2.2-5. These tables provide information on all testing activities, such as location, number of events per year, and number of events per year analyzed in the 2018 Final EIS/OEIS. More information about each activity can be found in Appendix A (Activity Descriptions) and Appendix B (Activity Stressor Matrices).

The Coast Guard is not proposing any testing activities as part of the Proposed Action. The Coast Guard uses the same systems and weapons as the Navy and rely on the Navy's acquisition community to test all ships and systems to be added to the Coast Guard's inventory.

Table 2.2-3: Naval Air Systems Command Current and Proposed Testing Activities

Activity Name	*2018 EIS/OEIS Annual # of Activities*	*Supplemental Annual # of Activities[2]*		*Location[3]*
	Alt 1[1]	*Alt 1*	*Alt 2*	
Air Warfare				
Air Combat Maneuvers Test	550	550	550	Virginia Capes Range Complex
Air Platform Vehicle Test	12	12	12	Gulf of Mexico Range Complex
	9	9	9	Jacksonville Range Complex
	9	9	9	Key West Range Complex
	9	9	9	Navy Cherry Point Range Complex
	190	190	190	Virginia Capes Range Complex
Air Platform Weapons Integration Test	-	2	2	Gulf of Mexico Range Complex
	40	40	40	Virginia Capes Range Complex
Air-to-Air Gunnery Test – Medium-Caliber	55	55	55	Virginia Capes Range Complex
Air-to-Air Missile Test	83	83	83	Virginia Capes Range Complex
Air-to-Air Weapons System Test	10	2	2	Gulf of Mexico Range Complex
Intelligence, Surveillance, and Reconnaissance Test	-	5	5	Gulf of Mexico Range Complex
	7	8	8	Jacksonville Range Complex
	9	10	10	Navy Cherry Point Range Complex
	406	233	233	Virginia Capes Range Complex
Anti-Submarine Warfare				
Anti-Submarine Tracking Test – Fixed-Wing	10 - 15	15	15	Gulf of Mexico Range Complex
	19	19	19	Jacksonville Range Complex
	10 - 12	12	12	Key West Range Complex
	14 - 15	15	15	Navy Cherry Point Range Complex
	36 - 45	45	45	Northeast Range Complexes
	-	25	25	SINKEX Box
	25	25	25	Virginia Capes Range Complex
Anti-Submarine Warfare Torpedo Test	20 - 43	20 - 43	43	Jacksonville Range Complex
	40 - 121	40 - 121	121	Virginia Capes Range Complex
Anti-Submarine Warfare Tracking Test – Rotary Wing	4 - 6	6	6	Gulf of Mexico Range Complex
	0 - 12	23	23	Jacksonville Range Complex
	2 - 27	27	27	Key West Range Complex
	28 - 110	110	110	Northeast Range Complexes
	137 - 280	280	280	Virginia Capes Range Complex

Table 2.2-3: Naval Air Systems Command Current and Proposed Testing Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities[2] Alt 1	Supplemental Annual # of Activities[2] Alt 2	Location[3]
Kilo Dip Test	2 - 6	6	6	Gulf of Mexico Range Complex
	0 - 6	6	6	Jacksonville Range Complex
	0 - 6	6	6	Key West Range Complex
	0 - 4	4	4	Northeast Range Complexes
	20 - 40	40	40	Virginia Capes Range Complex
Sonobuoy Lot Acceptance Test	160	186	186	Key West Range Complex
Electronic Warfare				
Chaff Test	20	20	20	Gulf of Mexico Range Complex
	4	4	4	Jacksonville Range Complex
	24	24	24	Virginia Capes Range Complex
Electronic Systems Test	2	2	2	Jacksonville Range Complex
	61	61	61	Virginia Capes Range Complex
Flare Test	10	20	20	Gulf of Mexico Range Complex
	20	20	20	Virginia Capes Range Complex
Mine Warfare				
Airborne Dipping Sonar Minehunting Test	16 - 32	-	-	Gulf of Mexico Range Complex
	-	32	32	NSWC Panama City Testing Range
	6 - 18	40	40	Virginia Capes Range Complex
Airborne Laser Mine Detection System Test	40	-	-	Gulf of Mexico Range Complex
	-	40	40	NSWC Panama City Testing Range
	50	50	50	Virginia Capes Range Complex
Airborne Mine Neutralization System Test	20 - 27	-	-	Gulf of Mexico Range Complex
	-	27	27	NSWC Panama City Testing Range
	24	25	25	Virginia Capes Range Complex
Airborne Sonobuoy Minehunting Test	52	26	26	NSWC Panama City Testing Range
	24	12	12	Virginia Capes Range Complex
Mine Laying Test	1	1	1	Jacksonville Range Complex
	2	2	2	Virginia Capes Range Complex
Surface Warfare				
Air-to-Surface Bombing Test	20	20	20	Virginia Capes Range Complex
Air-to-Surface Gunnery Test	25 - 55	55	55	Jacksonville Range Complex
	110 - 140	140	140	Virginia Capes Range Complex
Air-to-Surface Missile Test	0 - 10	5	5	Gulf of Mexico Range Complex
	29 - 38	29	29	Jacksonville Range Complex
	117 - 148	117	117	Virginia Capes Range Complex
Air-to-Surface High-Energy Laser Test	108	108	108	Virginia Capes Range Complex
Laser Targeting Test	5	5	5	Virginia Capes Range Complex
Maritime Security Operations	12	12	12	Jacksonville Range Complex
	12	12	12	Navy Cherry Point Range Complex
	20	20	20	Virginia Capes Range Complex

Table 2.2-3: Naval Air Systems Command Current and Proposed Testing Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities[2] Alt 1	Supplemental Annual # of Activities[2] Alt 2	Location[3]
Rocket Test	15 - 19	19	19	Jacksonville Range Complex
	31 - 35	35	35	Virginia Capes Range Complex
Other Testing Activities				
Acoustic and Oceanographic Research	1	1	1	Gulf of Mexico Range Complex
	1	1	1	Jacksonville Range Complex
	1	1	1	Key West Range Complex
	1	1	1	Northeast Range Complex
	1	1	1	Virginia Capes Range Complex
Air Platform Shipboard Integration Test	-	30	30	Gulf of Mexico Range Complex
	-	30	30	Jacksonville Range Complex
	-	30	30	Key West Range Complex
	126	152	152	Virginia Capes Range Complex
Shipboard Electronics Systems Evaluation	24	-	-	Gulf of Mexico Range Complex
	24	-	-	Jacksonville Range Complex
	24	-	-	Key West Range Complex
	26	-	-	Virginia Capes Range Complex
Undersea Range System Test	4 - 20	4 – 20	20	Jacksonville Range Complex

[1] The Department of the Navy selected Alternative 1, the Preferred Alternative, in the Record of Decision signed October 18, 2018.
[2] For activities where the maximum number of events varies between years, a range is provided to indicate the "representative–maximum" number of events. For activities where no variation is anticipated, only the maximum number of events within a single year is provided.
[3] Locations given are areas where activities typically occur. However, activities could be conducted in other locations within the Study Area. Where multiple locations are provided within a single cell, the number of activities could occur in any of the locations, not in each of the locations.
Notes: EIS – Environmental Impact Statement; OEIS = Overseas Environmental Impact Statement; NSWC = Naval Surface Warfare Center; SINKEX = Sinking Exercise

Table 2.2-4: Naval Sea Systems Command Current and Proposed Testing Activities

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities[2] Alt 1	Supplemental Annual # of Activities[2] Alt 2	Location[3]
Amphibious Warfare				
Amphibious Vessel Testing	-	0 - 1	1	Gulf of Mexico Range Complex Inshore
Anti-Submarine Warfare				
Anti-Submarine Warfare Mission Package Testing	-	1 - 2	2	Gulf of Mexico Range Complex
	42	2	2	Jacksonville Range Complex
	-	1 - 2	2	Northeast Range Complexes
	4	-	-	Newport, RI
	4	-	-	NUWC Newport Testing Range
	26	-	-	Virginia Capes Range Complex

Table 2.2-4: Naval Sea Systems Command Current and Proposed Testing Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities[2] Alt 1	Supplemental Annual # of Activities[2] Alt 2	Location[3]
At-Sea Sonar Testing	5	7 - 9	9	Gulf of Mexico Range Complex Jacksonville Range Complex Navy Cherry Point Range Complex Northeast Range Complexes SFOMF Virginia Capes Range Complex
	-	7 - 14	14	Gulf of Mexico Range Complex
	4	4	4	Jacksonville Range Complex
	2	2	2	Navy Cherry Point Range Complex
	-	8 - 15	15	Northeast Range Complexes
	8	-	-	NUWC Newport Testing Range
	12	16-22	22	Virginia Capes Range Complex
	-	2	2	SFOMF
Pierside Sonar Testing	13	5 - 10	10	NSB New London Gulf of Mexico Range Complex Inshore[4] Jacksonville Range Complex[4] NSB Kings Bay Newport, RI[4] NS Norfolk Northeast Range Complexes[4] Port Canaveral, FL Virginia Capes Range Complex[4]
	11	10 - 20	20	Bath, ME
	8	-	-	Newport, RI
	-	10 - 18	18	NS Mayport
	13	63 - 84	84	NS Norfolk
	2	10 - 20	20	Pascagoula, MS
	2	16 - 24	24	Portsmouth Naval Shipyard
Submarine Sonar Testing/Maintenance	24	-	-	Portsmouth Naval Shipyard
	16	-	-	NS Norfolk
Surface Ship Sonar Testing/Maintenance	1	1	1	Jacksonville Range Complex
	1	-	-	NS Mayport
	3	4	4	Virginia Capes Range Complex
	3	-	-	NS Norfolk
Torpedo (Explosive) Testing	6	1 - 5	5	Gulf of Mexico Range Complex Jacksonville Range Complex Key West Range Complex Navy Cherry Point Range Complex Northeast Range Complexes Virginia Capes Range Complex

Table 2.2-4: Naval Sea Systems Command Current and Proposed Testing Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities[2] Alt 1	Supplemental Annual # of Activities[2] Alt 2	Location[3]
Torpedo (Non-Explosive) Testing	46	13 - 17	17	Gulf of Mexico Range Complex Jacksonville Range Complex Key West Range Complex[4] Navy Cherry Point Range Complex Northeast Range Complexes SFOMF[2] Virginia Capes Range Complex Jacksonville Range Complexes Inshore[5]
	30	30	30	NUWC Newport Testing Range
Electronic Warfare				
Radar and Other Systems Testing	6 - 13	5 - 15	15	Gulf of Mexico Range Complex Jacksonville Range Complex Key West Range Complex Navy Cherry Point Range Complex JEB Little Creek Fort Story[5] NS Norfolk Northeast Range Complexes NSWC Panama City Testing Range[4] NUWC Newport Testing Range[4] SFOMF Virginia Capes Range Complex
	-	17 - 34	34	Gulf of Mexico Range Complex
	2	5 - 10	10	NS Norfolk
	2	17 - 34	34	Northeast Range Complexes
	4	-	-	NSB New London
	21 - 45	33 - 65	65	Virginia Capes Range Complex
	-	0 - 1	1	Virginia Capes Range Complex Inshore
Mine Warfare				
Mine Countermeasure and Neutralization Testing	13	18 - 45	45	Gulf of Mexico Range Complex
	6	24 - 48	48	Virginia Capes Range Complex
Mine Countermeasure Mission Package Testing	19	15	15	Gulf of Mexico Range Complex
	10	8	8	Jacksonville Range Complex
	11	11	11	NSWC Panama City Testing Range
	2	2	2	SFOMF
	5	3	3	Virginia Capes Range Complex
Mine Detection and Classification Testing	-	0 - 1	1	Jacksonville Range Complex NSWC Panama City Testing Range Port Canaveral, FL
	6	-	-	Gulf of Mexico Range Complex
	-	0 - 1	1	Jacksonville Range Complex
	7 - 12	-	-	Jacksonville Range Complex Inshore

Table 2.2-4: Naval Sea Systems Command Current and Proposed Testing Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities[2] Alt 1	Supplemental Annual # of Activities[2] Alt 2	Location[3]
	10	-	-	Navy Cherry Point Range Complex
	47 - 55	286 - 287	287	NSWC Panama City Testing Range
	4	-	-	SFOMF
	3	-	-	Virginia Capes Range Complex
Other Testing Activities				
Acoustic and Oceanographic Research	-	0 - 1	1	Gulf of Mexico Range Complex Jacksonville Range Complex Key West Range Complex
	-	3	3	Northeast Range Complexes
	-	0 - 1	1	Other AFTT Areas[6]
Acoustic Component Testing	33	33	33	SFOMF
	-	1	1	Jacksonville Range Complex
Simulant Testing	80	-	-	Jacksonville Range Complex
	80	-	-	Navy Cherry Point Range Complex
	80	-	-	Northeast Range Complexes
	80	0-5	5	Virginia Capes Range Complex
Countermeasure Testing	7 - 9	16 - 20	20	Gulf of Mexico Range Complex Jacksonville Range Complex Key West Range Complex Navy Cherry Point Range Complex[4] Northeast Range Complexes NUWC Newport Testing Range[5] Virginia Capes Range Complex JEB Little Creek Fort Story[4]
	-	8 - 10	10	Gulf of Mexico Range Complex
	-	6	6	NUWC Newport Testing Range
	-	6 - 10	10	Virginia Capes Range Complex
Insertion/Extraction	268	501 - 502	502	Key West Range Complex NSWC Panama City Testing Range
Intelligence, Surveillance, Reconnaissance	-	2	2	Jacksonville Range Complex
	-	1	1	Virginia Capes Range Complex
Line Charge Testing	4	4	4	NSWC Panama City Testing Range
Non-Acoustic Component Testing	-	0 - 3	3	Gulf of Mexico Range Complex Virginia Capes Range Complex
	4	0 - 3	3	Gulf of Mexico Range Complex
	-	0 - 1	1	Hampton Roads, VA
	4	0 - 1	1	Virginia Capes Range Complex
Payload Deployer Testing	1	1 - 2	2	Gulf of Mexico Range Complex
	1	1 - 2	2	Northeast Range Complexes
	39	39	39	NUWC Newport Testing Range
Semi-Stationary Equipment Testing	-	8 - 14	14	NSB New London NS Mayport NS Norfolk

Table 2.2-4: Naval Sea Systems Command Current and Proposed Testing Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities	Supplemental Annual # of Activities[2]		Location[3]
	Alt 1[1]	Alt 1	Alt 2	
				Port Canaveral, FL Virginia Capes Range Complex Inshore Key West Range Complex Inshore
	4	4	4	Newport, RI
	11	-	-	Gulf of Mexico Range Complex
	-	30	30	NSWC Panama City Testing Range
	190	155 - 173	173	NUWC Newport Testing Range
Towed Equipment Testing	36	43 - 49	49	NUWC Newport Testing Range
Surface Warfare				
Gun Testing - Large-Caliber	19	1 - 15	15	Gulf of Mexico Range Complex[5] Jacksonville Range Complex Key West Range Complex[5] Navy Cherry Point Range Complex[5] Northeast Range Complexes[5] Virginia Capes Range Complex
	1	1 - 2	2	Gulf of Mexico Range Complex
	1	2 - 4	4	Jacksonville Range Complex
	1	1 - 2	2	Northeast Range Complexes
	33	15	15	NSWC Panama City Testing Range
Gun Testing - Medium-Caliber	12	-	-	Gulf of Mexico Range Complex Jacksonville Range Complex Key West Range Complex Navy Cherry Point Range Complex Northeast Range Complexes Virginia Capes Range Complex
	-	1 - 2	2	Gulf of Mexico Range Complex
	-	1 - 2	2	Northeast Range Complexes
	102	102	102	NSWC Panama City Testing Range
	5	12 - 21	21	Virginia Capes Range Complex
Gun Testing - Small-Caliber	24	0 - 3	3	Gulf of Mexico Range Complex Jacksonville Range Complex Key West Range Complex Navy Cherry Point Range Complex Northeast Range Complexes Virginia Capes Range Complex
	13	0 - 1	1	Gulf of Mexico Range Complex
	7	8	8	NSWC Panama City Testing Range
	8	0 - 3	3	Virginia Capes Range Complex
Kinetic Energy Weapons Testing	61	-	-	Gulf of Mexico Range Complex Jacksonville Range Complex Key West Range Complex Navy Cherry Point Range Complex

Table 2.2-4: Naval Sea Systems Command Current and Proposed Testing Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities[2] Alt 1	Supplemental Annual # of Activities[2] Alt 2	Location[3]
				Northeast Range Complexes Virginia Capes Range Complex
Missile and Rocket Testing	21	6 - 18	18	Gulf of Mexico Range Complex Jacksonville Range Complex Key West Range Complex[5] Navy Cherry Point Range Complex Northeast Range Complexes[5] Virginia Capes Range Complex
	22	20 - 30	30	Virginia Capes Range Complex
Unmanned Systems				
Underwater Search, Deployment, and Recovery	33	33	33	SFOMF
	-	0 - 5	5	Virginia Capes Range Complex
Unmanned Aerial System Testing	15	-	-	Northeast Range Complexes
	17	17	17	NUWC Newport Testing Range
	15	-	-	Virginia Capes Range Complex
Unmanned Surface Vehicle System Testing	-	8 - 14	14	Gulf of Mexico Range Complex Gulf of Mexico Range Complex Inshore Jacksonville Range Complex Key West Range Complex NS Mayport Navy Cherry Point Range Complex NS Norfolk Other AFTT Areas[6] Pascagoula, MS Virginia Capes Range Complex
	132	4	4	NUWC Newport Testing Range
Unmanned Underwater Vehicle Testing	16	-	-	Gulf of Mexico Range Complex Jacksonville Range Complex NUWC Newport Testing Range
	41	-	-	Gulf of Mexico Range Complex
	25	-	-	Jacksonville Range Complex
	9	-	-	Jacksonville Range Complex Inshore
	145 - 146	208 - 209	209	NSWC Panama City Testing Range
	308 - 309	138	138	NUWC Newport Testing Range
	42	1	1	SFOMF
Vessel Evaluation				
Air Defense Testing	1	-	-	Gulf of Mexico Range Complex
	2	2	2	Jacksonville Range Complex
	1	-	-	Northeast Range Complexes
	5	18 - 31	31	Virginia Capes Range Complex
Aircraft Carrier Sea Trials – Propulsion Testing	2	-	-	Virginia Capes Range Complex

Table 2.2-4: Naval Sea Systems Command Current and Proposed Testing Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities[2] Alt 1	Supplemental Annual # of Activities[2] Alt 2	Location[3]
Hydrodynamic and Maneuverability Testing	2	-	-	Gulf of Mexico Range Complex Jacksonville Range Complex Key West Range Complex Navy Cherry Point Range Complex Northeast Range Complexes Virginia Capes Range Complex
In-Port Maintenance Testing	24	2	2	NS Mayport, FL NS Norfolk
	2	2	2	NS Mayport
	5	4	4	NS Norfolk
Large Ship Shock Trials	0 - 1	-	-	Gulf of Mexico Range Complex Jacksonville Range Complex Virginia Capes Range Complex
Propulsion Testing	42	13 - 73	73	Gulf of Mexico Range Complex Gulf of Mexico Range Complex Inshore[4] Jacksonville Range Complex Key West Range Complex Navy Cherry Point Range Complex Northeast Range Complexes Virginia Capes Range Complex
	86	30 - 58	58	Gulf of Mexico Range Complex
	5	1 - 2	2	Northeast Range Complexes
	-	1 - 2	2	NSWC Panama City Testing Range
	7	15 - 74	74	Virginia Capes Range Complex
Signature Analysis Operations	-	0 - 1	1	Hampton Roads, VA
	1	-	-	Jacksonville Range Complex
	59	79 - 94	94	SFOMF
Small Ship Shock Trial	0 - 3	0 - 2	0 - 2	Jacksonville Range Complex Virginia Capes Range Complex Gulf of Mexico Range Complex[4]
Submarine Sea Trials – Propulsion Testing	1	-	-	Jacksonville Range Complex
	1	2 - 4	4	Northeast Range Complexes
	1	2 - 4	4	Virginia Capes Range Complex
Submarine Sea Trials – Weapons System Testing	6	3 - 7	7	Gulf of Mexico Range Complex Jacksonville Range Complex Jacksonville Range Complex Inshore[5] NSB Kings Bay[4] Northeast Range Complexes Port Canaveral, FL[4] SFOMF[5] Virginia Capes Range Complex
	4	2 - 4	4	Northeast Range Complexes

Table 2.2-4: Naval Sea Systems Command Current and Proposed Testing Activities (continued)

Activity Name	2018 EIS/OEIS Annual # of Activities Alt 1[1]	Supplemental Annual # of Activities[2] Alt 1	Supplemental Annual # of Activities[2] Alt 2	Location[3]
	-	1	1	Northeast Range Complexes Inshore
	4	2 - 4	4	Virginia Capes Range Complex
Surface Warfare Testing	-	17 - 76	76	Jacksonville Range Complex Virginia Capes Range Complex
	2	0 - 2	2	Gulf of Mexico Range Complex
	13	4 - 6	6	Jacksonville Range Complex
	1	-	-	Key West Range Complex
	10	-	-	Northeast Range Complexes
	9	5 - 7	7	Virginia Capes Range Complex
Undersea Warfare Testing	4 - 6	6 - 24	24	Jacksonville Range Complex Navy Cherry Point Range Complex Northeast Range Complexes[4] SFOMF Virginia Capes Range Complex
	2	-	-	Gulf of Mexico Range Complex
	6	4 - 6	6	Jacksonville Range Complex
	-	0 - 1	1	Key West Range Complex
Vessel Signature Evaluation	9	1 - 4	4	Jacksonville Range Complex Virginia Capes Range Complex
	2	0 - 1	1	Gulf of Mexico Range Complex
	-	1 - 3	3	Hampton Roads, VA
	16	-	-	Jacksonville Range Complex
	-	0 - 1	1	NUWC Newport Testing Range
	-	0 - 1	1	SFOMF
	18	0 - 1	1	Virginia Capes Range Complex
	5	-	-	JEB Little Creek Fort Story

[1] The Department of the Navy selected Alternative 1, the Preferred Alternative, in the Record of Decision signed October 18, 2018.

[2] For activities where the maximum number of events varies between years, a range is provided to indicate the "representative–maximum" number of events. For activities where no variation is anticipated, only the maximum number of events within a single year is provided.

[3] Locations given are areas where activities typically occur. However, activities could be conducted in other locations within the Study Area. Where multiple locations are provided within a single cell, the number of activities could occur in any of the locations, not in each of the locations.

[4] Location is proposed for this Supplemental EIS/OEIS, but was not proposed for the 2018 AFTT EIS/OEIS

[5] Location was proposed for the 2018 AFTT EIS/OEIS, but is not proposed for this Supplemental EIS/OEIS[6] Other AFTT Areas include areas outside of range complexes and testing ranges but still within the AFTT Study Area. Other AFTT Area activities typically refer to those activities that occur while vessels are in transit.

Notes: AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; FL = Florida; GA = Georgia; JEB = Joint Expeditionary Base; MS = Mississippi; NS = Naval Station; NSB = Naval Submarine Base; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; OEIS = Overseas Environmental Impact Statement; RI = Rhode Island; SFOMF = South Florida Ocean Measurement Facility; VA = Virginia

Table 2.2-5: Current and Proposed Office of Naval Research Testing Activities

Activity Name	*2018 EIS/OEIS Annual # of Activities*	*Supplemental Annual # of Activities[2]*		*Location[3]*
	Alt 1[1]	*Alt 1*	*Alt 2*	
Acoustic and Oceanographic Science and Technology				
Acoustic and Oceanographic Research	5	-	-	Gulf of Mexico Range Complex
	9	-	-	Northeast Range Complexes
	2	-	-	Other AFTT Areas
	2	-	-	Virginia Capes Range Complex
	-	12 - 15	15	Gulf of Mexico Range Complex Jacksonville Range Complex Northeast Range Complexes Virginia Capes Range Complex
Large Displacement Unmanned Undersea Vehicle Testing	4	-	-	Gulf of Mexico Range Complex
	12	-	-	Jacksonville Range Complex
	4	-	-	Navy Cherry Point Range Complex
	16	-	-	Northeast Range Complexes
	8	-	-	Virginia Capes Range Complex
	-	4 - 5	5	Gulf of Mexico Range Complex Jacksonville Range Complex Northeast Range Complexes Virginia Capes Range Complex
Mine Countermeasure Technology Research	-	4 - 5	5	Gulf of Mexico Range Complex Jacksonville Range Complex Northeast Range Complexes Virginia Capes Range Complex
	1	-	-	Jacksonville Range Complex
	2	-	-	Northeast Range Complexes
	1	-	-	Virginia Capes Range Complex

[1] The Department of the Navy selected Alternative 1, the Preferred Alternative, in the Record of Decision signed October 18, 2018.
[2] For activities where the maximum number of events varies between years, a range is provided to indicate the "representative–maximum" number of events. For activities where no variation is anticipated, only the maximum number of events within a single year is provided.
[3] Locations given are areas where activities typically occur. However, activities could be conducted in other locations within the Study Area. Where multiple locations are provided within a single cell, the number of activities could occur in any of the locations, not in each of the locations.
Notes: AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; OEIS = Overseas Environmental Impact Statement

2.3 Action Alternatives Development

The identification, consideration, and analysis of alternatives are critical components of the National Environmental Policy Act (NEPA) process and contribute to the goal of informed decision making. The Council on Environmental Quality (CEQ) issued regulations implementing NEPA, and these regulations require the decision maker to consider the reasonably foreseeable environmental effects of the proposed action and a reasonable range of alternatives (including the no action alternative) to the proposed action (40 CFR section 1502.14). CEQ guidance further provides that an EIS must evaluate reasonable alternatives to the proposed actions and, for alternatives eliminated from detailed study, briefly discuss the reasons for them having been eliminated. To be reasonable, an alternative, except for the no action alternative, must be technically and economically feasible and meet the purpose and need for the proposed action.

The Action Alternatives, and in particular the mitigation measures incorporated within the Action Alternatives, were developed to meet both the Action Proponents' purpose and need to train and test and NMFS's independent purpose and need to evaluate the potential impacts of Action Proponents' activities. The Action Proponents will implement mitigation measures to avoid or reduce potential impacts from the Proposed Action on environmental resources. Mitigation measures would be implemented under either Action Alternative and are detailed and analyzed in Chapter 5 (Mitigation).

The Action Proponents developed the alternatives considered in this Supplemental EIS/OEIS after careful assessment by subject matter experts, including military commands that utilize the ranges, military range management professionals, and Navy environmental managers and scientists. The Action Proponents also used the most recent military policy and historical data in developing alternatives.

Through comparison of Navy's Strategic Planning for projected capability requirements against historical analysis of multiple years of classified sonar usage data, followed by cross referencing the training requirements during the same time period, the Action Proponents produced a refined estimate of sonar usage anticipated to meet its training and testing requirements, which support the development of the action alternatives. The Navy, in its role as the Lead Agency, continues this refined process of checks and balances from phase to phase.

With regards to testing activities, the level of activity in any given year is highly variable and is dependent on technological advancements, emergent requirements identified during operations, and fiscal fluctuations. Therefore, the environmental analysis must consider all testing activities that could possibly occur to ensure that the analysis fully captures the potential environmental effects. These factors were considered in alternatives carried forward for consideration and analysis as described in Section 2.4 (Alternatives Carried Forward).

2.3.1 Alternatives Eliminated from Further Consideration

This Supplemental EIS/OEIS serves as an update to the 2018 Final EIS/OEIS; therefore, alternatives eliminated from consideration in the 2018 Final EIS/OEIS were evaluated to determine if they should be reconsidered for the Supplemental EIS/OEIS and are discussed below. The Action Proponents determined that these alternatives did not meet the purpose of and need for the Proposed Action after a thorough consideration of each.

2.3.1.1 Alternative Training and Testing Locations

The 2018 Final EIS/OEIS Section 2.4.3.1 (Alternative Training and Testing Locations) states there is no other series of integrated ranges in the Atlantic Ocean that affords this level of operational support and comprehensive integration for range activities. There are no other potential locations in the Atlantic where roughly half of the Navy's fleet is located, where land ranges, OPAREAs, undersea terrain and ranges, testing ranges, and military airspace combine to provide the venues necessary for the training and testing realism and effectiveness required to train and certify U.S. forces ready for combat operations. U.S. Coast Guard stations need to be strategically located to perform all of their missions, and they cannot move training to other locations. Therefore, conducting military readiness activities in alternative locations does not meet the purpose of and need for the Proposed Action and has been eliminated from detailed study.

2.3.1.2 Simulated Training and Testing Only

The 2018 Final EIS/OEIS Section 1.4.1 (Why the Navy Trains) states that simulators and synthetic training are critical elements that provide early skill repetition and enhance teamwork aboard vessels and in aircraft. For the purposes of this Supplemental EIS/OEIS, "simulators" will be used to describe specific devices that mimic actual equipment, such as an Anti-Submarine Warfare simulator, while "synthetic training" will refer to any training that takes place in a virtual environment. Since 2018, advanced technology has ushered in training environments that merge live, virtual and constructive capabilities to expand the scale and complexity of training conditions. Such training environments connect live, in-person elements with manned virtual simulators and constructive computer-generated forces.

The Action Proponents currently use simulation for training and testing whenever possible; however, there are limitations, and its use cannot completely replace live training or testing. To determine the balance of live and synthetic military readiness activities, the roles of live and simulated activities in relation to attaining performance goals should be considered. Measuring the relative effectiveness of in-port and underway training is difficult at best. However, if the Action Proponents are to pursue an increased use of simulation to replace live underway training, the combination of live and synthetic training to achieve maximum readiness must be evaluated.

- While simulation is often more cost-effective, some training events cannot or should not be replaced by a simulator. For example, conducting live fire exercises increases operator and crew proficiency, tests weapons system and ordnance reliability under live conditions, evaluates doctrinal procedures and system performance, and assesses the effectiveness of past training.
- Underway training can be used to validate the level of proficiency attained from using synthetic training while ashore.
- Simulation can be used to augment training completed underway but cannot completely replace it.
- Some simulators cannot provide the same level of fidelity as live events.

Training and Testing Without Use of Active Sonar. The Navy uses passive and active sonar to detect submarines. Sonar proficiency is a complex and perishable skill that requires regular, hands-on training in realistic and diverse conditions. More than 475 submarines are operated by approximately 40 countries worldwide (Global Firepower, 2024). As a result, detection of and defense against enemy submarines is a top Navy priority. Anti-submarine warfare training and testing activities prepare and equip sailors for countering such threats. Failure to detect and defend against hostile submarines can cost lives, such as the 46 sailors who died when a Republic of Korea frigate (CHEONAN) was sunk by a North Korean submarine in March 2010 (Gregg, 2010). These difficult-to-detect submarines are true threats to global commerce, national security, and the safety of military personnel. As a result, defense against enemy submarines is a top priority for the Navy.

Although the Navy's Anti-Submarine Warfare simulators provide all-world, high-fidelity synthetic environments and realistic and versatile scenarios, there remain limits to the realism that current technology can presently provide. For example:

- Bottom bounce and other environmental conditions. Sound hitting the ocean floor (bottom bounce) reacts differently depending on the bottom type and depth. Likewise, sound is affected by passing through changing currents, eddies, or across differences in ocean temperature, pressure, or salinity.

- Ambient noise. Not all worldwide oceanographic phenomena have been modeled, including some types of naturally occurring noise in the sea and the noise resulting from human activity but excluding self-noise and reverberation.
- Mutual sonar interference. When multiple sonar sources are operating in the vicinity of each other, interference due to similarities in frequency can occur. Again, this is a complex variable that must be recognized by sonar operators but is difficult to simulate with any degree of fidelity.

Similar to the limitations noted above, operational testing cannot be based exclusively on computer modeling and simulation either (see 10 United States Code sections 4171 - 72). At-sea testing provides the critical information on usability, operability, reliability, survivability, lethality, and supportability needed by the Navy to make decisions on the procurement of platforms and systems (to include sonar), ensuring that what is purchased performs as expected and that tax dollars are used effectively. This testing requirement is also critical to protect the Sailors, Marines, and Coast Guardsmen who depend on these technologies to execute their mission with minimal risk to themselves.

The Navy's Systems Commands are responsible for administering large contracts for the Navy's procurement of platforms and systems, and also share those platforms/systems with the U.S. Coast Guard. These contracts include performance criteria and specifications that must be verified through testing to ensure that the Navy accepts platforms and systems that support the warfighter's needs. Although simulation is a key component in platform and systems development, it does not adequately provide information on how a system will perform or whether it will be available to meet performance and other specification requirements due to the complexity of the technologies in development and environments in which they will operate. For this reason, at some point in the development process, platforms and systems must undergo at-sea or in-flight testing. Therefore, simulation as an alternative that replaces training and testing in the field does not meet the purpose of and need for the Proposed Action and has been eliminated from detailed study.

2.3.1.3 Alternatives Including Geographic Mitigation Measures within the Study Area

The Action Proponents considered, but did not develop, an alternative based solely on geographic mitigation. Developing such an alternative would mean that geographic or temporal restrictions would be included for one action alternative but not for others. Such a framework would not meet the Action Proponents' purpose and need for the reasons described below and outlined in Chapter 1 (Purpose and Need).

NEPA regulations allow agencies to "include appropriate mitigation measures not already included in the Proposed Action or alternatives" (40 CFR section 1502.14(e)). The Navy defines its Proposed Action and alternatives prior to conducting its environmental analyses. As a general approach, the Action Proponents develop mitigation outside of (i.e., after) the alternatives development framework, and mitigation is designed to be implemented under all action alternatives carried forward. This approach allows the Action Proponents to refine and tailor their mitigation measures based on the findings of their environmental analyses, potential benefits to marine resources, suggestions received through public comments during scoping and on the Draft Supplemental EIS/OEIS, consultations with environmental regulatory agencies, and operational practicality assessments. The Action Proponents will consider applicable existing mitigation measures developed during previous EIS/OEIS projects and develop new mitigations as appropriate.

As described in Section 5.2 (Mitigation Dissemination) of Chapter 5 (Mitigation), the Action Proponents conduct extensive biological effectiveness and operational practicality assessments of all potential mitigations. Action Proponents' senior leadership review and approve all mitigations included in a Draft or Final EIS/OEIS. Therefore, if the Action Proponents were to create a geographic mitigation alternative, all mitigations included in that alternative would have been verified as effective and practical, and approved by

Action Proponents' senior leadership prior to publication of a Draft EIS/OEIS. From an MMPA compliance standpoint, NMFS would require the Navy to implement mitigations that benefit marine mammals under all action alternatives (i.e., not only the mitigation alternative) to meet the least practicable adverse impact standard. In other words, approved and effective mitigation would be implemented regardless of its association with an alternative; therefore, basing an alternative solely on geographic mitigation would not be reasonable. Overall, the Action Proponents' mitigation development process ensures that it includes the maximum level of mitigation that is practical to implement under the Proposed Action.

2.3.1.4 "Status Quo" Alternative

The Action Proponents considered a Status Quo Alternative based on the 2018 Final EIS/OEIS Preferred Alternative (see Section 2.5.2, Alternative 1, in the 2018 Final EIS/OEIS) and the 2018 Final EIS/OEIS Record of Decision. Under such an alternative, the Navy and Marine Corps would continue military readiness activities in the Study Area at current levels documented in the 2018 Final EIS/OEIS Record of Decision, and would request separate authorizations under the MMPA and Endangered Species Act (ESA) as required. The Navy and Marine Corps could continue to conduct military readiness activities, and the U.S. Coast Guard Activities post-2025 would require separate NEPA analysis and MMPA permitting. A Status Quo Alternative may limit the Action Proponents' ability to implement new systems and platforms. This alternative may not allow for new testing requirements, and future training requirements are based on changing world events, advances in technology, and Action Proponents' tactical and strategic priorities; the "status quo" alternative would not afford the Navy, Marine Corps, or Coast Guard the ability to meet these evolving requirements. Thus, such an alternative would not be reasonable and has been eliminated from detailed study.

2.4 Alternatives Carried Forward

The Action Proponents' anticipated level of training and testing activity evolves over time based on numerous factors. Additionally, the Action Proponents' ongoing sonar reporting program has gathered classified data regarding the number of active sonar hours used to meet anti-submarine warfare requirements, which are used to create an accurate projection of the number of active sonar hours required to meet anti-submarine warfare training requirements into the reasonably foreseeable future. Similarly, the Action Proponents collect data on explosives use to help refine requirements.

2.4.1 No Action Alternative

Under the No Action Alternative analyzed in this Supplemental EIS/OEIS, the Action Proponents would not conduct the proposed military readiness activities in the Study Area. Consequently, the No Action Alternative of not conducting the proposed live, at-sea training and testing in the Study Area is inherently unreasonable in that it does not meet the Action Proponents' purpose and need (see Section 1.4, Purpose and Need). From NMFS' perspective, pursuant to its obligation to grant or deny requests for authorization to take marine mammals under the MMPA, the No Action Alternative involves NMFS denying Navy's application for an incidental take authorization under section 101(a)(5)(A) of the MMPA. If NMFS were to deny the Navy's application, the Navy would not be authorized to incidentally take marine mammals, and the Navy would not conduct the proposed training and testing activities proposed in this Supplemental EIS/OEIS. Thus, NMFS assumes that there would be no take of marine mammals.

Cessation of Action Proponents' proposed at-sea military readiness activities would mean that the Action Proponents would not fully meet their statutory requirements and would be less able to properly defend themselves and the United States from enemy forces, less able to successfully detect enemy submarines, and less able to effectively use their weapons systems or defensive countermeasures. For example, sonar proficiency, which is a complex and perishable skill, requires regular, underway training in realistic and diverse conditions to detect and counter hostile submarines. Inability to train at sea with active sonar would result in diminished anti-submarine warfare capability.

Additionally, without proper hands-on training while at sea, individual Sailors, Marines, and Coast Guardsmen serving onboard ships and submarines would not be adequately taught how to properly operate complex equipment in inherently dynamic and dangerous environments. Even with high levels of training and a culture of safety, injuries and death have occurred during routine non-combat operations. Therefore, without sufficient underway training, it is likely that there would be an increase in the number of mishaps, potentially resulting in the death or serious injury of Sailors, Marines and Coast Guardsmen. Failing to allow our Sailors, Marines, and Coast Guardsmen to achieve and maintain the skills necessary to defend the United States and its interests will result in an unacceptable increase in the danger they willingly face.

Finally, the lack of live training and testing would require a higher reliance on simulated training and testing. While the Action Proponents continue to develop new ways to provide realistic training through simulation, there are limits to the realism that current technology can provide. Sole reliance on simulation would limit the Navy's ability to fully develop battle-ready proficiency in the employment of active sonar (Section 2.3.1.2, Simulated Training and Testing Only).

2.4.2 Alternative 1

Alternative 1 is the Environmentally Preferred Action Alternative. It is also the Action Proponent's Preferred Action Alternative. Alternative 1 reflects a representative year of training and testing to account for the natural fluctuations of training cycles, testing programs, and deployment schedules that generally limit the maximum level of training and testing that could occur in the reasonably foreseeable future.

2.4.2.1 Training

Under this alternative, the Action Proponents propose to conduct military readiness training activities into the reasonably foreseeable future, as necessary to meet current and future readiness requirements. These military readiness training activities include new activities as well as activities subject to previous analysis that are currently ongoing and have historically occurred in the Study Area. The requirements for the types of activities to be conducted, as well as the intensity at which they need to occur, have been validated by senior Action Proponent leadership. Specifically, training activities are based on the requirements of the Optimized Fleet Response Plan and on changing world events, advances in technology, and Action Proponents' tactical and strategic priorities. These activities account for force structure changes and include training with new aircraft, vessels, unmanned/autonomous systems, and weapon systems that will be introduced to the Fleet after November 2025. The numbers and locations of all proposed training activities are provided in Table 2.2-1 and Table 2.2-2.

Alternative 1 reflects a representative year of training that (1) accounts for the natural fluctuation of training cycles and deployment schedules that influence the number of Composite Training Unit Exercises that would occur in any 7-year period, and (2) assumes that some unit-level training requirements are met during integrated, coordinated, and major training exercises vice discrete unit-level training events.

Using a representative level of activity rather than a maximum level of training activity in every year reduces the amount of hull-mounted mid-frequency active sonar estimated to be necessary to meeting training requirements. But also by using this framework, the Action proponents accept a degree of risk that if global events necessitated a rapid expansion of military training, they may not have sufficient capacity in their MMPA and ESA authorizations to carry out those training requirements.

2.4.2.2 Testing

Under Alternative 1, the Action Proponents propose an annual level of testing that reflects the fluctuations in testing programs by recognizing that the maximum level of testing will not be conducted each year. This alternative includes the testing of new platforms, systems, and related equipment that will be introduced after November 2025. The majority of testing activities that would be conducted under this alternative are similar to those conducted currently or in the past. This alternative includes the testing of some new systems using new technologies and takes into account inherent uncertainties in this type of testing. The numbers and locations of all proposed testing activities are listed in Table 2.2-3, Table 2.2-4, and Table 2.2-5.

2.4.3 Alternative 2

2.4.3.1 Training

As under Alternative 1, this alternative includes new and ongoing activities. Under Alternative 2, the Action Proponents would meet the highest levels of required military readiness by (1) conducting a total of four carrier strike group Composite Training Unit Exercises every year, and (2) meeting all unit-level training requirements using dedicated, discrete training events, instead of achieving them in conjunction with integrated, coordinated, and major training exercises as described for Alternative 1. The numbers and locations of all proposed training activities are provided in Section 2.2.1 (Proposed Training Activities), Table 2.2-1, and Table 2.2-2.

Alternative 2 reflects the maximum number of training activities that could occur within a given year and assumes that the maximum level of activity would occur every year over any 7-year period. This allows for the greatest capacity for the Navy to maintain readiness when considering potential changes in the national security environment, fluctuations in training and deployment schedules, and potential in-theater demands. Both unit-level training and major training exercises are assumed to occur at a maximum level every year.

Additionally, this alternative will analyze three Composite Training Unit Exercises each year along with a contingency Composite Training Unit Exercise in the Gulf of Mexico each year, for a maximum number of 28 Composite Training Unit Exercises over any 7-year period.

2.4.3.2 Testing

Like Alternative 1, Alternative 2 entails a level of testing activities to be conducted into the reasonably foreseeable future and includes the testing of new platforms, systems, and related equipment that will be introduced beginning in November 2025. The majority of testing activities that would be conducted under this alternative are the same as or similar to those conducted currently or in the past.

Alternative 2 would include the testing of some new systems using new technologies, taking into account the potential for delayed or accelerated testing schedules, variations in funding availability, and innovations in technology development. To account for these inherent uncertainties in testing, this alternative assumes that the maximum annual testing efforts predicted for each individual system or program could occur concurrently in any given year. This alternative also includes the contingency for augmenting some weapon systems tests in response to potential increased world conflicts and changing U.S. leadership priorities as the result of a direct challenge from a naval opponent that possesses near-peer capabilities. Therefore, this alternative includes the provision for higher levels of annual testing of certain anti-submarine warfare and mine warfare systems to support expedited delivery of these systems to the Fleet. All proposed testing activities are listed in Table 2.2-3 through Table 2.2-5, Section 2.2.2 (Proposed Testing Activities).

2.4.4 Comparison of Proposed Sonar and Explosive Use in the Action Alternatives to the 2018–2025 MMPA Permit Allotment

2.4.4.1 Training

As a comparison to the amount of training analyzed in the previous environmental planning compliance documents and reflected in the 2018–2025 MMPA permit (2018 Final EIS/OEIS), the Navy considered hull-mounted mid-frequency active sonar. Composite Training Unit Exercises are major exercises that involve multiple platforms and numerous hours of sonar to meet mission objectives. During Phase II, each Composite Training Unit Exercise was assumed to require 1,000 hours of hull-mounted mid-frequency sonar. In Phase III planning, based on our analysis of Phase II usage data, the Navy reduced the estimated number of hull-mounted mid-frequency sonar for each Composite Training Unit Exercise to 600 hours. Likewise, through analysis of Phase III usage data, the Navy has been able to further reduce the estimated amount of hull-mounted mid-frequency sonar that is used in a Composite Training Unit Exercise. As such, for both Alternatives 1 and 2, an estimated 400 hours of hull-mounted mid-frequency sonar is included for each Composite Training Unit Exercise. What differentiates the amount of hull-mounted mid-frequency sonar in Alternative 1 from Alternative 2 is (1) the completion of some unit-level training through other training exercises, and (2) 10 fewer Composite Training Unit Exercises over a 7-year period.

A comparison of proposed hours of hull-mounted mid-frequency sonar hours to that permitted from 2018 to 2025 is depicted in Figure 2.4-1.

For this Supplemental EIS/OEIS, Figure 2.4-2 shows the explosive use per bin (a category of explosives) proposed in this Supplemental EIS/OEIS compared to the 2018–2025 permitted level (there is no difference in explosive use between the alternatives).

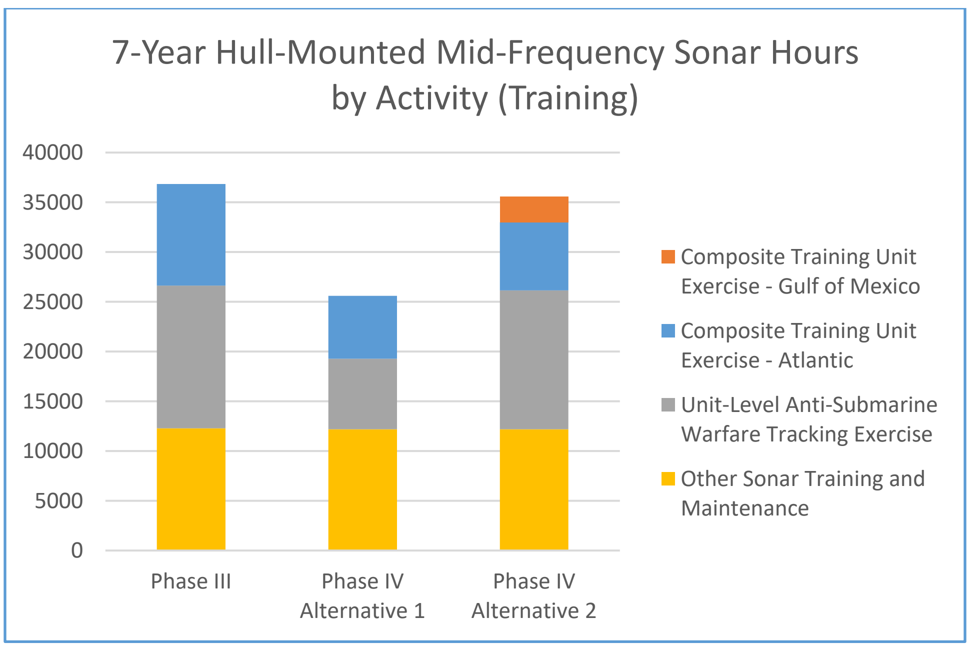
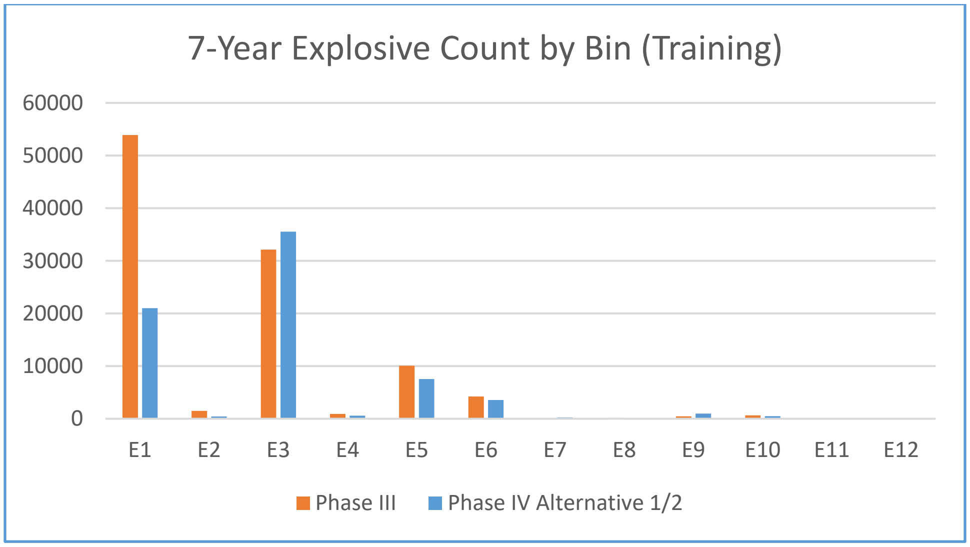


Figure 2.4-1: Proposed Hull-Mounted Mid-Frequency Sonar Hours by Training Activity Compared to the Number Authorized in the 2018–2025 Marine Mammal Protection Act Permit



Note: Alternative 1 and Alternative 2 would use the same number of explosives in this Supplemental EIS/OEIS; the bar graph depicts both alternatives.

Figure 2.4-2: Change in Explosive Use (for Both Action Alternatives) during Training Activities Compared to the 2013–2018 Marine Mammal Protection Act Permit

2.4.4.2 Testing

The Navy's testing community faces a number of challenges in accurately defining future testing requirements. These challenges include varying funding availability, changes in Congressional and Department of Defense/Navy priorities in response to emerging threats in the world, and the acquisition of new technologies that introduce increased uncertainties in the timeline, tempo, or success of a system's testing schedule. As it does now, the Navy testing community took into account these same challenges in projecting requirements for Phase IV. Although the best information available to the Navy has always been taken into account, as a result of the implementation of Phase III, the Navy testing community has improved its ability to obtain and define that information and, consequently, its ability to project future testing needs. It is expected that over time, the Navy's ability to project future testing requirements will continue to improve with increasing refinement of the process and more or better historical data. Nonetheless, the inherent challenges and uncertainties in testing, as described previously, will continue to make projection of future testing requirements challenging. The majority of platforms, weapons, and systems that use sonar and explosives for testing are the same or very similar to those analyzed in the 2018 Final EIS/OEIS. Some platforms, weapons, and systems will increase under the current Proposed Action, while others will decrease. For testing, the Action Proponents project a net increase in the use of sonar and a significant net decrease in the use of explosives.

References

Global Firepower. (2024). *Submarine Fleet Strength by Country (2024)*. Retrieved August 9, 2024, from https://www.globalfirepower.com/navy-submarines.php.

Gregg, D. P. (2010, August 31, 2010). Opinion: Testing North Korean Waters. *The New York Times*. Retrieved from https://www.nytimes.com/2010/09/01/opinion/01iht-edgregg.html?_r=2.

U.S. Department of the Navy. (2018). *Atlantic Fleet Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement*. Norfolk, VA: Naval Facilities Engineering Command Atlantic.

Draft

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3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.0 INTRODUCTION

This chapter describes existing environmental conditions in the Atlantic Fleet Training and Testing (AFTT) Study Area as well as the analysis of resources potentially impacted by the Proposed Action described in Chapter 2 (Description of Proposed Action and Alternatives). The Study Area is described in Section 2.1 (Description of the Atlantic Fleet Training and Testing Study Area) and depicted in Figure 2.1-1 (Atlantic Fleet Training and Testing Study Area).

3.0.1 NAVY COMPILED AND GENERATED DATA

While preparing this document, the best available data, science, and information accepted by the relevant and appropriate regulatory and scientific communities was used to establish a baseline and perform environmental analyses for all resources in accordance with the National Environmental Policy Act (NEPA) (42 United States Code [U.S.C.] section 431 et seq.), the Administrative Procedure Act (5 U.S.C. section 551 et seq.), and Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*.

Resources Analyzed

Physical Resources:

- Air Quality
- Sediment and Water Quality

Biological Resources:

- Habitats
- Vegetation
- Invertebrates
- Fishes
- Marine Mammals
- Reptiles
- Birds and Bats

In support of the environmental baseline and environmental consequences sections for this and other environmental documents, the Navy has sponsored and supported both internal and independent research and monitoring efforts. The Navy's research and monitoring programs, as described below, are largely focused on filling data gaps and obtaining the best available science.

3.0.1.1 Marine Species Monitoring and Research Programs

The Action Proponents have sponsored research and monitoring for more than 30 years. The Navy has invested nearly $55 million in compliance-monitoring activities in the Study Area since 2009 (U.S. Department of the Navy, 2022). The Navy, Coast Guard, United States (U.S.) Army Corps of Engineers, and National Marine Fisheries Service (NMFS) collaboratively sponsor aerial surveys off the southeastern coast from December 1 through March 31 to observe for North Atlantic right whales as part of the Early Warning System, which is described in Section 5.7.12 (Jacksonville Operating Area North Atlantic Right Whale Mitigation Area) and Section 5.7.13 (Southeast North Atlantic Right Whale Mitigation Area). Additional programs are described in Table 3.0-1.

Table 3.0-1: Marine Species Monitoring and Research Programs

Program	Description
U.S. Navy Marine Species Monitoring Program	The U.S. Navy Marine Species Monitoring Program was established to meet regulatory compliance requirements under the Marine Mammal Protection Act and Endangered Species Act. This program focuses on improving the broader scientific understanding of protected marine species across Study Areas, including species occurrences, responses to stressor exposure, and consequences of stressor exposure on individuals and populations. The monitoring program coordinates its investments across all regions where the Navy conducts military readiness activities. Resource allocation is guided by a set of intermediate scientific objectives, species of concern, and regional priorities. Program goals and objectives were developed in coordination with NMFS and in consultation with a Science Advisory Group and other regional experts. The monitoring program is designed to be flexible, scalable, and adjustable to periodically assess progress and reevaluate objectives. Detailed and specific studies that support the Action Proponents' and NMFS' top-level monitoring goals will continue to be developed through what is known as the Strategic Planning Process. Monitoring data are available to the public on the Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations webpage (http://seamap.env.duke.edu/), Animal Telemetry Network (https://ioos.noaa.gov/project/atn/), and through collaborations such as the National Oceanic and Atmospheric Administration's Passive Acoustic Cetacean Map (https://apps-nefsc.fisheries.noaa.gov/pacm/#/) and WhaleMap (https://whalemap.org/WhaleMap/). Additional information about the monitoring program, including annual reports, technical reports, publications, and project summaries are provided on the U.S. Navy Marine Species Monitoring webpage (http://www.navymarinespeciesmonitoring.us/).
Living Marine Resources Program	The Living Marine Resources program's fundamental mission is to support the Navy's ability to conduct uninterrupted training and testing by broadening the use of or improving the technology and methods available to the U.S. Navy Marine Species Monitoring Program, and improving best available science on potential impacts of military readiness activities on marine species. Sponsored research covers four main investment areas: (1) data to support risk threshold criteria, (2) data analysis and processing tools, (3) technology demonstrations, and (4) standards and metrics. Research on data to support risk threshold criteria is used to support the acoustic effects analyses as discussed in the *Marine Mammal Auditory Weighting Functions and Exposure Functions for U.S. Navy Phase IV Acoustic Effects Analyses Technical Report* and *Sea Turtle Auditory Criteria and Thresholds for U.S. Navy Phase IV Acoustic Effects Analyses Technical Report*. For publications, program reports, and details about current and completed projects, see the Living Marine Resources program webpage (https://exwc.navfac.navy.mil/LMR).
Office of Naval Research	The Office of Naval Research Marine Mammals and Biology program supports basic and applied research and technology development related to understanding the effects of sound on marine mammals. The program focuses on characterizing and understanding behavioral, ecological, physiological, and population-level impacts on marine mammals, primarily from exposure to sonar. Sponsored research across five main concentration areas (monitoring and detection, integrated ecosystem research, sensing and tag development, effects of sound on marine life, models and databases) focuses on improving marine mammal monitoring capabilities by developing technology such as passive acoustics, infrared, tags and sensors, and detection and signal processing software. An example of a recent success is the adaptation of autonomous ocean gliders for timely, reliable, accurate, and actionable marine mammal monitoring. A key goal is to make technologies available to the broader research and Navy communities. For additional information, see the program's webpage (https://www.nre.navy.mil/organization/departments/code-32/division-322/marine-mammals-and-biology).

Notes: NMFS = National Marine Fisheries Service; U.S. = United States

3.0.1.2 Quantitative Analysis to Determine Impacts to Fish, Marine Mammals, and Sea Turtles

The Action Proponents conducted a quantitative analysis of the potential impacts to fish, marine mammals, and sea turtles through modeling when an activity introduces sound or explosive energy into the marine environment. The density of animals for each species and stock, along with criteria and thresholds that define the levels of sound and energy that may cause certain types of impacts, are used to conduct the analysis. The inputs and process are described below. A detailed explanation of this analysis is provided in the technical report, *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (U.S. Department of the Navy, 2024b).

3.0.1.2.1 Marine Species Density Database

A quantitative analysis of impacts on a species requires data on their abundance and distribution in the potentially impacted area. The most appropriate metric for this type of analysis is density, which is the number of animals present per unit area. Estimating marine species density requires substantial surveys and effort to collect and analyze data to produce a usable estimate. NMFS is the primary agency responsible for estimating marine mammal and sea turtle density within the U.S. Exclusive Economic Zone. Other agencies and independent researchers often publish density data for species in specific areas of interest, including areas outside the U.S. Exclusive Economic Zone. In areas where surveys have not produced adequate data to allow robust density estimates, methods such as model extrapolation from surveyed areas, Relative Environmental Suitability models, or expert opinion are used to estimate occurrence. These density estimation methods rely on information such as animal sightings, amount of survey effort, and the associated environmental variables (e.g., depth, sea surface temperature).

There is no single source of density data for every area of the world, species, and season because of fiscal, resource, and practical limitations, as well as the level of effort required to provide survey coverage to sufficiently estimate density. Therefore, to characterize marine species density for large areas, such as the Study Area, the Navy compiled data from multiple sources and developed a protocol to select the best available density estimates based on species, area, and time (i.e., season).

The resulting Geographic Information System database includes density values, defined seasonally where possible, for every marine mammal and sea turtle species present within the Study Area. This database is described in the technical report, *U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area* (hereafter referred to as the Navy Marine Species Density Database) (U.S. Department of the Navy, 2024c). These data are used as an input into the Navy Acoustic Effects Model.

3.0.1.2.2 Developing Acoustic and Explosive Criteria and Thresholds

Quantitative information about sound and energy levels that are likely to result in physiological and behavioral reactions is needed to analyze potential impacts on marine species. The best available data from scientific journals, technical reports, and monitoring reports published since the previous analysis in *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III)* (U.S. Department of the Navy, 2017) were used to develop criteria and thresholds for estimating impacts on marine species.

A series of behavioral studies on how some species of marine mammals react to military sonar has led to new behavioral response functions for marine mammals. Additional information on auditory sensitivity and hearing loss contributed to the development of updated auditory weighting functions for marine mammals and sea turtles. A detailed description of the acoustic and explosive criteria and threshold development is included in the supporting technical report *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Impact to Marine Mammals and Sea Turtles* (U.S. Department of the Navy, 2024a).

The Navy also uses criteria for estimating ranges to effects for fishes. A working group of experts generated a technical report that provides numerical criteria and relative likelihood of effects to fishes within different hearing groups (Popper et al., 2014). Where applicable, thresholds and relative risk factors presented in the technical report were used to assist in the analysis of effects to fishes from Navy activities.

3.0.1.2.3 The Navy Acoustic Effects Model

The Navy Acoustic Effects Model calculates sound energy propagation from sonar and other transducers and explosives during naval activities and the energy or sound received by animat dosimeters. Animat dosimeters are virtual representations of marine mammals or sea turtles distributed in the area around the modeled naval activity; each animat records its individual sound "dose." The model bases the distribution of animats over the Study Area on the density values in the Navy Marine Species Density Database and distributes animats in the water column proportional to the known time that species spend at varying depths.

The model accounts for environmental variability of sound propagation in both distance and depth when computing the received sound level on the animats. The model conducts a statistical analysis based on multiple model runs to compute the estimated effects on animals. The number of animats that exceed the received threshold for an effect is tallied to provide an estimate of the number of marine mammals or sea turtles that could be affected.

Assumptions in the Navy model intentionally err on the side of overestimation to provide a conservative analysis and be protective of the species when there are unknowns:

- Training and testing activities are modeled as though they would occur regardless of proximity to marine mammals or sea turtles (i.e., mitigation and implementation of standard operating procedures that employ protective measures are not modeled) and without any avoidance of the activity by the animal. The final step of the quantitative analysis of acoustic effects is to consider the implementation of mitigation. For sonar and other transducers, the possibility that marine mammals or sea turtles would avoid continued or repeated sound exposures is also considered.
- Many explosions from munitions such as bombs and missiles actually occur upon impact with above-water targets and at the water's surface. However, for this analysis, sources such as these were modeled as exploding underwater. This modeling overestimates the amount of explosive and acoustic energy entering the water.

The model estimates the impacts caused by individual training and testing activities. During any individual modeled event, impacts on individual animats are considered over 24-hour periods. The animats do not represent actual animals, but rather allow for a statistical analysis of the number of instances that marine mammals or sea turtles may be exposed to sound levels resulting in an effect. Therefore, the model estimates the number of instances in which an effect threshold was exceeded over the course of a year, but it does not estimate the number of individual marine mammals or sea turtles that may be impacted over a year (i.e., some marine mammals or sea turtles could be impacted several times, while others would not experience any impact). A detailed explanation of the Navy Acoustic Effects Model is provided in the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing.*

3.0.1.3 Marine Habitat Database

The AFTT Marine Habitat Database (formerly aquatic habitat database) was developed to refine the regional scale and overlapping habitat data used in the quantitative analysis of military expended materials and explosives placed on or near the sea floor. The database includes numerous data sources and geometries (i.e., points, lines, polygons) ranging from regional-to-local scale. The polygon data sources are subsequently combined to create a non-overlapping mosaic of habitat information that presents the highest quality data for a given location. The database includes mapping of both abiotic (i.e., physical/non-living) and biotic habitat types as well as designated artificial reef areas that serve both the analysis in Chapter 3 and the consultation documents for the Magnuson-Stevens Fishery Conservation and Management Act. A detailed description of the database is included as a supporting technical document with associated Geographic Information System and database deliverables (Appendix O, Geographic Information System Data Sources).

3.0.2 Ecological Characterization of the Study Area

The Study Area includes the intertidal and subtidal marine waters within the boundaries shown in Figure 2.1-1 (Atlantic Fleet Training and Testing Study Area) but does not extend above the mean high tide line. The Proposed Action would predominately occur within established operating areas, range complexes, testing ranges, ports, pierside locations, and inshore waters. These locations are determined by Action Proponent requirements, with locations set so as not to interfere with existing civilian and commercial maritime and airspace boundaries. These boundaries are not consistent with ecological boundaries, such as ecosystems, that may be more appropriate when assessing potential impacts on marine resources. Therefore, for the purposes of this document, marine resources were analyzed in an ecological context to the extent possible to more comprehensively assess the potential impacts.

The ecological characterization of the Study Area has not changed since the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (hereinafter referred to as the "2018 Final EIS/OEIS") for AFTT activities. Refer to Section 3.0.2 (Ecological Characterization of the Study Area) for detailed descriptions of the bathymetry; currents, circulation patterns, and water masses; and ocean fronts located within the Study Area (U.S. Department of the Navy, 2018). New data on ocean currents that has been published since the completion of the 2018 Final EIS/OEIS is described in Section 3.3 (Habitats).

3.0.3 Overall Approach to Analysis

The overall approach to analysis in this Supplemental EIS/OEIS is consistent with the approach used in the 2018 Final EIS/OEIS and included the following general steps:

- Review the existing 2018 Final EIS/OEIS and Record of Decision.
- Determine if information about the affected environment has changed.
- Identify new activities and proposed changes to existing activities.
- New locations were reviewed to determine new species and sensitive resources.
- Identify the stressors associated with the updated list of activities.
- Determine if there is a new method of analysis for those activities.
- Review existing and identify new federal and state regulations and standards relevant to resource-specific management or protection to determine if there has been any change since the 2018 Final EIS/OEIS.
- Review and apply new literature, including science, surveys, and information on how resources could be affected by stressors.
- Review and incorporate any unchanged descriptions and analysis from the 2018 Final EIS/OEIS and Record of Decision.
- Review and consider comments received from members of the public and other stakeholders during scoping.

- Identify past, present, and reasonably foreseeable future actions to analyze the cumulative impacts.
- Consider mitigation measures to reduce identified potential impacts.

Military readiness activities in the Study Area may produce one or more stimuli that cause stress on a resource. Each proposed activity was examined to determine its potential stressors. The term stressor is broadly used in this document to refer to an agent, condition, or other stimulus that causes stress to an organism or alters physical, socioeconomic, or cultural resources. Not all stressors affect every resource, nor do all proposed activities produce all stressors.

The potential direct, indirect, and cumulative impacts of the Proposed Action were analyzed based on these potential stressors being present within range of the resource. Datasets used for analysis were considered across the full spectrum of training and testing for the foreseeable future. For the purposes of analysis and presentation within this Supplemental EIS/OEIS, data was organized and evaluated in 1-year and 7-year increments. Direct impacts are caused by the Proposed Action and occur at the same time and place as the activity. Indirect impacts result when a direct impact on one resource induces an impact on another resource (referred to as a secondary stressor). Indirect impacts would be reasonably foreseeable because of a functional relationship between the directly impacted resource and the secondarily impacted resource. For example, a significant change in water quality could secondarily impact those resources that rely on water quality, such as marine species and public health and safety.

First, a preliminary analysis was conducted to determine the environmental resources potentially impacted and associated stressors. Second, each resource was analyzed for potential impacts of individual stressors, followed by an analysis of the combined impacts of all stressors related to the Proposed Action. A cumulative impact analysis was conducted to evaluate the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions (Chapter 4, Cumulative Impacts).

In this sequential approach, the initial analyses were used to develop each subsequent step, so the analysis focused on relevant issues (defined during scoping) that warranted the most attention. The systematic nature of this approach allowed the Proposed Action, with the associated stressors and potential impacts, to be effectively tracked throughout the process. This approach provides a comprehensive analysis of applicable stressors and potential impacts. Each step is described in more detail below.

3.0.3.1 Resources and Issues Evaluated

Physical resources evaluated include air quality, sediment and water quality, and habitats. Biological resources (including threatened and endangered species) evaluated include vegetation, invertebrates, fishes, marine mammals, reptiles, and birds and bats.

3.0.3.2 Resources and Issues Eliminated from Further Consideration

This Supplemental EIS/OEIS specifically analyzes in-water activities as well as activities occurring over water. Any land-based impacts from activities associated with the Proposed Action are analyzed in separate NEPA documents; therefore, some resource areas are not analyzed. Resources and issues considered but not carried forward for further consideration include land use, demographics, cultural resources, socioeconomics, public health and safety, environmental justice, and children’s health and safety.

Land Use and Demographics. Land use was not further considered because at-sea activities in the Proposed Action are not connected to land use issues and no new actions are being proposed that would include relevant land use. Demographics were not further considered because the Proposed Action does not include any activities that would result in a change in the demographics within the Study Area or within the counties of the coastal states that abut the Study Area.

Cultural Resources. Impacts to cultural resources within the Study Area would be the same as described in Section 3.10 (Cultural Resources) of the 2018 Final EIS/OEIS. The Action Proponents' standard operating procedures to avoid shipwrecks and mitigation measures (Chapter 5, Mitigation) for cultural resources would minimize impacts to known cultural and historic resources within the Study Area. No additional resources were identified in the areas where the Study Area expanded from that analyzed in the 2018 Final EIS/OEIS. In the event that the Action Proponents inadvertently impact a submerged prehistoric site or historic resource, consultation would be conducted with the appropriate State Historic Preservation Officer(s). Therefore, cultural resources were not carried forward for detailed analysis in this Supplemental EIS/OEIS. The Action Proponents are consulting with State Historic Preservation Officers under Section 106 of the National Historic Preservation Act.

Socioeconomics. The Action Proponents' military readiness activities have the potential to temporarily change access to the ocean or airspace for a variety of human activities associated with sources of energy generation, mineral extraction, commercial transportation, and shipping, commercial and recreational and fishing, aquaculture, tourism, and other recreational activities in the Study Area. However, potential impacts to these six elements within the Study Area would be similar to those described in Section 3.11 (Socioeconomics) of the 2018 Final EIS/OEIS and are briefly discussed below.

Military readiness activities have occurred throughout the Study Area for decades, resulting in and sustaining increases in jobs, military and civilian infrastructure, and population growth in numerous towns, cities, and regions located along the Atlantic and Gulf Coasts. One additional pierside location in the Gulf of Mexico is considered in this Supplemental EIS/OEIS that was not considered in the 2018 Final EIS/OEIS. The Port of Gulfport is a deep-water international seaport located in the Gulf of Mexico, 16 miles from international shipping lanes and 5 nautical miles from the Gulf Intracoastal Waterway. The Port encompasses 300 acres and handles more than 2 million tons of cargo and over 200,000 twenty-foot equivalent units (Mississippi State Port Authority at Gulfport, 2023).

When military readiness activities are scheduled that require specific areas to be free of non-participating vessels and aircraft due to public safety concerns, the U.S. Coast Guard and Federal Aviation Administration issue Notices to Mariners and Notices to Air Missions, respectively, to warn the public of upcoming Navy activities. Many military readiness activities occur in established restricted areas or danger zones as published on navigational and aeronautical charts. Some frequently used areas have standing Notices to Mariners and Notices to Airmen to allow real-time, immediate use.

The Action Proponents are not proposing to add any new restricted areas and proposes to continue the same type of temporary area closures that have occurred for decades with the exception of changes to the Ship Shock Trial areas. The Gulf of Mexico ship shock trial area was moved to the south, the Jacksonville ship shock area expanded, and the Key West ship shock trial area was removed. Many of the restricted areas identified on these figures are artifacts of past military activities and are not currently scheduled (e.g., Small Point Mining Range off the coast of Maine).

Accessibility, or restrictions to the availability of air and ocean space, would be a temporary condition. While mariners and pilots have a responsibility to be aware of conditions on the ocean and in the air, it is not expected that direct conflicts in accessibility would occur. The locations of restricted areas are published and available to mariners and pilots, who typically review such information before boating or flying in any area. Restricted areas are typically avoided by experienced mariners and pilots. Prior to initiating a training or testing activity, the Action Proponents would follow standard operating procedures to visually scan an area to ensure that non-participants are not present. If non-participants are present, the Action Proponent would delay, move, or cancels its activity. Accessibility is no longer restricted once the activity concludes. In addition, project review and approval processes for many ongoing and planned offshore projects in the Study Area (i.e., oil and gas leasing, and wind energy projects) have integrated Action Proponent input and review to reduce the potential for conflicts to air and ocean space. Therefore, there would be minimal potential for access to the ocean and airspace to directly impact human activities.

The Department of Defense and the Federal Aviation Administration cooperate in managing the airspace used by the military to support training and testing requirements. Special Use Airspace (Military Operations Areas and Restricted Areas over land, and Warning Areas over the ocean) is scheduled by the military and is released to the Federal Aviation Administration for use by civilian aircraft when not in use by the military. Non-military air routes already overlay Special Use Airspace that is below 18,000 feet (ft.). The Action Proponents would accommodate the needs of commercial and civilian aviation by maintaining a working relationship with the Federal Aviation Administration.

Offshore wind development in the Atlantic Ocean would be expected to increasingly overlap with Navy operating areas as these developments move farther offshore. Through the Military Aviation and Installation Assurance Siting Clearinghouse (Clearinghouse), the Department of Defense and the Bureau of Ocean Energy Management work closely to thoroughly review all active and proposed lease areas and offshore wind projects to ensure compatibility with military readiness activities.

Considering the expansive size of the Operating Areas, the disbursement of military expended materials over these large areas, and the Action Proponents' standard operating procedures and existing mitigation measures (Chapter 5, Mitigation), impacts from accessibility, airborne acoustics, and physical disturbances and strikes on energy production and distribution, mineral extraction, commercial transportation and shipping, commercial and recreational fishing, aquaculture, and tourism would be negligible and insignificant and would not result in a direct loss of income, revenue, employment, resource availability, or quality of experience.

Public Health and Safety. The affected environment provides the context for evaluating the effects of the military readiness activities on public health and safety. Generally, the greatest potential for a proposed activity to impact the public is in nearshore areas because that is where public activities are most concentrated. Proposed military readiness activities in nearshore areas could be close to dive sites and other recreational areas where the collective health and safety of groups of individuals would be of concern. Most commercial and recreational marine activities (with the exception of commercial shipping) occur close to the shore, usually limited by the capabilities of the vessel or equipment used.

The area of interest for assessing potential impacts on public health and safety is generally the same as identified in the 2018 Final EIS/OEIS Section 3.12 (Public Health and Safety). This includes the United States territorial waters of the east and Gulf coasts (seaward of the mean high-water line to 12 nautical miles), including bays, harbors, and inshore waterways of the east coast and inshore waters and pierside locations off the Gulf of Mexico where military readiness activities occur. New to the Study Area for this Supplemental EIS/OEIS are inshore waters adjacent to the Gulf of Mexico, and changes to ship shock trial areas. The Gulf of Mexico ship shock trial area was moved to the south, the Jacksonville ship shock area expanded, and the Key West ship shock trial area was removed.

Military, commercial, institutional, and recreational activities take place simultaneously in the Study Area and have coexisted safely for decades. These activities coexist safely because established rules and practices lead to safe use of the waterways and airspace. The rules, regulations, and procedures that the Navy observes with respect to safe recreational, commercial, and military use in sea surface areas and airspace are discussed in detail in the 2018 Final EIS/OEIS Section 3.12 (Public Health and Safety). Sea Space, Airspace, Safety and Inspection Procedures, Aviation Safety, Submarine Navigation Safety, Surface Vessel Navigation Safety, Sonar Safety, Electromagnetic Energy Safety, Laser Safety, Explosive Munitions Detonation Safety, and Weapons Firing and Munitions Expenditure Safety within the Study Area are the same as described in the 2018 Final EIS/OEIS. Due to the Navy and Coast Guard's safety procedures, the potential for training and testing activities to impact public health and safety under the Proposed Action would be minor and insignificant.

Adverse Human Health and Environmental Effects that Disproportionately Affect Communities with Environmental Justice Concerns and Children's Health and Safety. Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, and Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, were not analyzed in detail because the proposed activities would result in minor and insignificant impacts to the human population in coastal areas.

New to the Study Area for this Supplemental EIS/OEIS are inshore waters and pierside testing locations adjacent to the Gulf of Mexico. The activities that would occur in this portion of the Study Area do not involve aircraft and would not be expected to adversely affect any minority or low-income populations.

Subsistence fishing is important for the economies and cultures of many tribal and non-tribal families and communities residing in states adjacent to the Study Area. Impacts on subsistence fishing may result when Navy activities restrict access to fishing areas or if Navy activities cause fish to abandon a popular fishing site. The Navy strives to conduct its operations in a manner compatible with ocean users by minimizing temporary access restrictions. Given the size of the Study Area, the opportunities for Navy activities to interfere with subsistence fishing are minimal because the majority of subsistence fishing would occur closer to the shore. Additionally, training or testing activities would be infrequent and temporary. Because the proposed activities would not lead to a noticeable change in Navy presence, and because the proposed locations for these activities do not differ much from historical use, it is unlikely that subsistence fishing activities would be noticeably affected by Navy activities requiring area restrictions.

The public may intermittently hear noise from transiting ships or aircraft overflights if they are in the general vicinity of a training or testing activity, but these occurrences would be infrequent. Occasional disturbances from military aircraft have been occurring for decades and are not expected to have lasting impacts on broader socioeconomics resources for the general public or have disproportionate impacts on socioeconomic resources for environmental justice communities. For most activities, airborne noise from aircraft activities would be far enough from tourist and residential areas to have a negligible impact on people either on the water or on land and less likely to cause a significant impact. Additionally, there would be an overall decrease in the number of aircraft activity throughout the Study Area compared to the 2018 Final EIS/OEIS, which would result in beneficial impacts from less frequent airborne acoustic events from aircraft.

There are potential environmental justice communities in the vicinity of several naval air stations that are adjacent to the Study Area. Aircraft would need to transit over these areas to participate in training and testing activities occurring offshore. Minority and low-income populations in these areas would experience brief levels of elevated noise during these transits; however, the impact of airborne noise would be negligible because it would be transient, of short duration, and localized. Additionally, there would be an overall decrease in the number of aircraft activity throughout the Study Area compared to the 2018 Final EIS/OEIS.

There would not be disproportionately high and adverse human health or environmental effects on any minority populations and low-income populations. Similarly, there would be negligible impacts on public health and safety because of the Action Proponents' standard operating procedures and therefore, there would not be disproportionately high and adverse human health or environmental effects on environmental justice communities or disproportionately high environmental health risks or safety risks to children.

3.0.3.3 Identifying Stressors for Analysis

The stressors analyzed in this Supplemental EIS/OEIS have not changed from those described in the 2018 Final EIS/OEIS. For a description of the Proposed Action military readiness activities and typical components of those activities (i.e., platforms, targets, and systems being trained/tested), see Appendix A (Activity Descriptions). For a description of which stressors are associated with each training or testing activity, see Appendix B (Activity Stressor Matrices).

For this Supplemental EIS/OEIS, the proposed military readiness activities were evaluated to identify if there were any changes in specific components that could act as an additional stressor by having direct or indirect impacts on the environment. This analysis includes identifying the spatial variation of all (existing and new) identified stressors. Matrices were prepared to identify associations between stressors, resources, and the spatial relationships of those stressors, resources, and activities within the Study Area. Stressors reviewed and analyzed in this Supplemental EIS/OEIS include acoustic, explosive, energy, physical disturbance and strike, entanglement, and ingestion stressors. Detailed information on each stressor can be found in the 2018 Final EIS/OEIS, and the discussion of the best available science about impacts from those stressors can be found in Appendix D (Acoustic and Explosive Impacts Supporting Information) and Appendix G (Non-Acoustic Impacts Supporting Information) of this Supplemental EIS/OEIS. Updates to individual components associated with a given stressor are provided in the appropriate sections below.

A preliminary analysis identified the stressor/resource interactions that warrant further analysis in the Supplemental EIS/OEIS based on public comments received during scoping, previous NEPA analyses, and opinions of subject matter experts. Stressor/resource interactions that are determined to have negligible or no impacts are documented in the relevant appendices and are not carried forward for analysis in the Supplemental EIS/OEIS. To aid in this assessment, the information provided in this section displays both the current stressor information for this Supplemental EIS/OEIS and the stressor information from the Selected Alternative (Alternative 1) of the 2018 Final EIS/OEIS. Seven-year totals have been included to show the big picture differences that are not always captured by just showing max and typical single years. The analysis of the 7 years also supports NMFS cooperating agency NEPA requirements for their determination whether to issue incidental take authorizations and Letters of Authorization. In many cases, the stressor information for this Supplemental EIS/OEIS is a reduction from the 2018 Final EIS/OEIS stressor information. There are several reasons for these reductions:

- The Action Proponents are proposing to conduct fewer activities to which various stressors are connected.
- Data collection for this Supplemental EIS/OEIS was more refined than that done for the 2018 Final EIS/OEIS, resulting in more accurate stressor data being captured.
- Data collection for this Supplemental EIS/OEIS was refined to consider materials realistically and consistently able to be recovered. The 2018 Final EIS/OEIS considered all materials to be either expended or recovered 100 percent of the time. Improvements to the data collection process included the capability to account for the partial recovery of materials to more realistically show how many materials would be expended. Examples of materials that are mostly recovered that were thought to be completely expended in the 2018 Final EIS/OEIS are casings of small-, medium-, and large-caliber projectiles, various targets, and in-water devices. The recovery rates of partially recovered materials was applied during data processing, resulting in a notable reduction in the amounts of various types of materials expected to be expended and other associated stressors for this Supplemental EIS/OEIS.

3.0.3.3.1 Acoustic Stressors

The acoustic sources identified for analysis in this Supplemental EIS/OEIS are the same as those in the 2018 Final EIS/OEIS (sonar and other transducers, pile driving, vessel noise, aircraft noise, weapons noise, and air guns). Detailed information describing these sources can be found in Appendix D (Acoustic and Explosive Impacts Supporting Information).

In order to better organize and facilitate the analysis of hundreds of individual sources of underwater sound produced by the Action Proponents, including sonars and explosives, a schema of source bins was developed and is used in this Supplemental EIS/OEIS. A detailed description of the schema and the benefits of using this method are found in the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing (U.S. Department of the Navy, 2024b)*.

In the 2018 Final EIS/OEIS, non-impulsive, narrow-band sources were grouped into bins that were defined by their acoustic properties and in some cases, their purpose or application. For this Supplemental EIS/OEIS, sources are binned based only on their acoustic properties without regard to purpose or application. As in the previous 2018 Final EIS/OEIS, each bin was represented by the most impactful characteristics of any source within that bin. Specifically, bin parameters were based on (1) highest source level, (2) lowest geometric mean frequency, (3) highest duty cycle, and (4) largest horizontal and vertical beam patterns.

Breaking the bins up to represent smaller ranges of acoustic properties resulted in bin parameters that more closely match those of the sources contained within. In binning sources for the purpose of modeling, the combination of the four parameters above allowed for over 1,000 potential unique bins. While AFTT training and testing only uses sources falling into 83 of these potential bins, the binning construct allows for easy addition of bins as required. For written reports, bins will only be described by their frequency (low, medium, high, or very high) and their source level (low, medium, or high), resulting in 12 individual bins.

In many cases, sources that previously fell into one purpose-based bin now fall into multiple bins. Likewise, sources with similar acoustic parameters that were previously broken into separate bins due to different purposes now share a bin. As a result, the new bins do not represent a one-for-one replacement and a crosswalk table between the old bins and new bins is not possible. An exception to the new naming convention was retention of “MF1” to represent the hull-mounted surface ship sonar that was previously in the MF1 bin. The retention of this name was to allow for clear comparison to past documents due to the extensive use of these sources in training and testing activities.

Broadband sources were divided into bins BB1–BB27, with AFTT training and testing only using sources falling into 16 of these bins. As in the 2018 Final EIS/OEIS, some sources were removed from quantitative analysis because they are not anticipated to result in takes of protected species. This included sources with low source level, narrow beamwidth, downward-directed transmission, short pulse lengths, frequencies above known hearing ranges of marine mammals and sea turtles, or some combination of these factors, as well as sources used for safety of navigation.

Sonars and other transducers are now grouped into bins based on the frequency or bandwidth; source level; duty cycle; and three-dimensional beam coverage.

The use of source bins provides the following benefits:

- provides the ability for new sensors or munitions to be covered under existing authorizations, as long as those sources fall within the parameters of a “bin”

- improves efficiency of source utilization data collection and reporting requirements anticipated under the Marine Mammal Protection Act authorizations
- ensures a conservative approach to all impact estimates, as all sources within a given class are modeled as the most impactful source (highest source level, longest duty cycle, or largest net explosive weight) within that bin
- allows analyses to be conducted in a more efficient manner, without any compromise of analytical results
- provides a framework to support the reallocation of source usage (hours/explosives) between different source bins, as long as the total numbers of takes remain within the overall analyzed and authorized limits (This flexibility is required to support evolving training and testing requirements, which are linked to real world events.)

Table 3.0-2 through Table 3.0-4 show the bin use that could occur in any year under each action alternative for military readiness activities. A range of annual bin use indicates that use of that bin is anticipated to vary annually, consistent with the variation in the number of annual activities described in Chapter 2 (Description of Proposed Action and Alternatives). The 7-year total for both action alternatives takes that variability into account. Due to the changes in bin structure described above, a comparison to the Selected Alternative of the 2018 Final EIS/OEIS is not included in Table 3.0-2.

Table 3.0-2: Sonar and Transducer Sources Quantitatively Analyzed

Source Class Category	Description	Unit	Training				Testing			
			Alternative 1		Alternative 2		Alternative 1		Alternative 2	
			Annual	7-Year Total	Annual	7-Year Total	Annual	7-Year Total	Annual	7-Year Total
Broadband Sources										
LF	<205 dB	H	-	-	-	-	206-252	1,580	220-252	1,636
LF to MF		H	-	-	-	-	1,501-1,503	10,519	1,501-1,503	10,519
LF to HF		C	-	-	-	-	791-1,020	5,101	791-1,020	5,101
		H	-	-	-	-	2,367-2,571	16,356	2,367-2,571	16,356
MF to HF		C	133	931	133	931	-	-	-	-
		H	1,215-1,232	8,555	1,318-1,329	9,261	2,749-2,950	19,308	2,749-2,950	19,308
HF to VHF		H	10	70	10	70	-	-	-	-
Low-Frequency Acoustic Sources										
LFL	160 dB to 185 dB	H	-	-	-	-	1,969	13,783	1,969	13,783
LFM	185 dB to 205 dB	C	-	-	-	-	360	2,520	360	2,520
		H	746	5,219	746	5,219	5,386-6,106	39,862	6,106	42,742
LFH	>205 dB	C	1,920-2,020	13,740	2,020-2,120	14,440	6,078-6,084	42,588	6,078-6,084	42,588
		H	144	1,008	144	1,008	414-479	3,101	518	3,623
Mid-Frequency Acoustic Sources										
MFL	160 dB to 185 dB	H	-	-	-	-	3,238-3,582	22,336	3,238-3,582	22,336
MFM	185 dB to 205 dB	C	6,826-6,964	48,196	6,978-7,102	49,218	16,017-16,040	111,849	16,017-16,040	111,849
		H	2	14	2	14	3,081-3,509	23,012	3,358-3,509	24,121
MFH	>205 dB	H	2,343-2,466	16,794	2,481-2,566	17,646	7,203-7,943	52,542	7,622-7,943	53,976
High-Frequency Acoustic Sources										
HFL	160 dB to 185 dB	H	169	1,183	169	1,183	96	672	96	672
HFM	185 dB to 205 dB	C	-	-	-	-	860-1,660	8,420	1,660	11,620
		H	1,463-1,465	10,247	1,463-1,465	10,247	4,125-4,489	29,941	4,461-4,489	31,285
HFH	>205 dB	C	138	966	138	966	1,621-1,858	11,684	1,725-1,858	12,100
		H	3,892-3,940	27,436	3,892-3,940	27,436	3,779-4,580	28,383	3,851-4,580	28,671

Table 3.0-2: Sonar and Transducer Sources Quantitatively Analyzed (continued)

Source Class Category	Description	Unit	Training				Testing			
			Alternative 1		Alternative 2		Alternative 1		Alternative 2	
			Annual	7-Year Total	Annual	7-Year Total	Annual	7-Year Total	Annual	7-Year Total
Very High-Frequency Acoustic Sources										
VHFL	160 dB to 185 dB	H	12	84	12	84	-	-	-	-
VHFM	185 dB to 205 dB	H	918	6,426	918	6,426	120	840	120	840
VHFH	>205 dB	C	-	-	-	-	69-103	520	69-103	520
		H	719	5,031	719	5,031	5,584	39,088	5,584	39,088
Hull-Mounted Surface Ship Sonar										
MF1C	Hull-mounted surface ship sonar (previously MF11) with duty cycle >80%	H	661-722	4,811	991-1,027	7,043	1,139	7,974	1,139	7,974
MF1K	Hull-mounted surface ship sonar in Kingfisher mode	H	280	1,957	280	1,957	108	759	108	759
MF1	Hull-mounted surface ship sonar (previously MF1)	H	3,498-3,870	25,602	4,983-5,223	35,601	1,102-1,390	8,464	1,102-1,390	8,464

Notes: - = Not Applicable; % = percent; < = less than; > = greater than; C = Count; dB = decibel; F = frequency; H = high (Source Class Category); H = Hours (Unit); L = low; M = mid; V = very

Table 3.0-3: Training and Testing Air Gun and Non-Explosive Impulsive Sources Quantitatively Analyzed in the Study Area

Source Class Category	Description	Unit	Training					Testing				
			2018 Final EIS/OEIS	Alternative 1		Alternative 2		2018 Final EIS/OEIS	Alternative 1		Alternative 2	
			Annual Number of Activities	Annual	7-Year Total	Annual	7-Year Total	Annual Number of Activities	Annual	7-Year Total	Annual	7-Year Total
NEI	Non-explosive impulsive	C	-	-	-	-	-	-	192-240	1,488	240	1,680
AG	Air gun	C	-	-	-	-	-	604	4,400-5,400	33,800	5,400	37,800

Notes: - = Not Applicable; AG = Air gun; C = Count; EIS = Environmental Impact Statement; NEI = Non-explosive impulsive; OEIS = Overseas Environmental Impact Statement

Table 3.0-4: Number of Piles/Sheets Quantitatively Analyzed under Pile Driving and Removal Training Activities

Method	Pile Size and Type	Alternative 1		Alternative 2	
		Annual	7-Year Total	Annual	7-Year Total
Impact[1]	16-inch Timber or Plastic Round Piles	80	560	80	560
Vibratory	16-inch Timber or Plastic Round Piles	160	1,120	160	1,120
Vibratory	27-inch Steel Sheet	240	1,680	240	1,680

[1] Installation only

3.0.3.3.2 Explosive Stressors

The explosive sources identified for analysis in this Supplemental EIS/OEIS are the same as those in the 2018 Final EIS/OEIS (explosions in air and explosions in water). Detailed information describing these sources can be found in Appendix D (Acoustic and Explosive Impacts Supporting Information). As was done in the 2018 Final EIS/OEIS, the explosive sources are sorted by bins based on net explosive weight. Explosives were divided into bins E0-E17, with AFTT training and testing only using explosives falling into 15 of these bins. Table 3.0-5 shows the bin use that could occur in any year under each action alternative for military readiness activities. A range of annual bin use indicates that use of that bin is anticipated to vary annually, consistent with the variation in the number of annual activities described in Chapter 2 (Description of Proposed Action and Alternatives). The 7-year total for both action alternatives takes that variability into account.

Table 3.0-5: Explosive Sources Quantitatively Analyzed that Could Be Used Underwater or at the Water Surface

Bin	Net Explosive Weight	Example Explosive Source	Training					Testing				
			2018 Final EIS/OEIS	Alternative 1		Alternative 2		2018 Final EIS/OEIS	Alternative 1		Alternative 2	
			Annual	Annual	7-Year Total	Annual	7-Year Total	Annual	Annual	7-Year Total	Annual	7-Year Total
E1	0.1–0.25	Medium-caliber projectile	7,700	3,002	21,014	3,002	21,014	17,840-26,840	1,825	12,775	2,184	15,295
E2	> 0.25–0.5	Medium-caliber projectile	210-214	60	420	60	420	-	-	-	-	-
E3	> 0.5–2.5	Large-caliber projectile	4,592	5,258	36,806	5,258	36,086	3,054-3,422	1,069-1,971	8,705	1,249-2,151	9,965
E4	> 2.5–5	Mine neutralization charge	127-133	82	574	82	574	746-800	2,893-4,687	30,889	2,893-4,687	30,889
E5	> 5–10	5 in. projectile	1,436	1,109	7,763	1,109	7,763	1,325	1,268-1,860	11,540	1,268- 1,860	11,540
E6	> 10–20	Hellfire missile	602	508	3,556	508	3,556	28-48	17-25	125	21-25	149
E7	> 20–60	Demo block/ shaped charge	4	10	70	10	70	-	8-22	62	8-22	62
E8	> 60–100	Lightweight torpedo	22	20	140	20	140	33	10-13	41	10-13	41
E9	> 100–250	500 lb. bomb	66	138	966	138	966	4	5	35	5	35
E10	> 250–500	Harpoon missile	90	71	497	71	497	68-98	4	28	4	28
E11	> 500–675	650 lb. mine	1	1	7	1	7	10	1-2	8	1-2	8
E12	> 650–1,000	2,000 lb. bomb	18	20	140	20	140	-	-	-	-	-
E16	> 7,250–14,500	Small ship shock trial	-	-	-	-	-	0-12	0-6	15	0-6	15
E17	> 14,500–58,000	Full ship shock trial	-	-	-	-	-	0-4	-	-	-	-

Notes: - = Not Applicable; > = greater than; EIS = Environmental Impact Statement; in. = inch; lb. = pound; OEIS = Overseas Environmental Impact Statement

3.0.3.3.3 Energy Stressors

The energy stressors identified for analysis in this Supplemental EIS/ OEIS are the same as those in the 2018 Final EIS/OEIS (in-water electromagnetic devices, in-air electromagnetic devices, and high-energy lasers). Detailed information describing these stressors can be found in Section 3.0.3.3.3 of the 2018 Final EIS/OEIS. Table 3.0-6 and Table 3.0-7 show the number and location of proposed activities that include energy stressors that are considered in this Supplemental EIS/OEIS and the equivalent information from the 2018 Final EIS/OEIS for comparison. As with the 2018 Final EIS/OEIS, it is assumed that in-air electromagnetic devices would be utilized during all activities involving vessels or aircraft, with very limited exceptions. Table 3.0-9 and Table 3.0-16 show the number and location of proposed activities that include vessels and aircraft, respectively, which provide a proxy for the level of in-air electromagnetic device use for the purposes of this Supplemental EIS/OEIS.

The only update to the high-energy laser stressor for this Supplemental EIS/OEIS is a change to the impact analysis based on new information regarding an automatic cutoff safety feature for these devices. These devices automatically shut down if the target is lost, which makes the odds of striking an in-water animal discountable. This updated assumption has been incorporated into the appropriate resource sections.

Table 3.0-6: Number and Location of Activities Using In-Water Electromagnetic Devices

Location	*2018 Final EIS/OEIS*	*Supplemental EIS/OEIS*			
	Annual Maximum Number of Activities	*Annual Maximum Number of Activities*		*7-Year Number of Activities*	
	Selected Alternative	*Alternative 1*	*Alternative 2*	*Alternative 1*	*Alternative 2*
Training					
VACAPES RC	1,203	1,473	1,473	10,311	10,311
Navy Cherry Point RC	2,823	417	417	2,919	2,919
JAX RC	350	398	398	2,786	2,786
Key West RC	-	202	202	1,414	1,414
GOMEX RC	104	342	342	2,394	2,394
Inshore Areas					
VACAPES RC Inshore[1]	-	375	375	2,625	2,625
Port and Pierside Areas					
Boston, MA	4	1	1	1	1
Earle, NJ	4	1	1	1	1
Delaware Bay, DE	4	1	1	1	1
Hampton Roads, VA	8	1	1	1	1
Morehead City, NC	4	1	1	1	1
Wilmington, NC	4	1	1	1	1
Savannah, GA	4	1	1	1	1
Kings Bay, GA	4	1	1	1	1
Mayport, FL	4	1	1	1	1
Port Canaveral, FL	4	1	1	1	1

Table 3.0-6: Number and Location of Activities Using In-Water Electromagnetic Devices (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Activities	Annual Maximum Number of Activities		7-Year Number of Activities	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Tampa, FL	4	1	1	1	1
Beaumont, TX	8	1	1	1	1
Corpus Christi, TX	4	1	1	1	1
Total	***4,540***	***3,220***	***3,220***	***22,462***	***22,462***
Testing					
Northeast RC	-	2	2	8	8
VACAPES RC	294	6	6	29	29
Navy Cherry Point RC	2	1	1	3	3
JAX RC	92	6	6	29	29
SFOMF	3	-	-	-	-
NSWC Panama City Testing Range	3	5	5	35	35
GOMEX RC	40	2	2	8	8
Port and Pierside Areas					
Hampton Roads, VA	-	4	4	10	17
Little Creek, VA[1]	100	-	-	-	-
Total	***534***	***26***	***26***	***122***	***129***

[1] Activities occurred in these areas in the 2018 Final EIS/OEIS but the location name has been updated for this Supplemental EIS/OEIS.

Notes: - = Not Applicable; EIS = Environmental Impact Statement; GOMEX = Gulf of Mexico; JAX = Jacksonville; NSWC = Naval Surface Warfare Center; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility; VACAPES = Virginia Capes

Table 3.0-7: Number and Location of Activities Using High-Energy Lasers

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Activities	Annual Maximum Number of Activities		7-Year Number of Activities	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Training					
VACAPES RC	4	8	8	56	56
Navy Cherry Point RC	-	10	10	70	70
JAX RC	4	8	8	56	56
Total	***8***	***26***	***26***	***182***	***182***
Testing					
Northeast RC	8	2	2	8	8
NUWC Newport Testing Range	8	2	2	8	8
VACAPES RC	116	110	110	764	764
Navy Cherry Point RC	8	2	2	8	8
JAX RC	8	7	7	38	38
SFOMF	8	-	-	-	-
Key West RC	8	-	-	-	-
NSWC Panama City Testing Range	8	2	2	8	8
GOMEX RC	8	2	2	8	8
Total	***180***	***127***	***127***	***842***	***842***

Notes: - = Not Applicable; EIS = Environmental Impact Statement; GOMEX = Gulf of Mexico; JAX = Jacksonville; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility; VACAPES = Virginia Capes

3.0.3.3.4 Physical Disturbance and Strike Stressors

The physical disturbance and strike stressors identified for analysis in this Supplemental EIS/OEIS are the same as those in the 2018 Final EIS/OEIS (vessels and in-water devices, aircraft and aerial targets, military expended material, seafloor devices, and pile driving). Detailed information describing these stressors can be found in Section 3.0.3.3.4. of the 2018 Final EIS/OEIS. While the majority of information is the same as the 2018 Final EIS/OEIS, there are several updates to this stressor that are noted below.

Regarding vessels, in-water devices, aircraft, targets, military expended material, and pile driving, this Supplemental EIS/OEIS includes the addition of U.S. Coast Guard activities and vessels. Representative vessels used by the Coast Guard within the Study Area are presented in Table 3.0-8. Representative vessels used by the U.S. Navy are the same as those described in Table 3.0-17 of the 2018 Final EIS/OEIS. Also of note, the number of high-speed vessel hours for small crafts in inshore waters would be the same as was described in Table 3.0-20 of the 2018 Final EIS/OEIS, and therefore that information will not be provided here. The inshore waters added to the Study Area for this Supplemental EIS/OEIS would not be utilized for high-speed vessel activity. Coast Guard air frames are similar, and in most cases the same, as the U.S. Navy's aircraft; see Appendix A (Activity Descriptions) for more information.

Table 3.0-8: Representative U.S. Coast Guard Vessel Types, Lengths, and Speeds

Type	*Example(s)*	*Length*	*Typical Operating Speed*
Large cutters	Legend-Class, Heritage-Class, Famous-Class, Juniper-Class, Reliance-Class	181 ft. to 418 ft.	0 to 30 knots
Small cutters	Keeper-Class, Sentinel-Class, Bay-Class, Island-Class, Marine Protector-Class, Small Harbor Tug	66 ft. to 180 ft.	0 to 30 knots
Boats	Aid to Navigation Boats, Screening Vessels, Lifeboats, Response Boats, Training Boats, Long-Range Interceptors, Law Enforcement Boats, Cutterboat Over the Horizon, Transportable Security Boats	13 ft. to 65 ft.	0 to 40 knots

Note: ft. = feet

Regarding military expended material, various materials have reductions in the amounts expended based on more accurate data collection processes and applying recovery rates, as applicable, as previously described above. Table 3.0-4, Table 3.0-9 through Table 3.0-16, and Table 3.0-19 show either the number and location of proposed activities that include physical disturbance and strike stressors or the actual number of those stressors that are considered in this Supplemental EIS/OEIS and the equivalent information from the 2018 Final EIS/OEIS for comparison.

Table 3.0-9: Number and Location of Activities Including Vessels

Location	*2018 Final EIS/OEIS*	*Supplemental EIS/OEIS*			
	Annual Maximum Number of Activities	*Annual Maximum Number of Activities*		*7-Year Number of Activities*	
	Selected Alternative	*Alternative 1*	*Alternative 2*	*Alternative 1*	*Alternative 2*
Training					
Northeast RC	411	489	498	3,420	3,482
VACAPES RC	12,412	9,552	9,702	66,861	67,932
Navy Cherry Point RC	6,754	2,654	2,688	18,569	18,810
SINKEX Box[1]	2	1	1	7	7
JAX RC	10,841	4,130	4,295	28,902	30,074
Key West RC	131	231	243	1,617	1,701
GOMEX RC	771	859	874	6,012	6,115
Other AFTT Areas	689	364	419	2,541	2,930
Inshore Areas					
Northeast RC Inshore[2]	198	283	287	1,981	2,008
VACAPES RC Inshore[2]	2,270	2,428	2,446	16,996	17,122
JAX RC Inshore[2]	122	228	234	1,596	1,638
Key West RC Inshore[2]	5	176	176	1,232	1,232
GOMEX RC Inshore[2]	50	68	69	471	483

Table 3.0-9: Number and Location of Activities Including Vessels (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Activities	Annual Maximum Number of Activities		7-Year Number of Activities	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Port and Pierside Areas					
Boston, MA	2	1	1	1	1
NSB New London	235	66	66	462	462
Earle, NJ	2	1	1	1	1
Delaware Bay, DE	2	1	1	1	1
JEB Little Creek Fort Story	386	231	231	1,613	1,613
NS Norfolk	515	209	209	1,463	1,463
Hampton Roads, VA	4	1	1	1	1
Morehead City, NC	2	1	1	1	1
Wilmington, NC	2	1	1	1	1
Savannah, GA	2	1	1	1	1
Kings Bay, GA	2	1	1	1	1
NSB Kings Bay	5	2	2	14	14
Mayport, FL	2	1	1	1	1
NS Mayport	341	119	120	833	840
Port Canaveral, FL	47	3	3	15	15
Tampa, FL	2	18	20	121	134
Pascagoula, MS	-	18	19	121	133
Gulfport, MS	-	20	20	140	140
Beaumont, TX	4	18	20	121	134
Corpus Christi, TX	2	1	1	1	1
Total	***36,213***	***22,177***	***22,652***	***155,118***	***158,492***
Testing					
Northeast RC	1,088	314	335	1,998	2,206
NUWC Newport Testing Range	767	304	304	2,062	2,066
VACAPES RC	1,784	1,243	1,306	6,617	7,391
Navy Cherry Point RC	791	28	30	169	189
JAX RC	1,298	359	381	2,003	2,269
SFOMF	198	156	156	1,003	1,003
Key West RC	398	262	290	1,802	2,012
NSWC Panama City Testing Range	406	900	900	6,285	6,285
GOMEX RC	618	323	340	1,787	2,164
Other AFTT Areas	-	28	31	187	208
Inshore Areas					
Northeast RC Inshore[2]	-	1	1	6	6

Table 3.0-9: Number and Location of Activities Including Vessels (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Activities	Annual Maximum Number of Activities		7-Year Number of Activities	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
VACAPES RC Inshore[2]	-	1	1	3	7
GOMEX RC Inshore[2]	-	24	24	123	123
Port and Pierside Areas					
Bath, ME	11	20	20	110	110
Portsmouth Naval Shipyard	26	24	24	152	152
Newport, RI	4	5	5	32	32
NSB New London	9	2	2	13	13
Hampton Roads, VA	-	5	5	11	24
NS Norfolk	64	103	103	532	532
JEB Little Creek	61	2	2	12	12
NSB Kings Bay	4	3	3	15	15
NS Mayport	27	23	23	120	120
Port Canaveral, FL	3	4	4	15	15
Pascagoula, MS	7	22	22	120	120
Total	***7,564***	***4,156***	***4,312***	***25,177***	***27,074***

[1] SINKEX Box numbers included with Other AFTT Areas in the 2018 Final EIS/OEIS.

[2] Activities occurred in these areas in the 2018 Final EIS/OEIS but the location name has been updated for this Supplemental EIS/OEIS.

Notes: -= Not Applicable; AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; GOMEX = Gulf of Mexico; JAX = Jacksonville; JEB = Joint Expeditionary Base; NS = Naval Station; NSB = Naval Submarine Base; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; SINKEX = Sinking Exercise; SFOMF = South Florida Ocean Measurement Facility; VACAPES = Virginia Capes

Table 3.0-10: Number and Location of Activities Including In-Water Devices

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Activities	Annual Maximum Number of Activities		7-Year Number of Activities	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Training					
Northeast RC	135	181	181	1,264	1,264
VACAPES RC	7,316	4,274	4,374	29,913	30,613
Navy Cherry Point RC	2,027	1,365	1,387	9,546	9,703
SINKEX Box[1]	1	1	1	7	7
JAX RC	5,097	3,060	3,210	21,412	22,465
Key West RC	32	147	147	1,029	1,029
Other AFTT Areas	361	231	286	1,614	1,999
NSWC Panama City Testing Range	328	-	-	-	-
GOMEX RC	724	432	436	3,021	3,049
Inshore Areas					
Northeast RC Inshore[2]	-	24	24	168	168
VACAPES RC Inshore[2]	998	416	416	2,912	2,912
Port and Pierside Areas					
Boston, MA	7	1	1	1	1
Earle, NJ	7	1	1	1	1
Delaware Bay, DE	7	1	1	1	1
Hampton Roads, VA	14	1	1	1	1
Morehead City, NC	7	1	1	1	1
Wilmington, NC	7	1	1	1	1
Savannah, GA	7	1	1	1	1
Kings Bay, GA	51	1	1	1	1
Mayport, FL	77	1	1	1	1
Port Canaveral, FL	7	1	1	1	1
Tampa, FL	7	1	1	1	1
Beaumont, TX	14	1	1	1	1
Corpus Christi, TX	7	1	1	1	1
Total	***17,238***	***10,144***	***10,475***	***70,899***	***73,222***
Testing					
Northeast RC	450	203	219	1,333	1,499
NUWC Newport Testing Range	1,032	400	400	2,722	2,722
VACAPES RC	1,266	957	1,019	5,905	6,397
Navy Cherry Point RC	137	7	7	37	37
JAX RC	800	278	295	1,681	1,858
SFOMF	204	109	109	682	682

Table 3.0-10: Number and Location of Activities Including In-Water Devices (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Activities	Annual Maximum Number of Activities		7-Year Number of Activities	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Key West RC	111	32	39	207	256
NSWC Panama City Testing Range	438	506	510	3,532	3,560
GOMEX RC	322	160	172	1,027	1,167
Inshore Areas					
GOMEX RC Inshore	-	1	1	4	4
Port and Pierside Areas					
Bath, ME	-	2	2	11	11
Newport, RI	-	5	5	32	32
Pascagoula, MS	-	2	2	11	11
Total	***4,760***	***2,662***	***2,780***	***17,184***	***18,236***

[1] SINKEX Box numbers included with Other AFTT Areas in the 2018 Final EIS/OEIS.

[2] Activities occurred in these areas in the 2018 Final EIS/OEIS but the location name has been updated for this Supplemental EIS/OEIS.

Notes: - = Not Applicable; AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; GOMEX = Gulf of Mexico; JAX = Jacksonville; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Table 3.0-11: Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Training					
Kinetic Energy Rounds					
VACAPES RC	32	-	-	-	-
Navy Cherry Point RC	4	-	-	-	-
JAX RC	4	-	-	-	-
GOMEX RC	4	-	-	-	-
Other AFTT Areas	4	-	-	-	-
Total	***48***	***0***	***0***	***0***	***0***
Large-Caliber Projectiles					

Table 3.0-11: Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Northeast RC	-	100	100	700	700
VACAPES RC	4,930	3,710	3,710	25,970	25,970
Navy Cherry Point RC	1,234	1,174	1,174	8,218	8,218
JAX RC	2,534	2,284	2,284	15,988	15,988
Other AFTT Areas	210	210	210	1,470	1,470
GOMEX RC	498	538	538	3,766	3,766
Total	***9,406***	***8,016***	***8,016***	***56,112***	***56,112***
Large-Caliber Projectile Casings[1]					
Northeast RC	-	17	17	114	114
VACAPES RC	4,930	267	267	1,863	1,863
Navy Cherry Point RC	2,274[2]	126	126	877	877
SINKEX Box	-	1	1	7	7
JAX RC	2,534	137	137	955	955
Other AFTT Areas	210	17	17	114	114
GOMEX RC	498	85	85	591	591
Total	***10,446***	***646***	***646***	***4,521***	***4,521***
Medium-Caliber Projectiles					
Northeast RC	1,000	13,500	13,500	94,500	94,500
VACAPES RC	658,561	745,450	745,450	5,218,150	5,239,150
Navy Cherry Point RC	328,149	333,250	333,250	2,332,750	2,332,750
JAX RC	383,861	374,150	374,150	2,619,050	2,633,050
Key West RC	28,000	19,000	19,000	133,000	133,000
Other AFTT Areas	21,150	10,750	10,750	75,250	75,250
GOMEX RC	28,950	38,350	38,350	268,450	268,450
Total	***1,449,671***	***1,534,450***	***1,534,450***	***10,741,150***	***10,776,150***
Medium-Caliber Projectile Casings[1]					
Northeast RC	1,000	645	645	4,515	4,515
VACAPES RC	658,561	19,020	19,020	133,137	133,137
Navy Cherry Point RC	328,149	8,318	8,318	58,223	58,223
JAX RC	383,861	9,935	9,935	69,542	69,542
Key West RC	28,000	495	495	3,465	3,465
Other AFTT Areas	21,150	558	558	3,903	3,903
GOMEX RC	28,950	1,443	1,443	10,098	10,098
Total	***1,449,671***	***40,414***	***40,414***	***282,883***	***282,883***

Table 3.0-11: Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities (continued)

Location	*2018 Final EIS/OEIS*	*Supplemental EIS/OEIS*			
	Annual Maximum Number of Materials	*Annual Maximum Number of Materials*		*7-Year Number of Materials*	
	Selected Alternative	*Alternative 1*	*Alternative 2*	*Alternative 1*	*Alternative 2*
Small-Caliber Projectiles					
Northeast RC	27,000	35,000	35,000	245,000	245,000
VACAPES RC	2,262,000	2,915,000	2,915,000	20,405,000	20,405,000
Navy Cherry Point RC	393,000	408,800	408,800	2,861,600	2,861,600
JAX RC	1,026,000	1,067,400	1,067,400	7,471,800	7,471,800
Other AFTT Areas	100,000	105,000	105,000	735,000	735,000
GOMEX RC	83,000	150,000	150,000	1,050,000	1,050,000
Total	***3,891,000***	***4,681,200***	***4,681,200***	***32,768,400***	***32,768,400***
Small-Caliber Projectile Casings[1]					
Northeast RC	27,000	8,000	8,100	56,000	56,700
NUWC Newport Testing Range	8,320	-	-	-	-
VACAPES RC	2,267,000[2]	590,000	590,100	4,130,000	4,130,700
Navy Cherry Point RC	393,000	82,760	82,860	579,320	580,020
JAX RC	1,031,000[2]	217,480	217,580	1,522,360	1,523,060
Key West RC	-	1,000	1,100	7,000	7,700
Other AFTT Areas	100,000	21,000	21,000	147,000	147,000
GOMEX RC	83,000	31,000	31,100	217,000	217,700
Inshore Areas					
VACAPES RC Inshore[3]	181,020	-	-	-	-
Port and Pierside Areas					
Port Canaveral, FL	12,800	-	-	-	-
Total	***4,103,140***	***951,240***	***951,840***	***6,658,680***	***6,662,880***
Rockets					
Northeast RC	1	4	4	28	28
VACAPES RC	1,835	788	788	5,516	5,516
Navy Cherry Point RC	304	385	385	2,695	2,695
JAX RC	2,095	1,063	1,063	7,441	7,441
Key West RC	-	16	16	112	112
GOMEX RC	191	120	120	840	840
Total	***4,426***	***2,376***	***2,376***	***16,632***	***16,632***
Rockets (Flechette)					
VACAPES RC	95	-	-	-	-
JAX RC	110	-	-	-	-
Total	***205***	***0***	***0***	***0***	***0***

Table 3.0-11: Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Torpedoes					
Northeast RC	24	2	2	9	9
VACAPES RC	21	2	2	8	8
JAX RC	92	5	5	33	33
Total	***137***	***9***	***9***	***50***	***50***
Bombs					
VACAPES RC	2,188	2,192	2,192	15,344	15,344
Navy Cherry Point RC	596	620	620	4,340	4,340
JAX RC	1,360	1,328	1,328	9,296	9,296
GOMEX RC	270	268	268	1,876	1,876
Total	***4,414***	***4,408***	***4,408***	***30,856***	***30,856***
Testing					
Kinetic Energy Rounds					
Northeast RC	33,503	-	-	-	-
NUWC Newport Testing Range	4	-	-	-	-
VACAPES RC	35,003	-	-	-	-
Navy Cherry Point RC	35,003	-	-	-	-
JAX RC	35,003	-	-	-	-
SFOMF	4	-	-	-	-
Key West RC	35,003	-	-	-	-
NSWC Panama City Testing Range	4	-	-	-	-
GOMEX RC	35,003	-	-	-	-
Total	***208,530***	***0***	***0***	***0***	***0***
Large-Caliber Projectiles					
Northeast RC	1,761	55	55	307	307
NUWC Newport Testing Range	-	5	5	32	32
VACAPES RC	8,147	3,177	3,177	15,396	15,396
Navy Cherry Point RC	1,440	5	5	32	32
JAX RC	14,524	2,581	2,581	11,224	11,224
Key West RC	3,190	-	-	-	-
NSWC Panama City RC	280	105	105	732	732
GOMEX RC	2,774	55	55	307	307
Total	***32,116***	***5,983***	***5,983***	***28,030***	***28,030***

Table 3.0-11: Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Large-Caliber Projectile Casings[1]					
Northeast RC	1,761	3	3	17	17
NUWC Newport Testing Range	-	1	1	3	3
VACAPES RC	8,147	223	223	1,042	1,042
Navy Cherry Point RC	1,440	1	1	3	3
JAX RC	14,524	230	230	1,067	1,067
Key West RC	3,190	-	-	-	-
NSWC Panama City RC	280	11	11	73	73
GOMEX RC	2,774	3	3	17	17
Total	***32,116***	***472***	***472***	***2,222***	***2,222***
Medium-Caliber Projectiles					
Northeast RC	9,060	3,000	3,000	16,500	16,500
VACAPES RC	234,665	219,575	219,575	796,625	796,625
Navy Cherry Point RC	8,160	-	-	-	-
JAX RC	237,360	22,500	22,500	150,400	150,400
Key West RC	32,660	-	-	-	-
NSWC Panama City Testing Range	5,100	5,100	5,100	35,700	35,700
GOMEX RC	22,860	4,000	4,000	19,500	19,500
Total	***549,865***	***254,175***	***254,175***	***1,018,725***	***1,018,725***
Medium-Caliber Projectile Casings[1]					
Northeast RC	9,060	150	150	825	825
VACAPES RC	234,665	12,709	12,709	52,016	52,016
Navy Cherry Point RC	8,160	-	-	-	-
JAX RC	237,360	663	663	4,364	4,364
Key West RC	32,660	-	-	-	-
NSWC Panama City Testing Range	5,100	102	102	714	714
GOMEX RC	22,860	200	200	975	975
Total	***549,865***	***13,824***	***13,824***	***58,894***	***58,894***
Small-Caliber Projectiles					
Northeast RC	4,800	-	-	-	-
VACAPES RC	77,800	25,375	25,375	177,300	177,300
Navy Cherry Point RC	4,800	-	-	-	-
JAX RC	4,800	11,275	11,275	78,600	78,600

Table 3.0-11: Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities (continued)

Location	*2018 Final EIS/OEIS*	*Supplemental EIS/OEIS*			
	Annual Maximum Number of Materials	*Annual Maximum Number of Materials*		*7-Year Number of Materials*	
	Selected Alternative	*Alternative 1*	*Alternative 2*	*Alternative 1*	*Alternative 2*
NSWC Panama City Testing Range	7,000	8,000	8,000	50,000	50,000
Key West RC	4,800	-	-	-	-
GOMEX RC	17,800	-	-	-	-
Total	***121,800***	***44,650***	***44,650***	***305,900***	***305,900***
Small-Caliber Projectile Casings[1]					
Northeast RC	4,800	-	-	-	-
VACAPES RC	77,800	7,035	7,035	38,620	38,620
Navy Cherry Point RC	4,800	-	-	-	-
JAX RC	4,800	2,415	2,415	16,080	16,080
NSWC Panama City Testing Range	7,000	1,600	1,600	10,000	10,000
Key West RC	4,800	-	-	-	-
GOMEX RC	17,800	600	600	1,400	1,400
Total	***121,800***	***11,650***	***11,650***	***66,100***	***66,100***
Rockets					
Northeast RC	1	16	16	102	102
NUWC Newport Testing Range	-	12	12	80	80
VACAPES RC	759	1,272	1,272	7,934	7,934
Navy Cherry Point RC	-	12	12	80	80
JAX RC	407	752	752	5,024	5,024
NSWC Panama City Testing Range	-	12	12	80	80
GOMEX RC	1	16	16	102	102
Total	***1,168***	***2,092***	***2,092***	***13,402***	***13,402***
Rockets (Flechette)					
VACAPES RC	249	252	252	1,764	1,764
JAX RC	136	171	171	1,197	1,197
Total	***385***	***423***	***423***	***2,961***	***2,961***
Torpedoes					
Northeast RC	146	42	42	170	170
NUWC Newport Testing Range	315	2	2	14	14
VACAPES RC	375	51	51	207	227
Navy Cherry Point RC	118	3	3	15	15
JAX RC	369	50	50	215	219

Table 3.0-11: Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
SFOMF	6	1	1	4	4
Key West RC	2	2	2	5	5
NSWC Panama City Testing Range	180	31	31	216	216
GOMEX RC	132	41	41	163	163
Total	***1,643***	***223***	***223***	***1,009***	***1,033***
Bombs					
VACAPES RC	916	178	178	1,246	1,246
JAX RC	12	12	12	84	84
GOMEX RC	-	8	8	56	56
Total	***928***	***198***	***198***	***1,386***	***1,386***
Missiles					
Northeast RC	25	2	2	6	6
VACAPES RC	1,633	288	288	1,882	1,882
Navy Cherry Point RC	25	2	2	6	6
JAX RC	594	70	70	430	430
SFOMF	-	2	2	6	6
Key West RC	32	-	-	-	-
GOMEX RC	42	6	6	42	42
Total	***2,351***	***370***	***370***	***2,372***	***2,372***

[1] In the 2018 Final EIS/OEIS, projectile casings (outside of small-caliber) were not individually listed as military expended material in the non-explosive practice munitions table, rather the medium- and large-caliber projectiles accounted for both the projectile itself and the casing. It was assumed for every one projectile expended there was also one casing. In the 2018 Final EIS/OEIS, all projectiles and casings were assumed to be expended at a rate of 100 percent.

[2] A small amount of casings (only) were accounted for separately in the 2018 Final EIS/OEIS due to specific training events and are added to the total projectile casing count for the location.

[3] Activities occurred in these areas in the 2018 Final EIS/OEIS but the location name has been updated for this Supplemental EIS/OEIS.

Notes: - = Not Applicable; AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; GOMEX = Gulf of Mexico; JAX = Jacksonville; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Table 3.0-12: Number and Location of Explosives that May Result in Fragments Used during Military Readiness Activities

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Munitions	Annual Maximum Number of Munitions		7-Year Number of Munitions	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Training					
Neutralizers					
VACAPES RC	62	60	60	420	420
Navy Cherry Point RC	1	2	2	14	14
JAX RC	2	-	-	-	-
GOMEX RC	22	20	20	140	140
Total	***87***	***82***	***82***	***574***	***574***
Bombs					
VACAPES RC	88	108	108	756	756
JAX RC	56	70	70	490	490
SINKEX Box	12	10	10	70	70
GOMEX RC	4	16	16	112	112
Total	***160***	***204***	***204***	***1,428***	***1,428***
Drones					
Navy Cherry Point RC	-	34	34	238	238
Total	***0***	***34***	***34***	***238***	***238***
EOD					
Key West RC Inshore	10	72	72	504	504
Total	***10***	***72***	***72***	***504***	***504***
Grenades					
Northeast RC	56	-	-	-	-
VACAPES RC	4,070	36	36	252	252
Navy Cherry Point RC	28	-	-	-	-
JAX RC	28	-	-	-	-
GOMEX RC	28	-	-	-	-
Total	***4,210***	***36***	***36***	***252***	***252***
Torpedoes					
SINKEX Box	1	1	1	7	7
Total	***1***	***1***	***1***	***7***	***7***
Large-Caliber Projectiles					
Northeast RC	-	45	45	315	315
VACAPES RC	762	662	662	4,634	4,634
Navy Cherry Point RC	210	290	290	2,030	2,030

Table 3.0-12: Number and Location of Explosives that May Result in Fragments Used during Military Readiness Activities (continued)

Location	*2018 Final EIS/OEIS*	*Supplemental EIS/OEIS*			
	Annual Maximum Number of Munitions	*Annual Maximum Number of Munitions*		*7-Year Number of Munitions*	
	Selected Alternative	*Alternative 1*	*Alternative 2*	*Alternative 1*	*Alternative 2*
SINKEX Box	200	20	20	140	140
JAX RC	642	442	442	3,094	3,094
Other AFTT Areas	114	114	114	798	798
GOMEX RC	114	199	199	1,393	1,393
Total	***2,042***	***1,772***	***1,772***	***12,404***	***12,404***
Medium-Caliber Projectiles					
Northeast RC	-	3,000	3,000	21,000	21,000
VACAPES RC	46,100	56,200	56,200	393,400	393,400
Navy Cherry Point RC	20,000	33,400	33,400	233,800	233,800
JAX RC	45,600	52,400	52,400	366,800	366,800
Other AFTT Areas	400	400	400	2,800	2,800
Key West RC	-	500	500	3,500	3,500
GOMEX RC	6,000	7,900	7,900	55,300	55,300
Total	***118,100***	***153,800***	***153,800***	***1,076,600***	***1,076,600***
Missiles					
Northeast RC	2	2	2	14	14
VACAPES RC	199	173	173	1,211	1,211
Navy Cherry Point RC	187	379	379	2,653	2,653
SINKEX Box	4	2	2	14	14
JAX RC	192	125	125	875	875
Key West RC	8	24	24	168	168
GOMEX RC	2	32	32	224	224
Total	***594***	***737***	***737***	***5,159***	***5,159***
Rockets					
VACAPES RC	1,748	2,160	2,160	15,120	15,120
Navy Cherry Point RC	76	90	90	630	630
JAX RC	1,824	2,184	2,184	15,288	15,288
GOMEX RC	190	224	224	1,568	1,568
Total	***3,838***	***4,658***	***4,658***	***32,606***	***32,606***
Testing					
Neutralizers					
VACAPES RC	250	1,782	1,782	10,698	10,698
JAX RC	50	-	-	-	-
NSWC Panama City Testing Range	328	6	6	42	42

Table 3.0-12: Number and Location of Explosives that May Result in Fragments Used during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Munitions	Annual Maximum Number of Munitions		7-Year Number of Munitions	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
GOMEX RC	100	1,470	1,470	10,290	10,290
Total	**728**	**3,258**	**3,258**	**21,030**	**21,030**
Bombs					
VACAPES RC	4	-	-	-	-
Total	**4**	**0**	**0**	**0**	**0**
Buoys					
Northeast RC	736	180	225	1,260	1,575
VACAPES RC	368	180	225	1,260	1,575
Navy Cherry Point RC	152	-	-	-	-
JAX RC	152	180	225	1,260	1,575
Key West RC	202	60	60	420	420
GOMEX RC	368	180	225	1,260	1,575
Total	**1,978**	**780**	**960**	**5,460**	**6,720**
Torpedoes					
Northeast RC	7	2	2	4	4
VACAPES RC	7	2	2	4	4
Navy Cherry Point RC	3	2	2	4	4
JAX RC	7	2	2	4	4
Key West RC	3	2	2	4	4
NSWC Panama City Testing Range	12	-	-	-	-
GOMEX RC	7	2	2	4	4
Total	**46**	**12**	**12**	**24**	**24**
Large-Caliber Projectiles					
Northeast RC	1,632	-	-	-	-
VACAPES RC	4,763	1,271	1,271	5,411	5,411
Navy Cherry Point RC	1,632	-	-	-	-
JAX RC	7,876	2,015	2,015	10,079	10,079
Key West RC	2,332	-	-	-	-
NSWC Panama City Testing Range	280	100	100	700	700
GOMEX RC	2,243	-	-	-	-
Total	**20,758**	**3,386**	**3,386**	**16,190**	**16,190**

Table 3.0-12: Number and Location of Explosives that May Result in Fragments Used during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Munitions	Annual Maximum Number of Munitions		7-Year Number of Munitions	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Medium-Caliber Projectiles					
Northeast RC	3,860	-	-	-	-
VACAPES RC	17,270	10,775	10,775	75,425	75,425
Navy Cherry Point RC	3,360	-	-	-	-
JAX RC	14,860	5,400	5,400	37,800	37,800
Key West RC	3,360	-	-	-	-
GOMEX RC	3,360	-	-	-	-
Total	***46,070***	***16,175***	***16,175***	***113,225***	***113,225***
Missiles					
Northeast RC	10	2	2	11	11
VACAPES RC	222	245	245	1,100	1,124
Navy Cherry Point RC	-	2	2	14	14
JAX RC	70	76	76	241	241
GOMEX RC	12	9	9	60	60
Total	***314***	***334***	***334***	***1,426***	***1,450***
Rockets					
VACAPES RC	206	9	9	63	63
JAX RC	200	-	-	-	-
Total	***406***	***9***	***9***	***63***	***63***
Sonobuoys					
Northeast RC	-	432	540	3,024	3,780
VACAPES RC	-	432	540	3,024	3,780
JAX RC	-	432	540	3,024	3,780
Key West RC	36	10	10	70	70
GOMEX RC	-	432	540	3,024	3,780
Total	***36***	***1,738***	***2,170***	***12,166***	***15,190***

Notes: - = Not Applicable; AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; EOD = Explosive Ordnance Disposal; GOMEX = Gulf of Mexico; JAX = Jacksonville; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Table 3.0-13: Number and Location of Targets Expended during Military Readiness Activities

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number Targets	Annual Maximum Number of Targets		7-Year Number of Targets	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Training					
Air Targets (Decoy)					
Northeast RC	2	-	-	-	-
VACAPES RC	81	-	-	-	-
Navy Cherry Point RC	52	-	-	-	-
JAX RC	61	-	-	-	-
Key West RC	9	-	-	-	-
GOMEX RC	2	-	-	-	-
Total	***207***	***0***	***0***	***0***	***0***
Air Targets (Drone)					
Northeast RC	-	1	1	5	5
VACAPES RC	18	22	22	153	153
Navy Cherry Point RC	28	249	249	1,742	1,742
JAX RC	7	11	11	77	77
Key West RC	2	3	3	17	17
GOMEX RC	-	10	10	65	65
Total	***55***	***296***	***296***	***2,059***	***2,059***
Air Targets (Other)					
VACAPES RC	-	25	25	171	173
Navy Cherry Point RC	-	13	13	87	87
JAX RC	-	16	16	107	108
Key West RC	-	10	10	70	70
Total	***0***	***64***	***64***	***435***	***435***
Mine Targets					
VACAPES RC	221	94	94	657	657
Navy Cherry Point RC	78	26	26	176	176
JAX RC	78	25	25	175	175
Key West RC	2	11	11	77	77
GOMEX RC	93	23	23	161	161
Inshore Areas					
VACAPES RC Inshore[1]	2	22	22	154	154
JAX RC Inshore[1]	-	1	1	2	2
Key West RC Inshore[1]		1	1	4	4
Total	***474***	***203***	***203***	***1,406***	***1,406***

Table 3.0-13: Number and Location of Targets Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number Targets	Annual Maximum Number of Targets		7-Year Number of Targets	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Ship Hulks					
VACAPES RC	-	1	1	4	4
JAX RC	-	1	1	4	4
SINKEX Box	1	1	1	7	7
Total[2]	***1***	***3***	***3***	***15***	***15***
Sub-Surface Targets (Maneuvering)					
Northeast RC	82	62	62	434	434
VACAPES RC	304	204	274	1,423	1,913
Navy Cherry Point RC	98	57	72	393	501
JAX RC	1,057	811	916	5,677	6,412
Other AFTT Areas	134	70	109	490	759
GOMEX RC	3	6	6	40	40
Total	***1,678***	***1,210***	***1,439***	***8,457***	***10,059***
Surface Targets (Floating)					
Northeast RC	20	34	34	232	232
VACAPES RC	4,512	1,691	1,691	11,831	11,831
Navy Cherry Point RC	1,298	540	540	3,777	3,777
JAX RC	3,013	961	961	6,724	6,724
Key West RC	-	3	3	17	17
Other AFTT Areas	200	46	46	322	322
GOMEX RC	334	152	152	1,058	1,058
Totals	***9,377***	***3,427***	***3,427***	***23,961***	***23,961***
Surface Targets (Maneuvering)					
VACAPES RC	70	-	-	-	-
Navy Cherry Point RC	23	-	-	-	-
JAX RC	78	-	-	-	-
GOMEX RC	3	-	-	-	-
Total	***174***	***0***	***0***	***0***	***0***
Testing					
Air Targets (Decoy)					
VACAPES RC	5	55	55	385	385
JAX RC	2	-	-	-	-
GOMEX RC	-	2	2	14	14
Total	***7***	***57***	***57***	***399***	***399***

Table 3.0-13: Number and Location of Targets Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number Targets	Annual Maximum Number of Targets		7-Year Number of Targets	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Air Targets (Drone)					
Northeast RC	6	7	7	48	48
NUWC Newport Testing Range	6	18	18	126	126
VACAPES RC	200	157	157	635	645
Navy Cherry Point RC	8	7	7	44	44
JAX RC	62	46	46	178	187
SFOMF	6	-	-	-	-
NSWC Panama City Testing Range	-	7	7	44	44
Key West RC	6	-	-	-	-
GOMEX RC	16	7	7	48	48
Total	***310***	***249***	***249***	***1,123***	***1,142***
Air Targets (Other)					
Northeast RC	-	1	1	2	2
NUWC Newport Testing Range	-	1	1	2	2
VACAPES RC	-	6	6	13	13
Navy Cherry Point RC	-	1	1	2	2
JAX RC	-	1	1	2	2
NSWC Panama City Testing Range	-	1	1	2	2
GOMEX RC	-	1	1	2	2
Total	***0***	***12***	***12***	***25***	***25***
Mine Targets					
NUWC Newport Testing Range	-	45	45	306	306
VACAPES RC	127	1,207	1,207	7,367	7,367
JAX RC	122	204	204	1,368	1,368
SFOMF	40	146	146	1,020	1,020
NSWC Panama City Testing Range	370	2,141	2,141	11,971	11,971
GOMEX RC	232	364	364	2,548	2,548
Port and Pierside Areas					
Port Canaveral, FL	-	12	12	25	25
Total	***891***	***4,119***	***4,119***	***24,605***	***24,605***

Table 3.0-13: Number and Location of Targets Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number Targets	Annual Maximum Number of Targets		7-Year Number of Targets	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Ship Hulks					
Northeast RC	-	1	1	1	1
VACAPES RC	-	1	1	1	1
Navy Cherry Point RC	-	1	1	1	1
JAX RC	-	1	1	1	1
Key West RC	-	1	1	1	1
GOMEX RC	-	1	1	1	1
Total[3]	***0***	***1***	***1***	***3***	***3***
Sub-Surface Targets (Maneuvering)					
Northeast RC	54	189	189	1,253	1,253
NUWC Newport Testing Range	516	-	-	-	-
VACAPES RC	57	501	501	3,383	3,383
Navy Cherry Point RC	7	2	2	4	4
JAX RC	184	150	150	854	854
SFOMF	95	1	1	7	7
Key West RC	3	42	42	288	288
GOMEX RC	208	33	33	161	161
Total	***1,124***	***918***	***918***	***5,950***	***5,950***
Sub-Surface Targets (Stationary)					
Northeast RC	2,228	-	-	-	-
NUWC Newport Testing Range	374	-	-	-	-
VACAPES RC	1,142	-	-	-	-
Navy Cherry Point RC	81	-	-	-	-
JAX RC	320	-	-	-	-
SFOMF	84	-	-	-	-
Key West RC	32	-	-	-	-
GOMEX RC	960	-	-	-	-
Total	***5,221***	***0***	***0***	***0***	***0***
Surface Targets (Floating)					
Northeast RC	172	12	12	59	59
NUWC Newport Testing Range	484	24	24	164	164
VACAPES RC	832	162	162	640	640
Navy Cherry Point RC	172	4	4	27	27

Table 3.0-13: Number and Location of Targets Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number Targets	Annual Maximum Number of Targets		7-Year Number of Targets	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
JAX RC	545	48	48	189	189
SFOMF	56	-	-	-	-
Key West RC	178	1	1	3	3
NSWC Panama City Testing Range	-	214	214	1,074	1,074
GOMEX RC	248	32	32	119	119
Total	***2,687***	***497***	***497***	***2,275***	***2,275***
Surface Targets (Maneuvering)					
Northeast RC	-	1	1	2	2
NUWC Newport Testing Range	450	1	1	2	2
VACAPES RC	153	16	16	65	65
Navy Cherry Point RC	-	1	1	2	2
JAX RC	19	6	6	31	31
Key West RC	2	-	-	-	-
NSWC Panama City Testing Range	-	1	1	2	2
GOMEX RC	2	1	1	2	2
Total	***627***	***27***	***27***	***106***	***106***

[1] Activities occurred in these areas in the 2018 Final EIS/OEIS but the location name has been updated for this Supplemental EIS/OEIS.

[2] For this Supplemental EIS/OEIS, ship hulks may be expended in either Virginia Capes Range Complex or Jacksonville Range Complex, but only up to one would be expended per year and only up to seven over 7 years for these two locations.

[3] For the Supplemental EIS/OEIS, ship hulks may be expended in any of the six locations listed, but only up to one would be expended per year and only up to three over 7 years.

Notes: - = Not Applicable; AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; GOMEX = Gulf of Mexico; JAX = Jacksonville; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility; VACAPES = Virginia Capes

Table 3.0-14: Number and Location of Other Military Materials Expended during Military Readiness Activities

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Training					
Acoustic Countermeasures					
Northeast RC	84	12	12	84	84
VACAPES RC	51	25	25	175	175
Navy Cherry Point RC	24	-	-	-	-
JAX RC	184	96	96	672	672
Other AFTT Areas	88	-	-	-	-
Total	***431***	***133***	***133***	***931***	***931***
AMNS Neutralizer (Non-Explosive)					
VACAPES RC	-	12	12	80	80
Navy Cherry Point RC	-	2	2	10	10
JAX RC	-	2	2	11	11
Key West RC	-	1	1	3	3
GOMEX RC	-	3	3	16	16
Total	***0***	***20***	***20***	***120***	***120***
Mine Anchors					
VACAPES RC	-	124	124	867	867
Navy Cherry Point RC	-	36	36	248	248
JAX RC	-	34	34	234	234
Key West RC	-	15	15	102	102
GOMEX RC	-	38	38	266	266
Inshore Areas					
VACAPES RC Inshore[1]	-	43	43	301	301
JAX RC Inshore[1]	-	1	1	3	3
Total	***0***	***291***	***291***	***2,021***	***2,021***
Bottom-Placed Instruments					
Other AFTT Areas	-	6	6	42	42
Total	***0***	***6***	***6***	***42***	***42***
Buoy (Fixed)					
Other AFTT Areas	-	1	1	3	3
Total	***0***	***1***	***1***	***3***	***3***
Chaff – Air Cartridge					
VACAPES RC	2,080	2,080	2,080	14,560	14,560
Navy Cherry Point RC	25,760	25,760	25,760	180,320	180,320
JAX RC	47,840	47,840	47,840	334,880	334,880
Key West RC	4,800	48,000	48,000	336,000	336,000

Table 3.0-14: Number and Location of Other Military Materials Expended during Military Readiness Activities (continued)

Location	*2018 Final EIS/OEIS*	*Supplemental EIS/OEIS*			
	Annual Maximum Number of Materials	*Annual Maximum Number of Materials*		*7-Year Number of Materials*	
	Selected Alternative	*Alternative 1*	*Alternative 2*	*Alternative 1*	*Alternative 2*
GOMEX RC	288	288	288	2,016	2,016
Total	***80,768***	***123,968***	***123,968***	***867,776***	***867,776***
Chaff – Ship Cartridge					
VACAPES RC	264	150	150	1,050	1,050
Navy Cherry Point RC	480	40	40	280	280
JAX RC	516	40	40	280	280
GOMEX RC	120	40	40	280	280
Total	***1,380***	***270***	***270***	***1,890***	***1,890***
Compression Pad/Plastic Piston					
VACAPES RC	1,000	1,000	1,000	7,000	7,000
Navy Cherry Point RC	22,300	5,000	5,000	35,000	35,000
JAX RC	38,000	8,000	8,000	56,000	56,000
Key West RC	31,000	25,000	25,000	175,000	175,000
GOMEX RC	1,840	1,840	1,840	12,880	12,880
Inshore Areas					
VACAPES RC Inshore[1]	20,400	-	-	-	-
Total	***114,540***	***40,840***	***40,840***	***285,880***	***285,880***
Decelerator/Parachute – Extra Large					
VACAPES RC	5	-	-	-	-
Total	***5***	***0***	***0***	***0***	***0***
Decelerator/Parachute – Large					
Northeast RC	1	2	2	14	14
VACAPES RC	30	44	44	308	308
Navy Cherry Point RC	-	10	10	67	67
JAX RC	1	14	14	95	95
Key West RC	-	8	8	56	56
GOMEX RC	1	32	32	224	224
Total	***33***	***110***	***110***	***764***	***764***
Decelerator/Parachute – Medium					
VACAPES RC	40	8	8	56	56
Navy Cherry Point RC	48	8	8	53	53
JAX RC	48	8	8	53	53
Key West RC	8	8	8	56	56
Total	***144***	***32***	***32***	***218***	***218***
Decelerator/Parachute – Small					
Northeast RC	2,882	5,120	5,120	35,840	35,840

Table 3.0-14: Number and Location of Other Military Materials Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
VACAPES RC	7,497	10,975	10,975	76,823	76,823
Navy Cherry Point RC	2,542	4,657	4,657	32,068	32,180
JAX RC	27,265	43,213	43,213	296,859	297,083
Other AFTT Areas	432	504	504	3,528	3,528
GOMEX RC	-	63	1,601	441	11,207
Total	***40,618***	***64,532***	***66,070***	***445,559***	***456,661***
Endcap – Chaff and Flare					
VACAPES RC	3,120	3,088	3,088	21,616	21,616
Navy Cherry Point RC	48,108	48,068	48,068	336,473	336,473
JAX RC	85,888	85,848	85,848	600,933	600,933
Key West RC	79,008	79,008	79,008	553,056	553,056
GOMEX RC	2,128	2,128	2,128	14,896	14,896
Inshore Areas					
VACAPES RC Inshore[1]	20,400	-	-	-	-
Total	***238,652***	***218,140***	***218,140***	***1,526,974***	***1,526,974***
Expended Bathythermograph					
Northeast RC	142	98	98	686	686
VACAPES RC	414	371	471	2,593	3,293
Navy Cherry Point RC	108	388	410	2,564	2,821
JAX RC	1,353	1,300	1,450	8,222	9,477
Other AFTT Areas	154	347	402	2,429	2,814
GOMEX RC	5	5	262	35	1,834
Total	***2,176***	***2,509***	***3,093***	***16,529***	***20,925***
Fiber-Optic Canister					
VACAPES RC	62	117	117	819	819
Navy Cherry Point RC	1	9	9	63	63
JAX RC	2	8	8	51	51
Key West RC	-	2	2	14	14
GOMEX RC	22	32	32	219	219
Total	***87***	***168***	***168***	***1,166***	***1,166***
Flare O-Ring					
VACAPES RC	1,040	1,008	1,008	7,056	7,056
Navy Cherry Point RC	22,348	5,008	5,008	35,053	35,053
JAX RC	38,048	8,008	8,008	56,053	56,053
Key West RC	31,008	25,008	25,008	175,056	175,056
GOMEX RC	1,840	1,840	1,840	12,880	12,880

Table 3.0-14: Number and Location of Other Military Materials Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Inshore Areas					
VACAPES RC Inshore[1]	20,400	-	-	-	-
Total	***114,684***	***40,872***	***40,872***	***286,098***	***286,098***
Flares					
VACAPES RC	1,040	1,000	1,000	7,000	7,000
Navy Cherry Point RC	22,348	5,000	5,000	35,000	35,000
JAX RC	38,048	8,000	8,000	56,000	56,000
Key West RC	31,008	25,000	25,000	175,000	175,000
GOMEX RC	1,840	1,840	1,840	12,880	12,880
Inshore Areas					
VACAPES RC Inshore[1]	20,400	-	-	-	-
Total	***114,684***	***40,840***	***40,840***	***285,880***	***285,880***
Grenade (Non-Explosive)					
Northeast RC	-	500	550	3,500	3,850
VACAPES RC	-	500	550	3,500	3,850
Navy Cherry Point RC	-	500	550	3,500	3,850
JAX RC	-	500	550	3,500	3,850
Key West RC	-	500	550	3,500	3,850
GOMEX RC	-	500	550	3,500	3,850
Total	***0***	***3,000***	***3,300***	***21,000***	***23,100***
Heavyweight Torpedo Accessories					
Northeast RC	24	24	24	168	168
VACAPES RC	8	8	8	56	56
JAX RC	48	48	48	336	336
SINKEX Box	1	1	1	7	7
Total	***81***	***81***	***81***	***567***	***567***
JATO Bottles					
Northeast RC	1	-	-	-	-
VACAPES RC	35	-	-	-	-
JAX RC	1	-	-	-	-
GOMEX RC	1	-	-	-	-
Total	***38***	***0***	***0***	***0***	***0***
Lightweight Torpedo Accessories					
VACAPES RC	13	13	13	91	91
JAX RC	44	44	44	308	308
Total	***57***	***57***	***57***	***399***	***399***

Table 3.0-14: Number and Location of Other Military Materials Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Marine Markers					
NUWC Newport Testing Range	64	-	-	-	-
VACAPES RC	1,022	388	388	2,716	2,716
Navy Cherry Point RC	332	50	50	350	350
JAX RC	1,060	674	674	4,718	4,718
Other AFTT Areas	24	50	50	350	350
Key West RC	30	-	-	-	-
GOMEX RC	53	50	50	350	350
Inshore Areas					
VACAPES RC Inshore[1]	978	660	660	4,620	4,620
Port and Pierside Areas					
Port Canaveral, FL	64	-	-	-	-
Total	***3,627***	***1,872***	***1,872***	***13,104***	***13,104***
Non-Explosive Buoy					
VACAPES RC	24	-	-	-	-
Navy Cherry Point RC	17	-	-	-	-
JAX RC	116	-	-	-	-
Total	***157***	***0***	***0***	***0***	***0***
Non-Explosive Sonobuoy					
Northeast RC	2,882	5,120	5,120	35,840	35,840
VACAPES RC	7,484	10,967	10,967	76,767	76,767
Navy Cherry Point RC	2,542	4,657	4,657	32,068	32,180
JAX RC	27,237	43,185	43,185	296,663	296,887
Other AFTT Areas	432	504	504	3,528	3,528
GOMEX RC	-	63	1,601	441	11,207
Total	***40,577***	***64,496***	***66,034***	***445,307***	***456,409***
Sabot-Plastic					
VACAPES RC	-	62,250	62,250	435,750	446,250
Navy Cherry Point RC	-	19,000	19,000	133,000	133,000
JAX RC	-	33,500	33,500	234,500	234,500
Other AFTT Areas	-	4,500	4,500	31,500	31,500
GOMEX RC	-	4,500	4,500	31,500	31,500
Total	***0***	***123,750***	***123,750***	***866,250***	***876,750***
Sabot-Kinetic Energy Round					
VACAPES RC	32	-	-	-	-

Table 3.0-14: Number and Location of Other Military Materials Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS Annual Maximum Number of Materials	Supplemental EIS/OEIS Annual Maximum Number of Materials		Supplemental EIS/OEIS 7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Navy Cherry Point RC	4	-	-	-	-
JAX RC	4	-	-	-	-
Other AFTT Areas	4	-	-	-	-
GOMEX RC	4	-	-	-	-
Total	***48***	***0***	***0***	***0***	***0***
Small Floating Surface Device					
VACAPES RC	-	347	347	2,429	2,429
Navy Cherry Point RC	-	50	50	350	350
JAX RC	-	130	130	910	910
Other AFTT Areas	-	50	50	350	350
GOMEX RC	-	50	50	350	350
Inshore Areas					
VACAPES RC Inshore[1]	-	47	47	329	329
JAX RC Inshore[1]	-	5	5	35	35
GOMEX RC Inshore[1]	-	25	25	175	175
Total	***0***	***704***	***704***	***4,928***	***4,928***
Testing					
Acoustic Countermeasures					
Northeast RC	843	237	237	1,158	1,158
NUWC Newport Testing Range	64	104	104	664	664
VACAPES RC	1,163	265	265	1,354	1,354
Navy Cherry Point RC	708	132	132	607	607
JAX RC	1,508	317	317	1,482	1,482
SFOMF	17	13	13	88	88
Key West RC	-	104	104	411	411
GOMEX RC	697	147	147	620	620
Port and Pierside Areas					
NSB Kings Bay	-	10	10	10	10
Port Canaveral, FL	-	10	10	10	10
Total	***5,000***	***1,339***	***1,339***	***6,404***	***6,404***
AMNS Neutralizer (Non-Explosive)					
VACAPES RC	-	2	2	14	14
NSWC Panama City Testing Range	-	3	3	15	15
Total	***0***	***5***	***5***	***29***	***29***

Table 3.0-14: Number and Location of Other Military Materials Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Anchors					
Northeast RC	-	561	563	3,481	3,938
VACAPES RC	-	561	563	3,481	3,938
JAX RC	-	561	563	3,481	3,938
GOMEX RC	-	561	563	3,481	3,938
Total	**0**	**2,244**	**2,252**	**13,924**	**15,752**
Anchors (Other)					
Northeast RC	685	38	38	233	233
NUWC Newport Testing Range	70	-	-	-	-
VACAPES RC	343	64	64	380	408
JAX RC	20	170	170	430	470
SFOMF	654	600	600	2,830	2,830
GOMEX RC	338	50	50	310	350
Total	***2,110***	***922***	***922***	***4,183***	***4,291***
Mine Anchors					
VACAPES RC	2	1,202	1,202	7,203	7,203
NSWC Panama City Testing Range	4	2,100	2,100	10,500	10,500
JAX RC	-	20	20	140	140
SFOMF	-	408	408	2,856	2,856
Total	***6***	***3,730***	***3,730***	***20,699***	***20,699***
Anti-Torpedo Torpedo					
Northeast RC	78	3	3	15	15
VACAPES RC	96	3	3	15	15
Navy Cherry Point RC	36	1	1	3	3
JAX RC	104	3	3	15	15
Key West RC	-	1	1	3	3
GOMEX RC	72	1	1	4	4
Total	***386***	***12***	***12***	***55***	***55***
Anti-Torpedo Torpedo Accessories					
Northeast RC	78	56	56	296	296
VACAPES RC	96	56	56	296	296
Navy Cherry Point RC	36	12	12	43	43
JAX RC	104	56	56	296	296
Key West RC	-	12	12	43	43

Table 3.0-14: Number and Location of Other Military Materials Expended during Military Readiness Activities (continued)

Location	*2018 Final EIS/OEIS*	*Supplemental EIS/OEIS*			
	Annual Maximum Number of Materials	*Annual Maximum Number of Materials*		*7-Year Number of Materials*	
	Selected Alternative	*Alternative 1*	*Alternative 2*	*Alternative 1*	*Alternative 2*
GOMEX RC	72	18	18	67	67
Total	***386***	***210***	***210***	***1,041***	***1,041***
Bottom-Placed Instruments					
Northeast RC	-	1	1	1	1
NUWC Newport Testing Range	-	1	1	3	3
VACAPES RC	-	1	1	1	1
Navy Cherry Point RC	-	1	1	1	1
JAX RC	-	1	1	1	1
Key West RC	-	1	1	1	1
GOMEX RC	-	1	1	1	1
Total	***-***	***7***	***7***	***9***	***9***
Concrete Slugs					
Northeast RC	38	76	76	418	418
VACAPES RC	-	72	72	192	192
JAX RC	-	72	72	192	192
GOMEX RC	38	76	76	418	418
Total	***76***	***296***	***296***	***1,220***	***1,220***
Compression Pad/Piston					
VACAPES RC	20,195	11,010	11,010	77,070	77,070
GOMEX RC	600	1,200	1,200	8,400	8,400
Total	***20,795***	***12,210***	***12,210***	***85,470***	***85,470***
Chaff – Air Cartridge					
Northeast RC	-	2	2	11	11
VACAPES RC	20,595	11,410	11,410	79,870	79,870
JAX RC	400	400	400	2,800	2,800
GOMEX RC	1,200	1,202	1,202	8,411	8,411
Total	***22,195***	***13,014***	***13,014***	***91,092***	***91,092***
Chaff – Ship Cartridge					
Northeast RC	144	-	-	-	-
VACAPES RC	1,019	132	132	780	852
Navy Cherry Point RC	144	-	-	-	-
JAX RC	480	84	84	444	516
Key West RC	144	-	-	-	-
GOMEX RC	144	-	-	-	-
Total	***2,075***	***216***	***216***	***1,224***	***1,368***

Table 3.0-14: Number and Location of Other Military Materials Expended during Military Readiness Activities (continued)

Location	*2018 Final EIS/OEIS*	*Supplemental EIS/OEIS*			
	Annual Maximum Number of Materials	*Annual Maximum Number of Materials*		*7-Year Number of Materials*	
	Selected Alternative	*Alternative 1*	*Alternative 2*	*Alternative 1*	*Alternative 2*
Canister – Miscellaneous					
Northeast RC	240	-	-	-	-
VACAPES RC	240	-	-	-	-
Total	***480***	***0***	***0***	***0***	***0***
Decelerators/Parachutes – Extra Large					
Northeast RC	-	6	6	40	40
NUWC Newport Testing Range	-	6	6	40	40
VACAPES RC	-	44	44	124	124
Navy Cherry Point RC	-	6	6	40	40
JAX RC	-	6	6	40	40
NSWC Panama City Testing Range	-	6	6	40	40
GOMEX RC	-	6	6	40	40
Total	***0***	***80***	***80***	***364***	***364***
Decelerators/Parachutes – Large					
Northeast RC	1	14	14	91	91
NUWC Newport Testing Range	-	12	12	80	80
VACAPES RC	14	274	274	1,429	1,429
Navy Cherry Point RC	-	12	12	80	80
JAX RC	1	52	52	239	239
NSWC Panama City Testing Range	-	12	12	80	80
GOMEX RC	1	14	14	91	91
Total	***17***	***390***	***390***	***2,090***	***2,090***
Decelerators/Parachutes – Small					
Northeast RC	3,637	13,272	13,272	92,399	92,399
NUWC Newport Testing Range	1,200	1,220	1,220	8,540	8,540
VACAPES RC	5,711	18,077	18,077	125,462	125,866
Navy Cherry Point RC	2,185	2,730	2,730	18,605	18,605
JAX RC	6,037	4,839	4,839	32,935	33,027
SFOMF	32	32	32	224	224
Other AFTT Areas	-	5,065	5,065	35,455	35,455
Key West RC	3,008	7,305	7,305	50,630	50,630

Table 3.0-14: Number and Location of Other Military Materials Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
NSWC Panama City Testing Range	192	716	716	5,012	5,012
GOMEX RC	2,068	4,127	4,127	28,384	28,384
Total	***24,070***	***57,383***	***57,383***	***397,646***	***398,142***
Endcap – Chaff and Flare					
VACAPES RC	40,790	22,420	22,420	156,940	156,940
JAX RC	400	400	400	2,800	2,800
GOMEX RC	1,800	2,400	2,400	16,800	16,800
Total	***42,990***	***25,220***	***25,220***	***176,540***	***176,540***
Endcaps and Pistons (Non Chaff and Flare)					
NUWC Newport Testing Range	379	379	379	2,653	2,653
Total	***379***	***379***	***379***	***2,653***	***2,653***
Expendable Bathythermographs					
Northeast RC	21,104	45	45	192	192
VACAPES RC	9,740	289	289	1,722	1,722
Navy Cherry Point RC	277	93	93	534	534
JAX RC	561	578	578	2,662	2,662
SFOMF	4	21	21	115	115
Key West RC	10	23	23	80	80
GOMEX RC	9,813	32	32	131	131
Total	***41,509***	***1,081***	***1,081***	***5,436***	***5,436***
Fiber-Optic Canister					
VACAPES RC	250	100	100	700	700
JAX RC	50	-	-	-	-
NSWC Panama City Testing Range	328	108	108	756	756
GOMEX RC	100	-	-	-	-
Total	***728***	***208***	***208***	***1,456***	***1,456***
Flares					
VACAPES RC	20,195	11,010	11,010	77,070	77,070
GOMEX RC	600	1,200	1,200	8,400	8,400
Totals	***20,795***	***12,210***	***12,210***	***85,470***	***85,470***
Flare O-Rings					
VACAPES RC	20,195	11,010	11,010	77,070	77,070
GOMEX RC	600	1,200	1,200	8,400	8,400

Table 3.0-14: Number and Location of Other Military Materials Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Total	***20,795***	***12,210***	***12,210***	***85,470***	***85,470***
Heavyweight Torpedo Accessories					
Northeast RC	98	129	129	568	568
NUWC Newport Testing Range	20	20	20	140	140
VACAPES RC	128	157	157	764	764
Navy Cherry Point RC	42	49	49	272	272
JAX RC	134	171	171	845	845
SFOMF	6	12	12	74	74
Key West RC	2	18	18	66	66
GOMEX RC	84	107	107	443	443
Total	***514***	***663***	***663***	***3,172***	***3,172***
JATO Bottles					
Northeast RC	1	18	18	120	120
NUWC Newport Testing Range	-	18	18	120	120
VACAPES RC	14	361	361	2,185	2,185
Navy Cherry Point RC	-	18	18	120	120
JAX RC	1	23	23	149	149
NSWC Panama City Testing Range	-	18	18	120	120
GOMEX RC	1	18	18	120	120
Total	***17***	***474***	***474***	***2,934***	***2,934***
Lander					
Northeast RC	-	50	50	310	350
VACAPES RC	-	50	50	310	350
JAX RC	-	50	50	310	350
GOMEX RC	-	50	50	310	350
Total	***0***	***200***	***200***	***1,240***	***1,400***
Lightweight Torpedo Accessories					
Northeast RC	54	7	7	24	24
NUWC Newport Testing Range	20	20	20	140	140
VACAPES RC	225	149	149	572	976
Navy Cherry Point RC	50	7	7	24	24
JAX RC	213	124	124	662	754
Key West RC	2	7	7	24	24

Table 3.0-14: Number and Location of Other Military Materials Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
NSWC Panama City Testing Range	192	616	616	4,312	4,312
GOMEX RC	54	7	7	24	24
Total	***810***	***937***	***937***	***5,782***	***6,278***
Sabot – Plastic					
Northeast RC	-	1,500	1,500	8,250	8,250
VACAPES RC	-	63,900	63,900	120,100	120,100
JAX RC	-	750	750	3,000	3,000
GOMEX RC	-	1,500	1,500	8,250	8,250
Total	***0***	***67,650***	***67,650***	***139,600***	***139,600***
Sabot – Kinetic Energy Round					
Northeast RC	33,503	-	-	-	-
NUWC Newport Testing Range	4	-	-	-	-
VACAPES RC	33,503	-	-	-	-
Navy Cherry Point RC	33,503	-	-	-	-
JAX RC	33,503	-	-	-	-
SFOMF	4	-	-	-	-
Key West RC	33,503	-	-	-	-
NSWC Panama City Testing Range	4	-	-	-	-
GOMEX RC	33,503	-	-	-	-
Total	***201,030***	***0***	***0***	***0***	***0***
Non-Explosive Sonobuoy					
Northeast RC	3,596	13,399	13,399	92,881	92,881
NUWC Newport Testing Range	1,200	1,200	1,200	8,400	8,400
VACAPES RC	5,505	18,222	18,222	126,472	126,472
Navy Cherry Point RC	2,144	2,989	2,989	20,023	20,023
JAX RC	5,847	6,305	6,305	43,671	43,671
SFOMF	32	32	32	224	224
Key West RC	3,007	7,531	7,531	51,817	51,817
NSWC Panama City Testing Range	192	159	159	1,113	1,113
GOMEX RC	2,027	3,129	3,129	20,991	20,991
Other AFTT Areas	-	5,065	5,065	35,455	35,455
Total	***23,550***	***58,031***	***58,031***	***401,047***	***401,047***

Table 3.0-14: Number and Location of Other Military Materials Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Tripods					
Northeast RC	-	5	5	31	35
VACAPES RC	-	5	5	31	35
JAX RC	-	5	5	31	35
GOMEX RC	-	5	5	31	35
Total	***0***	***20***	***20***	***124***	***140***

[1] Activities occurred in these areas in the 2018 Final EIS/OEIS but the location name has been updated for this Supplemental EIS/OEIS.

Notes: - = Not Applicable; AFTT = Atlantic Fleet Training and Testing; AMNS = Airborne Mine Neutralization System; EIS = Environmental Impact Statement; GOMEX = Gulf of Mexico; JATO = Jet-Assisted Take-Off; JAX = Jacksonville; NSB = Naval Submarine Base; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Table 3.0-15: Number and Location of Activities that Use Seafloor Devices

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Activities	Annual Maximum Number of Activities		7-Year Number of Activities	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Training					
Northeast RC	-	12	12	84	84
VACAPES RC	3,176	3,475	3,475	24,321	24,321
Navy Cherry Point RC	662	551	551	3,857	3,857
JAX RC	665	916	916	6,412	6,412
Key West RC	23	292	292	2,044	2,044
NSWC Panama City Testing Range	244	-	-	-	-
GOMEX RC	383	637	637	4,459	4,459
Other AFTT Areas	-	2	2	14	14
Inshore Areas					
VACAPES RC Inshore[1]	402	1,238	1,238	8,666	8,666
JAX RC Inshore[1]	-	14	14	98	98
Key West RC Inshore[1]	84	176	176	1,232	1,232
Port and Pierside Areas					
Boston, MA	1	1	1	1	1
Earle, NJ	1	1	1	1	1
Delaware Bay, DE	1	1	1	1	1
Hampton Roads, VA	2	1	1	1	1
JEB Little Creek Fort Story	216	231	231	1,613	1,613
Morehead City, NC	1	1	1	1	1
Wilmington, NC	1	1	1	1	1
Savannah, GA	1	1	1	1	1
Kings Bay, GA	1	1	1	1	1
NSB Kings Bay	22	-	-	-	-
Mayport, FL	1	1	1	1	1
NS Mayport	-	60	60	420	420
Port Canaveral, FL	1	1	1	1	1
Tampa, FL	1	1	1	1	1
Gulfport, MS	-	20	20	140	140
Beaumont, TX	2	1	1	1	1
Corpus Christi, TX	1	1	1	1	1
Total	***5,676***	***7,637***	***7,637***	***53,373***	***53,373***
Testing					
Northeast RC	11	84	86	521	592
NUWC Newport Testing Range	322	272	272	1,864	1,864
VACAPES RC	159	186	187	1,002	1,079
Navy Cherry Point RC	10	2	2	7	8

Table 3.0-15: Number and Location of Activities that Use Seafloor Devices (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Activities	Annual Maximum Number of Activities		7-Year Number of Activities	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
JAX RC	33	124	125	780	860
SFOMF	100	128	128	814	814
Key West RC	1	4	4	9	18
NSWC Panama City Testing Range	344	506	506	3,528	3,528
GOMEX RC	50	104	105	637	726
Inshore Areas					
VACAPES RC Inshore[1]	-	1	1	3	3
Key West RC Inshore[1]	-	1	1	3	3
Port and Pierside Areas					
NSB New London	-	1	1	3	3
NS Mayport	-	1	1	3	3
Port Canaveral, FL	-	1	1	4	4
Total	***1,030***	***1,415***	***1,420***	***9,178***	***9,505***

[1] Activities occurred in these areas in the 2018 Final EIS/OEIS but the location name has been updated for this Supplemental EIS/OEIS.

Notes: - = Not Applicable; AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; GOMEX = Gulf of Mexico; JAX = Jacksonville; JEB = Joint Expeditionary Base; NS = Naval Station; NSB = Naval Submarine Base; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Table 3.0-16: Number and Location of Activities with Aircraft

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Activities	Annual Maximum Number of Activities		7-Year Number of Activities	
	Preferred Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Training					
Northeast RC	92	107	107	749	749
VACAPES RC	22,111	10,463	10,508	73,236	73,572
Navy Cherry Point RC	36,031	8,415	8,422	58,896	58,948
SINKEX Box[1]	1	1	1	7	7
JAX RC	38,101	11,120	11,130	77,832	77,919
Key West RC	26,346	11,108	11,108	77,756	77,756
NSWC Panama City Testing Range	244	-	-	-	-

Table 3.0-16: Number and Location of Activities with Aircraft (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Activities	Annual Maximum Number of Activities		7-Year Number of Activities	
	Preferred Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
GOMEX RC	1,088	856	864	5,992	6,048
Other AFTT Areas	47	37	37	259	259
Inshore Areas					
VACAPES RC Inshore[2]	2,910	1,139	1,139	7,973	7,973
JAX RC Inshore[2]	144	10	10	70	70
GOMEX RC Inshore[2]	50	50	50	350	350
Port and Pierside Areas					
Boston, MA	1	1	1	1	1
Earle, NJ	1	1	1	1	1
Delaware Bay, DE	1	1	1	1	1
Hampton Roads, VA	2	1	1	1	1
Morehead City, NC	1	1	1	1	1
Wilmington, NC	1	1	1	1	1
Savannah, GA	1	1	1	1	1
Kings Bay, GA	1	1	1	1	1
NSB Kings Bay	480	-	-	-	-
Mayport, FL	1	1	1	1	1
NS Mayport	35	-	-	-	-
Port Canaveral, FL	1	1	1	1	1
Tampa, FL	1	1	1	1	1
Beaumont, TX	2	1	1	1	1
Corpus Christi, TX	1	1	1	1	1
Total	***127,695***	***43,319***	***43,389***	***303,133***	***303,664***
Testing					
Northeast RC	756	202	224	1,348	1,502
NUWC Newport Testing Range	49	26	25	176	176
VACAPES RC	4,595	2,611	2,878	17,162	18,906
Navy Cherry Point RC	639	49	56	336	385
JAX RC	921	316	344	1,966	2,189
SFOMF	35	1	1	7	7
Key West RC	253	273	308	1,903	2,148
NSWC Panama City Testing Range	229	190	194	1,313	1,341
GOMEX RC	192	185	205	1,217	1,363
Other AFTT Areas	-	25	28	175	196

Table 3.0-16: Number and Location of Activities with Aircraft (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Activities	Annual Maximum Number of Activities		7-Year Number of Activities	
	Preferred Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Port and Pierside Areas					
Little Creek, VA[2]	2	-	-	-	-
Norfolk, VA	2	-	-	-	-
Total	***7,673***	***3,878***	***4,263***	***25,603***	***28,213***

[1] SINKEX Box numbers included with Other AFTT Areas in the 2018 Final EIS/OEIS.
[2] Activities occurred in these areas in the 2018 Final EIS/OEIS but the location name has been updated for this Supplemental EIS/OEIS.
Notes: - = Not Applicable AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; GOMEX = Gulf of Mexico; JAX = Jacksonville; NS = Naval Station; NSB = Naval Submarine Base; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; OEIS = Overseas EIS Environmental Impact Statement; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

3.0.3.3.5 Entanglement Stressors

The entanglement stressors identified for analysis in this Supplemental EIS/OEIS are the same as those in the 2018 Final EIS/OEIS (wires and cables, decelerators/parachutes, and biodegradable polymers). The only update to the biodegradable polymer stressor for this Supplemental EIS/OEIS is the addition of bio-inspired slime resulting from testing activities. Detailed information describing these stressors (with the exception of bio-inspired slime, which can be found in the following paragraph) can be found in Section 3.0.3.3.5 of the 2018 Final EIS/OEIS.

Maritime vessel-stopping techniques are designed to slow or potentially stop the advance of a vessel using biodegradable polymers that interact with the vessel's propulsion or sensor systems.

Examples of maritime vessel-stopping proposed activities using biodegradable polymers include bio-inspired slime. The polymers are designed to temporarily interact with the marine vessel (e.g., propeller(s) of a target craft), rendering it either less effective or ineffective. The bio-inspired slime consists of spun fibers made from synthetic proteins, which are based on the amino acid repeat units found in natural hagfish slime material. These proteins are configured into a non-woven mat that can be deployed on the water surface. Once wet, the fiber mats turn into more of a viscous fiber material which increases its ability to adhere to surfaces. In all end-uses, the biodegradable polymers are designed to degrade to smaller compounds as a result of microorganisms and enzymes.

Some of the polymer constituents would dissolve or break down within two hours of immersion. Based on the constituents of the proposed biodegradable polymers, it is anticipated that the material would break down into small pieces within a few days or weeks and then dissolve into the water column within subsequent months. Degradation and dispersal timelines are influenced by water temperature, currents, and other oceanographic features.

Overall, the longer the polymer remains in the water, the more it will break down and become weaker, thus making it more likely to further degrade or become brittle and likely to break. Once the protein fibers in the bio-inspired slime are fully wetted, the material will have a slight net negative buoyancy and thus will sink over time. At the end of dispersion, the remaining materials are likely to comprise either generally separated fibers with lengths on the order of 54 micrometers or small particles of nominally the same size. Biodegradable polymers would be used only during proposed testing activities, not during training activities.

Table 3.0-17 and Table 3.0-18 show either the number and location of proposed activities that include entanglement stressors or the actual number of those stressors that are considered in this Supplemental EIS/OEIS and the equivalent information from the 2018 Final EIS/OEIS for comparison.

Table 3.0-14 shows the number and location of decelerators/parachutes proposed for this Supplemental EIS/OEIS and the equivalent information from the 2018 Final EIS/OEIS for comparison.

Table 3.0-17: Number and Location of Wires and Cables Expended during Military Readiness Activities

Location	*2018 Final EIS/OEIS*	*Supplemental EIS/OEIS*			
	Annual Maximum Number of Materials	*Annual Maximum Number of Materials*		*7-Year Number of Materials*	
	Selected Alternative	*Alternative 1*	*Alternative 2*	*Alternative 1*	*Alternative 2*
Training					
Bathythermograph Wires					
Northeast RC	142	98	98	686	686
VACAPES RC	414	371	471	2,593	3,293
Navy Cherry Point RC	108	388	410	2,564	2,821
JAX RC	1,353	1,300	1,450	8,222	9,477
GOMEX RC	5	5	262	35	1,834
Other AFTT Areas	154	347	402	2,429	2,814
Total	***2,176***	***2,509***	***3,093***	***16,529***	***20,925***
Fiber-Optic Cables					
VACAPES RC	62	117	117	819	819
Navy Cherry Point RC	9	9	9	63	63
JAX RC	2	8	8	51	52
Key West RC	-	2	2	14	14
GOMEX RC	22	32	32	219	219
Total	***95***	***168***	***168***	***1,166***	***1,167***
Guidance Wires					
Northeast RC	24	24	24	168	168
VACAPES RC	8	8	8	56	56
JAX RC	48	48	48	336	336
SINKEX Box	1	1	1	7	7
Total	***81***	***81***	***81***	***567***	***567***
Sonobuoy Wires					
Northeast RC	2,882	5,120	5,120	35,840	35,840

Table 3.0-17: Number and Location of Wires and Cables Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
VACAPES RC	7,484	10,967	10,967	76,767	76,767
Navy Cherry Point RC	2,542	4,657	4,657	32,068	32,180
JAX RC	27,237	43,185	43,185	296,663	296,887
GOMEX RC	-	63	1,601	441	11,207
Other AFTT Areas	432	504	504	3,528	3,528
Total	***40,577***	***64,496***	***66,034***	***445,307***	***456,409***
Testing					
Bathythermograph Wires					
Northeast RC	21,104	139	139	774	849
VACAPES RC	9,740	414	414	2,497	2,497
Navy Cherry Point RC	277	93	93	534	534
JAX RC	561	703	703	3,437	3,537
SFOMF	4	21	21	115	115
Key West RC	10	23	23	80	80
GOMEX RC	9,813	157	157	906	1,006
Total	***41,509***	***1,550***	***1,550***	***8,343***	***8,618***
Fiber-Optic Cable					
VACAPES RC	250	100	100	700	700
JAX RC	50	1	1	2	2
NSWC Panama City Testing Range	328	108	108	756	756
GOMEX RC	100	-	-	-	-
Total	***728***	***209***	***209***	***1,458***	***1,458***
Guidance Wires					
Northeast RC	98	129	129	568	568
NUWC Newport Testing Range	20	20	20	140	140
VACAPES RC	128	157	157	764	764
Navy Cherry Point RC	42	49	49	272	272
JAX RC	134	171	171	845	845
SFOMF	6	12	12	74	74
Key West RC	2	18	18	66	66
GOMEX RC	84	107	107	443	443
Total	***514***	***663***	***663***	***3,172***	***3,172***

Table 3.0-17: Number and Location of Wires and Cables Expended during Military Readiness Activities (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Materials	Annual Maximum Number of Materials		7-Year Number of Materials	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Sonobuoy Wires					
Northeast RC	3,596	13,384	13,384	92,826	92,826
NUWC Newport Testing Range	1,200	2,400	2,400	16,800	16,800
VACAPES RC	5,505	18,207	18,207	126,417	126,417
Navy Cherry Point RC	2,144	2,974	2,974	19,968	19,968
JAX RC	5,847	5,290	5,290	35,816	35,816
SFOMF	32	32	32	224	224
Key West RC	3,007	7,412	7,412	51,034	51,034
NSWC Panama City Testing Range	192	159	159	1,113	1,113
GOMEX RC	2,027	3,114	3,114	20,936	20,936
Other AFTT Areas	-	5,065	5,065	35,455	35,455
Total	***23,550***	***58,037***	***58,037***	***400,589***	***400,589***

Notes: - = Not Applicable AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; GOMEX = Gulf of Mexico; JAX = Jacksonville; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Table 3.0-18: Number and Location of Activities Including Biodegradable Polymers during Testing

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Activities	Annual Maximum Number of Activities		7-Year Number of Activities	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Testing					
Northeast RC	-	2	2	12	12
NUWC Newport Testing Range	30	-	-	-	-
VACAPES RC	30	2	2	12	12
Navy Cherry Point RC		2	2	12	12
JAX RC	30	2	2	12	12
Key West RC	30	2	2	12	12
GOMEX RC	30	7	7	43	43
Port and Pierside Areas					
JEB Little Creek Fort Story	-	2	2	12	12
Total	***150***	***19***	***19***	***115***	***115***

Notes: - = Not Applicable; EIS = Environmental Impact Statement; GOMEX = Gulf of Mexico; JAX = Jacksonville; JEB = Joint Expeditionary Base; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; VACAPES = Virginia Capes

3.0.3.3.6 Ingestion Stressors

The ingestion stressors identified for analysis in this Supplemental EIS/OEIS are the same as those in the 2018 Final EIS/OEIS (military expended materials – munitions and military expended materials other than munitions). The only update to this stressor for the Supplemental EIS/OEIS is the addition of synthetic bio-inspired slime resulting from testing activities, described above in Section 3.0.3.3.5 (Entanglement Stressors) (Table 3.0-18). Detailed information describing ingestion stressors (with the exception of synthetic slime) can be found in Section 3.0.3.3.6 of the 2018 Final EIS/OEIS.

Table 3.0-11, Table 3.0-12, Table 3.0-14, and Table 3.0-19 show either the number and location of proposed activities that include ingestion stressors or the actual number of those stressors that are considered in this Supplemental EIS/OEIS and the equivalent information from the 2018 Final EIS/OEIS for comparison.

Table 3.0-19: Number and Location of Targets Expended during Military Readiness Activities that May Result in Fragments

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Targets	Annual Maximum Number of Targets		7-Year Number of Targets	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Training					
Air Targets					
Northeast RC	2	1	1	5	5
VACAPES RC	99	21	21	144	144
Navy Cherry Point RC	80	150	150	1,048	1,048
JAX RC	68	11	11	76	76
Key West RC	11	10	10	68	68
GOMEX RC	2	7	7	47	47
Total	***262***	***200***	***200***	***1,388***	***1,388***
Mine Shapes					
VACAPES RC	221	2	2	11	11
Navy Cherry Point RC	78	1	1	1	1
JAX RC	78	-	-	-	-
Key West RC	2	-	-	-	-
GOMEX RC	93	1	1	4	4
Total	***472***	***4***	***4***	***16***	***16***
Surface Targets					
Northeast RC	20	22	22	148	148
VACAPES RC	4,582	331	331	2,312	2,312
Navy Cherry Point RC	1,321	146	146	1,018	1,018
JAX RC	3,091	315	315	2,199	2,199
Key West RC	-	1	1	3	3
GOMEX RC	336	51	51	357	357
Other AFTT Areas	200	4	4	27	27
Total	***9,550***	***870***	***870***	***6,064***	***6,064***
Testing					
Air Targets					
Northeast RC	14	5	5	29	29
NUWC Newport Testing Range	-	4	4	26	26
VACAPES RC	583	105	105	456	456
Navy Cherry Point RC	6	4	4	26	26
JAX RC	168	37	37	141	141
Key West RC	13	-	-	-	-

Table 3.0-19: Number and Location of Targets Expended during Military Readiness Activities that May Result in Fragments (continued)

Location	2018 Final EIS/OEIS	Supplemental EIS/OEIS			
	Annual Maximum Number of Targets	Annual Maximum Number of Targets		7-Year Number of Targets	
	Selected Alternative	Alternative 1	Alternative 2	Alternative 1	Alternative 2
NSWC Panama City Testing Range	-	4	4	26	26
GOMEX RC	25	5	5	29	29
Total	***809***	***164***	***164***	***733***	***733***
Mine Shapes					
VACAPES RC	127	15	15	105	105
JAX RC	122	-	-	-	-
SFOMF	40	-	-	-	-
NSWC Panama City Testing Range	370	15	15	105	105
GOMEX RC	232	15	15	105	105
Total	***891***	***45***	***45***	***315***	***315***
Sub-Surface Targets					
Northeast RC	-	1	1	1	1
VACAPES RC	-	1	1	1	1
Navy Cherry Point RC	-	1	1	1	1
JAX RC	-	5	5	5	5
Key West RC	-	1	1	1	1
GOMEX RC	-	1	1	1	1
Total	***0***	***10***	***10***	***10***	***10***
Surface Targets					
Northeast RC	173	4	4	27	27
NUWC Newport Testing Range	934	4	4	26	26
VACAPES RC	984	44	44	211	235
Navy Cherry Point RC	172	4	4	27	27
JAX RC	545	15	15	98	98
SFOMF	56	-	-	-	-
Key West RC	180	1	1	1	1
NSWC Panama City Testing Range	-	4	4	26	26
GOMEX RC	250	4	4	27	27
Total	***3,294***	***80***	***80***	***443***	***467***

Notes: - = Not Applicable; AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; GOMEX = Gulf of Mexico; JAX = Jacksonville; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

3.0.3.4 Resource-Specific Impacts Analysis for Individual Stressors

The direct and indirect impacts of each stressor are analyzed in each resource section for which there may be an impact. Quantitative methods were used to the extent possible, but data limitations required the use of qualitative methods for most stressor/resource interactions. Resource-specific methods are described in the relevant resource sections. While specific methods used to analyze the impacts of individual stressors varied by resource, the following generalized approach was used for all stressor/resource interactions:

- The frequency, duration, and spatial extent of exposure to stressors were analyzed for each resource. The frequency of exposure to stressors, or frequency of a proposed activity, was characterized as intermittent or continuous and was quantified in terms of number per unit of time when possible. Duration of exposure was expressed as short- or long-term and was quantified in units of time (e.g., seconds, minutes, hours) when possible. The spatial extent of exposure was generally characterized as widespread or localized, and the stressor footprint or area (e.g., square feet, square nautical miles) was quantified when possible.
- An analysis was conducted to determine whether, and how, resources are likely to respond to stressor exposure or be altered by stressor exposure based upon available scientific knowledge. This step included reviewing available scientific literature and empirical data. For many stressor/resource interactions, a range of likely responses or endpoints was identified. For example, exposure of an organism to sound produced by an underwater explosion could result in no response, a physiological response such as increased heart rate, a behavioral response such as being startled, or injury.
- The information obtained was used to analyze the likely impacts of individual stressors on a resource and to characterize the type, duration, and intensity of impacts. The type of impact was generally defined as beneficial or adverse and was further defined as a specific endpoint (e.g., change in behavior, mortality, change in concentration, loss of habitat, loss of fishing time). When possible, the endpoint was quantified. The duration of an impact was generally characterized as short-term (e.g., minutes, days, weeks, months, depending on the resource), long-term (e.g., months, years, decades, depending on the resource), or permanent. The intensity of an impact was then determined. For biological resources, the analysis started with individual organisms and their habitats, and then addressed populations, species, communities, and representative ecosystem characteristics, as appropriate.

3.0.3.5 Resource-Specific Impacts Analysis for Multiple Stressors

The stressors associated with the proposed military readiness activities could affect the environment individually or in combination. When appropriate, resource impacts were collectively considered for multiple stressors in addition to resource impacts considered for individual stressors. Therefore, following the resource-specific impacts analysis for individual stressors, the combined impacts of all stressors were analyzed for that resource. This step determines the overall impacts of the alternatives on each resource, and it considers the potential for impacts that are additive (where the combined impacts on the resource are equal to the sum of the individual impacts), synergistic (where impacts combine in such a way as to amplify the effect on the resource), and antagonistic (where impacts will cancel each other out or reduce a portion of the effect on the resource). This analysis helps inform the cumulative impacts analysis and make overall impact conclusions for each resource.

Evaluating the combined impacts of multiple stressors can be complex, especially when the impacts associated with a stressor are hard to measure. Therefore, some general assumptions were used to help determine the potential for individual stressors to contribute to combined impacts. For this analysis, combined impacts were considered more likely to occur in the following situations:

- Stressors co-occur in time and space, causing a resource to be simultaneously affected by more than one stressor.
- A resource is repeatedly affected by multiple stressors or is re-exposed before fully recovering from a previous exposure.
- The impacts of individual stressors are permanent or long term (years or decades) versus short term (minutes, days, or months).
- The intensity of the impacts from individual stressors contributes to a combined overall adverse impact.

The resource-specific impacts analysis for multiple stressors included the following steps:

- Information obtained from the analysis of individual stressors was used to develop a conceptual model to predict the combined impacts of all stressors on each resource. This conceptual model incorporated factors such as the co-occurrence of stressors in space and time, the impacts or assessment endpoints of individual stressors (e.g., mortality, injury, changes in animal behavior or physiology, habitat alteration, or changes in human use), and the duration and intensity of the impacts of individual stressors.
- To the extent possible, additive impacts on a given resource were considered by summing the impacts of individual stressors. This summation was only possible for stressors with identical and quantifiable assessment endpoints. For example, if one stressor disturbed 0.25 square nautical miles (NM^2) of benthic habitat, a second stressor disturbed 0.5 NM^2, and all other stressors did not disturb benthic habitat, then the total benthic habitat disturbed would be 0.75 NM^2. For stressors with identical but not quantifiable assessment endpoints, available scientific knowledge, best professional judgment, and the general assumptions outlined above were used to evaluate potential additive impacts.
- For stressors with differing impacts and assessment endpoints, the potential for additive, synergistic, and antagonistic effects were evaluated based on available scientific knowledge, professional judgment, and the general assumptions outlined above.

A cumulative impact is the impact on the environment that results when the incremental impact of an action is added to other past, present, and reasonably foreseeable future actions. The cumulative impacts analysis considers other actions regardless of what agency (federal or nonfederal) or person undertakes the actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time (40 Code of Federal Regulations section 1508.1(i)(3)). The goal of the analysis is to provide the decision makers with information relevant to reasonably foresee potentially significant impacts. See Chapter 4 (Cumulative Impacts) for the specific approach used for determining cumulative impacts.

3.0.3.6 Significance Criteria

Significance criteria provide a structured framework for assessing impacts, supporting conclusions regarding the significance of effects, and comparing effects between alternatives. For this Supplemental EIS/OEIS, the Action Proponents developed significance criteria for each resource by defining the context and intensity of potential impacts and dividing those impacts into four categories. A significance conclusion was then designated for each category of impacts. The significance criteria for each resource analyzed are provided in the relevant resource section. Appendix K (Activity Impact Determinations) contains the activity level NEPA significance determinations for the military readiness activities under the Proposed Action.

3.0.3.7 Biological Resource Methods

The analysis of impacts on biological resources focused on the likelihood of encountering the stressor, the primary stimulus, response, and recovery of individual organisms. Where appropriate, the potential of a biological resource to overlap with a stressor was analyzed with consideration given to the specific geographic area (coastal areas, open-ocean areas, range complexes, operating areas, and other training and testing ranges) in which the overlap could occur. Additionally, the differential impacts of training versus testing activities that introduce stressors to the resource were considered.

For each of the non-biological resources considered in this Supplemental EIS/OEIS, the methods are unique to each specific resource and are therefore described in each resource section. See the 2018 Final EIS/OEIS's Section 3.1.1.3 (Approach to Analysis) for air quality, Section 3.2.1.2 (Methods) for sediment and water quality, Section 3.10.1.3 (Methods) for cultural resources, Section 3.11.1 (Introduction and Methods) for socioeconomics, and the Methods subsection under Section 3.12.1 (Introduction) for public health and safety. Changes to methods for Air Quality for this Supplemental EIS/OEIS are addressed in Section 3.1 (Air Quality).

3.0.3.7.1 Conceptual Framework for Assessing Effects from Proposed Action Activities

The conceptual framework for assessing effects from non-acoustic activities used for this Supplemental EIS/OEIS is the same as that from the 2018 Final EIS/OEIS. Detailed information describing the conceptual framework can be found in the following sections of the 2018 Final EIS/OEIS:

- Acoustic and explosive activities – Section 3.0.3.6.1
- Energy-producing activities – Section 3.0.3.6.2
- Physical disturbance or strike – Section 3.0.3.6.3
- Entanglement – Section 3.0.3.6.4
- Ingestion – Section 3.0.3.6.5
- Secondary stressors – Section 3.0.3.6.6

In addition to the conceptual framework, a comparison of stressor numbers between this Supplemental EIS/OEIS and the 2018 Final EIS/OEIS was conducted. The supplemental analysis threshold was set as the proportional limit that could potentially have an impact on previous analyses. This threshold was set at a 5 percent proportional change for all stressors and locations. This analysis categorized each stressor and location combination to determine the changes in stressor levels:

- Notable increase: The stressor for that location is above the supplemental analysis threshold (5 percent proportional increase).
- Not Previously Analyzed: The stressor was not previously analyzed in this location in the 2018 Final EIS/OEIS; however, the location is not new for the Supplemental EIS/OEIS.
- New: New location for Supplemental EIS/OEIS Study Area, and therefore the stressor has not been analyzed there previously.
- Removed: The stressor is no longer occurring in that location for the Supplemental EIS/OEIS.
- Decrease: The stressor amount has decreased in that location between the 2018 Final EIS/OEIS and this Supplemental EIS/OEIS.

- Same: The stressor amount is the same for that location in both the 2018 Final EIS/OEIS and this Supplemental EIS/OEIS.
- Discountable: The stressor for that location is below the supplemental analysis threshold (5 percent proportional increase).

The resulting information was incorporated into the analysis for each biological resource section of this Supplemental EIS/OEIS, and used in the non-biological resource sections, where appropriate.

References

Mississippi State Port Authority at Gulfport. (2023). *Business Overview*. Retrieved August 4, 2023, from https://shipmspa.com/doing-business/business/.

Popper, A. N., A. D. Hawkins, R. R. Fay, D. A. Mann, S. M. Bartol, T. J. Carlson, S. Coombs, W. T. Ellison, R. L. Gentry, M. B. Halvorsen, S. Løkkeborg, P. H. Rogers, B. L. Southall, D. G. Zeddies, and W. N. Tavolga. (2014). *ASA S3/SC1.4 TR-2014 Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI*. Acoustical Society of America Press, New York, NY.

U.S. Department of the Navy. (2017). *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III)*. San Diego, CA: Space and Naval Warfare Systems Command, Pacific.

U.S. Department of the Navy. (2018). *Atlantic Fleet Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement*. Norfolk, VA: Naval Facilities Engineering Command Atlantic.

U.S. Department of the Navy. (2022). *Marine Species Monitoring for the U.S. Navy's Atlantic Fleet Training and Testing (AFTT)—2021 Annual Report*. Norfolk, VA: U.S. Fleet Forces Command.

U.S. Department of the Navy. (2024a). *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase IV)*. San Diego, CA: Naval Information Warfare Center, Pacific.

U.S. Department of the Navy. (2024b). *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (Technical Report prepared by Naval Information Warfare Center Pacific). San Diego, CA: Naval Undersea Warfare Center.

U.S. Department of the Navy. (2024c). *U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area* (Naval Facilities Engineering Command Atlantic Technical Report). Norfolk, VA: Naval Facilities Engineering Command Atlantic.

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Supplemental Environmental Impact Statement/ Overseas Environmental Impact Statement Atlantic Fleet Training and Testing

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3.1 Air Quality and Climate Change

AIR QUALITY SYNOPSIS

The Action Proponents considered the stressors to air quality and climate change that could result from the action alternatives within the Study Area. The following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Criteria air pollutants: The emission of criteria pollutants resulting from activities in the Study Area would not cause a violation or contribute to an ongoing violation of the National Ambient Air Quality Standards.
- Hazardous air pollutants: Mobile sources would operate intermittently over a large area and would produce negligible ambient hazardous air pollutant impacts, predominantly in areas not routinely accessed by the general public.
- Greenhouse gases: While greenhouse gas emissions generated by military readiness activities alone would not be enough to cause global warming, in combination with past and future emissions from all other sources, they would contribute incrementally to the global warming that produces the adverse effects of climate change; see Section 4.3.1 (Air Quality) of Chapter 4 (Cumulative Impacts).

3.1.1 Introduction

This section describes air quality in the Study Area and analyzes potential effects to air quality from the proposed Atlantic Fleet Training and Testing (AFTT) military readiness activities. The approach to analyzing air quality impacts produced by the Proposed Action was explained in the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (hereinafter referred to as the “2018 Final EIS/OEIS”). The Study Area is generally consistent with that analyzed in the 2018 Final EIS/OEIS. Additions to the Study Area include pierside training and testing events and transit along established navigation channels from pierside locations to offshore range complexes in the Gulf of Mexico. United States (U.S.) Coast Guard activities are similar in nature to Navy activities and fall under the same stressor categories. The air quality analysis takes into consideration the existing air quality and potential air quality impacts that would occur from the project alternatives within these new areas.

Laws, regulations, and guidance that were described in the 2018 Final EIS/OEIS remain applicable to this Supplemental EIS/OEIS, with two exceptions. First, the *South Coast Air Quality Management District v. EPA* decision of 2018 changed the requirements for maintenance areas under the revoked 1997 8-hour ozone standard, holding that these maintenance areas continue to meet the requirements of the standard, even though it has been revoked and superseded (Section 3.1.2.3, Existing Air Quality). Second, the approach to greenhouse gas analysis has evolved as a result of recent executive orders and guidance (Section 4.3.1, Cumulative Impacts, Air Quality).

3.1.1.1 Criteria Pollutants

The Clean Air Act requires the U.S. Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards for six major pollutants of concern, also known as “criteria pollutants.” The six criteria pollutants are: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter (dust particles less than or equal to 10 microns in diameter and fine particulate matter less than or equal to 2.5 microns in diameter), and sulfur dioxide. National Ambient Air Quality Standards for criteria pollutants are set forth in Table 3.1-1. Locations are designated as either attainment or nonattainment areas based on whether they are within compliance or violation of pollutant standards, respectively. Locations that have been nonattainment, but have subsequently lowered emissions to attainment levels, are classified as maintenance areas. USEPA must also classify nonattainment areas according to the severity of the pollution. Classifications include marginal, moderate, serious, severe, and extreme. All states located in the Study Area have adopted the National Ambient Air Quality Standards for criteria pollutants. Delaware and North Carolina also have adopted state ambient air quality standards for purposes of regulating air quality within their jurisdictions.

Several regions along the Atlantic and Gulf of Mexico coastlines are known as "orphan" maintenance areas regarding the 1997 ozone National Ambient Air Quality Standards. In *South Coast Air Quality Management District v. EPA*, 882 F.3d 1138 (D.C. Cir. 2018), the U.S. Court of Appeals for the District of Columbia Circuit held that USEPA could not waive the 1997 ozone National Ambient Air Quality Standards maintenance plan requirements with respect to orphan maintenance areas, even though the 1997 standard had been revoked and replaced with the 2008 ozone standard. Accordingly, states with orphan maintenance areas under the 1997 8-hour ozone standard were required to submit maintenance plans for the second maintenance period. These areas will remain as maintenance areas for the 1997 8-hour ozone standard until expiration of the second maintenance period.

Table 3.1-1: National Ambient Air Quality Standards

Pollutant		***Primary/Secondary***	***Averaging Time***	***Level***	***Form***
Carbon monoxide		Primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead		Primary and secondary	Rolling 3-month period	0.15 μg/m^3 (1)	Not to be exceeded
Nitrogen dioxide		Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Primary and secondary	1 year	53 ppb (2)	Annual mean
Ozone		Primary and secondary	8 hours	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle pollution (particulate matter)	$PM_{2.5}$	Primary	1 year	9 μg/m^3	Annual mean, averaged over 3 years
		Secondary	1 year	15.0 μg/m^3	Annual mean, averaged over 3 years
		Primary and secondary	24 hours	35 μg/m^3	98th percentile, averaged over 3 years
	PM_{10}	Primary and secondary	24 hours	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur dioxide		Primary	1 hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

[1] In areas designated nonattainment for the lead standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 μg/m^3 as a calendar quarter average) also remain in effect.

[2] The level of the annual nitrogen dioxide standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

[3] Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) ozone standards are not revoked and remain in effect for designated areas. Additionally, some areas may have certain continuing implementation obligations under the prior revoked 1-hour (1979) and 8-hour (1997) ozone standards.

Table 3.1-1: National Ambient Air Quality Standards (continued)

Pollutant	Primary/Secondary	Averaging Time	Level	Form

[4] The previous sulfur dioxide standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous sulfur dioxide standards or is not meeting the requirements of a State Implementation Plan call under the previous sulfur dioxide standards (40 Code of Federal Regulations section 50.4(3)). A State Implementation Plan call is a USEPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required National Ambient Air Quality Standards.

Source: (U.S. Environmental Protection Agency, 2024)

Notes: $\mu g/m^3$ = micrograms per cubic meter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; ppb = parts per billion; ppm = parts per million; USEPA = United States Environmental Protection Agency

3.1.1.2 Hazardous Air Pollutants

In addition to the National Ambient Air Quality Standards for criteria pollutants, there are national standards for hazardous air pollutants. USEPA has designated 187 substances as hazardous air pollutants under the federal Clean Air Act. Hazardous air pollutants are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects (U.S. Environmental Protection Agency, 2016). National Ambient Air Quality Standards are not established for these pollutants; however, USEPA has developed rules that limit emissions of hazardous air pollutants from specific stationary industrial sources. These emissions control standards are known as “maximum achievable control technologies” and “generally achievable control technologies.” They are intended to achieve the maximum degree of reduction in emissions of hazardous air pollutants from stationary sources, taking into consideration the cost of emissions control, non-air quality health and environmental impacts, and energy requirements. USEPA also promulgated a Mobile Source Air Toxics Rule to regulate hazardous air pollutants from mobile sources. USEPA controls hazardous air pollutants from mobile sources by regulating constituents of concern in fuels, promulgating cleaner engine emission standards, and limiting excessive engine operations.

The potential risk of health effects from exposure to hazardous air pollutants can be estimated by applying inhalation exposure values developed by USEPA to ambient pollutant concentrations (U.S. Environmental Protection Agency, 2021). Risk values include incremental lifetime cancer risk and the level of hazard associated with noncancer health effects, depending on the pollutant of concern.

3.1.1.3 General Conformity Evaluation

Federal actions are required to conform with the approved State Implementation Plan for those areas of the United States designated as nonattainment or maintenance areas for any criteria air pollutant under the Clean Air Act (40 Code of Federal Regulations [CFR] parts 51 and 93). The purpose of the General Conformity Rule is to ensure that applicable federal actions, such as the Proposed Action evaluated in this Supplemental EIS/OEIS, would not interfere with an implementation plan to attain and maintain the National Ambient Air Quality Standards. A conformity evaluation must be completed for every applicable federal action that generates nonattainment pollutants (or their precursors) within nonattainment or maintenance areas to determine and document whether a proposed action complies with the General Conformity Rule.

The Navy Guidance for Compliance with the Clean Air Act General Conformity Rule section 4.1 states that a Record of Non-Applicability must be prepared if the proposed action is subject to the Conformity Rule, but is exempt because it fits within one of the exemption categories listed under 40 CFR part 93B, because the action's projected emissions are below the *de minimis* conformity applicability threshold values, or because it is presumed to conform (U.S. Department of the Navy, 2013). *De minimis* thresholds are lowered as the air quality of a nonattainment area worsens. For example, the threshold for an ozone precursor is 10 tons per year in an extreme nonattainment area, but 100 tons per year in a moderate nonattainment area.

Certain military readiness activities take place within nonattainment and maintenance areas. Several nonattainment and maintenance areas were identified as relevant to training or testing activities in the Study Area and are further discussed in Section 3.1.2.3 (Existing Air Quality). Therefore, the air quality analysis for this Supplemental EIS/OEIS includes estimates of proposed emissions within these areas as required for the General Conformity applicability analysis.

3.1.1.4 National Environmental Policy Act Evaluation

The evaluation of impacts to air quality requires two separate analyses: (1) impacts of air pollutants emitted by military readiness activities within U.S. territorial seas (i.e., within 12 nautical miles [NM] of the coast) are assessed under the National Environmental Policy Act (NEPA); and (2) impacts of air pollutants emitted by military readiness activities outside U.S. territorial seas are evaluated under Executive Order 12114, *Environmental Effects of Major Federal Actions*.

The analysis in this Supplemental EIS/OEIS estimated the magnitude of criteria air pollutant emissions that could occur from the proposed activities and qualitatively determined their potential to exceed an ambient air quality standard (see Table 3.1-1). Factors considered in the analysis included existing air quality, the magnitudes and locations of proposed emissions, and the intermittent and mobile nature of proposed emission sources.

In addition to criteria pollutants, the NEPA air quality analysis also addresses hazardous air pollutants emitted by the proposed activities and qualitatively assesses their potential impacts on air quality. Hazardous air pollutants are generated by combustion of fuels, explosives, propellants, and the materials of which targets, munitions, and other training and testing materials are constructed (e.g., plastic, paint, wood). Fugitive volatile and semi-volatile petroleum compounds also may be emitted whenever mechanical devices are used. The analysis qualitatively evaluated the potential for hazardous air pollutant emissions from the proposed activities to affect public receptors. If proposed emissions would not exceed the health standard for cancer or non-cancer effects at these locations, then impacts would be less than significant.

3.1.1.5 Approach to Analysis

Boundaries of Analysis

As discussed in Section 3.1.1.4 (National Environmental Policy Act Evaluation), impacts of air pollutants emitted by military readiness activities in the Study Area within territorial waters are assessed under NEPA and impacts outside territorial waters are assessed under the guidelines of Executive Order 12114.

Air pollutants emitted more than 3,000 feet above ground level are considered to be above the atmospheric mixing layer and therefore do not affect ground level air quality(40 CFR 93.153(c)(2)(xxii)). Accordingly, analysis of health-based air quality impacts under NEPA and Executive Order 12114 includes estimates of criteria air pollutants for all military readiness activities where aircraft, missiles, or targets operate at or below the inversion layer or that involve vessels in U.S. territorial seas.

Emission Sources

Criteria air pollutants are generated by the combustion of fuel by surface vessels and by fixed-wing and rotary-wing aircraft. These mobile sources are the primary emitters of air pollution associated with military readiness activities. Emissions are also generated by the combustion of explosives and propellants in various types of munitions.

3.1.1.5.1 Analysis Framework

Emissions sources and the approach used to estimate emissions under Alternative 1 and Alternative 2 for the air quality analysis are based, wherever possible, on information from Navy subject matter experts and established training and testing requirements. The pollutants for which calculations are made include exhaust criteria pollutants, hazardous air pollutants, and carbon dioxide.

The analysis includes a NEPA analysis, a separate section for a Clean Air Act General Conformity applicability analysis to support a determination pursuant to the General Conformity Rule (40 CFR part 93B), and discussion of impacts outside territorial waters pursuant to Executive Order 12114.

3.1.1.6 Emission Estimates

Emission sources analyzed in this Supplemental EIS/OEIS include aircraft, vessels, and munitions. To estimate aircraft emissions in the 2018 Final EIS/OEIS, the operating modes, number of hours of operation, and type of engine for each type of aircraft were evaluated to assess impacts on air quality concentrations. Aircraft criteria pollutant emissions are only analyzed for those operations below 3,000 feet above ground level. This atmospheric boundary layer is not applicable to greenhouse gases. Greenhouse gases are analyzed based on all aircraft operations, regardless of altitude.

Vessel emissions include those produced by military ships and smaller boats providing services for military readiness activities. The methods for estimating military ship emissions involve evaluating the type of activity and generating the average annual operational hours for ships in each operational area, both within state waters and beyond state waters. In the 2018 Final EIS/OEIS, this was done to create annual averages for the years 2010 through 2015. The average annual hours were used for Alternative 1 in the 2018 Final EIS/OEIS. Alternative 1 reflected a representative year of training to account for the natural fluctuation of training cycles and deployment schedules that generally influence the maximum level of training that may occur year after year in any 5-year period. For Alternative 2 in the 2018 Final EIS/OEIS, the year with the highest number of operational hours (2011) was selected as the year to represent maximum operations. Alternative 1 was selected as the Preferred Alternative and the Record of Decision to implement that alternative was published in the *Federal Register* on October 26, 2018 (83 *Federal Register* 54097).

For this Supplemental EIS/OIES, Alternative 1 reflects a representative year of training and testing to account for the natural fluctuations of training cycles, testing programs, and deployment schedules that generally limit the maximum level of training and testing from occurring for the foreseeable future. Alternative 2 reflects the maximum number of training and testing activities that could occur within a given year and assumes that the maximum level of activity would occur every year over any 7-year period.

3.1.1.7 Greenhouse Gases

The heating effect from the greenhouse gases carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride, and sulfur hexafluoride is considered the primary cause of the climate change observed over the last 50 years (74 *Federal Register* 66496–66546, December 15, 2009). Climate change is predicted to produce negative environmental, economic, and social consequences across the globe (Intergovernmental Panel on Climate Change, 2023; Marvel et al., 2023).

Executive Order 14008, *Tackling the Climate Crisis at Home and Abroad* (86 *Federal Register* 7619, February 1, 2021), requires all agencies to use their procurement power to limit greenhouse gas emissions, to submit a Climate Action Plan, and to adhere to the requirements of the Made in America Laws in making clean energy, energy efficiency, and clean energy procurement decisions. Executive Order 14057, *Executive Order on Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability* (86 *Federal Register* 70935–70943, 2021), establishes policy for federal agencies to further these goals through use of their procurement power to limit greenhouse gas emissions including a number of goals for clean electricity, electric vehicles, and net-zero emissions.

In October 2022, the Department of Defense published the *Climate Adaptation Plan 2022 Progress Report* to update on progress of priority actions and other initial plan topics and introduce new topics from Executive Order 14057 (U.S. Department of Defense, 2022).

Executive Order 14008 instructs agency heads to prepare Climate Action Plans for their agency operations. The Department of the Navy Climate Action Plan (U.S. Department of the Navy, 2022) details the Navy's goals to meet the requirements of Executive Order 14008 and Executive Order 14057. These goals include 65 percent reductions in scope 1 and 2 greenhouse gas emissions by 2030, acquiring 100 percent zero-emission, light-duty vehicles by 2027, achieving a 50 percent reduction in greenhouse gas emissions from buildings by 2032, diverting at least 50 percent of non-hazardous solid waste from landfills by 2025, instituting nature-based resilience to reduce greenhouse gas emissions, and establishing energy resilience.

On January 9, 2023, the Council on Environmental Quality (CEQ) released interim guidance that describes how federal agencies should consider the effects of greenhouse gases and climate change in their NEPA reviews (Council on Environmental Quality, 2023). This guidance is similar to previous iterations and suggests that agencies should calculate estimated greenhouse gas emissions in NEPA analyses to assess potential effects on climate change. The CEQ states that NEPA reviews should provide the social cost of a project's greenhouse gas emissions even if no other costs or benefits are monetized, because it can help decision-makers and the public understand the effects of a project's greenhouse gas emissions. The guidance also states that agencies should explain how a proposed action and alternatives would help meet or detract from achieving climate action goals or commitments, including international agreements, federal government-wide and agency goals and planning documents, and state, regional, and tribal goals. The guidance states that NEPA reviews should consider the projected future state of the environment and the effects of climate change on a proposed action based on the best available climate change reports, such as the National Climate Assessment. The CEQ also encourages agencies to mitigate greenhouse gas emissions to the greatest extent possible.

The Navy is committed to improving energy security and environmental stewardship by reducing reliance on fossil fuels. The Navy is actively developing and participating in energy, environmental, and climate change initiatives that will increase use of alternative energy and reduce emissions of greenhouse gases. The Navy has adopted energy, environmental, and climate change goals. These goals include (1) ensuring that the Navy's forces, systems, and facilities can continue to operate effectively and achieve the mission in the face of changing climate conditions and worsening climate impacts and (2) reducing greenhouse gas emissions and drawing greenhouse gases out of the atmosphere, stabilizing ecosystems, and achieving, as an enterprise, the nation's commitment to net-zero emissions by 2050 (U.S. Department of the Navy, 2022).

The action alternatives would emit greenhouse gases to the atmosphere. The potential effects of proposed greenhouse gas emissions are by nature global and cumulative impacts because worldwide sources of greenhouse gas emissions contribute to climate change. Therefore, the analysis estimated greenhouse gas emissions for the proposed training and testing in the Study Area for use in assessing their potential effects on climate change in Section 4.3.1 (Air Quality) of Chapter 4 (Cumulative Impacts).

3.1.2 Affected Environment

3.1.2.1 General Background

3.1.2.1.1 Region of Influence

The region of influence for air quality is a function of the type of pollutant, emission rates of the pollutant source, proximity to other emission sources, and local and regional meteorology. The region of influence for air quality includes the Study Area as well as adjoining land areas several miles inland, which may from time to time be downwind from emission sources associated with the action alternatives.

3.1.2.2 Sensitive Receptors

Identification of sensitive receptors is part of describing the existing air quality environment. Sensitive receptors are individuals in residential areas, schools, parks, hospitals, or other sites for which there is a reasonable expectation of continuous human exposure during the timeframe coinciding with peak pollution concentrations.

3.1.2.2.1 Climate of the Study Area

Section 3.1.2.2.1 of the 2018 Final EIS/OEIS describes the climates of the regions included within the Study Area, and this description is still accurate. The Study Area is divided into four areas: the North Atlantic Region (Arctic Region through Nova Scotia), the Mid-Atlantic Region (Maine through Virginia), the Southeast Atlantic Region (North Carolina to southern Florida), and the Gulf of Mexico Region (southern Florida through Texas). Meteorological conditions affect air quality due to (1) winds, which transport and disperse emissions from a source and (2) the vertical temperature structure of the lower atmosphere, which determines the ability of the atmosphere to disperse air pollutants (known as atmospheric stability). These conditions are more variable on land than over oceans due to the effects of topography and the greater daily and seasonal temperature variations on land.

Wind conditions can be defined with the use of a wind rose, which displays the frequency of occurrence of wind direction and wind speed of data collected at a location. Figure 3.1-1 presents a wind rose for Naval Air Station Oceana, which is on the Atlantic shoreline of Hampton Roads, Virginia. These data, recorded over a 79-year period, show that winds prevail from the southwest and north directions, with lesser amounts of contributions from all other directions. These data also signify, on an annual average basis, how winds would transport air pollutants emitted from a source near this location. Appendix H (Air Quality Emissions Calculations) includes wind roses for various locations along the coastline of the Study Area from Maine to Texas.

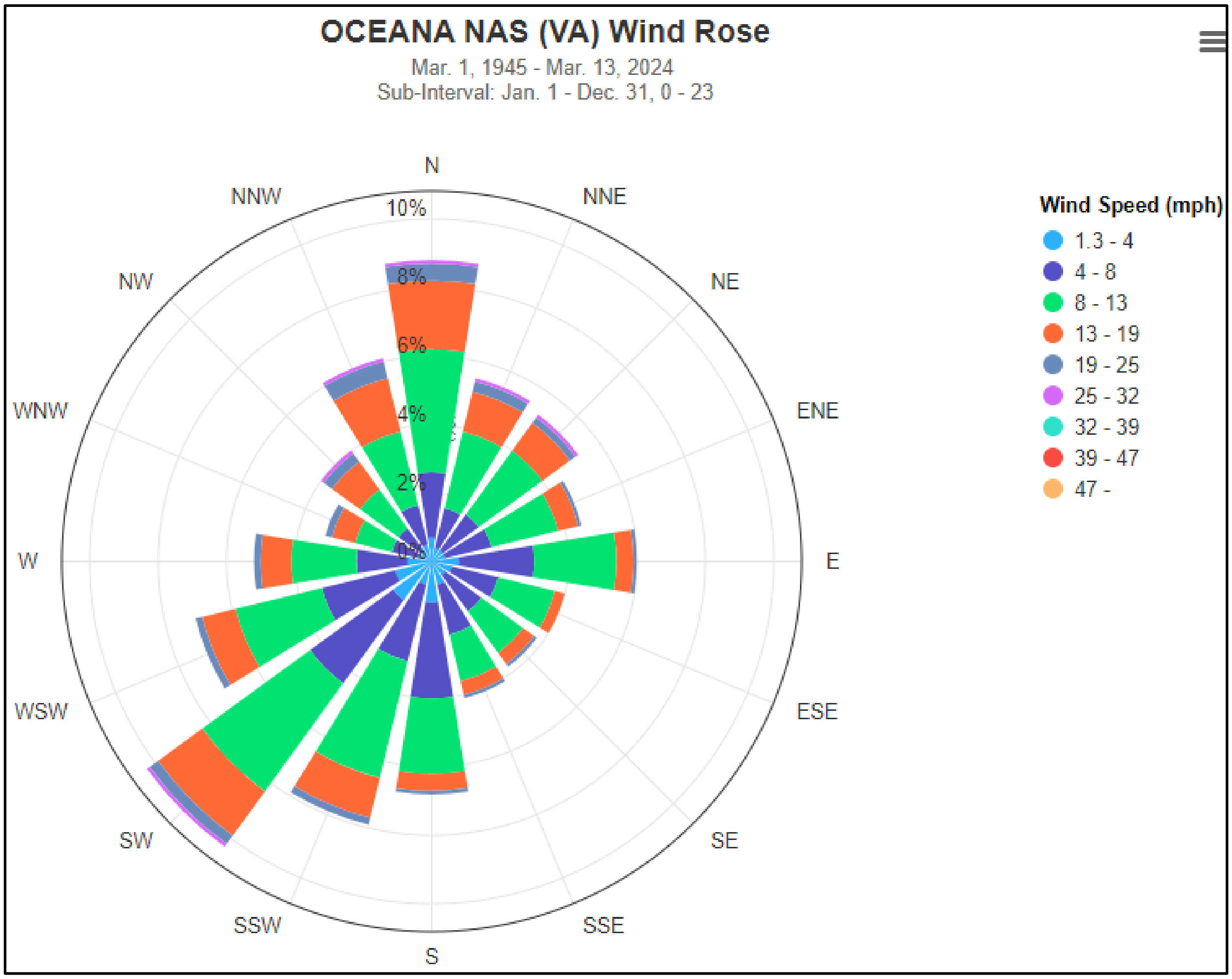
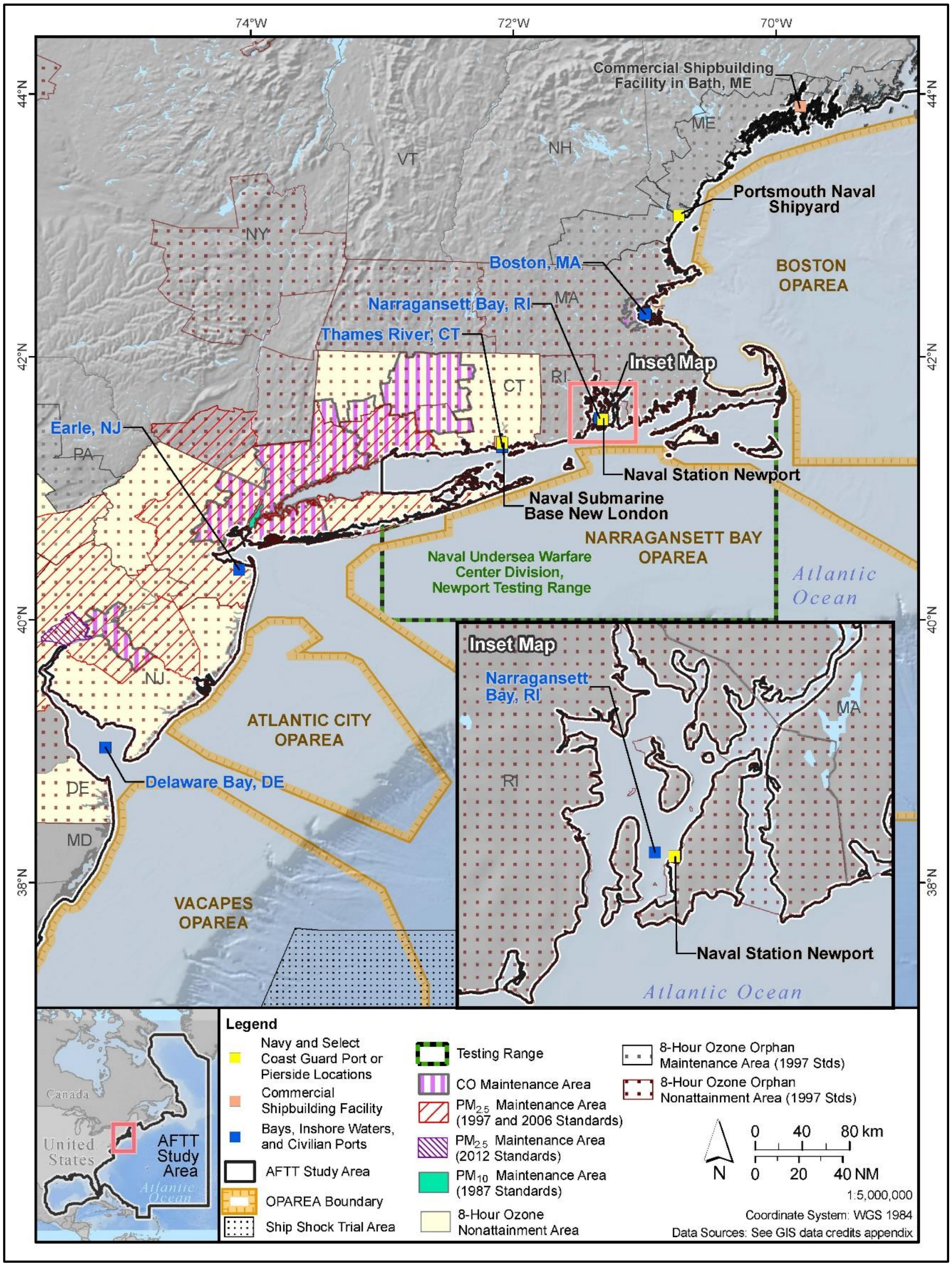


Figure 3.1-1: Wind Rose for Naval Air Station Oceana, Hampton Roads, Virginia

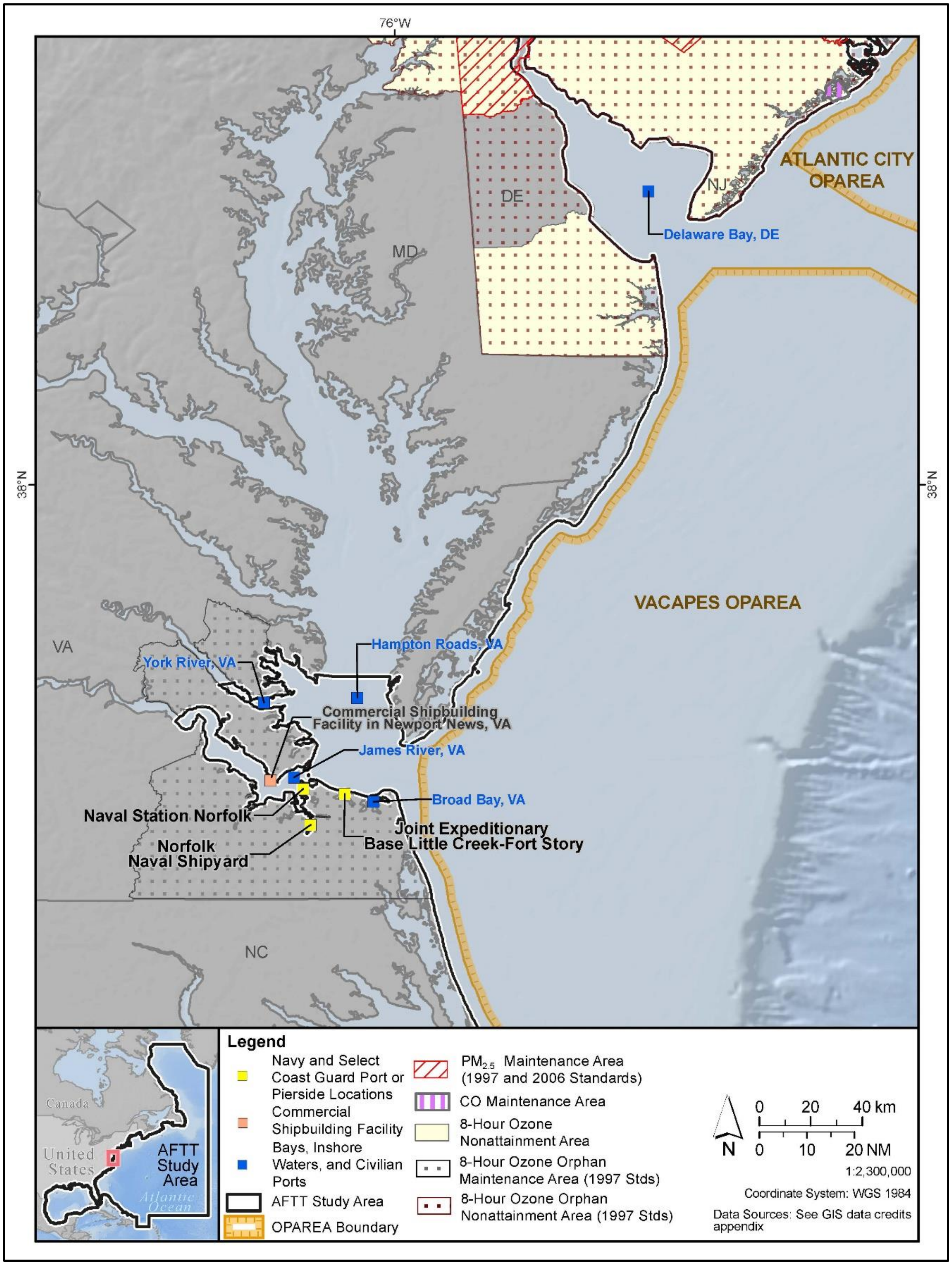
3.1.2.3 Existing Air Quality

Most of the Study Area is classified as attainment for all National Ambient Air Quality Standards. As shown in Figure 3.1-2 through Figure 3.1-5, most nonattainment and maintenance areas in the eastern half of the continental United States are in the northeastern states. Many are located in inland, urban, and industrialized areas where air pollutant sources contribute to elevated pollutant impacts. Some coastal areas, however, have nonattainment or maintenance areas for one or more criteria pollutants. These designations are based on air quality data collected from monitors at locations in urban and rural settings, as well as modeling. Nonattainment and maintenance designations range in size from as small as a few square miles to large multi-state regions.



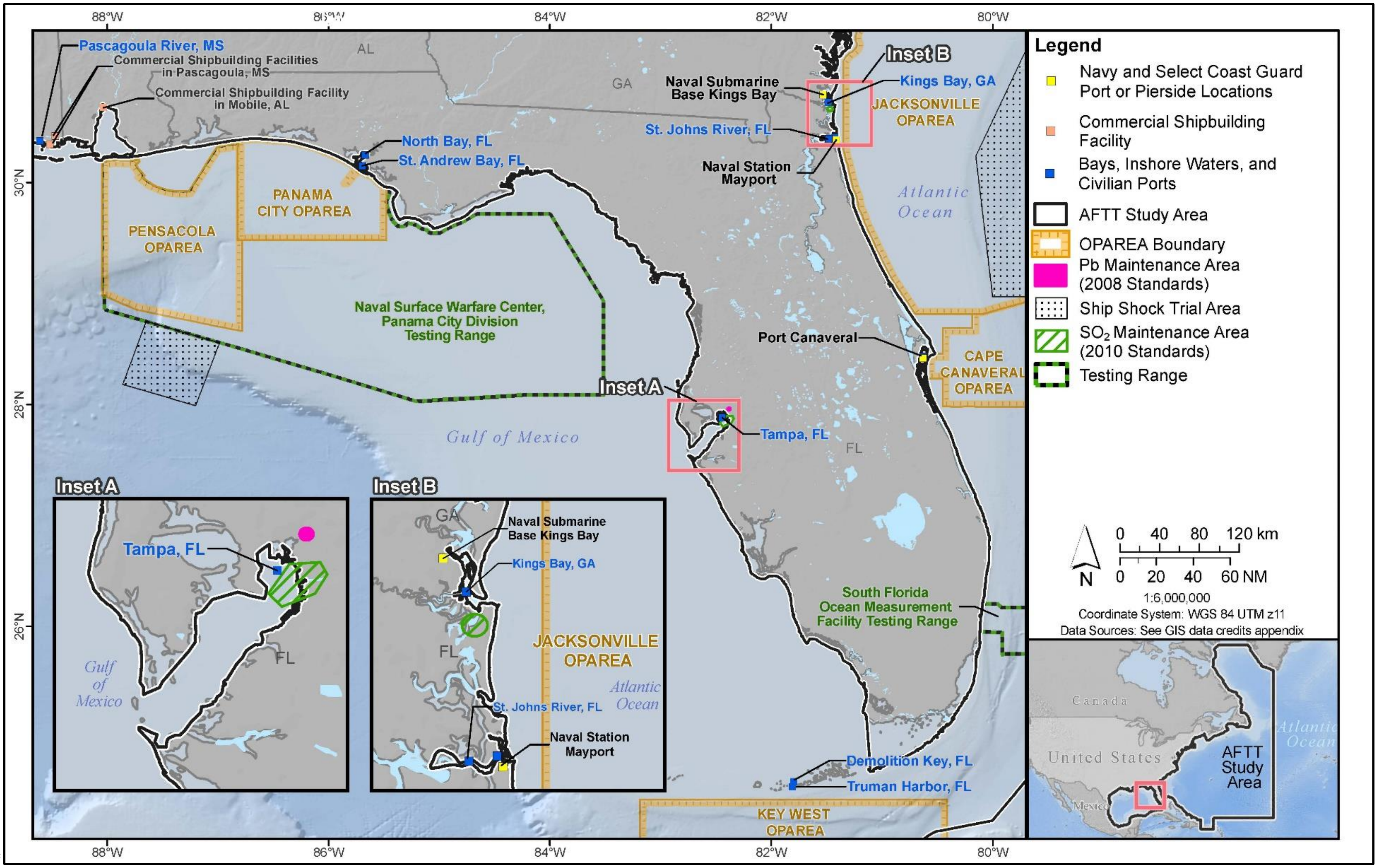
Notes: AFTT = Atlantic Fleet Training and Testing; CO = carbon monoxide; OPAREA = operating area; PM_{10}/$PM_{2.5}$ = particulate matter less than or equal to 10/2.5 microns in diameter; Stds = Standards; VACAPES = Virginia Capes

Figure 3.1-2: Applicable Nonattainment or Maintenance Areas in USEPA Regions 1 and 2 (New York-Northern New Jersey-Long Island, NY-NJ-CT Air Quality Control Region)



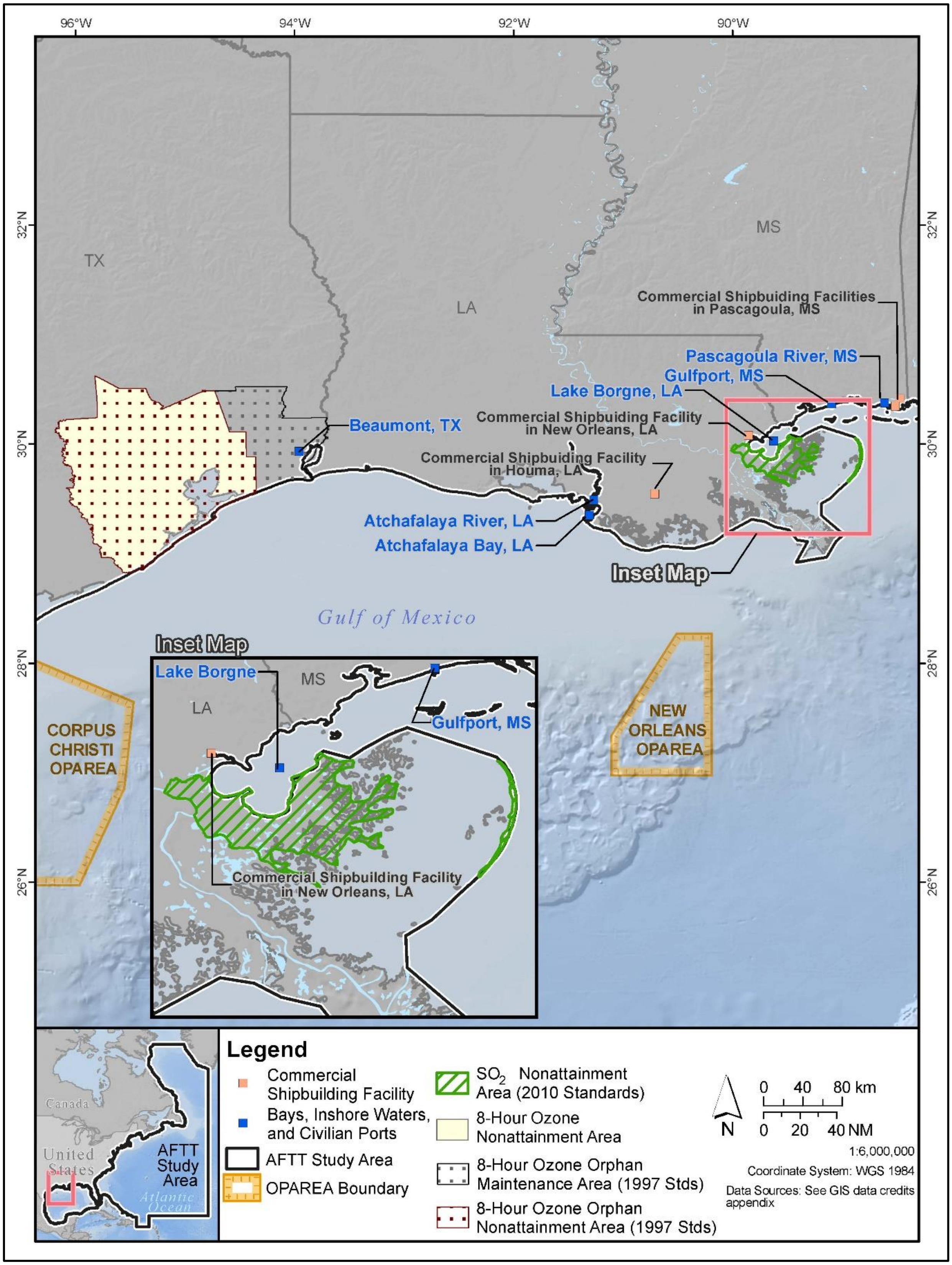
Notes: AFTT = Atlantic Fleet Training and Testing; CO = carbon monoxide; OPAREA = operating area; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; Stds = Standards; VACAPES = Virginia Capes

Figure 3.1-3: Applicable Nonattainment and Maintenance Areas in USEPA Region 3



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; Pb = lead; SO_2 = sulfur dioxide

Figure 3.1-4: Applicable Nonattainment and Maintenance Areas in USEPA Region 4



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SO_2 = sulfur dioxide; Stds = Standards

Figure 3.1-5: Applicable Nonattainment and Maintenance Areas in USEPA Region 6

Table 3.1-2 identifies the nonattainment and maintenance areas that are adjacent to the Study Area and Table 3.1-3 lists the Study Area pierside locations and the attainment status for each. The attainment status of the Study Area and the associated regulatory thresholds remain unchanged from the 2018 Final EIS/OEIS (including new areas under analysis), with the following exceptions:

- Western Rockingham and Eastern Hillsborough Counties, New Hampshire, were redesignated from nonattainment to maintenance for sulfur dioxide on September 20, 2019.
- Atlantic, Cape May, and Ocean Counties, New Jersey, were changed from marginal to moderate nonattainment status for the 2015 ozone standard.
- Hillsborough County, Florida, was redesignated from nonattainment to maintenance for sulfur dioxide on March 23, 2020, and for lead on October 11, 2018.
- Nassau County, Florida, was redesignated from nonattainment to maintenance for sulfur dioxide on February 15, 2019.
- As a result of the 2018 court decision in *South Coast Air Quality Management District v. EPA* (D.C. Circuit), (a) the coastal region from Massachusetts to Delaware was designated as orphan nonattainment areas for the 1997 8-hour ozone standard and (b) the southern coastal region of Maine, Hampton Roads Intrastate Air Quality Control region, and the Southern Louisiana-Southeast Texas Interstate region were designated as orphan maintenance areas for the 1997 8-hour ozone standard (U.S. Environmental Protection Agency, 2018).

Table 3.1-2: Nonattainment and Maintenance Areas Adjacent to the Study Area

Air Quality Control Region	*County/Area*	*National Ambient Air Quality Standards Attainment Status*
USEPA Regions 1 and 2		
Merrimack Valley, Southern NH	Partial portions of Rockingham, Hillsborough, and Merrimack Counties	Maintenance area for sulfur dioxide (2010)
Metropolitan Boston Intrastate	Boston, MA	Maintenance area for carbon monoxide (1971)
	Boston-Lawrence-Worcester (eastern MA)	Orphan nonattainment area for the 1997 ozone standard[1]
	Boston-Manchester-Portsmouth (southeast), NH	Orphan maintenance area for the 1997 ozone standard[1]
Dukes County, MA	Martha's Vineyard and surrounding islands	Marginal nonattainment for 8-hr ozone (2008)
Eastern Connecticut Intrastate	Greater Connecticut, CT	Moderate nonattainment for 8-hr ozone (2015)
		Serious nonattainment for 8-hr ozone (2008)
		Orphan nonattainment area for the 1997 ozone standard[1]
Androscoggin Valley Interstate	Hancock, Knox, Lincoln and Waldo Counties (central ME coast), ME	Orphan maintenance area for the 1997 ozone standard[1]
Hartford-New Haven-Springfield Interstate	Hartford-New Britain-Middletown, CT	Maintenance area for carbon monoxide (1971)
	New Haven-Meriden-Waterbury, CT	Maintenance area for carbon monoxide (1971)

Table 3.1-2: Nonattainment and Maintenance Areas Adjacent to the Study Area (continued)

Air Quality Control Region	*County/Area*	*National Ambient Air Quality Standards Attainment Status*
New Jersey-New York-Connecticut Interstate	NY County, NY	Moderate nonattainment for PM_{10} (1987)
	New York-New Jersey-Long Island, NY-NJ-CT	Severe nonattainment for 8-hr ozone (2008)
		Orphan nonattainment area for the 1997 ozone standard[1]
		Maintenance area for $PM_{2.5}$ (1997)
		Maintenance area for $PM_{2.5}$ (2006)
		Maintenance area for carbon monoxide (1971)
	NY-Northern NJ-Long Island, NY-NJ-CT	Moderate nonattainment for 8-hr ozone (2015)
Metropolitan Philadelphia Interstate	Philadelphia-Wilmington, PA-NJ-DE	Maintenance area for $PM_{2.5}$ (1997)
		Maintenance area for $PM_{2.5}$ (2006)
		Maintenance area for $PM_{2.5}$ (1997)
		Maintenance area for $PM_{2.5}$ (2006)
	Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE	Moderate nonattainment for 8-hr ozone (2015)
		Marginal nonattainment for 8-hr ozone (2008)
		Orphan nonattainment area for the 1997 ozone standard[1]
	Atlantic City, NJ	Maintenance area for carbon monoxide (1971)
Metropolitan Portland Intrastate	Portland, ME	Orphan maintenance area for the 1997 ozone standard[1]
Metropolitan Providence Interstate	Providence (all of RI), RI	Orphan nonattainment area for the 1997 ozone standard[1]
USEPA Region 3		
Southern Delaware Intrastate	Seaford, DE	Marginal nonattainment for 8-hr ozone (2008)
Hampton Roads Area, VA	Gloucester, Isle of Wight, James City, and York Counties	Orphan maintenance area for the 1997 ozone standard[1]
Metropolitan Philadelphia Interstate	Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE (DE, only portion within Region 3)	Orphan nonattainment area for the 1997 ozone standard[1]
USEPA Region 4		
West Central Florida Intrastate	Hillsborough County, FL	Maintenance area for SO_2 (2010)
	Tampa, FL	Maintenance area for lead (2008)
Jacksonville (Florida)-Brunswick (Georgia) Interstate	Nassau County, FL	Maintenance area for SO_2 (2010)
USEPA Region 6		
Southern Louisiana-Southeast Texas Interstate	Beaumont-Port Arthur, TX	Orphan maintenance area for the 1997 ozone standard[1]
	St. Bernard Parish, LA	Nonattainment for SO_2 (2010)

Table 3.1-2: Nonattainment and Maintenance Areas Adjacent to the Study Area (continued)

Air Quality Control Region	*County/Area*	*National Ambient Air Quality Standards Attainment Status*
Metropolitan Houston-Galveston Intrastate	Houston-Galveston-Brazoria, TX	Severe nonattainment for 8-hr ozone (2008)
		Moderate nonattainment for 8-hr ozone (2015)
		Orphan maintenance area for the 1997 ozone standard[1]

[1] In *South Coast Air Quality Management District v. EPA*, 882 F.3d 1138 (D.C. Cir. 2018), the U.S. Court of Appeals for the District of Columbia Circuit held that the U.S. Environmental Protection Agency could not waive the 1997 ozone National Ambient Air Quality Standards maintenance plan requirements with respect to "orphan maintenance areas," even though the 1997 standard had been revoked. "Orphan maintenance areas" are those areas that had been redesignated to attainment for the 1997 8-hour ozone National Ambient Air Quality Standards and were designated attainment for the 2008 ozone National Ambient Air Quality Standards, even though the 1997 standard had been revoked. Accordingly, states with orphan maintenance areas under the 1997 8-hour ozone National Ambient Air Quality Standards were required to submit maintenance plans for the second maintenance period.

Source: (U.S. Environmental Protection Agency, 2023)

Notes: CT = Connecticut; DE = Delaware; FL = Florida; hr = hour; LA = Louisiana; MA = Massachusetts; MD = Maryland; ME = Maine; NJ = New Jersey; NY = New York; PA = Pennsylvania; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; RI = Rhode Island; SO_2 = sulfur dioxide; TX = Texas; VA = Virginia

Table 3.1-3: Pierside and Coastal Activity Locations and Their Area's Attainment Status

Air Quality Control Region	*Pierside Location*	*Designated Area*	*National Ambient Air Quality Standards Attainment Status*
Metropolitan Portland Intrastate	Portsmouth Naval Shipyard, Kittery ME; Shipyard – Bath, ME	Metropolitan Portland/Cumberland County	Orphan maintenance area for the 1997 ozone standard[1]
Metropolitan Providence Interstate	NUWC, Division Newport, Newport, RI	Providence (all of RI), RI	Orphan nonattainment area for the 1997 ozone standard[1]
Eastern Connecticut Intrastate	Naval Submarine Base New London; Groton, Connecticut Shipyard – Groton, CT and Thames River	Greater Connecticut, CT	Moderate nonattainment of the 8-hr ozone standard (2015)
			Serious nonattainment of the 8-hr ozone standard (2008)
			Orphan nonattainment area for the 1997 ozone standard[1]
Hampton Roads Intrastate	Naval Station Norfolk, Norfolk, VA; JEB Little Creek-Fort Story, Virginia Beach, VA; Norfolk Naval Shipyard, Portsmouth, VA; Shipyard – Newport News, VA; Broad Bay; York River; James River and Tributaries	Hampton Roads Intrastate	Orphan maintenance area for the 1997 ozone standard[1]
Charleston Intrastate	Cooper River; Charleston Pier, SC	Charleston County	Attainment of all applicable standards
Jacksonville (FL)-Brunswick (GA) Interstate	Naval Submarine Base Kings Bay, GA	Camden County	Attainment of all applicable standards

Table 3.1-3: Pierside and Coastal Activity Locations and Their Area's Attainment Status (continued)

Air Quality Control Region	*Pierside Location*	*Designated Area*	*National Ambient Air Quality Standards Attainment Status*
Jacksonville (FL)-Brunswick (GA) Interstate	Naval Station Mayport, Jacksonville, FL; St. Johns River, FL	Duval County	Attainment of all applicable standards
Central Florida Intrastate	Port Canaveral, Cape Canaveral, FL	Brevard County	Attainment of all applicable standards
Southeast Florida Intrastate	South Florida Ocean Measurement Facility Testing Range	Broward County	Attainment of all applicable standards
Mobile (AL)-Pensacola-Panama City (FL)-Southern Mississippi Interstate	Saint Andrew Bay, FL	Bay County	Attainment of all applicable standards
Mobile (AL)-Pensacola-Panama City (FL)-Southern Mississippi Interstate	Shipyard – Pascagoula, MS	Jackson County	Attainment of all applicable standards

[1] In South Coast Air Quality Management District v. EPA, 882 F.3d 1138 (D.C. Cir. 2018), the U.S. Court of Appeals for the District of Columbia Circuit held that the U.S. Environmental Protection Agency could not waive the 1997 ozone National Ambient Air Quality Standards maintenance plan requirements with respect to "orphan maintenance areas," even though the 1997 standard had been revoked. "Orphan maintenance areas" are those areas that had been redesignated to attainment for the 1997 8-hour ozone National Ambient Air Quality Standards and were designated attainment for the 2008 ozone National Ambient Air Quality Standards, even though the 1997 standard had been revoked. Accordingly, states with orphan maintenance areas under the 1997 8-hour ozone National Ambient Air Quality Standards were required to submit maintenance plans for the second maintenance period.

Source: (U.S. Environmental Protection Agency, 2023)

Notes: AL = Alabama; CT = Connecticut; FL = Florida; GA = Georgia; hr = hour; JEB = Joint Expeditionary Base; ME = Maine; MS = Mississippi; NUWC = Naval Undersea Warfare Center; RI = Rhode Island; SC = South Carolina; VA = Virginia

3.1.2.3.1 Air Quality Adjacent to the Study Area

More than 70 percent of all AFTT military readiness activities are largely conducted well offshore and a small percentage are performed in areas offshore of coastal nonattainment or maintenance areas. The transport of emissions from offshore sources to land is well documented.

There are also activities that occur within state waters. Vessels traverse state waters during ingress/egress to operating areas and other Study Area locations further offshore. Certain training activities occur in coastal areas, including riverine and bay locations. The area of greatest activity is in the lower Chesapeake Bay and in tributaries to the bay, primarily the James and York Rivers in Virginia. Additional areas where training or testing occurs within state waters include Narragansett Bay near the Naval Undersea Warfare Center Division, Newport, Rhode Island; the St. Johns River near Naval Station Mayport, Florida; Port Canaveral, Florida; Broward County, Florida, adjacent to the South Florida Ocean Measurement Facility Testing Range; St. Andrew Bay near Naval Support Activity Panama City, Florida; and the Cooper River near Charleston, South Carolina. Of these, only Naval Station Mayport is in an Air Quality Control Region with a nonattainment designation within its borders.

Each state adjacent to the Study Area is responsible for regulating air quality within its jurisdiction, including out to the limits of its state waters. Most state waters extend out to 3 NM from the coastline; however, state waters for Florida (Gulf of Mexico coast only), Texas, and Puerto Rico extend out to 9 NM from the coastline. In addition, the following two local air agencies regulate air quality within the Study Area: (1) Broward County Natural Resources Division – Air Quality Program (adjacent to the South Florida Ocean Measurement Facility Testing Range) and (2) City of Jacksonville Environmental Quality Division – Air Quality Branch (encompassing Naval Station Mayport and adjacent to the Jacksonville operating area).

3.1.3 Environmental Consequences

None of the proposed military readiness activities would be conducted under the No Action Alternative. Therefore, the existing air quality and climate affected environments would either remain unchanged or would improve by negligible to minor amounts after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further in this section.

This section presents an analysis of how the action alternatives would impact air quality within the Study Area. This section describes the NEPA impacts related to the applicable air quality stressors: criteria pollutants and hazardous pollutants. The air quality analysis estimated the magnitude of emissions that would occur from training and testing activities for each action alternative. The analysis then qualitatively estimated the potential for proposed emissions to contribute to an exceedance of an ambient air quality standard or public health standard within adjacent onshore locations. Factors considered in the analysis included existing air quality, prevailing wind conditions, the magnitudes and locations of proposed emissions, and the intermittent and mobile nature of proposed emission sources.

The analysis also estimated emissions from each action alternative that would occur within nonattainment or maintenance areas for the National Ambient Air Quality Standards and compared these emissions to General Conformity *de minimis* thresholds to assess the applicability of the General Conformity Rule to each action alternative in these areas. Details of the emission estimates and General Conformity applicability analyses are provided in Appendix H (Air Quality Emissions Calculations).

The criteria for determining the significance of Proposed Action stressors on air quality are described in Table 3.1-4. The abbreviated analysis information provided under each substressor and alternative provides the technical support for these determinations.

The affected environment provides the context for evaluating the effects of the proposed training and testing activities on air quality. With noted exceptions, the affected environment for air quality in the Study Area is not meaningfully different from what is described in the 2018 Final EIS/OEIS.

This section also presents estimates of greenhouse gas emissions that would occur from each action alternative. These estimates are used as indicators to evaluate their potential effects on climate change, as presented in Section 4.3.1 (Air Quality) of Chapter 4 (Cumulative Impacts).

Table 3.1-4: Criteria for Determining the Significance of Proposed Action Stressors on Air Quality

Impact Descriptor	*Context and Intensity*	*Significance Conclusions*
Negligible	Measurable or anticipated degree of change to ambient criteria pollutant or hazardous air pollutant concentrations would be undetectable or only slightly detectable.	Less than significant

Table 3.1 4: Criteria for Determining the Significance of Proposed Action Stressors on Air Quality (continued)

Impact Descriptor	*Context and Intensity*	*Significance Conclusions*
Minor	Likely to measurably increase ambient criteria pollutant or hazardous air pollutant concentrations compared to existing conditions. Impacts would not contribute to an exceedance or of a national ambient air quality standard or cause appreciable risks to populations, including sensitive receptors, due to exposure to hazardous air pollutants.	Less than significant
Moderate	A measurable or anticipated degree of change is readily apparent, appreciable, and would be noticed by most people. However, the impacts would be low enough such that they would not contribute to an exceedance of a national ambient air quality standard or cause appreciable risks to populations, including sensitive receptors, resulting from the exposure to hazardous air pollutants.	Less than significant
Major	Measurable or anticipated degree of change would be substantial and highly noticeable compared to existing conditions. Impacts would contribute to an exceedance of a national ambient air quality standard. Exposure to hazardous air pollutants would cause significant and unacceptable health impacts to populations, including sensitive receptors.	Significant

Note: Criteria to determine the significance of greenhouse gas emissions from the action alternatives are included in the discussion on climate change in Section 4.3.1 (Air Quality) of Chapter 4 (Cumulative Impacts).

3.1.3.1 Impacts from Air Emissions under Alternative 1

3.1.3.1.1 NEPA Impacts from Air Emissions under Alternative 1

Table 3.1-5 presents estimations of annual emissions that would occur from Alternative 1 for each operational region in the Study Area and includes all locations, regardless of proximity to the coastline. The overwhelming majority of emissions would occur from the operation of vessels beyond state waters, except that most emissions within the Northeast OPAREA would occur from small boat operations while in state waters. Most military readiness activities that would be conducted under Alternative 1 are the same as or similar to those conducted currently or in the past. In addition, the analysis considered U.S. Coast Guard military readiness activities and activities in locations not covered in the 2018 Final EIS/OEIS, including inshore areas of Louisiana and Mississippi and adjustments to the Gulf of Mexico, Jacksonville, and Key West ship shock areas. While natural fluctuations would occur in training cycles, testing programs, and deployment schedules, air pollutant annual emissions are expected to decrease somewhat compared to levels associated with the preferred alternative (Alternative 1) in the 2018 Final EIS/OEIS, as shown in Table 3.1-5.

Most military readiness activities would occur more than 12 NM offshore. Depending on the location of these activities and time of year, winds would disperse emissions from training and testing activities away from the coastal land masses at frequencies similar to those shown in the wind roses presented in Appendix H (Air Quality Emissions Calculations). During periods when winds would transport training and testing emissions into coastal areas, the substantial transport distance and resulting dispersion of these emissions would produce negligible to minor increases of air pollutant concentrations at onshore locations. The mobile and intermittent operation of most emission sources over such large areas also would contribute to dispersed ambient pollutant impacts at a given location. As a result, military readiness activities associated with Alternative 1 within U.S. territorial waters would not contribute to an exceedance of an ambient air quality standard at any location within the Study Area and would produce less than significant impacts to criteria pollutant levels.

Table 3.1-5: Estimated Annual Air Pollutant Emissions from Activities Occurring within the AFTT Study Area - Alternative 1

Operational Area	*Emissions by Air Pollutant (TPY)*					
	VOC	*CO*	*NO_X*	*SO_X*	*PM_{10}*	*$PM_{2.5}$*
Northeast	6.75	83.45	193.98	26.17	8.81	8.81
Virginia Capes	137.53	893.00	3,903.49	996.03	193.66	193.66
Virginia Capes Inshore	31.91	454.14	1,159.19	36.53	18.32	18.32
Cherry Point	43.79	175.51	941.21	214.64	47.82	47.82
Charleston	4.91	12.20	118.84	17.73	2.90	2.90
Jacksonville	43.45	325.61	938.67	262.81	51.66	51.66
Cape Canaveral/Southeast Florida	1.87	42.37	65.06	3.05	0.51	0.51
Key West	2.68	10.89	70.20	12.95	3.26	3.26
Gulf of Mexico	6.99	94.88	315.04	82.25	21.74	21.74
Outside Range Complex Areas	57.31	241.62	1,622.11	371.69	54.24	54.24
Total – Alternative 1	**37.20**	**2,333.68**	**9,327.77**	**2,023.85**	**402.93**	**376.67**
Total – 2018 Final EIS/OEIS Preferred Alternative	**345.98**	**2,519.60**	**9,547.94**	**2,113.79**	**409.63**	**400.45**
Net Change – Alternative 1 minus 2018 Final EIS/OEIS Preferred Alternative	**-8.78**	**-185.92**	**-220.17**	**-89.94**	**-6.70**	**-6.70**

Notes: AFTT= Atlantic Fleet Training and Testing; CO = carbon monoxide; N/A = not applicable; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; SO_X = sulfur oxides; TPY = tons per year; VOC = volatile organic compound

Proposed training and testing activities would emit hazardous pollutants, mainly due to the combustion of fuels in vessels and aircraft. Like the dispersion of criteria pollutants mentioned above, training and testing activities also would produce negligible to minor increases of ambient concentrations of hazardous pollutants at any onshore location. As a result, the exposure of sensitive receptors to hazardous pollutants emissions would remain well below health standards set for cancer and non-cancer effects. Therefore, Alternative 1 would produce less than significant hazardous pollutant impacts.

3.1.3.1.2 General Conformity Analysis under Alternative 1 in Areas Designated Nonattainment or Maintenance

3.1.3.1.2.1 Northeast Areas Designated Nonattainment or Maintenance

In the northeast, areas within the New York-Northern New Jersey-Long Island, NY-NJ-CT Air Quality Control Region (U.S. Environmental Protection Agency, 1972) (see Figure 3.1-2) are designated as moderate to severe nonattainment for ozone, maintenance for particulate matter less than or equal to 2.5 microns in diameter, and maintenance for carbon monoxide. In addition, the coastal region from Massachusetts to Delaware is designated as orphan nonattainment for the 1997 8-hour ozone standard (see Table 3.1-2 for specific locations). The Clean Air Act sets out specific requirements for a group of northeast states that make up the Ozone Transport Region. This region includes Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia. States in this region are required to submit a State Implementation Plan and install a certain level of controls for the pollutants that form ozone, even if they meet the ozone standards. A portion of the Eastern Connecticut Intrastate Control Region is also designated as moderate nonattainment for ozone. A very small area of coastal New Hampshire that was previously designated nonattainment for sulfur dioxide was redesignated to maintenance on September 20, 2019, and there is a small area of ozone nonattainment in the coastal counties of New Jersey as well as near the coast at Seaford, Delaware. Although classified as attainment for all pollutants, the coastal Maine region is subject to maintenance requirements for the revoked 1997 ozone standards.

Activities in state waters are not scheduled to occur in the majority of these nonattainment or maintenance areas. The primary location where activities in state waters occur is at Naval Undersea Warfare Center Division Newport and Narragansett Bay, both of which are in Rhode Island. Because Rhode Island is considered an orphan nonattainment area for ozone, a General Conformity applicability analysis was performed to determine if the requirements of a formal General Conformity Determination applied to Alternative 1.

Table 3.1-6 presents the emissions estimated for Alternative 1 that would occur within Rhode Island state waters and their relevance to applicable General Conformity thresholds. The analysis conservatively assumed that 95 percent of the emissions produced by Alternative 1 within the state waters of the Northeast OPAREA would occur within the Metropolitan Providence Interstate ozone nonattainment area (all of Rhode Island), although some emissions also would occur in adjacent nonattainment areas, such as the Dukes County, Massachusetts, ozone nonattainment area, which encompasses Martha's Vineyard and surrounding islands. The data in Table 3.1-6 show that the net change in emissions produced from Alternative 1 and the 2018 Final EIS/OEIS preferred alternative within the state waters of Rhode Island would not exceed the applicable General Conformity *de minimis* thresholds for ozone precursors (nitrogen oxides and volatile organic compound). As a result, no further analysis of conformity is required and a Record of Non-Applicability was prepared in accordance with Navy guidance (Appendix H, Air Quality Emissions Calculations).

Table 3.1-6: Estimated Annual Air Pollutant Emissions from Activities Occurring in State Waters in the Metropolitan Providence Interstate (All of Rhode Island) Area, Alternative 1

	Emissions by Air Pollutant (TPY)					
	VOC	***CO***	***NO_X***	***SO_X***	***PM_{10}***	***$PM_{2.5}$***
Metropolitan Providence Interstate Ozone Nonattainment Area						
Total – Alternative 1	4.86	67.62	147.70	12.31	2.92	2.92
Total – 2018 Final EIS/OEIS Preferred Alternative	**3.92**	**9.70**	**94.39**	**14.12**	**3.20**	**3.20**
Net Change – Alternative 1 minus 2018 Final EIS/OEIS Preferred Alternative	**0.95**	**57.93**	**53.31**	**-1.81**	**-0.28**	**-0.28**
General conformity thresholds	100	N/A	100	N/A	N/A	N/A
Exceedance?	No	N/A	No	N/A	N/A	N/A

Notes: CO = carbon monoxide; N/A = not applicable; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; SO_X = sulfur oxides; TPY = tons per year; VOC = volatile organic compound

Activities in state waters would also occur in the Metropolitan Portland/Cumberland County region of Maine. Because Cumberland County is considered an orphan maintenance area for ozone, a General Conformity applicability analysis was performed to determine if the requirements of a formal General Conformity Determination applied to Alternative 1. Table 3.1-7 presents the emissions estimated for Alternative 1 that would occur within the state waters of the Cumberland County Area and their relevance to applicable General Conformity thresholds. The analysis assumed that 5 percent of the emissions produced by Alternative 1 within the state waters of the Northeast OPAREA would occur within this ozone nonattainment area. The data in Table 3.1-7 show that the net change in emissions produced from Alternative 1 and the 2018 Final EIS/OEIS preferred alternative within the state waters of Cumberland County, Maine, would not exceed the applicable General Conformity *de minimis* thresholds for ozone precursors (nitrogen oxides and volatile organic compound). As a result, no further analysis of conformity is required and a Record of Non-Applicability was prepared in accordance with Navy guidance (Appendix H, Air Quality Emissions Calculations).

Table 3.1-7: Estimated Annual Air Pollutant Emissions from Activities Occurring in State Waters in the Metropolitan Portland/Cumberland County Area, Alternative 1

	Emissions by Air Pollutant (TPY)					
	VOC	***CO***	***NO_X***	***SO_X***	***PM_{10}***	***$PM_{2.5}$***
Metropolitan Portland/Cumberland County Ozone Maintenance Area						
Total – Alternative 1	0.26	3.56	7.77	0.65	0.15	0.15
Total – 2018 Final EIS/OEIS Preferred Alternative	**0.21**	**0.51**	**4.97**	**0.74**	**0.17**	**0.17**
Net Change – Alternative 1 minus 2018 Final EIS/OEIS Preferred Alternative	**0.05**	**3.05**	**2.81**	**-0.10**	**-0.01**	**-0.01**
General conformity thresholds	100	N/A	100	N/A	N/A	N/A
Exceedance?	No	N/A	No	N/A	N/A	N/A

Notes: CO = carbon monoxide; N/A = not applicable; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; SO_X = sulfur oxides; TPY = tons per year; VOC = volatile organic compound

3.1.3.1.2.2 Hampton Roads, Virginia Areas Designated Nonattainment or Maintenance

Activities from Alternative 1 in state waters would also occur in the Hampton Roads Intrastate Area. Because Hampton Roads is considered an orphan maintenance area for ozone, a General Conformity applicability analysis was performed to determine if the requirements of a formal General Conformity Determination applied to Alternative 1. Table 3.1-8 presents emissions estimated for Alternative 1 that would occur within the state waters of the Hampton Roads Intrastate Area and their relevance to applicable General Conformity thresholds. The analysis conservatively assumed that 75 percent of the emissions produced by Alternative 1 within the Chesapeake Bay area and state waters of the Virginia Capes OPAREA would occur within this ozone maintenance area. The data in Table 3.1-8 show that the net change in emissions produced from Alternative 1 and the 2018 Final EIS/OEIS preferred alternative within the Hampton Roads Intrastate Area would not exceed the applicable General Conformity *de minimis* thresholds for ozone precursors (nitrogen oxides and volatile organic compound). As a result, no further analysis of conformity is required and a Record of Non-Applicability was prepared in accordance with Navy guidance (Appendix H, Air Quality Emissions Calculations).

Table 3.1-8: Estimated Annual Air Pollutant Emissions from Activities Occurring in State Waters in the Hampton Roads Intrastate Area, Alternative 1

	Emissions by Air Pollutant (TPY)					
	VOC	*CO*	*NO_X*	*SO_X*	*PM_{10}*	*$PM_{2.5}$*
Hampton Roads Ozone Maintenance Area						
Total – Alternative 1	31.27	396.01	1,105.46	48.29	34.79	34.79
Total – 2018 Final EIS/OEIS Preferred Alternative	**46.83**	**220.28**	**1,172.67**	**101.36**	**45.08**	**45.08**
Net Change – Alternative 1 minus 2018 Final EIS/OEIS Preferred Alternative	**-15.56**	**175.73**	**-67.21**	**-53.07**	**-10.29**	**-10.29**
General conformity thresholds	100	N/A	100	N/A	N/A	N/A
Exceedance?	No	N/A	No	N/A	N/A	N/A

Notes: CO = carbon monoxide; N/A = not applicable; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; SO_X = sulfur oxides; TPY = tons per year; VOC = volatile organic compound

3.1.3.1.2.3 Jacksonville, Florida Areas Designated Nonattainment or Maintenance

In the southeast, the coastal area of Nassau County, Florida (just north of Jacksonville), is designated as a maintenance area for sulfur dioxide. Table 3.1-9 presents the estimated emissions for Alternative 1 activities that would occur within the state waters of Nassau County and their relevance to applicable General Conformity thresholds. The analysis conservatively assumed that all of the emissions produced by Alternative 1 within the state waters of the Jacksonville OPAREA would occur within this sulfur dioxide maintenance area. As shown in Table 3.1-9, the net change in sulfur dioxide emissions produced from AFTT activities in this area and the 2018 Final EIS/OEIS preferred alternative would be well below the applicable General Conformity de minimis threshold (less than 4 percent of the 100 ton per year threshold level). As a result, no further analysis of conformity is required and a Record of Non-Applicability was prepared in accordance with Navy guidance (Appendix H, Air Quality Emissions Calculations).

Table 3.1-9: Estimated Annual Air Pollutant Emissions from Activities Occurring in State Waters in Nassau County, Florida, Alternative 1

	Emissions by Air Pollutant (TPY)					
	VOC	*CO*	*NO_X*	*SO_X*	*PM_{10}*	*$PM_{2.5}$*
Nassau County Sulfur Dioxide Maintenance Area						
Total – Alternative 1	0.40	2.66	13.05	3.14	0.67	0.67
Total – 2018 Final EIS/OEIS Preferred Alternative	2.46	13.04	66.45	4.84	2.08	2.08
Net Change – Alternative 1 minus 2018 Final EIS/OEIS Preferred Alternative	-2.06	-10.39	-53.40	-1.70	-1.41	-1.41
General conformity thresholds	N/A	N/A	N/A	100	N/A	N/A
Exceedance?	N/A	N/A	N/A	No	N/A	N/A

Notes: CO = carbon monoxide; N/A = not applicable; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; SO_X = sulfur oxides; TPY = tons per year; VOC = volatile organic compound

3.1.3.1.2.4 Gulf of Mexico Areas Designated Nonattainment or Maintenance

In the Gulf of Mexico, Hillsborough County, Florida, contains maintenance areas for sulfur dioxide and lead. In addition, Saint Bernard Parish in southern Louisiana is a nonattainment area for sulfur dioxide and the Houston-Galveston-Brazoria area is designated as a severe nonattainment area for the 2008 ozone standard.

AFTT activities under Alternative 1 are not scheduled to occur in any of these nonattainment or maintenance areas. The primary location where activities would occur within state waters of the Gulf of Mexico is at the Naval Surface Warfare Center Panama City Division Testing Area, Florida, which is in attainment for all pollutants.

3.1.3.1.3 Executive Order 12114 Analysis under Alternative 1 in Areas Beyond 12 Nautical Miles from Shore

The majority of military readiness activities proposed for Alternative 1 and presented in Table 3.1-5 would occur outside of U.S. territorial waters. Executive Order 12114 requires analysis of these impacts. During infrequent periods when winds would transport proposed emissions to coastal areas, the extensive travel distance of these emissions would produce dispersed and negligible ambient pollutant concentrations at these areas. As a result, military readiness activities associated with Alternative 1 beyond U.S. territorial waters would not contribute to an exceedance of an ambient air quality standard at any location within the Study Area and would produce less than significant impacts to criteria pollutant levels.

Like the dispersion of criteria pollutants mentioned above, training and testing activities also would produce negligible increases of ambient concentrations of hazardous pollutants at any onshore location. As a result, the exposure of sensitive receptors to hazardous pollutant emissions would remain well below health standards set for cancer and non-cancer effects. Therefore, military readiness activities associated with Alternative 1 beyond U.S. territorial waters would produce less than significant hazardous pollutant impacts.

3.1.3.1.4 Greenhouse Gas Emissions

Table 3.1-10 presents annual greenhouse gas emissions estimated for all training and testing activities proposed within the entire Study Area under Alternatives 1 and 2. Table 3.1-10 compares annual greenhouse gas emissions from Alternatives 1 and 2 to those estimated for the preferred alternative in the 2018 Final EIS/OEIS. These data shows that Alternative 1 would result in minor reductions in greenhouse gas emissions within the Study Area compared to those estimated for the preferred alternative in the 2018 Final EIS/OEIS. Section 4.3.1 (Air Quality) of Chapter 4 (Cumulative Impacts) presents an analysis of the potential effects of greenhouse gas emissions from Alternative 1 on climate change.

Table 3.1-10: Total Annual Greenhouse Gas Emissions from All Study Area Training and Testing Activities (metric tons/year), Alternatives 1 and 2

2018 Final EIS/OEIS Emission Estimates	*Alternative 1 Emissions*	*Alternative 1 Net Change from 2018 Estimates*	*Alternative 2 Emissions*	*Alternative 2 Net Change from 2018 Estimates*
1,188,000	1,160,000	-28,000	1,338,000	150,000

3.1.3.1.5 Summary of Air Quality Impacts under Alternative 1

While-pollutants emitted under Alternative 1 would at times be carried ashore by prevailing winds, most military readiness activities would occur beyond state water boundaries and the substantial transport distance and resulting dispersion of these emissions would produce negligible to minor increases of air pollutant concentrations to adjacent air quality control regions. As a result, military readiness activities associated with Alternative 1 would not contribute to an exceedance of an ambient air quality standard or interfere with the attainment of the National Ambient Air Quality Standards at any location within the Study Area. Emissions from inshore operations in Rhode Island; Cumberland County, Maine; Hampton Roads, Virginia; and Nassau County, Florida, under Alternative 1 would remain below General Conformity *de minimis* thresholds and therefore would not require a General Conformity Determination.

Alternative 1 also would not appreciably increase the exposure of sensitive receptors to hazardous pollutant emissions or associated cancer or non-cancer health effects. Therefore, Alternative 1 would produce less than significant impacts to hazardous pollutant levels. In addition, greenhouse gas emissions from Alternative 1 would incrementally contribute to future climate change, the effects of which are identified in Section 4.3.1 (Air Quality) of Chapter 4 (Cumulative Impacts).

3.1.3.2 Impacts from Air Emissions under Alternative 2

3.1.3.2.1 NEPA Impacts from Air Emissions under Alternative 2

Table 3.1-11 presents estimations of the annual emissions that would occur from Alternative 2 for each operational region in the Study Area and includes all locations, regardless of proximity to the coastline. The overwhelming majority of emissions would occur from the operation of vessels beyond state waters, except that most emissions within the Northeast OPAREA would occur from small boat operations while in state waters. Most military readiness activities that would be conducted under Alternative 2 are the same as or similar to those conducted currently or in the past. In addition, the analysis considered U.S. Coast Guard military readiness activities and activities in locations not covered in the 2018 Final EIS/OEIS, including inshore areas of Louisiana and Mississippi and adjustments to the Gulf of Mexico, Jacksonville, and Key West ship shock areas. While natural fluctuations would occur in training cycles, testing programs, and deployment schedules, annual air emissions from Alternative 2 are not expected to increase substantially compared to levels associated with the preferred alternative in the 2018 Final EIS/OEIS, as shown in Table 3.1-11.

Table 3.1-11: Estimated Annual Air Pollutant Emissions from Activities Occurring within the AFTT Study Area - Alternative 2

Operational Area	*Emissions by Air Pollutant (TPY)*					
	VOC	*CO*	*NO_X*	*SO_X*	*PM_{10}*	*$PM_{2.5}$*
Northeast	6.20	84.15	172.59	17.31	10.14	10.14
Virginia Capes	143.82	1,065.99	4,515.41	1,200.66	231.46	231.46
Virginia Capes Inshore	31.91	454.14	1,159.19	36.53	18.32	18.32
Cherry Point	37.93	222.44	931.80	256.50	51.49	47.82
Charleston	4.91	12.20	118.84	17.73	2.90	2.90
Jacksonville	53.78	504.21	1,687.91	450.52	74.63	74.63
Cape Canaveral/Southeast Florida	1.87	42.37	65.06	3.05	0.51	0.51
Key West	0.75	12.03	23.69	8.85	3.17	3.26
Gulf of Mexico	2.20	30.24	56.02	18.77	13.42	13.42
Outside Range Complex Areas	172.20	437.62	3,929.37	604.78	81.29	54.24
Total – Alternative 2	**455.58**	**2,865.39**	**12,659.86**	**2,614.69**	**487.32**	**487.32**
Total – 2018 Final EIS/OEIS Preferred Alternative	**345.98**	**2,519.60**	**9,547.94**	**2,113.79**	**409.63**	**409.63**
Net Change – Alternative 2 minus 2018 Final EIS/OEIS Preferred Alternative	**109.60**	**345.79**	**3,111.93**	**500.90**	**77.70**	**77.70**

Notes: CO = carbon monoxide; N/A = not applicable; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; SO_X = sulfur oxides; TPY = tons per year; VOC = volatile organic compound

Most military readiness activities under Alternative 2 would occur more than 12 NM offshore. Depending on the location of these activities and time of year, winds would disperse emissions from training and testing activities away from the coastal land masses at frequencies similar to those shown in the wind roses presented in Appendix H (Air Quality Emissions Calculations). During periods when winds would transport training and testing emissions into coastal areas, the substantial transport distance and resulting dispersion of these emissions would produce minor to immeasurable increases of air pollutant concentrations at onshore locations. The mobile and intermittent operation of most emission sources over such large areas also would contribute to dispersed ambient pollutant impacts at a given location. As a result, military readiness activities associated with Alternative 2 within U.S. territorial waters would not contribute to an exceedance of an ambient air quality standard at any location within the Study Area and would produce less than significant impacts to criteria pollutant levels.

Proposed training and testing activities would emit hazardous pollutants, mainly due to the combustion of fuels in vessels and aircraft. Like the dispersion of criteria pollutants mentioned above, training and testing activities also would produce negligible to minor increases of ambient concentrations of hazardous pollutants at any onshore location. As a result, the exposure of sensitive receptors to hazardous pollutants emissions would remain well below health standards set for cancer and non-cancer effects. Therefore, Alternative 2 would produce less than significant hazardous pollutant impacts.

3.1.3.2.2 General Conformity Analysis under Alternative 2 in Areas Designated Nonattainment or Maintenance

3.1.3.2.2.1 Northeast Areas Designated Nonattainment or Maintenance

The nonattainment and maintenance areas for national ambient air quality standards that are applicable to the proposed training and testing activities under Alternative 2 are the same as those identified above in Section 3.1.3.1.2.1 (Northeast Areas Designated Nonattainment or Maintenance).

Activities in state waters are not scheduled to occur in the majority of these nonattainment or maintenance areas. The primary location where activities in state waters occur is at Naval Undersea Warfare Center Division Newport and Narragansett Bay, both of which are in Rhode Island. Because Rhode Island is considered an orphan nonattainment area for ozone, a General Conformity applicability analysis was performed to determine if the requirements of a formal General Conformity Determination applied to Alternative 2.

Table 3.1-12 presents the emissions estimated for Alternative 2 that would occur within Rhode Island state waters and their relevance to applicable General Conformity thresholds. The analysis conservatively assumed that 95 percent of the emissions produced by Alternative 2 within the state waters of the Northeast OPAREA would occur within the Metropolitan Providence Interstate ozone nonattainment area (all of Rhode Island), although some emissions also would occur in adjacent nonattainment areas, such as the Dukes County, Massachusetts, ozone nonattainment area, which encompasses Martha's Vineyard and surrounding islands. The data in Table 3.1-12 show that the net change in emissions produced from Alternative 2 and the 2018 Final EIS/OEIS Preferred Alternative within the state waters of Rhode Island would not exceed the applicable General Conformity *de minimis* thresholds for ozone precursors (nitrogen oxides and volatile organic compound). As a result, no further analysis of conformity is required and a Record of Non-Applicability was prepared in accordance with Navy guidance (Appendix H, Air Quality Emissions Calculations).

Table 3.1-12: Estimated Annual Air Pollutant Emissions from Activities Occurring in State Waters in the Metropolitan Providence Interstate (All of Rhode Island) Area, Alternative 2

	Emissions by Air Pollutant (TPY)					
	VOC	*CO*	*NO_X*	*SO_X*	*PM_{10}*	*$PM_{2.5}$*
Metropolitan Providence Interstate Ozone Nonattainment Area						
Total – Alternative 2	4.84	67.57	147.21	12.17	2.90	2.90
Total – 2018 Final EIS/OEIS Preferred Alternative	**3.89**	**9.62**	**93.78**	**13.96**	**3.18**	**3.18**
Net Change – Alternative 2 minus 2018 Final EIS/OEIS Preferred Alternative	**0.95**	**57.94**	**53.44**	**1.79**	**-0.28**	**-0.28**
General conformity thresholds	100	N/A	100	N/A	N/A	N/A
Exceedance?	No	N/A	No	N/A	N/A	N/A

Notes: CO = carbon monoxide; N/A = not applicable; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; SO_X = sulfur oxides; TPY = tons per year; VOC = volatile organic compound

Activities in state waters would also occur in the Metropolitan Portland/Cumberland County region of Maine. Because Cumberland County is considered an orphan maintenance area for ozone, a General Conformity applicability analysis was performed to determine if the requirements of a formal General Conformity Determination applied to Alternative 2. Table 3.1-13 presents the emissions estimated for Alternative 2 that would occur within the state waters of Cumberland County and their relevance to applicable General Conformity thresholds. The analysis assumed that 5 percent of the emissions produced by Alternative 2 within the state waters of the Northeast OPAREA would occur within this ozone nonattainment area. The data in Table 3.1-13 show that the net change in emissions produced from Alternative 2 and the 2018 Final EIS/OEIS preferred alternative within the state waters of Cumberland County, Maine, would not exceed the applicable General Conformity *de minimis* thresholds for ozone precursors (nitrogen oxides and volatile organic compound). As a result, no further analysis of conformity is required and a Record of Non-Applicability was prepared in accordance with Navy guidance (Appendix H, Air Quality Emissions Calculations).

Table 3.1-13: Estimated Annual Air Pollutant Emissions from Activities Occurring in State Waters in the Metropolitan Portland/Cumberland County Area, Alternative 2

	Emissions by Air Pollutant (TPY)					
	VOC	*CO*	*NO_X*	*SO_X*	*PM_{10}*	*$PM_{2.5}$*
Metropolitan Portland/Cumberland County Ozone Maintenance Area						
Total – Alternative 2	0.25	3.56	7.75	0.64	0.15	0.15
Total – 2018 Final EIS/OEIS Preferred Alternative	0.20	0.51	4.94	0.73	0.17	0.17
Net Change – Alternative 2 minus 2018 Final EIS/OEIS Preferred Alternative	0.05	3.05	2.81	-0.09	-0.01	-0.01

Table 3.1-13: Estimated Annual Air Pollutant Emissions from Activities Occurring in State Waters in the Metropolitan Portland/Cumberland County Area, Alternative 2 (continued)

	Emissions by Air Pollutant (TPY)					
	VOC	***CO***	***NO_X***	***SO_X***	***PM_{10}***	***$PM_{2.5}$***
Metropolitan Portland/Cumberland County Ozone Maintenance Area						
General conformity thresholds	100	N/A	100	N/A	N/A	N/A
Exceedance?	No	N/A	No	N/A	N/A	N/A

Notes: CO = carbon monoxide; N/A = not applicable; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; SO_X = sulfur oxides; TPY = tons per year; VOC = volatile organic compound

3.1.3.2.2.2 Hampton Roads, Virginia, Areas Designated Nonattainment or Maintenance

Activities in state waters would also occur in the Hampton Roads Intrastate region. Because Hampton Roads is considered an orphan maintenance area for ozone, a General Conformity applicability analysis was to be performed to determine if the requirements of a formal General Conformity Determination applied to Alternative 2. Table 3.1-14 presents emissions estimated for Alternative 2 that would occur within the state waters of the Hampton Roads Intrastate Area and their relevance to applicable General Conformity thresholds. The analysis conservatively assumed that 75 percent of the emissions produced by Alternative 2 within the Chesapeake Bay area and state waters of the Virginia Capes OPAREA would occur within this ozone maintenance area. The data in Table 3.1-14 show that the net change in emissions produced from Alternative 2 and the 2018 Final EIS/OEIS preferred alternative within the Hampton Roads Intrastate Area would not exceed the applicable General Conformity *de minimis* thresholds for ozone precursors (nitrogen oxides and volatile organic compound). As a result, no further analysis of conformity is required and a Record of Non-Applicability was prepared in accordance with Navy guidance (Appendix H, Air Quality Emissions Calculations).

Table 3.1-14: Estimated Annual Air Pollutant Emissions from Activities Occurring in State Waters in the Hampton Roads Intrastate Area, Alternative 2

	Emissions by Air Pollutant (TPY)					
	VOC	***CO***	***NO_X***	***SO_X***	***PM_{10}***	***$PM_{2.5}$***
Hampton Roads Intrastate Ozone Maintenance Area						
Total – Alternative 2	31.60	398.33	1,119.09	52.13	35.32	35.32
Total – 2018 Final EIS/OEIS Preferred Alternative	**47.00**	**222.08**	**1,175.69**	**101.67**	**45.25**	**45.25**
Net Change – Alternative 2 minus 2018 Final EIS/OEIS Preferred Alternative	**-15.40**	**176.26**	**-56.60**	**-49.53**	**-9.93**	**-9.93**
General conformity thresholds	100	N/A	100	N/A	N/A	N/A
Exceedance?	No	N/A	No	N/A	N/A	N/A

Notes: CO = carbon monoxide; N/A = not applicable; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; SO_x = sulfur oxides; TPY = tons per year; VOC= volatile organic compound

3.1.3.2.2.3 Jacksonville, Florida Areas Designated Nonattainment or Maintenance

In the southeast, the coastal area of Nassau County, Florida (just north of Jacksonville), is designated as a maintenance area for sulfur dioxide. Table 3.1-15 presents the estimated emissions for Alternative 2 activities that would occur within the state waters of Nassau County and their relevance to applicable General Conformity thresholds. The analysis conservatively assumed that all of the emissions produced by Alternative 2 within the state waters of the Jacksonville OPAREA would occur within this sulfur dioxide maintenance area. As shown in Table 3.1-15, the net change in AFTT activities in this area and the 2018 Final EIS/OEIS preferred alternative would produce a net reduction in sulfur dioxide emissions and therefore would not exceed the applicable General Conformity *de minimis* threshold for this pollutant. As a result, no further analysis of conformity is required and a Record of Non-Applicability was prepared in accordance with Navy guidance (Appendix H, Air Quality Emissions Calculations).

Table 3.1-15: Estimated Annual Air Pollutant Emissions from Activities Occurring in State Waters in Nassau County, Florida, Alternative 2

	Emissions by Air Pollutant (TPY)					
	VOC	*CO*	*NO_X*	*SO_X*	*PM_{10}*	*$PM_{2.5}$*
Nassau County Sulfur Dioxide Maintenance Area						
Total – Alternative 2	0.57	5.17	19.07	4.44	0.94	0.94
Total – 2018 Final EIS/OEIS Preferred Alternative	**2.64**	**15.99**	**72.47**	**6.03**	**2.38**	**2.38**
Net Change – Alternative 2 minus 2018 Final EIS/OEIS Preferred Alternative	**-2.07**	**-10.82**	**-53.40**	**-1.59**	**-1.44**	**-1.44**
General conformity thresholds	N/A	N/A	N/A	100	N/A	N/A
Exceedance?	N/A	N/A	N/A	No	N/A	N/A

Notes: CO = carbon monoxide; N/A = not applicable; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; PM_{10} = particulate matter less than or equal to 10 microns in diameter; SO_X = sulfur oxides; TPY = tons per year; VOC = volatile organic compound

3.1.3.2.2.4 Gulf of Mexico Areas Designated Nonattainment or Maintenance

In the Gulf of Mexico, Hillsborough County, Florida, contains maintenance areas for sulfur dioxide and lead. In addition, Saint Bernard Parish in southern Louisiana is a nonattainment area for sulfur dioxide and the Houston-Galveston-Brazoria area is designated as a severe nonattainment area for the 2008 ozone standard.

AFTT activities under Alternative 2 are not scheduled to occur in any of these nonattainment or maintenance areas. The primary location where activities would occur within state waters of the Gulf of Mexico is at the Naval Surface Warfare Center Panama City Division Testing Area, Florida, which is in attainment for all pollutants.

3.1.3.2.3 Executive Order 12114 Analysis under Alternative 2 in Areas Beyond 12 Nautical Miles from Shore

The majority of military readiness activities proposed for Alternative 2 and presented in Table 3.1-11 would occur outside of U.S. territorial waters. Executive Order 12114 requires analysis of these impacts. During infrequent periods when winds would transport proposed emissions to coastal areas, the extensive travel distance of these emissions would produce dispersed and negligible ambient pollutant concentrations at these locations. As a result, military readiness activities associated with Alternative 2 beyond U.S. territorial waters would not contribute to an exceedance of an ambient air quality standard at any location within the Study Area and would produce less than significant impacts to criteria pollutant levels.

Like the dispersion of criteria pollutants mentioned above, training and testing activities also would produce negligible increases of ambient concentrations of hazardous pollutants at any onshore location. As a result, the exposure of sensitive receptors to hazardous pollutant emissions would remain well below health standards set for cancer and non-cancer effects. Therefore, military readiness activities associated with Alternative 2 beyond U.S. territorial waters would produce less than significant hazardous pollutant impacts.

3.1.3.2.4 Greenhouse Gas Emissions

Table 3.1-10 presents annual greenhouse gas emissions estimated for all training and testing activities proposed within the entire Study Area under Alternative 2. Table 3.1-10 compares annual greenhouse gas emissions from Alternative 2 to those estimated for the preferred alternative in the 2018 Final EIS/OEIS. These data show that Alternative 2 would result in minor increases in greenhouse gas emissions within the Study Area compared to those estimated for the preferred alternative in the 2018 Final EIS/OEIS. Section 4.3.1 (Air Quality) of Chapter 4 (Cumulative Impacts) presents an analysis of the potential effects of greenhouse gas emissions from Alternative 1 on climate change.

3.1.3.2.5 Summary of Air Quality Impacts under Alternative 2

While pollutants emitted under Alternative 2 would at times be carried ashore by prevailing winds, most military readiness activities would occur beyond state water boundaries and the substantial transport distance and resulting dispersion of these emissions would produce negligible to minor increases of air pollutant concentrations to adjacent air quality control regions. As a result, military readiness activities associated with Alternative 2 would not contribute to an exceedance of an ambient air quality standard or interfere with the attainment of the National Ambient Air Quality Standards at any location within the Study Area. Inshore operations in Rhode Island; Cumberland County, Maine; Hampton Roads, Virginia; and Nassau County, Florida, would not exceed General Conformity *de minimis* thresholds and therefore would not require a General Conformity Determination.

Alternative 2 also would not appreciably increase the exposure of sensitive receptors to hazardous pollutant emissions or associated cancer or non-cancer health effects. Therefore, Alternative 2 would produce less than significant impacts to hazardous pollutant levels. In addition, greenhouse gas emissions from Alternative 2 would incrementally contribute to future climate change, the effects of which are identified in Section 4.3.1 (Air Quality) of Chapter 4 (Cumulative Impacts).

References

Council on Environmental Quality. (2023). *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change*. Washington, DC: Council on Environmental Quality.

Intergovernmental Panel on Climate Change. (2023). *Climate Change 2023 - Synthesis Report - Summary for Policy Makers*. Cambridge, United Kingdom and New York, NY: Cambridge University Press.

Marvel, K., W. Su, R. Delgado, S. Aarons, A. Chatterjee, M. Garcia, Z. Hausfather, K. Hayhoe, D. Hence, and E. Jewett. (2023). *Ch. 2. Climate Trends* (Fifth National Climate Assessment). Washington, DC: U.S. Global Change Research Program.

U.S. Department of Defense. (2022). *Department of Defense Climate Adaptation Plan 2022 Progress Report*. Washington, DC: Department of Defense, Office of the Undersecretary of Defense (Acquisition and Sustainment).

U.S. Department of the Navy. (2013). *Navy Guidance for Compliance with the Clean Air Act General Conformity Rule*. Washington, DC: Office of the Chief of Naval Operations Energy and Environmental Readiness Division.

U.S. Department of the Navy. (2022). *Department of the Navy Climate Action 2030*. Washington, DC: Office of the Assistant Secretary of the Navy for Energy, Installations, and Environment.

U.S. Environmental Protection Agency. (1972). *Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States*. Research Triangle Park, NC: Environmental Protection Agency Office of Air Programs.

U.S. Environmental Protection Agency. (2016). *Hazardous Air Pollutants*. Retrieved January 11, 2016, from https://www.epa.gov/haps.

U.S. Environmental Protection Agency. (2018). *Resource Document for 1997 Ozone NAAQS Areas: Supporting Information for States Developing Maintenance Plans*. Washington, DC: U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency. (2021). *Dose-Response Assessment for Assessing Health Risks Associated With Exposure to Hazardous Air Pollutants*. Retrieved May 23, 2024, from https://www.epa.gov/fera/dose-response-assessment-assessing-health-risks-associated-exposure-hazardous-air-pollutants.

U.S. Environmental Protection Agency. (2023). *NAAQS Nonattainment and Maintenance Area Data*. Retrieved August 31, 2023, from https://www.epa.gov/green-book.

U.S. Environmental Protection Agency. (2024). *National Ambient Air Quality Standards Table*. Retrieved April 2, 2024, from https://www.epa.gov/criteria-air-pollutants/naaqs-table.

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3.2 Sediment and Water Quality

SEDIMENT AND WATER QUALITY SYNOPSIS

The Action Proponents assessed all stressors from the Proposed Action that potentially could affect sediment and water quality within the Study Area and reached the following conclusions:

- Explosives and explosives byproducts: Military readiness activities would result in releases of explosives and constituent compounds to the marine environment that could persist depending on the integrity of the undetonated munitions casing and the physical conditions on the seafloor where the munitions reside. Impacts to sediment and water quality from unconsumed explosives and constituent chemical compounds would be minor and localized to an area immediately adjacent to the munition. Chemical and physical changes to sediment and water quality, as measured by the concentrations of explosives byproduct compounds, may be detectable within a limited radius of the explosives source but would not result in harmful effects on biological resources and habitats.
- Metals: Impacts to sediment and water quality from expended objects containing metals (e.g., non-explosive munitions) would vary to some extent depending on the metal type, locations where the objects are released, and the physical conditions on the seafloor where the metal object resides. The effects of releases from expended material or munitions to sediment and water quality may be measurable within the area adjacent to the metal object, but concentrations would be below applicable regulatory standards or guidelines for adverse effects levels on biological resources and habitats.
- Chemicals and other materials not associated with explosives: Impacts from chemicals and other materials not associated with explosives would be both short term and long term depending on the chemical and the physical conditions (e.g., substrate, temperature, currents) on the seafloor where the source materials reside. Impacts would be minor and localized to the immediate area of the source of the chemicals/materials. Chemical and physical changes to sediment and water quality, as measured by the concentrations of contaminants associated with the expended material, would likely be indistinguishable from conditions at reference locations.

These findings and conclusions with respect to potential impacts from the Proposed Action on sediment and water quality are consistent with those associated with previous military readiness activities, as presented in the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (U.S. Department of the Navy, 2018).

3.2.1 Introduction

The following sections provide an overview of sediment and water quality in the Study Area and describe the methods used to analyze potential impacts of the Proposed Action on these resources. Additional relevant information related to existing ecological characteristics of the Study Area, including bathymetry, currents, and water masses, is provided in Section 3.0.2 (Ecological Characterization of the Study Area) of the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (EIS/OEIS) (U.S. Department of the Navy, 2018) (hereinafter referred to as the 2018 Final EIS/OEIS), and a discussion of existing substrate and habitat characteristics is provided in Section 3.3 (Habitats).

As discussed in Chapter 2 (Description of Proposed Action and Alternatives), the details of the proposed military readiness activities are largely consistent with those analyzed in the 2018 Final EIS/OEIS and are representative of the activities the U.S. Department of the Navy (Navy) has been conducting in the Study Area for decades. Impacts to sediment and water quality from those prior activities were evaluated and presented in the 2018 Final EIS/OEIS. Thus, the following sections focus on the changes to the project description and areas of operation, as well as recent information related to the affected environment and science for evaluating sediment and water quality that was not available at the time the 2018 Final EIS/OEIS was prepared.

3.2.2 Affected Environment

This section addresses sediment and water quality within the Study Area. The Study Area is generally consistent with that analyzed in the 2018 Final EIS/OEIS. Additions to the Study Area include pierside training and testing events and transit along established navigation channels from pierside locations to offshore range complexes in the Gulf of Mexico. United States (U.S.) Coast Guard activities are similar in nature to Navy activities and fall under the same stressor categories. Based on the review of relevant literature since 2018, information for characterizing the affected environment for sediment and water quality in the Study Area has not changed substantially from that provided in the 2018 Final EIS/OEIS. As such, the general information presented in the 2018 Final EIS/OEIS (Section 3.2.2, Affected Environment) regarding sediment and water quality within the Study Area remains valid. Therefore, this Supplemental EIS/OEIS references the 2018 Final EIS/OEIS for a more detailed discussion of sediment and water quality within the Study Area, with the exception that updated information is provided to characterize conditions at the one new location (Pascagoula) where military readiness activities have the potential to affect sediment and water quality.

3.2.2.1 Sediment Quality

Sediment quality within the Study Area is mostly determined from information and data from the 2010 National Coastal Condition Assessment, which was sponsored by the U.S. Environmental Protection Agency (USEPA) (U.S. Environmental Protection Agency, 2016). Note that the National Coastal Condition Assessment for coastal areas has not been updated since the 2018 Final EIS/OEIS was released. Therefore, the sediment quality characterizations included in this Supplemental EIS/OEIS are largely unchanged. For this reason, the results of the National Coastal Condition Assessment are herein summarized; for more details, refer to the 2018 Final EIS/OEIS (Section 3.2.2, Affected Environment). A more recent, nationwide National Coastal Condition Assessment survey was conducted in 2015 (U.S. Environmental Protection Agency, 2021), but it focused on estuarine water bodies and the Great Lakes and did not address coastal marine sediment quality. Because some of the military readiness activities included in the Proposed Action (listed in Appendix A, Activity Descriptions, and Appendix B, Activity Stressor Matrices) would occur within estuarine waters, such as the Chesapeake Bay, results from the National Coastal Condition Assessment are relevant to the affected environment. Understanding of offshore conditions within the Study Area is generally dependent on site-specific studies of adjacent areas with similar habitats because large-scale, synoptic surveys of sediment and water quality in offshore areas are rare.

A summary of sediment quality by region is provided in Table 3.2-1. Sediment quality ratings for coastal and estuarine waters are provided in the 2018 Final EIS/OEIS (Section 3.2.2, Affected Environment).

Table 3.2-1: Sediment Quality Summary

Region	General Description	Sediment Quality Summary
North Atlantic	• The region includes the coasts and offshore marine areas southwest of Greenland, east and northeast of Newfoundland and Labrador, and surrounding Nova Scotia. • Although there are no designated range complexes in this region, the area may be used for Action Proponents' military readiness activities. • The continental shelf is wide with several large, cross-shelf incisions. • Surficial sediments in the region consist almost entirely of soft, unconsolidated sediments derived from glacial debris, with little modern delivery of sediment from land. Sands dominate the open shelf, with higher proportions of silts and clays in deep basins on the Nova Scotian Shelf and in the Gulf of Maine. • The region is intensely trawled, and sediment resuspension at depths greater than 100 meters (m) is substantially affected by commercial fishing (Townsend et al., 2004).	• The proportions of good, fair, and poor sediment quality within the North Atlantic region were not evaluated in the 2010 National Coastal Condition Assessment (U.S. Environmental Protection Agency, 2016). • However, Wilson and Addison (1984) concluded that the offshore Northwest Atlantic is relatively uncontaminated due, in part, to the low population density, limited industrial activity, and dynamic nature of the environment.
Northeast and Mid-Atlantic	• These regions border the states of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, and northeast North Carolina. • The Northeast region includes the Northeast Range Complexes and VACAPES RC and the Naval Undersea Warfare Center (NUWC) Division Newport Testing Range that includes Narragansett Bay, Rhode Island Sound, and Block Island Sound. • The Northeast coast is divided into two biogeographical provinces: the Acadian Province, north of Cape Cod (featuring smaller watersheds, rocky coasts, and open, well-flushed estuaries), and the Virginian Province from Cape Cod to the Chesapeake Bay (featuring larger watersheds drained by riverine systems that	• The overall assessment for coastal portions of the region was that 60% of the area had a good rating, 20% had a fair rating, and 9% had a poor rating (U.S. Environmental Protection Agency, 2016). • The overall assessment for estuarine portions of the region was that 76% of the area had a good rating, 16% had a fair rating, and 1% had a poor rating (U.S. Environmental Protection Agency, 2016). • A study conducted by the National Oceanic and Atmospheric Administration and USEPA in 2006 (Balthis et al., 2009) to assess sediment quality of shelf areas of the Mid-Atlantic Bight showed that sediments in offshore areas contained substantially lower contaminant concentrations compared to sediments with adjacent coastal areas and estuaries.

Table 3.2-1: Sediment Quality Summary (continued)

Region	*General Description*	*Sediment Quality Summary*
	empty into relatively shallow and poorly flushed estuaries). • The continental shelf along the Northeast coast is composed mostly of sandy sediments with finer-grained sediments generally absent except in bathymetric depressions (Rabalais & Boesch, 1987).	• The study (Balthis et al., 2009) noted that while some chemical contaminants from land-based sources were detected in the sediment, they were present at low concentrations and below levels associated with adverse biological effects. • These spatial patterns were consistent with results from other offshore studies conducted to assess the status of ecological condition and stressor impacts throughout various coastal-ocean regions of the United States (U.S. Environmental Protection Agency, 2012b).
Southeast	• The region extends southward from the Virginia–North Carolina border to Biscayne Bay, Florida. • The region includes the Navy Cherry Point, Charleston, and Jacksonville operating areas. • Southeast coastal waters are located within two biogeographical provinces: the Carolinian Province and the West Indian Province. The Carolinian Province extends from the Virginia–North Carolina border to the Indian River Lagoon in Florida and reflects a warm, temperate climate similar to the northern Gulf. The West Indian Province extends from the Port St. Lucie Inlet to Biscayne Bay, Florida, and represents a more subtropical environment. • Southeast region estuarine resources are diverse and extensive, and include salt marshes, tidal rivers, coastal lagoons, and open-water embayments and sounds. • The shallow, wide shelf of the region has a mostly sandy bottom (coarse to medium sands) interspersed with isolated areas of hard bottom (i.e., reefs). • The continental margin of the South Atlantic Bight includes several prominent features, such as the Blake Plateau, which is a broad, terrace-like feature seaward of the	• The overall assessment for coastal portions of the region was that 60% of the area had a good rating, 30% had a fair rating, and 4% had a poor rating (U.S. Environmental Protection Agency, 2016). • The overall assessment for estuarine portions of the region was that 84% of the area had a good rating, 13% had a fair rating, and 3% had a poor rating (U.S. Environmental Protection Agency, 2016).

Table 3.2-1: Sediment Quality Summary (continued)

Region	*General Description*	*Sediment Quality Summary*
	southern Atlantic shelf off Georgia and South Carolina in water depths ranging from 500 to 1,100 m. • The continental margin also includes the Charleston Bump, Blake Ridge, and Blake Escarpment (Kaplan, 2011).	
Gulf of Mexico	• States bordering the Gulf of Mexico region include the west coast of Florida, Alabama, Mississippi, Louisiana, and Texas. • The region includes the Corpus Christi, New Orleans, Pensacola, Panama City, and Key West operating areas. Four locations in the Gulf of Mexico region—Atchafalaya Bay, Atchafalaya River, Lake Borgne, and Pascagoula River—are new areas added for this Supplemental EIS/OEIS (see Table 2.1-1, Atlantic Fleet Training and Testing Study Area Summary Table). • The region includes more than 750 estuaries, bays, and sub-estuary systems associated with larger estuaries. • A broad range of sedimentary environments exists in the Gulf of Mexico. The western and central portions of the region are dominated by sediment deposition from the Rio Grande and Mississippi River systems. • DeSoto Canyon, a submarine feature southwest of Pensacola, Florida, marks the transition between the Mississippi River-influenced sediment to the west (Alabama, Mississippi, Louisiana, and Texas) and the carbonate-dominated sediment to the east and south along western Florida. • Waves and tides, along with the effects of weather (e.g., hurricanes), are primary mechanisms that move sediments (Ward & Tunnell, 2017).	• The overall assessment for the region was that 54% of the area had a good rating, 17% had a fair rating, and 25% had a poor rating (U.S. Environmental Protection Agency, 2016). • The overall assessment for estuarine portions of the region was that 75% of the area had a good rating, 23% had a fair rating, and 2% had a poor rating (U.S. Environmental Protection Agency, 2016). • Contaminant concentrations in sediments generally decrease with distance from shore. • A study conducted by the National Oceanic and Atmospheric Administration (Cooksey et al., 2014) determined that sediments in offshore areas of the Gulf of Mexico were relatively uncontaminated as compared to typical near-shore sediments, with all of the Study Area having low levels of chemical contaminants relative to sediment quality guidelines. • Petroleum hydrocarbons in continental shelf and slope sediments are almost exclusively due to natural oil and gas seepage (Ward & Tunnell, 2017).
Caribbean	• The Caribbean region includes offshore areas south and southeast of the Florida Keys.	• Sediment quality in Puerto Rico was not assessed in the 2010 National Coastal Condition Assessment (U.S.

Table 3.2-1: Sediment Quality Summary (continued)

Region	General Description	Sediment Quality Summary
	• The majority of the Key West RC is located within this ecosystem. • Sediments in the Caribbean Region consist largely of (50 to 95%) a combination of carbonate sand, mud, and silt. • Sediment distribution in shallower areas (100 to 500 m) is influenced by tides and the Gulf of Mexico Loop Current. • Sediments at intermediate depth and deeper (greater than 800 m) are influenced by the eastward-flowing Florida Current and low-energy, westward-flowing currents, respectively (Brooks & Holmes, 1990).	Environmental Protection Agency, 2016). • However, the previous (2008) assessment (U.S. Environmental Protection Agency, 2012b) included island territories. Coastal sediments in Puerto Rico were rated 72% good, 2% fair, and 20% poor with 6% of data missing. • Elevated levels of organic carbon and sediment toxicity were found at several sites across the U.S. Virgin Islands (U.S. Environmental Protection Agency, 2012b).

Notes: % = percent; EIS = Environmental Impact Statement; m = meters; NUWC = Naval Undersea Warfare Center; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; U.S. = United States; USEPA = U.S. Environmental Protection Agency; VACAPES = Virginia Capes

Inshore waters and pierside testing locations in the Gulf of Mexico (Pascagoula, Atchafalaya River, Atchafalaya Bay, and Lake Borgne) have been added to the Study Area for the Proposed Action; these locations were not addressed in the 2018 Final EIS/OEIS. Sediment quality near the site of the former Naval Station Pascagoula on the man-made Singing River Island is influenced by freshwater inflow from rivers that discharge to the Mississippi Sound. A portion of the nearby navigation channel that passes to the east of Naval Station Pascagoula (Bayou Casotte Channel) and extends to the Port of Pascagoula contains sediments that are predominantly (70 to 98 percent) fine grained (silts and clays). Sediment metal concentrations are below biological effects levels (probable effects limits) and the simultaneously extracted metal to acid volatile sulfides ratios are below one, indicating sediment-sorbed metals are not biologically available (U.S. Army Corps of Engineers, 2019). Concentrations of common trace organic contaminants (polycyclic aromatic hydrocarbons, butyltins, polychlorinated biphenyls, and chlorinated pesticides) are also below respective biological effects levels (thresholds effects limits) (U.S. Army Corps of Engineers, 2019).

3.2.2.2 Water Quality

Characterizations of water quality within coastal portions of the Study Area are based largely on information and data from the 2010 National Coastal Condition Assessment sponsored by USEPA (U.S. Environmental Protection Agency, 2016). The National Coastal Condition Assessment for coastal areas has not been updated since the 2018 Final EIS/OEIS was released. Therefore, the water quality characterizations included in this Supplemental EIS/OEIS are largely unchanged. For this reason, the results of the National Coastal Condition Assessment are herein summarized; for more details, refer to the 2018 Final EIS/OEIS (Section 3.2.2, Affected Environment). A more recent, nationwide National Coastal Condition Assessment survey was conducted in 2015 (U.S. Environmental Protection Agency, 2021) that focused on estuarine water bodies and the Great Lakes. This survey developed a water quality (eutrophication) index based on nutrient, dissolved oxygen, and chlorophyll-*a* concentrations, as well as water clarity.

A summary of water quality by region is provided in Table 3.2-2. (General descriptions of each region are provided in Table 3.2-1.)

Table 3.2-2: Water Quality Summary

Region	*Water Quality Summary*
North Atlantic	• The proportions of good, fair, and poor water quality within the North Atlantic Region were not evaluated in the 2010 National Coastal Condition Assessment (U.S. Environmental Protection Agency, 2016) integrated water quality index. • However, Wilson and Addison (1984) concluded that the offshore Northwest Atlantic is relatively uncontaminated due, in part, to the low population density, limited industrial activity, and dynamic nature of the environment.
Northeast and Mid-Atlantic	• The overall assessment for coastal portions of the region was that 44% of the area had a good rating, 49% had a fair rating, and 6% had a poor rating (U.S. Environmental Protection Agency, 2016). • The overall assessment for estuarine portions of the region was that 48% of the area had a good rating, 45% had a fair rating, and 7% had a poor rating (U.S. Environmental Protection Agency, 2016). • According to USEPA (2012b), the water quality index exhibits a strong gradient along the Northeast coast, with generally good conditions in the well-mixed, open estuaries of the Acadian Province and fair conditions in the poorly flushed, highly settled Virginian Province estuaries that are more susceptible to eutrophication. • Pockets of poor water quality are apparent in Great Bay, New Hampshire; Narragansett Bay, Rhode Island; Long Island Sound; New York/New Jersey Harbor; the Delaware Estuary; and the western tributaries of Chesapeake Bay. The poor water quality ratings are based on elevated chlorophyll-*a* concentrations and low dissolved oxygen concentrations as indicators of eutrophication (U.S. Environmental Protection Agency, 2016), and largely reflect patterns of population density and industrial and agricultural activity in the Northeast. • A study conducted in May 2006 by the National Oceanic and Atmospheric Administration and USEPA (Balthis et al., 2009) to assess shelf waters of the Mid-Atlantic Bight generally showed that the quality of ocean waters is affected by human influence to a much lesser extent than coastal waters and adjacent estuaries. • These patterns were consistent with other offshore studies conducted to assess the status of ecological conditions and stressor impacts throughout various coastal-ocean regions of the United States (U.S. Environmental Protection Agency, 2012b).
Southeast	• The overall assessment for coastal portions of the region was that 21% of the area had a good rating, 69% had a fair rating, and 9% had a poor rating (U.S. Environmental Protection Agency, 2016). • The overall assessment for estuarine portions of the region was that 17% of the area had a good rating, 77% had a fair rating, and 10% had a poor rating (U.S. Environmental Protection Agency, 2016). • Offshore water quality in the region is influenced by the Florida Current, which exits the Gulf of Mexico through the Straits of Florida to become the Gulf Stream. • Within the southern extent of the South Atlantic Bight, nutrients are upwelled along the shelf break, primarily driven by eddies, meanders, and subsurface intrusions of the Gulf Stream complex toward the shelf. • Nutrient upwelling promotes highly productive fishery habitats along Florida's coastal zones (Morey et al., 2017).
Gulf of Mexico	• Water quality conditions vary throughout the northern Gulf of Mexico. Many Gulf of Mexico coastal environments are highly influenced by human activities and exhibit high levels of eutrophication, with high chlorophyll-*a* concentrations, particularly along the west coast of Florida, Louisiana, and lower Texas (Ward & Tunnell, 2017).

Table 3.2-2: Water Quality Summary (continued)

Region	*Water Quality Summary*
	• Nutrient pollution from point and non-point sources has a major impact on coastal water quality, contributing to toxic algal blooms, loss of seagrass habitat and coral reefs, and oxygen depletion over a large portion of the Gulf of Mexico. • The overall assessment for coastal portions of the region was that 16% of the area had a good rating, 58% had a fair rating, and 24% had a poor rating (U.S. Environmental Protection Agency, 2016). • The overall assessment for estuarine portions of the region was that 18% of the area had a good rating, 55% had a fair rating, and 28% had a poor rating (U.S. Environmental Protection Agency, 2016). • Water quality rapidly improves with progressively greater distance from the shore (Ward & Tunnell, 2017). • Outside the influence of coastal processes, water quality in the Gulf of Mexico is generally good, with the exceptions of hypoxic zones on the continental shelf caused by inputs of nutrient-enriched waters from the Mississippi River (Ward & Tunnell, 2017). • Low dissolved oxygen is not a problem in the Southeast Shelf waters, where 99% of the area is rated good, and the remaining one percent is rated fair (U.S. Environmental Protection Agency, 2016). • The outer continental shelf, slope, and abyssal Gulf of Mexico waters remain mostly unimpaired by human activities, principally because of the low levels of pollutant discharges with the large volume and mixing rates of receiving waters (Ward & Tunnell, 2017).
Caribbean	• Water quality in nearshore waters of Puerto Rico was not assessed by the National Coastal Condition Assessment in 2010; however, it was assessed in the 2008 National Coastal Condition Assessment survey (U.S. Environmental Protection Agency, 2012b). • Coastal water quality in Puerto Rico was rated 50% good, 40% fair, and 10% poor (U.S. Environmental Protection Agency, 2012b). • Poor water clarity ratings in combination with elevated dissolved inorganic phosphorous levels or chlorophyll-*a* concentrations at individual sites resulted in the poor ratings (U.S. Environmental Protection Agency, 2012b). • Several of the poor water quality ratings were in coastal areas near San Juan, the most populous city on the island. • Coastal water quality in the U.S. Virgin Islands was rated 60% good, 34% fair, and 0% poor with 6% of data missing (U.S. Environmental Protection Agency, 2012b).

Notes: % = percent; U.S. = United States; USEPA = U.S. Environmental Protection Agency

Water quality near Naval Station Pascagoula is influenced by inflows from the major river systems that drain to the Mississippi Sound. In particular, freshwater inflows provide nutrients and sediment to the Sound and also result in typically low salinities (17 to 26 parts per thousand) in surface waters. High organic loadings, coupled with restricted vertical exchange due to water column stratification, can result in oxygen depletion in near-bottom waters during the summer (U.S. Army Corps of Engineers, 2019).

3.2.2.2.1 Marine Debris and Water Quality

Marine debris or litter is defined as “any persistent, manufactured, or processed solid material discarded, disposed of, or abandoned in the marine and coastal environment” (Bergmann et al., 2015). Land-based sources of marine debris include public litter, industry, harbors and unprotected landfills and dumps located near the coast, but also sewage overflows, introduction by accidental loss, and extreme events, such as flooding. Litter from land-based sources can be transported to the sea by rivers and runoff or can be blown into the ocean by winds. Ocean-based sources include commercial shipping, both commercial and recreational fishing vessels, military and research fleets, pleasure boats, and offshore installations such as platforms and aquaculture sites. Factors such as ocean current patterns, climate and tides, the proximity to urban, industrial and recreational areas, shipping lanes, and fishing grounds also influence the types and amount of litter that are found in the open ocean or along beaches (Galgani et al., 2015).

Plastics, including packaging, fishing nets and pieces thereof, and small pieces of unidentifiable plastic or polystyrene make up the largest proportion of overall litter pollution (Galgani et al., 2015). While plastic debris is ubiquitous in the marine environment, amounts vary widely over regional scales due to factors such as proximity of urban activities, shore and coastal uses, winds, and ocean currents. Plastic debris degrades slowly in the marine environment. One degradation pathway involves breaking into small pieces, called “microplastics.” Some persistent organic compounds and metals can adhere to microplastic particles, and subsequent ingestion of these plastic particles by aquatic organisms represents a pathway for contaminant bioaccumulation in the marine food chain (Andrady, 2015; Rochman, 2015).

3.2.2.2.2 Climate Change and Water Quality

The most recent (2018) National Climate Assessment (U.S. Global Change Research Program, 2018) concluded that climate change and, in particular, increasing atmospheric carbon dioxide levels are altering ocean conditions through three main factors: warming seas (i.e., water temperatures); ocean acidification (decreasing pH); and deoxygenation (decreased dissolved oxygen concentrations). Changes in temperature in the ocean and in the atmosphere alter ocean currents and wind patterns, which influence the seasonality, abundance, and diversity of phytoplankton and zooplankton communities that support ocean food webs. In addition to warming, excess carbon dioxide in the atmosphere has a direct and independent effect on the chemistry of the ocean. When carbon dioxide dissolves in seawater, it changes three aspects of ocean chemistry: (1) increases dissolved carbon dioxide and bicarbonate ions, which are used by algae and plants as the fuel for photosynthesis; (2) increases the concentration of hydrogen ions, acidifying the water; and (3) reduces the concentration of carbonate ions. Carbonate is a critical component of calcium carbonate, which is used by many marine organisms to form their shells or skeletons. All three of these processes—warming, acidification, and deoxygenation—interact with one another and with other stressors in the ocean environment. As carbon emissions drive average temperatures higher and increase ocean acidification, natural climate cycles will occur on top of ocean conditions that are warmer, acidified, and have generally lower oxygen levels. A major uncertainty is whether these natural cycles will function in the same way under altered climate conditions (Pershing et al., 2018).

3.2.3 Environmental Consequences

None of the proposed military readiness activities would be conducted under the No Action Alternative. Therefore, baseline conditions of the existing environment for sediment and water quality would either remain unchanged or would improve after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further in this section.

This section assesses the potential environmental impacts of the Proposed Action to sediment and water quality by considering the fate and effects of four stressors associated with military readiness activities: (1) explosives and explosives byproducts, (2) metals, (3) chemicals other than explosives, and (4) a miscellaneous category of other materials, such as plastics, referred to as “other material.” The term “stressor” is used because the military expended materials in these four categories may affect sediments or water quality by altering their physical or chemical properties and, consequently, their suitability as habitat for aquatic organisms and other designated uses. Potential impacts of these stressors are evaluated based on the extent to which the release of these materials could directly or indirectly impact sediments or water quality such that existing state or federal laws or standards would be violated, recommended guidelines would be exceeded, or designated uses of the water body would be impaired. The criteria for determining the significance of Proposed Action stressors on sediment and water quality are described in Table 3.2-3.

The relationships between the military readiness activities and the four sediment and water quality stressors are identified in Table B-1 (Stressors by Training Activity) and Table B-2 (Stressors by Testing Activity) in Appendix B (Activity Stressor Matrices). Appendix A (Activity Descriptions) provides additional information regarding the components of each activity, including typical duration and locations. Note that not all the military readiness activities would result in stressors to sediment and water quality; some activities would not result in any stressors, whereas others could result in one or several stressors depending on the nature of the activity. Also, the military readiness activities included in the Proposed Action would result in releases of negligible amounts of nutrients or substances with an oxygen demand. Thus, except for metals, the Proposed Action generally would not affect any of the water quality indicators typically used by the National Coastal Condition Assessment (e.g., nutrients, dissolved oxygen, chlorophyll-*a*, water clarity) and other similar programs to characterize the general condition and health of coastal and offshore waters. Consequently, the discussion of impacts to sediment and water quality focuses on the four classes of stressors.

Table 3.2-3: Criteria for Determining the Significance of Proposed Action Stressors on Sediment and Water Quality

Impact Descriptor	*Context and Intensity*	*Significance Conclusions*
Negligible	Changes to one or more sediment or water quality parameters would be within the range of natural variation and would not violate existing state or federal laws or standards (where they exist), accumulate at concentrations that pose unacceptable health risks to ecological or human receptors, or impair designated uses of the water body.	Less than significant
Minor	Changes to one or more sediment or water quality parameters may exceed the range of natural variation, but changes would be temporary (i.e., hours to days) and would not violate existing state or federal laws or standards, accumulate at concentrations that pose unacceptable health risks to ecological or human receptors, or impair designated uses of the water body.	Less than significant
Moderate	Changes to one or more sediment or water quality parameters may exceed the range of natural variation and persist for longer periods (e.g., weeks or longer) but would not violate existing state or federal laws or standards, accumulate at concentrations that pose unacceptable health risks to ecological or human receptors, or impair designated uses of the water body.	Less than significant
Major	Impacts to sediment and water quality would violate existing state or federal laws or standards, accumulate at concentrations that pose unacceptable health risks to ecological or human receptors, or impair designated uses of the water body.	Significant

With noted exceptions, the stressor background information and environmental consequences are not meaningfully different from what is described in the 2018 Final EIS/OEIS (Section 3.2.3, Environmental Consequences).

3.2.3.1 Explosives and Explosives Byproducts

Background information related to explosives and explosives byproducts as potential stressors to sediment and water quality is summarized in Table 3.2-4. Additional background information is provided in the 2018 Final EIS/OEIS (Section 3.2.3.1, Explosives and Explosive Byproducts).

Much of the information in Table 3.2-4 regarding the environmental risks of munitions constituents is based on the findings and conclusions from a study conducted by the U.S. Army Corps of Engineers titled "Review and Synthesis of Evidence Regarding Environmental Risks Posed by Munitions Constituents in Aquatic Systems" (Lotufo et al., 2017) as part of the DoD's Strategic Environmental Research and Development Program.

Table 3.2-4: Explosives and Explosives Byproducts Background Information Summary

Background Information Summary

• Military readiness activities, such as those associated with the Proposed Action, release explosives and explosives byproducts (i.e., munitions constituents) into the marine environment.
• Munitions constituents are defined in 10 U.S. Code section 2710(e)(3) as "[A]ny materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions."
• Explosive fillers contained within munitions used during military readiness activities and their degradation products can enter the environment through high- or low-order detonations.
• In high-order detonations, only a small or residual amount of explosives is released to the environment (U.S. Environmental Protection Agency, 2012a). For a low-order detonation, some unconsumed explosives and residual explosives byproducts remain in the munitions casing with the potential to eventually enter the marine environment.
• Failure and low-order detonation rates for a subset of munitions types were listed in the in the 2018 Final EIS/OEIS. A 5% munitions failure rate (i.e., for unexploded munitions) was identified as a reasonable average for all munitions used in the Proposed Action.
• Typical chemical ingredients (munitions constituents) for military explosives are listed in the 2018 Final EIS/OEIS.
• Munitions constituents persistence in the environment is a key determinant of exposure. In open water environments, munitions constituents dissolve and are released to the overlying water, carried away from the source by currents, readily diluted, and subjected to transformative processes in the water column (Lotufo et al., 2017).
• Numeric sediment and water quality standards do not exist for munitions constituents in the marine environment. However, Lotufo et al. (2017) used available acute and chronic toxicity data to derive provisional water and sediment quality criteria for munitions constituents (Table 3.2-5 and Table 3.2-6).
• Lotufo et al. (2017) reviewed data from several studies of munitions constituents in water, sediment, and biota and concluded that:
    o Concentrations of munitions constituents in water and sediment at these sites were largely below detection or were relatively low (e.g., parts per billion), with detectable concentrations being highly localized and typically near (i.e., within 1 meter of) a point source.
    o Munitions constituent concentrations drop substantially with distance from the source, such that organisms living farther than 1 meter from the source are likely unaffected by munitions constituents present in the water column because actual exposure levels are several orders of magnitude lower than concentrations expected to be toxic to most species (i.e., provisional screening or benchmark levels).
    o These findings and conclusions are consistent with those of other studies conducted at Navy training ranges.

Notes: % = percent; EIS = Environmental Impact Statement; OEIS = Overseas Environmental Impact Statement

Unexploded ordnance generated by the Proposed Action would result in environmental releases of munitions constituents only after the munition is breached by corrosion or mechanical breakage. As long as munitions remain intact, no munitions constituents would be released to the environment. However, since the munitions typically corrode or breach over time, it is expected that their contents would be released gradually until totally depleted (Lotufo et al., 2017). After a breach, rates of munitions constituents release would be related to several factors such as ambient current speed, hydrodynamic mixing coefficient, size of the breach hole, cavity radius inside the shell, and dissolution rate of munitions constituents from the solid to aqueous phase inside the shell (Wang et al., 2013). Most activities associated with the Proposed Action that involve explosives and explosives byproducts would be conducted in offshore, open-water range complexes and testing ranges. However, some explosives are also used in nearshore areas (low tide line to 3 nautical miles [NM]) that are specifically designated for mine countermeasure and mine neutralization activities.

Table 3.2-5: Provisional Acute and Chronic Values Derived as Water Quality Criteria for Munitions Constituents

Munitions Constituents	*Freshwater WQC (µg/L)*		*Marine WQC (µg/L)*		*Combined WQC (µg/L)*		*RMUS Screening Value (µg/L)*
	Acute	*Chronic*	*Acute*	*Chronic*	*Acute*	*Chronic*	
2,4,6-TNT	570	90	--	--	--	--	90
2,4,6-TNT	1,130	39.9	85.4	28.4	--	--	--
2,4,6-TNT	230	73	398	32.6	140	61	--
2-A-4,6-DNT (II)	351	18.9	--	--	--	--	20
2-A-4,6-DNT (II)	--	--	--	--	147	34	--
4-A-2,6-DNT (II)	180	74	--	--	--	--	--
1,3,5-TNB (II)	60	11	--	--	--	--	10
1,3,5-TNB	--	--	--	--	189	25	--
1,3-DNB (II)	215	17	--	--	--	--	20
1,3-DNB (II)	194	76	--	--	--	--	--
2,4-DNT	--	--	--	--	977	900	44
RDX (II)	1,390	186	--	--	--	--	--
RDX	351	NA	--	--	351	NA	190
RDX	6,190	6,140	859	853	2,720	2,700	--
HMX (II)	3,750	329	--	--	--	--	--
HMX	749	NA	--	--	--	--	150
NG	410	7	--	--	--	--	138
NG (II)	188	6.8	--	--	--	--	--
NC	50,000	NA	--	--	--	--	--
Perchlorate	--	--	--	--	--	--	9,300

Sources: (Lotufo et al., 2017; U.S. Department of the Air Force, 2011)

Notes: µg/L = micrograms per liter; -- = no value available; DNB = dinitrobenzene; DNT = dinitrotoluene; HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine; NA = not available; NC = nitrocellulose; NG = nitroglycerin; RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine; RMUS = DoD's Range and Munitions Use Subcommittee; TNB = trinitrobenzene; TNT = 2,4,6-trinitrotoluene; WQC = water quality criteria

Table 3.2-6: Sediment Quality Benchmarks for Munitions Constituents

Munitions Constituents	*Selected Toxicity Value (µg/L)*	*Sediment Quality Benchmarks (mg/kg, based on 1% organic carbon and 70% solids)*		*RMUS Screening Values (mg/kg)*
		Low	*High*	
–NT	28.4	0.023	0.140	0.092 – 9.2
2-A-4.6-DNT	19	0.021	0.024	--
4-A-2.6-DNT	30	0.048	--	--
2,4-DA-6-NT	19	0.009	--	--
2,6-DA-4-NT	19	0.009	--	--
2,4-DNT	2,400	3.2	8.2	0.23
2,6-DNT	1,800	2.9	3.5	0.55
2-NT	3,400	7.6	--	--
3-NT	750	2.2	--	--
4-NT	320	0.82	--	--
1,3-DNB	17	0.012	0.043	--
1,3,5-TNB	11	0.0063	0.0132	0.0024 – 0.24
3,5-DNA	59	0.0678	--	
NB	2,700	2.9	4.7	27
Picric acid	9,200	7.4	--	--
Picramic acid	6,980	3.6	--	--
2,4-DNP	62	0.040	--	--
–HMX	330	0.1452	0.6	0.0047 – 0.4
RDX	186	0.091	0.2	0.013 – 1.3
NG	3230	2.65	7.20	--
NQ	260,000	112	176	--
PETN	850,000	690	1886	--

Sources: (Lotufo et al., 2017; U.S. Department of the Air Force, 2011)

Notes: % = percent; µg/L = micrograms per liter; mg/kg = milligrams per kilogram; -- = no value available; DA = diamino; DNA = dinitroaniline; DNB = dinitrobenzene; DNP = dinitrophenol; DNT = dinitrotoluene; HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine; NC = nitrocellulose; NG = nitroglycerin; NQ = nitroguanidine; NT = nitrotoluene; PETN = pentaerythritol tetranitrate; RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine; RMUS = DoD's Range and Munitions Use Subcommittee; TNB = trinitrobenzene; TNT = 2,4,6-trinitrotoluene

3.2.3.1.1 Impacts from Explosives and Explosives Byproducts under Alternative 1

Twenty training activities associated with Alternative 1 would result in releases of explosives and explosives byproducts to the marine environment (see Table B-1, Stressors by Training Activity, in Appendix B, Activity Stressor Matrices). As shown in Table 2.2-1, 10 of these activities would be largely unchanged or would occur at the same locations but with fewer annual numbers of exercises than for comparable activities evaluated in the 2018 Final EIS/OEIS. Four new U.S. Coast Guard gunnery exercises (Table 2.2-2), along with the Amphibious Operations in a Contested Environment and Long-Range Unmanned Surface Vessel Training, were not addressed in the 2018 Final EIS/OEIS. The remaining training activities that would result in releases of explosives and explosives byproducts to the marine environment would differ from those evaluated in the 2018 Final EIS/OEIS (Section 3.2.3.1, Explosives and Explosive Byproducts).

Twenty-six testing activities associated with Alternative 1 would result in releases of explosives and explosives byproducts to the marine environment (see Table B-2, Stressors by Testing Activity, in Appendix B, Activity Stressor Matrices). As shown in Table 2.2-3 through Table 2.2-6, 12 of these activities would be largely unchanged or would occur at the same locations but with fewer numbers of annual exercises than those analyzed in the 2018 Final EIS/OEIS. Impacts to sediment and water quality from explosives and explosives byproducts associated with these testing activities would be the same or less than those discussed in the 2018 Final EIS/OEIS. One of the testing activities, Naval Information Warfare Systems Command Intelligence, Surveillance, and Reconnaissance, would be a new activity that was not addressed in the 2018 Final EIS/OEIS. The remaining 13 activities were included in the 2018 Final EIS/OEIS and would have an increased number of exercises or would occur at a different location(s) under the Proposed Action. Ten of these activities would occur in the same or similar areas (e.g., moved to another range complex that has been used previously for the activity) as before, and the differences in numbers of additional exercises under the Proposed Action would be discountable. The following focuses on those military readiness activities that are new, would have an increased number of exercises, or would occur at a different location(s) under the Proposed Action.

The new Amphibious Operations in a Contested Environment training activity would occur within coastal and offshore waterways (Virginia Capes Range Complex and Navy Cherry Point Range Complex) and would use in-water explosives (gunnery, missiles, and rockets). Long-Range Unmanned Surface Vessel training would occur within the Jacksonville and Virginia Capes Range Complexes and would involve above-water explosives from medium-caliber projectiles. The Man-Portable Air Defense System activity would occur in inshore waters of the Navy Cherry Point Range Complex and use missiles fired over water. Compared to the activities evaluated in the 2018 Final EIS/OEIS, the Proposed Action would include greater numbers of Missile Exercise – Man-Portable Air Defense System, Missile Exercise Air-to-Air, Gunnery Exercise Surface-to-Surface Boat Medium-Caliber, Missile Exercise Air-to-Surface – Rocket, and Missile Exercise Surface-to-Surface exercises. The overall number of Missile Exercise Air-to-Surface exercises would be unchanged, but some exercises would be moved to an inshore range complex. There would be fewer Mine Countermeasures – Mine Neutralization – Remotely Operated Vehicles exercises, but some exercises along with some Missile Exercise Surface-to-Surface exercises that were previously conducted in other range complexes would be moved to the Key West Range Complex. All other training activities that are new or changed for the Proposed Action, including the four U.S. Coast Guard gunnery activities, would occur only in offshore training ranges.

Five of the testing activities (Airborne Mine Neutralization System Test; Radar and Other Systems Testing; Mine Detection and Classification Testing; Unmanned Underwater Vehicle Testing; and Semi-Stationary Equipment Testing) would conduct exercises within inshore portions of the Study Area. In contrast, the Anti-Submarine Warfare Mission Package Testing activity would move some exercises that previously occurred within Study Area inshore locations (e.g., Newport and Naval Undersea Warfare Center Newport Testing Range) to offshore range complexes. Radar and Other Systems Testing exercises would occur at Study Area inshore locations such as Joint Expeditionary Base Little Creek Fort Story, Naval Station Norfolk, Naval Surface Warfare Center Panama City Testing Range, and Naval Undersea Warfare Center Newport Testing Range. This activity would involve explosive missiles that detonate in air outside of state coastal waters. Given the in-air explosions associated with the Radar and Other Systems Testing exercises and the overall low failure rate or explosive munitions (see Table 3.2-4), this activity would result in releases of only small amounts of explosives and explosives byproducts to offshore waters.

Not all of the explosives and explosives byproducts associated with training activities would be released directly to seawater. For example, for the Man-Portable Air Defense System activity, all missiles would explode in-air at low altitude and all propellant and explosives would be consumed by the explosion (see Appendix A, Activity Descriptions). For other missile training activities (e.g., Missile Exercise Air-to-Surface—Rocket), missile and rocket explosions would occur at or below the water surface. Consequently, the environmental fate (i.e., proportions of the initial mass of explosives and explosives byproducts that are chemically transformed, volatilize, dissolve in water, and/or sorb to particles and sink) would vary somewhat for the different training activities. Regardless, the activity locations typically would be dispersed in open water over large expanses of the training ranges. Due to the large size of the ranges, it is unlikely that explosives and byproducts from these activities would accumulate at a single location. Therefore, explosives residues and degradation products would not be concentrated within a small geographic area.

Most of the Airborne Mine Neutralization System Test exercises use recoverable non-explosive neutralizers and inert mine shapes or non-explosive mines. However, some testing scenarios employ an explosive neutralizer against an explosive mine. Approximately half of the planned exercises would occur within the Naval Surface Warfare Center Panama City Testing Range, which extends to the shoreline and includes St. Andrew Bay. Mine Detection and Classification Testing could also use explosive detonation devices. The majority of these exercises would occur within the Naval Surface Warfare Center Panama City Testing Range. Unmanned Underwater Vehicle Testing could equip unmanned underwater vehicles with explosive devices for mine warfare. The majority of the exercises for this activity would be moved from Naval Undersea Warfare Center Newport Testing Ranges to Naval Surface Warfare Center Panama City. Therefore, these activities could result in releases of explosives and explosive compounds to nearshore and inland waters. Semi-Stationary Equipment Testing would employ demolition devices and most of the exercises would occur within the Naval Surface Warfare Center Panama City, with a smaller number of exercises at several Study Area inshore locations, such as Naval Submarine Base New London and Naval Station Norfolk. None of the testing activities that could release explosives and explosives byproducts to the marine environment would occur at the inshore waters and pierside testing locations in the Gulf of Mexico (Pascagoula, Atchafalaya River, Atchafalaya Bay, and Lake Borgne) that were added to the Study Area.

The other testing activities, including activities that are unchanged from those evaluated in the 2018 Final EIS/OEIS, would occur in offshore range complexes that extend over large areas of the Atlantic Ocean and Gulf of Mexico. As indicated by information provided in Appendix G (Non-Acoustic Impacts Supporting Information), the total impact footprint from explosives represents a negligible proportion of the range complexes.

Based on information reviewed by Lotufo et al. (2017), concentrations of explosives compounds at historically used underwater munitions sites are typically below analytical detection limits and/or relevant screening levels, except within or immediately adjacent to a source, such as a breached bomb. Nevertheless, concentrations of munitions constituents resulting from training activities associated with the Proposed Action are expected to be below the respective screening levels for water and sediments listed in Table 3.2-5 and Table 3.2-6 because (1) most of the explosives would be consumed during detonation; (2) the frequency of low-order detonations would be low, and therefore the frequency of releases of explosives directly into the water column would be low; (3) the amounts of explosives used would be small relative to the area over which they would be distributed; and (4) residual munitions constituents would be subject to physical, chemical, and biological processes that would degrade, dilute, and disperse the materials to undetectable levels.

The 2018 Final EIS/OEIS (Section 3.2.3.1, Explosives and Explosive Byproducts) concluded that releases of explosives and explosives byproducts to the marine environment during military readiness activities would not result in adverse impacts to sediment and water quality in large part because the failure and low-order detonation rates for military munitions are low and expenditures would occur over large areas of open ocean at least 50 NM from shore in water depths of at least 2,000 m. The impacts discussion for explosives and explosive byproducts as presented in the 2018 Final EIS/OEIS remains valid. With some minor exceptions, the types and quantities of explosives proposed for use and the locations where they would be released under Alternative 1 would be similar to the 2018 Final EIS/OEIS. The total number of explosives released during Alternative 1 training would be only slightly greater than the numbers analyzed in the 2018 Final EIS/OEIS, whereas the total number of explosives released during Alternative 1 testing would be less than the numbers released during testing activities evaluated in the 2018 Final EIS/OEIS. These differences would be discountable. Small changes in the numbers of exercises for some activities or changes in the offshore locations of the exercise would not result in more severe impacts than those associated with activities evaluated in the 2018 Final EIS/OEIS.

None of the military readiness activities that could release explosives and explosives byproducts to the marine environment would occur at the inshore waters and pierside testing locations in the Gulf of Mexico (Pascagoula, Atchafalaya River, Atchafalaya Bay, and Lake Borgne) that were added to the Study Area. Therefore, releases of explosives or explosives byproducts associated with Alternative 1 would result in only minor impacts to sediment or water quality and would represent a negligible secondary stressor to other resources. Differences between Alternative 1 and the No Action Alternative in impacts to sediment and water quality from releases of explosives or explosives byproducts would likely be undetectable.

3.2.3.1.2 Impacts from Explosives and Explosives Byproducts under Alternative 2

Impacts to sediment and water quality from releases of explosives and explosives byproducts to the marine environment during training activities under Alternative 2 would be similar to those discussed above for Alternative 1 because the numbers and locations of the exercises, and the types, amounts, and distributions of munitions constituents released would be the same. Impacts would be minor and insignificant.

Similarly, impacts to sediment and water quality from releases of explosives and explosives byproducts to the marine environment related to 18 of the testing activities under Alternative 2 would be similar to those discussed above for Alternative 1 because the numbers and locations of the exercises, and the types, amounts, and distributions of munitions constituents released would be the same. For the other testing activities that would release explosives and explosives byproducts, the number of exercises conducted under Alternative 2 could be greater than under Alternative 1, although in many of these cases the ranges in possible numbers of annual exercises overlap such that actual number of exercises could also be the same. Regardless, this would result in minor adverse impacts to sediment or water quality and negligible impacts as a secondary stressor to other resources. Differences between Alternative 2 and the No Action Alternative in impacts to sediment and water quality from releases of explosives or explosives byproducts would likely be undetectable.

3.2.3.2 Metals

Background information related to metals as potential stressors to sediment and water quality is summarized in Table 3.2-7. Additional background information is provided in the 2018 Final EIS/OEIS (Section 3.2.3.3, Metals).

Table 3.2-7: Metals Background Information Summary

Background Information Summary
• Military readiness activities, such as those associated with the Proposed Action, would release a variety of metal-containing materials into the marine environment. • The amounts of metals associated with individual munitions vary depending on the design and structural requirements. • Metal surfaces such as munitions casings are susceptible to physical and chemical decomposition when immersed in water. The decomposition process has the potential to leach metals to the environment. However, this is a relatively slow process that is related to the density and surface area of the object and the duration of exposure. • Rates of mass loss vary depending on whether the metal object is exposed or buried, along with other environmental conditions. • Multiple studies that have analyzed marine sediment and seawater from various bombing ranges and munitions disposal sites consistently show no discernable impact from munitions to metals concentrations in water, sediment, or biota. • At some historically used munitions disposal sites, metal concentrations in various matrices were elevated relative to corresponding water quality standards or screening levels, but the relationship to munitions as a possible source was unclear.

3.2.3.2.1 Impacts from Metals under Alternative 1

Seventy-one of the training activities under Alternative 1 would result in releases of metals to the marine environment (see Table B-1, Stressors by Training Activity, in Appendix B, Activity Stressor Matrices). As shown in Table 2.2-1, 39 of these activities would be largely unchanged or would occur at the same locations but with fewer annual numbers of exercises than analyzed in the 2018 Final EIS/OEIS. Impacts from metals releases associated with these activities would be the same as discussed in the 2018 Final EIS/OEIS (Section 3.2.3.3, Metals). Nineteen new activities, including 12 U.S. Coast Guard activities (Table 2.2-2), were not addressed in the 2018 Final EIS/OEIS. The remaining activities would have an increased number of exercises and/or occur at a different location(s) during Alternative 1. None of the training activities that could release metals to the marine/estuarine environment would occur at the inshore waters and pierside testing locations in the Gulf of Mexico (Pascagoula, Atchafalaya River, Atchafalaya Bay, and Lake Borgne) that were added to the Study Area in this Supplemental EIS/OEIS.

Fifty-two of the testing activities under Alternative 1 would result in releases of metals to the marine environment (see Table B-2, Stressors by Testing Activity, in Appendix B, Activity Stressor Matrices). Twenty-nine of the testing activities would remain relatively unchanged from those analyzed in the 2018 Final EIS/OEIS (i.e., same locations and numbers of exercises or same locations with fewer numbers of exercises). Two activities—Acoustic and Oceanographic Research (Naval Submarine Support Center/Command) and Intelligence, Surveillance, and Reconnaissance—are new testing activities that were not analyzed in the 2018 Final EIS/OEIS. As shown in Table 2.2-3 through Table 2.2-6, the remaining activities would have a greater number of exercises and/or exercises within a location under the Proposed Action that are different from those analyzed in the 2018 Final EIS/OEIS. Impacts from metals releases associated with those testing activities that are unchanged would be the same as discussed in the 2018 Final EIS/OEIS (Section 3.2.3.3, Metals). The following focuses on those testing activities that are new, would have an increased number of exercises, or would occur at a different location(s) under the Proposed Action.

The majority of training activities resulting in metals releases primarily would occur within the offshore testing ranges/range complexes. The 12 new U.S. Coast Guard activities, along with Gunnery Exercise Air-to-Air Small-Caliber, and Submarine Mine Laying, Unmanned Aerial System Training and Certification activities, with the potential for releasing metals to the marine environment would all occur within the offshore range complexes. However, some training activities with the potential for releasing metals to the marine environment could occur in nearshore waters. For example, Amphibious Operations in a Contested Environment training could occur in coastal and offshore waterways and could result from minor metals releases from use of metal-containing projectiles, rockets, and missiles. Installation and Maintenance of Mine Training Areas exercises would occur in designated areas that contain inert mine shapes within Virginia Capes Range Complex Inshore as well as several offshore range complexes and could result from minor metals releases from inert mine shapes. Unmanned Underwater Vehicle Training – Certification and Development training could occur within Virginia Capes Range Complex Inshore as well as several offshore range complexes and could result in minor metals releases from use of metal-containing mine targets. Personnel Insertion/Extraction–Air training, which is typically conducted in waters near land, could occur within the Virginia Capes, Jacksonville, and Gulf of Mexico inshore range complexes and could result in metals releases to nearshore marine environments from use of marine markers. This is an example of a training activity that occurred in the past, as analyzed in the 2018 Final EIS/OEIS, but some exercises would be moved to inshore ranges under the Proposed Action with an offsetting reduction in the number of exercises conducted in the offshore Virginia Capes Range Complex.

As noted in Section 3.2.3.1.1 (Impacts from Explosives and Explosives Byproducts under Alternative 1), Intelligence, Surveillance, and Reconnaissance is a new testing activity that would occur within the Virginia Capes and Jacksonville Range Complexes. Acoustic and Oceanographic Research (Naval Sea Systems Command) is the other new activity that would occur in offshore range complexes. Both activities are potential sources for metals releases to the marine environment from employment of various metal-containing oceanographic sampling equipment, projectiles, mine targets, demolition devices, and related components. None of the new testing activities would result in metals releases at the new locations added to the Proposed Action, although Propulsion Testing may occur near Pascagoula, when ships are in the Gulf of Mexico.

As with the training activities, metals releases primarily would occur within the offshore testing ranges/range complexes. However, nine testing activities would move some exercises from offshore range complexes to inshore portions of the Study Area or increase the number of exercises within inshore testing ranges. In contrast, some activities, such as the Anti-Submarine Warfare Mission Package Testing and At-Sea Sonar Testing, would shift testing locations from inshore sites (e.g., Naval Undersea Warfare Center Newport) to offshore range complexes. Metals releases by Semi-Stationary Equipment Testing and Radar and Other Systems Testing would be from deployments of recoverable and non-recoverable military expended materials that contain metals. Metals releases from Airborne Mine Neutralization System Test, Countermeasure Testing, Mine Detection and Classification Testing, Insertion/Extraction Testing, Towed Equipment Testing, and Unmanned Underwater Vehicle Testing could be related to leaching from metal mine shapes, sub-surface targets, and/or sonobuoys, some of which are recoverable with limited potential for metal loadings to the environment. Metals releases from Propulsion Testing could be related to leaching from floating surface targets. Metals leaching from physical and chemical decomposition of recoverable military expended materials would be negligible due to the relatively short period of time the materials are exposed to seawater. The effects of metals releases from intermittent deployments of recoverable and non-recoverable military expended material to inshore water and sediment quality would be minor due to the limited mass loadings associated with these testing exercises.

Previous assessments of metals releases associated with military readiness activities in the Study Area (2018 Final EIS/OEIS) concluded that impacts to sediment and water quality would be minor and likely undetectable. This conclusion was based on the following: (1) metals released through corrosion would be diluted by currents or sequestered in adjacent sediment; (2) elevated concentrations of metals in sediments, if present, would be limited to the immediate area around the expended material; and (3) the areas over which munitions and other metal components would be distributed are large and typically outside of state coastal waters, thereby reducing the potential for activities to contribute to existing impairments in nearshore and estuarine water bodies. However, a subset of the military readiness activities conducted within the inshore range complexes could release metals to nearshore or coastal water bodies. Water and sediment quality of nearshore and estuarine water bodies, particularly those near industrial, agricultural, and densely urbanized areas, tend to be affected to a greater extent than offshore areas removed from the influences of watershed inputs. Regardless, due to the small number of activities that would occur in nearshore waters, and the small metal loadings associated with the individual activities, the effect of the metals released to water and sediment quality would be minor. With few exceptions, the types, amounts, and distributions of metals released to the marine environment during Alternative 1 would be the same as those associated with previous military readiness activities as analyzed in the 2018 Final EIS/OEIS (Section 3.2.3.3, Metals). Therefore, the analysis from the 2018 Final EIS/OEIS remains valid, and impacts to sediment and water quality from metals releases during military readiness activities under Alternative 1 would also be minor. Impacts as a secondary stressor to other resources would be negligible. Differences between Alternative and the No Action Alternative in impacts to sediment and water quality from metals releases likely would be undetectable.

3.2.3.2.2 Impacts from Metals under Alternative 2

Impacts to sediment and water quality from metals releases to the marine environment during training activities under Alternative 2 would be similar to those discussed above for Alternative 1 because the numbers and locations of training activities would be the same, with the exception of up to four additional Composite Training Unit exercises in the Gulf of Mexico Range Complex. These differences would be discountable and impacts to sediment or water quality would be minor.

Compared to Alternative 1, 17 of the proposed testing activities under Alternative 2 could involve a comparatively greater number of exercises. For several of the other testing activities, the respective ranges in numbers of possible exercises overlap, such that it is possible that the number of exercises conducted under Alternative 2 could be the same as under Alternative 1. Of the 17 activities that could release metals and have a higher number of exercises under Alternative 2, only Unmanned Underwater Vehicle testing would occur in inshore/nearshore waters (e.g., Naval Surface Warfare Center Panama City Testing Range). Impacts to sediment and water quality from metals releases to the marine environment during testing activities under Alternative 2 would be comparable to those discussed above for Alternative 1 because the number and locations of activities with the potential for releasing metals would be similar. Thus, metals releases from military readiness activities under Alternative 2 would result in minor impacts to sediment or water quality and would represent a negligible secondary stressor to other resources. Differences between Alternative 2 and the No Action Alternative in impacts to sediment and water quality from metals releases would likely be undetectable.

3.2.3.3 Chemicals Other Than Explosives

Background information related to chemicals other than explosives as potential stressors to sediment and water quality is summarized in Table 3.2-8. Additional background information is provided in the 2018 Final EIS/OEIS (Section 3.2.3.3, Chemicals Other Than Explosives).

Table 3.2-8: Chemicals Other Than Explosives Background Information Summary

Background Information Summary
• Military readiness activities, such as those associated with the Proposed Action, would release a variety of chemicals other than explosives into the marine environment. • Chemicals other than explosives are associated with the following military expended materials: o solid-fuel propellants in missiles and rockets o Otto Fuel II torpedo propellant and combustion byproducts o chemicals associated with other non-explosive materials, including munitions. • Constituents commonly found in the energetics, propellant, and pyrotechnic elements of munitions may also leach from solid components of munitions and release into seawater. • Propellants used by rockets and missiles are typically completely consumed prior to impact of the water surface even if the munition fails to detonate upon impact. • Perchlorates, which make up a large percentage of rocket and missile propellants, are water soluble and any residuals that are not consumed dissolve and are dispersed in surface waters. • Aluminum powder is used as a fuel additive and ranges from 5 to 22% by weight of solid propellant. • Other explosives (e.g., octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine and hexahydro-1,3,5-trinitro-1,3,5-triazine) may be added, although they usually comprise less than 30% by weight of the propellant. • Otto Fuel II is used as a liquid propellant in torpedoes; it is consumed underwater, and any combustion products would enter the marine environment. • Combustion byproducts include nitrous oxides, carbon monoxide, carbon dioxide, hydrogen, nitrogen, methane, ammonia, and hydrogen cyanide (Arai & Chino, 2012). These byproducts occur naturally in the marine environment and are considered non-toxic. • Target vessels used during sinking exercises are a potential source of polychlorinated biphenyls that may be present. However, USEPA considers the contaminant levels released during the sinking of a target to be within the standards of the Marine Protection, Research, and Sanctuaries Act (U.S. Environmental Protection Agency, 2014). • The DoD uses relatively harmless compounds as chemical simulants for chemical and biological warfare agents for the purposes of testing equipment intended to detect their presence. Given the criteria for choosing simulants for use in testing activities, it is reasonable to conclude that simulants would have no impact on sediment and water quality in the Study Area. Therefore, simulants are not analyzed further in this section.

Note: % = percent; DoD = Department of Defense; USEPA = U.S. Environmental Protection Agency

3.2.3.3.1 Impacts from Chemicals Other Than Explosives under Alternative 1

Forty-three of the training activities under Alternative 1 would result in releases of chemicals other than explosives to the marine environment (see Table B-1, Stressors by Training Activity, in Appendix B, Activity Stressor Matrices). As shown in Table 2.2-1, 29 of these activities would be largely unchanged or would occur at the same locations but with fewer annual numbers of exercises than those analyzed in the 2018 Final EIS/OEIS. Impacts from releases of chemicals other than explosives associated with these activities would be the same as discussed in the 2018 Final EIS/OEIS (Section 3.2.3.2, Chemicals Other Than Explosives). Eight activities, including six U.S. Coast Guard training activities (Table 2.2-2), would be new and were not addressed in the 2018 Final EIS/OEIS. The remaining training activities would have a greater number of exercises and/or occur at locations that are different from those analyzed in the 2018 Final EIS/OEIS.

Forty-three of the testing activities under Alternative 1 would result in releases of chemicals other than explosives to the marine environment (see Table B-2, Stressors by Testing Activity, in Appendix B, Activity Stressor Matrices). Of these, 23 testing activities would remain relatively unchanged from activities evaluated in the 2018 Final EIS/OEIS (i.e., same locations and numbers of exercises or same locations with fewer numbers of exercises). One activity—Intelligence, Surveillance, and

Reconnaissance—was not evaluated in the 2018 Final EIS/OEIS. As shown in Table 2.2-3 through Table 2.2-6, the remaining 19 activities would have a greater number of exercises and/or exercises within a location that are different from those evaluated in the 2018 Final EIS/OEIS. Impacts from releases of chemicals other than explosives associated with those testing activities that are unchanged would be the same as discussed in the 2018 Final EIS/OEIS (Section 3.2.3.2, Chemicals Other Than Explosives). Therefore, the following focuses on those training and testing activities that are new, would have an increased number of exercises, or would occur at a different location(s) for the Proposed Action.

The Amphibious Operations in a Contested Environment training activity would occur in coastal and offshore waterways (Virginia Capes Range Complex and Navy Cherry Point Range Complex) and would use various targets and towed devices that represent potential sources for releases of chemicals other than explosives to the marine environment. Unmanned Aerial System Training and Certification would occur within coastal and offshore waterways (Jacksonville, Virginia Capes, and Navy Cherry Point Range Complexes) and would release unrecovered unmanned aerial systems that represent a potential source of chemicals other than explosives. All of the new U.S. Coast Guard training activities with the potential for releasing chemicals other than explosives would occur in the offshore testing ranges. None of the new training activities would occur at the inshore and pierside locations in the Gulf of Mexico (Pascagoula, Atchafalaya River, Atchafalaya Bay, and Lake Borgne) that were added to the Study Area.

For the other training activities, all but Personnel Insertion/Extraction – Air, Mine Neutralization Explosive Ordnance Disposal, and Search and Rescue would occur only in the offshore range complexes. Personnel Insertion/Extraction – Air exercises are typically conducted in nearshore areas and involve inserting a diver into water using a parachute. Mine Neutralization Explosive Ordnance Disposal exercises involve the use of explosive charges to disable mines or subsurface targets; mine shapes and all of the sub-surface I-beam demolition structures would be recovered. Search and Rescue exercises involve use of surface ships to conduct man overboard drills and deploy a dummy figure in the water.

Similar to training activities, most releases of chemicals other than explosives from testing activities, including the Intelligence, Surveillance, and Reconnaissance testing, would occur within the offshore testing ranges/range complexes. Of the testing activities that would be moved to a different location or would have an increased number of exercises compared to those evaluated in the 2018 Final EIS/OEIS, the following eight could occur within inshore waters: Airborne Mine Neutralization testing would be moved to Naval Surface Warfare Center Panama City; Countermeasures Testing would add exercises at Naval Undersea Warfare Center Newport and potentially Joint Expeditionary Base Little Creek Fort Story; Semi-Stationary Equipment Testing would occur at Naval Surface Warfare Center Panama City and Naval Undersea Warfare Center Newport; Unmanned Underwater Vehicle testing would add exercises at Naval Surface Warfare Center Panama City but reduce the number of exercises at Naval Undersea Warfare Center Newport; Radar and Other Systems Testing would occur at Naval Station Norfolk; Mine Detection and Classification Testing would occur at Naval Surface Warfare Center Panama City; Signature Analysis Operations testing would occur at Hampton Roads; and Submarine Sea Trial Weapons System testing would add up to one additional exercise at a Study Area inshore location, such as Kings Bay. However, Anti-Submarine Warfare Mission Package testing would be shifted from Study Area inshore locations (Newport and Naval Undersea Warfare Center Newport) to an offshore testing range, and At-Sea Sonar Testing would also shift testing from Naval Undersea Warfare Center Newport to an offshore testing range. Releases of chemicals other than explosives by these testing activities would be associated with recoverable and non-recoverable military expended material.

The types, amounts, and distributions of chemicals other than explosives released to the marine environment during military readiness activities under Alternative 1 would be similar to those associated with previous military readiness activities as analyzed in the 2018 Final EIS/OEIS. Assessments of releases of chemicals other than explosives associated with previous training activities in the Study Area (2018 Final EIS/OEIS; Section 3.2.3.2, Chemicals Other Than Explosives) concluded that for properly functioning munitions, impacts to sediment and water quality would be minimal for the following reasons: (1) the sizes of the offshore range complex areas in which expended materials would be distributed are large; (2) most propellant combustion byproducts are benign, while those of concern would be diluted to below detectable levels within a short time; (3) most propellants are consumed during normal operations; (4) most byproducts of Otto Fuel II combustion are non-toxic and naturally occurring chemicals, and most torpedoes are recovered after use, such that any fuel that is not consumed would be recovered along with the torpedo, limiting any direct exposure of sediments and water to Otto Fuel II; (5) the failure rate of munitions using propellants and other combustible materials is low; and (6) most of the constituents of concern are degradable via common biological, physical, and chemical processes. Thus, the analysis from the 2018 Final EIS/OEIS (Section 3.2.3.2, Chemicals Other Than Explosives) remains valid and impacts to sediment and water quality from releases of chemicals other than explosives during military readiness activities under Alternative 1 would also be minor. Impacts as a secondary stressor to other resources would be negligible. Differences between Alternative 1 and the No Action Alternative in impacts to sediment and water quality from releases of chemicals other than explosives would likely be undetectable.

3.2.3.3.2 Impacts from Chemicals Other Than Explosives under Alternative 2

Impacts to sediment and water quality from releases of chemicals other than explosives to the marine environment during training activities under Alternative 2 would be similar to those discussed above for Alternative 1 because the numbers and locations of training activities would be same, with the minor exception of one additional Composite Training Unit exercise in the Gulf of Mexico Range Complex. However, this difference would be discountable, and impacts to sediment and water quality would remain minor.

Impacts to sediment and water quality from releases of chemicals other than explosives to the marine environment during testing activities under Alternative 2 would be similar to those discussed above for Alternative 1 because the types, amounts, and distributions of chemicals other than explosives released would be comparable. However, for 14 of the activities that could result in releases of chemicals other than explosives, the numbers of exercises under Alternative 2 would be greater than the corresponding number of exercises under Alternative 1. For several of the other activities, the ranges in numbers of potential exercises overlap, such that there would be no difference between the two alternatives. The increased number of exercises under Alternative 2 would occur only in the offshore testing ranges for all but Unmanned Underwater Vehicle testing, which would have higher numbers of exercises at Naval Surface Warfare Center Panama City and Naval Undersea Warfare Center Newport. However, these slight differences would be discountable, and impacts to sediment and water quality from military readiness activities would remain minor. Impacts as a secondary stressor to other resources would be negligible. Differences between Alternative 2 and the No Action Alternative in impacts to sediment and water quality from releases of chemicals other than explosives likely would be undetectable.

3.2.3.4 Other Materials

Background information related to other materials as potential stressors to sediment and water quality is summarized in Table 3.2-9. Additional background information is provided in the 2018 Final EIS/OEIS (Section 3.2.3.4, Other Materials).

Table 3.2-9: Other Materials Background Information Summary

Background Information Summary

• Military readiness activities, such as those associated with the Proposed Action, would release a variety of other materials to the marine environment.
• These materials potentially could include marine markers and flares, chaff, towed and stationary targets, biodegradable polymers, and miscellaneous components of other expended objects.
• These materials and components are either made mainly of non-reactive or slowly reactive materials, such as glass, carbon fibers, and plastics, or break down or decompose into non-toxic byproducts (e.g., rubber, steel, iron, and concrete).
• Most of these other materials would settle to the seafloor where they would be:
  ○ exposed to seawater
  ○ lodged in or covered by seafloor sediments
  ○ encrusted by oxidation products such as rust
  ○ slowly degraded by chemical decomposition
  ○ covered by marine organisms
• Plastic components of the other materials may float or descend to the bottom, depending upon their buoyancy, and/or break into smaller microplastic particles.
• Combustion of red phosphorus produces phosphorus oxides, which have a low toxicity to aquatic organisms.
• Aluminum and iron canisters are expected to be covered by sediment over time, encrusted by chemical corrosion, and/or covered by marine organisms.
• Flares are usually consumed during flight. Combustion products from flares include magnesium oxide, sodium carbonate, carbon dioxide, and water.
• Chaff consists of small, thin glass fibers coated in aluminum that are light enough to remain in the air anywhere from 10 minutes to 10 hours (Farrell & Siciliano, 2004).
• Once released, chaff fibers disperse, and the extent of dispersion depends on the altitude and location where it is released, prevailing winds, and meteorological conditions (Spargo, 2007; Spargo et al., 1999).
• Chaff is generally resistant to chemical weathering and likely remains in the environment for long periods. The fibers are quickly dispersed by waves and currents.
• Chemicals leached from the chaff would be diluted by surrounding seawater, reducing the potential for chemical concentrations to reach levels that can affect sediment quality or benthic habitats.
• Sonobuoys typically contain both metal and nonmetal components and use lithium batteries.
• During battery operation of the sonobuoy, the lithium reaction proceeds nearly to completion prior to battery termination, and only a small number of reactants remain when the battery life ends. These residual materials gradually dissolve and/or are diluted by currents.
• After battery life expires (which takes no more than eight hours), the sonobuoy scuttles itself and sinks to the bottom.
• Biodegradable polymer, which includes bio-inspired slime, is a fibrous material comprising synthetic proteins.
• Following deployment, biodegradable polymer loses tensile strength after a few hours and eventually sinks due to the slight net negative buoyancy. The protein fibers biodegrade and dissolve in the water column within weeks to a few months (see Section 3.0.3.3.5, Entanglement Stressors).
• Some munitions and other military expended materials used for testing and training contain small amounts of plastic, such as that associated with chaff cartridge end caps and flare pads and pistons. The plastic residuals are not recovered after the munitions are expended.

3.2.3.4.1 Impacts from Other Materials under Alternative 1

Fifty-six of the training activities under Alternative 1 would result in releases of other materials to the marine environment (see Table B-1, Stressors by Training Activity, in Appendix B, Activity Stressor Matrices). As shown in Table 2.2-1, 36 of these activities would be largely unchanged or would occur at the same locations but with fewer annual numbers of exercises than those evaluated in the 2018 Final

EIS/OEIS. Impacts from other materials associated with these activities would be the same as discussed in the 2018 Final EIS/OEIS (Section 3.2.3.4, Other Materials). Eleven of the new U.S. Coast Guard training activities (Table 2.2-2) that could result in releases of other materials, along with six other new activities were not addressed in the 2018 Final EIS/OEIS. The remaining activities would have an increased number of exercises or occur at a different location(s) under the Proposed Action.

Fifty-four of the testing activities under Alternative 1 would result in releases of other military expended materials to the marine environment (see Table B-2, Stressors by Testing Activity, in Appendix B, Activity Stressor Matrices). As shown in Table 2.2-3 through Table 2.2-6, 27 of these activities would be largely unchanged or would occur at the same locations but with fewer annual numbers of exercises than for activities evaluated in the 2018 Final EIS/OEIS. The 2018 Final EIS/OEIS (Section 3.2.3.4, Other Materials) assessment of impacts from other materials associated with these activities remains valid. Several other activities that were evaluated in the 2018 Final EIS/OEIS would no longer occur under the Proposed Action. Two new testing activities, Acoustic and Oceanographic Research and Intelligence, Surveillance, and Reconnaissance, would be added with the potential for releasing other materials that were not addressed in the 2018 Final EIS/OEIS. The remaining activities would have an increased number of exercises or occur at a different location(s) under the Proposed Action. The following focuses on those training and testing activities that are new, would have an increased number of exercises, or would occur at a different location(s).

Of the new training activities, all but Amphibious Operations in a Contested Environment and the Installation and Maintenance of Mine Training Areas would occur primarily within offshore range complexes. The Amphibious Operations in a Contested Environment training would occur in coastal and offshore waterways (Virginia Capes Range Complex and Navy Cherry Point Range Complex) and would release other materials in addition to in-water explosives. Installation and Maintenance of Mine Training Areas could include one exercise within the Virginia Capes Range Complex Inshore and involve use of inert bottom and moored mine shapes.

Most of the remaining activities would also result in releases of other materials only within the offshore testing ranges/range complexes, primarily the Jacksonville and Virginia Capes Range Complexes. However, five activities, Personnel Insertion/Extraction – Air; Personnel Insertion/Extraction – Swimmer/Diver; Mine Neutralization Explosive Ordnance Disposal; Underwater Mine Countermeasures, Raise, Tow; and Search and Rescue, could result in releases of other materials to inshore waters at multiple locations throughout the Study Area. Under the Proposed Action, there would be fewer overall Personnel Insertion/Extraction – Air and Personnel Insertion/Extraction – Swimmer/Diver training exercises; however, some would be relocated from offshore to inshore ranges (Virginia Capes Range Complex Inshore and Jacksonville Range Complex Inshore). Both activities could result in minor releases of materials, such as parachutes, ropes, and markers. The Proposed Action would add Mine Neutralization Explosive Ordnance Disposal exercises to the Virginia Capes Range Complex Inshore and Key West Range Inshore. This activity uses explosive charges to disable threat mines, and although some mine shapes and all of the sub-surface I-beam demolition structures would be recovered, releases of debris and other materials could occur. Underwater Mine Countermeasures, Raise, Tow, Beach, and Exploitation training would add exercises to the Virginia Capes Range Complex Inshore and Jacksonville Range Complex Inshore. This activity would use a variety of materials, such as ropes, balloons, and mine shapes, to recover mines; mine shapes are typically recovered. The Proposed Action would also add Search and Rescue exercises to the Virginia Capes Range Complex Inshore and Jacksonville Range Complex Inshore. This activity would use a variety of materials, such as markers and a practice figure, for personnel recovery training.

The new Naval Sea Systems Command Acoustic and Oceanographic Research testing activity would occur within the offshore ranges (e.g., Northeast Range Complexes) and could use surface targets that would be a source for releases of other materials. Intelligence, Surveillance, and Reconnaissance is a new testing activity that would occur within the Virginia Capes and Jacksonville Range Complexes. Both activities are potential sources for releases of other materials to the marine environment from employment of various oceanographic sampling equipment, projectiles, mine targets, demolition devices, and related components. None of the new testing activities would result in releases of other materials at the new locations added to the Study Area.

Similar to training activities, most releases of other materials associated with the testing activities would occur within the offshore ranges/range complexes. As noted previously for other sediment and water quality stressors (i.e., metals and chemicals other than explosives), some activities would either add exercises to various Study Area inshore locations and/or move exercises that were previously conducted within offshore ranges to inshore ranges. In particular, Pierside Sonar Testing and Unmanned Surface Vehicle System Testing could occur at Pascagoula, which is a new location for the Study Area in this Supplemental EIS/OEIS. Both activities represent the minor potential for releases of other materials as a result of in-water testing of sonar and other related equipment. Also, for some activities (e.g., Anti-Submarine Warfare Mission Package Testing and At-Sea Sonar Testing), exercises that were previously conducted within inshore ranges would be moved to offshore ranges under the Proposed Action.

The Alternative 1 military readiness activities would result in periodic inputs of various materials that would be dispersed over large expanses of coastal and open ocean within the Study Area. Some of these materials would be consumed or otherwise transformed during use, whereas other military expended materials, such as plastics and metal debris, would be more resistant to chemical decomposition and could remain in the environment for prolonged periods of time. As discussed in Section 3.2.2.2.1 (Marine Debris and Water Quality), plastic debris is ubiquitous in the marine environment. Military readiness activities under Alternative 1 would add to the current plastic loadings to the marine environment, although the contribution based on the mass of plastics released by the activities would be minor. Also, because most releases occur only in offshore locations, the training activities would not contribute to any existing impairments in coastal or inland water bodies. The types, amounts, and distributions of other materials released to the marine environment during military readiness activities under Alternative 1 would be similar to those associated with previous military readiness activities such as those analyzed in the 2018 Final EIS/OEIS. Assessments of releases of other materials associated with military readiness activities in the Study Area (i.e., 2018 Final EIS/OEIS; Section 3.2.3.4, Other Materials) concluded that impacts to sediment and water quality would be minimal. The findings from the 2018 Final EIS/OEIS (Section 3.2.3.4, Other Materials) remain valid and impacts to sediment and water quality from Alternative 1 would be minor. Impacts as a secondary stressor to other resources would be negligible. Differences between Alternative 1 and the No Action Alternative in impacts to sediment and water quality from releases of other materials likely would be undetectable.

3.2.3.4.2 Impacts from Other Materials under Alternative 2

Impacts to sediment and water quality from releases of other materials to the marine environment during training activities under Alternative 2 would be similar to those discussed above for Alternative 1 because the numbers and locations of training activities with the potential for releases of other materials would be the same, with the minor exception of additional Composite Training Unit exercises in the Gulf of Mexico Range Complex. However, this difference would be discountable, and impacts to sediment and water quality would remain minor.

Impacts to sediment and water quality from releases of other materials to the marine environment during testing activities under Alternative 2 would be similar to those discussed above for Alternative 1. However, for 15 of the activities that could result in releases of other materials the numbers of exercises under Alternative 2 would be greater than the corresponding number of exercises under Alternative 1. For several of the other activities, the ranges in numbers of potential exercises overlap, such that there would be no difference between the two alternatives. The increased number of exercises under Alternative 2 would occur only in the offshore testing ranges. For Unmanned Underwater Vehicle testing, higher numbers of exercises would occur under Alternative 2 compared to Alternative 1 and could involve a slight increase in the number of exercises at inshore testing locations. However, in these cases, the overall number of exercises under Alternative 2 would be fewer than those assessed in the 2018 Final EIS/OEIS. Overall, these slight differences would be discountable, and impacts to sediment and water quality would remain minor. Impacts as a secondary stressor to other resources would be negligible. Differences between Alternative 2 and the No Action Alternative in impacts to sediment and water quality from releases of other materials likely would be undetectable.

3.2.3.5 Combined Impact of all Stressors under Alternative 1

When considered together, the impact of the four stressors would be additive. Under Alternative 1, chemical and physical changes in sediments and water quality would be minimal and only detectable in the immediate vicinity of munitions. Even in areas where multiple munitions and expended materials are in close proximity, chemical degradation products from each source or item are largely isolated from each other. The low failure rate of explosive munitions proposed for use reduces the likelihood of exposure to explosives materials that remain in intact munitions. Measurable concentrations of contaminants and other chemicals in the marine environment from munitions disposal sites have been shown to be below screening levels or similar to nearby reference areas where munitions are not present. Given that military readiness activities associated with the Proposed Action would result in much lower densities of munitions than those at disposal sites, resulting contaminant concentrations would also be proportionally lower. Many components of non-explosive munitions and other expended materials are inert or corrode slowly over years. Metals that could impact benthic habitat at higher concentrations comprise only a small portion of the alloys used in expended materials, and corrosion of metals in munitions casings and other expended materials is a slow process that allows for dilution. Elevated concentrations of metals and other chemical constituents in sediments would be limited to small zones adjacent to the munitions or other expended materials and would still most likely remain below screening levels even after years residing on the seafloor. The combined impact of all stressors to sediment and water quality under Alternative 1 would be minor. It is possible that Action Proponents' stressors could combine with non-Action Proponents' stressors, particularly in nearshore areas and bays, to exacerbate contaminant (e.g., metals) levels in already-impaired, nearshore or estuarine water bodies. This is discussed in Chapter 4 (Cumulative Impacts).

3.2.3.6 Combined Impact of all Stressors under Alternative 2

The combined impact of all four stressors to sediment and water quality under Alternative 2 would be similar to that of Alternative 1 because the types and amounts of explosives, metals, chemicals other than explosives, and other materials would be comparable, particularly for the training activities. As noted in the previous sections, some of the testing activities under Alternative 2 would involve a higher number of exercises compared to Alternative 1, but most of these additional exercises would occur in offshore rather than Study Area inshore locations. The additional loadings to offshore areas would represent a negligible potential for altering impact classifications due to greater potential for dilution and dispersion. Additionally, for some activities, even though the numbers of exercises under Alternative 2 would be higher than for Alternative 1 in certain locations, the overall number of exercises for Alternative 2 would be comparatively less than for the 2018 Final EIS/OEIS, which was determined to have only a minor impact on sediment and water quality.

Based on this analysis, combined impacts from all stressors on sediments and water quality under Alternative 2 would remain minor.

References

Andrady, A. (2015). Persistence of plastic litter in the oceans. In M. Bergmann, L. Gutow, & M. Klages (Eds.), *Marine Anthropogenic Litter*. New York, NY: Springer International Publishing.

Arai, T. and N. Chino. (2012). Diverse migration strategy between freshwater and seawater habitats in the freshwater eel genus Anguilla. *Journal of Fish Biology 81* (2): 442–455. DOI:10.1111/j.1095-8649.2012.03353

Balthis, W. L., J. L. Hyland, M. H. Fulton, E. F. Wirth, J. A. Kiddon, and J. Macauley. (2009). *Ecological condition of coastal ocean waters along the U.S. Mid-Atlantic Bight: 2006* (NOAA Technical Memorandum NOS NCCOS 109, EPA 600/R-09/159). Charleston, SC: Office of Research and Development, U.S. Environmental Protection Agency, and U.S. Department of Commerce National Oceanic Atmospheric Administration National Ocean Service.

Bergmann, M., L. Gutow, and M. Klages. (2015). *Marine Anthropogenic Litter*. New York, NY and London, United Kingdom: Springer.

Brooks, G. R. and C. W. Holmes. (1990). Modern configuration of the southwest Florida carbonate slope: Development by shelf margin progradation. *Marine Geology 94* (4): 301–315.

Cooksey, C. L., J. L. Hyland, M. H. Fulton, E. F. Wirth, W. L. Balthis, and T. L. Wade. (2014). *Ecological Condition of Coastal Ocean Waters along the U.S. Continental Shelf of Northeastern Gulf of Mexico: 2010* (NOAA Technical Memorandum NOS NCCOS 188). Silver Spring, MD: National Oceanic and Atmospheric Administration, National Ocean Service.

Farrell, R. E. and S. D. Siciliano. (2004). *Environmental Effects of Radio Frequency Chaff Released During Military Training Exercises: A Review of the Literature*. Saskatoon, Canada: Goose Bay Office of the Department of National Defense.

Galgani, F., G. Hanke, and T. Maes. (2015). Global Distribution, Composition and Abundance of Marine Litter. In M. Bergmann, L. Gutow, & M. Klages (Eds.), *Marine Anthropogenic Litter*. New York, NY: Springer International Publishing.

Kaplan, B. (2011). *Literature synthesis for the north and central Atlantic Ocean* (OCS Study BOEMRE 2011-012). New Orleans, LA: U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Gulf of Mexico OCS Region.

Lotufo, G. R., M. A. Chappell, C. L. Price, M. L. Ballentine, A. A. Fuentes, T. S. Bridges, R. D. George, E. J. Glisch, and G. Carton. (2017). *Review and Synthesis of Evidence Regarding Environmental Risks Posed by Munitions Constituents (MC) in Aquatic Systems*. Washington, DC: U.S. Army Corps of Engineers, Engineer Research and Development Center.

Morey, S., M. Koch, Y. Liu, and S.-K. Lee. (2017). Florida's oceans and marine habitats in a changing climate. In J. W. J. Eric P. Chassignet, Vasubandhu Misra, & Jayantha Obeysekera (Ed.), *Florida's Climate: Changes, Variations, & Impacts* (pp. 391–425). Gainesville, FL: Florida Climate Institute.

Pershing, A. J., R. B. Griffis, E. B. Jewett, A. C. T, J. F. Bruno, D. S. Busch, A. C. Haynie, S. A. Siedlecki, and D. Tommasi. (2018). Oceans and Marine Resources. In D. R. Reidmiller, A. C. W, D. R. Easterling, K. E. Kunkel, K. L. M. Lewis, T. K. Maycock, & B. C. Stewart (Eds.), *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* (pp. 353–390). Washington, DC: U.S. Global Change Research Program.

Rabalais, N. N. and D. F. Boesch. (1987). Dominant features and processes of continental shelf environments of the United States. In D. F. Boesch & N. N. Rabalais (Eds.), *Long-term Environmental Effects of Offshore Oil and Gas Development* (pp. 71–148). New York, NY: Elsevier Applied Science.

Rochman, C. M. (2015). The Complex Mixture, Fate and Toxicity of Chemicals Associated with Plastic Debris in the Marine Environment. In M. Bergmann, L. Gutow, & M. Klages (Eds.), *Marine Anthropogenic Litter* (pp. 117–140). Cham, Switzerland: Springer International Publishing.

Spargo, B. J. (2007, June 1). Personal communication via email between Barry Spargo, (U.S. Department of the Navy, Naval Research Laboratory) and Mark Collins (Parsons) regarding chaff end cap and piston buoyancy.

Spargo, B. J., T. L. Hullar, S. L. Fales, H. F. Hemond, P. Koutrakis, W. H. Schlesinger, and J. G. Watson. (1999). *Environmental Effects of RF Chaff*. Washington, DC: Naval Research Laboratory.

Townsend, D. W., A. C. Thomas, L. M. Mayer, M. A. Thomas, and J. A. Quinlan. (2004). Oceanography of the northwest Atlantic continental shelf (1,W). In A.R. Robinson & K.H. Brink (Eds.), *The Sea: The Global Coastal Ocean: Interdisciplinary Regional Studies and Syntheses* (Vol. 14, pp. 119–168). Cambridge, MA: Harvard University Press.

U.S. Army Corps of Engineers. (2019). *Final Environmental Impact Statement Bayou Casotte Harbor Channel Improvement Project Pascagoula, Mississippi*. Mobile, AL: U.S. Army Corps of Engineers, Mobile District.

U.S. Department of the Air Force. (2011). *Operational Range Assessment Program* (Version 3.0). Washington, DC: HQ USAF/A7CAN.

U.S. Department of the Navy. (2018). *Atlantic Fleet Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement*. Norfolk, VA: Naval Facilities Engineering Command Atlantic.

U.S. Environmental Protection Agency. (2012a). *EPA Federal Facilities Forum Fact Sheet*. Washington, DC: Solid Waste and Emergency Response.

U.S. Environmental Protection Agency. (2012b). *National Coastal Condition Report IV*. Washington, DC: Office of Research and Development/Office of Water.

U.S. Environmental Protection Agency. (2014). *2014 Letter: Marine Protection, Research, and Sanctuaries Act (MPRSA) General Permit for the Sinking Exercise (SINKEX) Program; Evaluation, Determination, and Agreement*. Washington, DC: U.S. Department of the Navy.

U.S. Environmental Protection Agency. (2016). *National Coastal Condition Assessment 2010*. Washington, DC: Office of Water and Office of Research and Development.

U.S. Environmental Protection Agency. (2021). *National Coastal Condition Assessment: A Collaborative Survey of the Nation's Estuaries and Great Lakes Nearshore Waters*. Washington, DC: U.S. Environmental Protection Agency.

U.S. Global Change Research Program. (2018). *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II*. Washington, DC: U.S. Government Publishing Office.

Wang, P. F., R. D. George, W. J. Wild, and Q. Liao. (2013). *Defining munition constituent (MC) source terms in aquatic environments on DoD Ranges (ER-1453), Final Report* (Report prepared for the

Strategic Environmental Research and Development Program (SERDP)). San Diego, CA: SPAWAR Pacific.

Ward, C. H. and J. W. Tunnell. (2017). Habitats and biota of the Gulf of Mexico: An Overview. In C. H. Ward (Ed.), *Habitats and Biota of the Gulf of Mexico: Before the Deepwater Horizon Oil Spill: Volume 1: Water Quality, Sediments, Sediment Contaminants, Oil and Gas Seeps, Coastal Habitats, Offshore Plankton and Benthos, and Shellfish* (pp. 1–54). New York, NY: Springer New York.

Wilson, R. and R. F. Addison. (1984). *Health of the Northwest Atlantic: A report to the Interdepartmental Committee on Environmental Issues*. Ottawa, Canada: Environment Canada and Department of Fisheries and Oceans.

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3.3 Habitats

HABITATS SYNOPSIS

The Action Proponents considered the stressors to abiotic habitats that could result from the Proposed Action in the Study Area. The following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Acoustics: Acoustic stressors are not applicable to abiotic habitats and are not analyzed in this section.
- Explosives: Most explosives would detonate in air or at or near the water surface. Some explosives would be placed on the bottom (i.e., seafloor). Explosive detonations on or near the bottom would produce percussive energy that could impact bottom habitat. While hard bottom would mostly reflect the energy (and be avoided per area mitigations), a crater would form in soft bottom. On substrates other than clay, the effects would be temporary, whereas craters in clay may be persistent. Craters in soft bottom, where substrate moves around with the tides and currents, would only last for days to weeks. The surface area of bottom substrate affected would be a tiny fraction of the total training and testing area available in the Study Area.
- Energy: Energy stressors are not applicable because of the lack of sensitivity of abiotic habitats and are not analyzed in this section.
- Physical disturbance and strike: Most seafloor devices would be placed in areas that would result in minor and temporary bottom substrate impacts. Once on the seafloor and over time, military expended material would be buried by sediment, corroded from exposure to the marine environment, or colonized by benthic organisms. The surface area of bottom substrate affected over the short term would be a tiny fraction of the total training and testing area available in the Study Area.
- Entanglement: Entanglement stressors are not applicable because habitats do not have the ability to become “entangled” by materials. The potential for expended material to cover a substrate is discussed under the physical disturbance and strike stressor.
- Ingestion: Ingestion stressors are not applicable because habitats lack the ability to ingest and are not analyzed in this section.
- Secondary stressors: Secondary stressors are not applicable to abiotic habitats, as they are the subject of secondary stressors for biological resources.

3.3.1 Introduction

The following sections describe the abiotic or non-living habitat features (e.g., water column, sandy shores, rocky bottoms) found in the Study Area and the potential for direct impacts from proposed military readiness activities on them. Impacts to habitats from the Proposed Action were analyzed in the 2018 Final EIS/OEIS. The primary changes from the analysis are provided where they apply in subsequent sections.

3.3.2 Affected Environment

The affected environment provides the context for evaluating the effects of the Action Proponent's military readiness activities on abiotic habitats. With noted exceptions, the general background for habitats in the Study Area is not meaningfully different from what is described in the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (hereinafter referred to as the 2018 Final EIS/OEIS) (Section 3.5.2.1, General Background). See Appendix F (Biological Resources Supplemental Information) for updated details on the general background for habitat. The details are specified in this section when they directly affect the analysis.

The Study Area is generally consistent with that analyzed in the 2018 Final EIS/OEIS. Additions to the Study Area include pierside training and testing events and transit along established navigation channels from pierside locations to offshore range complexes in the Gulf of Mexico. United States (U.S.) Coast Guard activities are similar in nature to Navy activities and fall under the same stressor categories.

3.3.2.1 General Background

Although many classification schemes are available that span a range of spatial dimensions and granularity of marine habitats (Allee et al., 2000; Cowardin et al., 1979; Federal Geographic Data Committee, 2012; Kendall et al., 2001; United Nations Educational Scientific and Cultural Organization, 2009; Valentine et al., 2005), three basic types of abiotic substrates describe the affected environment: soft, intermediate, and hard substrates. Soft substrate areas are dominated by mud (including clay and silt) or sand—substrate often too unstable for colonization by habitat-forming invertebrates (e.g., hard corals, oysters) or attached seaweed in the marine environment. Soft substrate in sheltered, estuarine environments may be colonized by seagrass or coastal wetland species. Hard substrate areas are dominated by cobbles, boulders, or consolidated bedrock that is stable enough for colonization by habitat-forming invertebrates or attached seaweed. Intermediate substrate areas are dominated by unconsolidated material larger than sand but smaller than cobbles (e.g., gravel, shell fragments), covered by a thin layer of soft substrate over hard substrate, or described as coral rubble. These areas may or may not be stable enough for habitat-forming invertebrates or attached seaweeds, depending on depth and other factors (e.g., current speeds). Artificial features are another type of abiotic substrate that was made by humans (e.g., shipwrecks, artificial reefs). Spatial and temporal variation in abiotic substrate is created by the interplay of surficial geology, currents, tides, water quality, and biological activity at a location.

There is updated information for the mapping of aquatic habitat types in the Study Area that include both natural and artificial features of the shoreline, bottom, and water column. More information on the sources of mapping and the process for combining maps is provided in the Marine Habitat Database Technical Report (U.S. Department of the Navy, 2024). The mapping in this section includes both the abiotic and biotic components of habitat to provide a single location to reference in the biological resources sections.

3.3.2.1.1 Natural Features

The features described in the following sections include only the naturally occurring features of the shoreline, bottom, and water column in the Study Area (e.g., rocky outcrops, sand bars). Artificial substrates that may serve as habitat are described in Section 3.3.2.1.2 (Artificial Features).

3.3.2.1.1.1 Shore Habitats

Shoreline habitats were not mapped for the 2018 Final EIS/OEIS, although they were described for the inshore training and testing area. The general descriptions of shore habitats in the Study Area have not changed despite the addition of some inshore locations in the Gulf of Mexico that are mostly surrounded by coastal wetlands.

3.3.2.1.1.2 Bottom Habitats

The overall distribution of substrate types within training and testing areas with proposed disturbance of the bottom is approximately 4 percent hard substrate (e.g., outcrops, bedrock, rubble), 5 percent intermediate substrate (e.g., gravel/shell), 24 percent soft substrate (e.g., silt, sand), and 67 percent not applicable/greater than 2,500 meters (m) deep (Table 3.3-1). Refer to Section 3.5 (Invertebrates) for why substrate types deeper than 2,500 m are considered not applicable. On seafloor less than 2,500 m deep, hard, intermediate, and soft substrate characterizes approximately 12, 16, and 72 percent of the bottom, respectively. The distribution of substrate types also varies among the training and testing locations, as summarized in Table 3.3-1 and depicted in Figure 3.3-1 through Figure 3.3-5. Among the offshore ranges, the Virginia Capes Range Complex has the largest proportion in substrate deeper than 2,500 m.

The table and figures in this section also depict the regional mapping for biotic features growing on various substrate types (e.g., vascular plant beds: seagrasses and coastal wetlands; benthic macroalgae, shallow-water hard corals). Hard substrate at depths less than 2,500 m may feature deep-sea hard corals and sponges. Hard substrate at depths less than 95 m may feature both sessile invertebrates and benthic macroalgae, including shallow-water hard corals in southern locations of the Study Area. Hard substrate that may feature living organisms is termed "live hard bottom." Submerged aquatic vegetation (e.g., seagrass, benthic macroalgae) and live hard bottom occupy greater percentages of the seafloor in the national marine sanctuaries (areas excluded from Table 3.3-1). Outside of national marine sanctuaries, the highest concentration of submerged aquatic vegetation and live hard bottom are in the Northeast Range Complexes Inshore and Jacksonville Range Complex, respectively.

3.3.2.1.1.3 Water Column

Water column habitats (e.g., floating *Sargassum*) and artificial feature points in the Study Area, including typical current speeds and directions of flow, are mapped in Figure 3.3-6 through Figure 3.3-10. The current satellite-based mapping is more detailed than the generalization of flow directions depicted in the 2018 Final EIS/OEIS Section 3.02 (Ecological Characterization of the Study Area).

Table 3.3-1: Percent Coverage of Seafloor Habitats and Abiotic Substrate Types in Training and Testing Locations of the Study Area

Training and Testing Locations	*Shallow Seafloor (0 to 95 m Depths)*						*Deep Seafloor (95 to 2,500 m Depths)*			*Bathyal-Abyssal Zone (>2,500 m Depths)*	*Total Area (km²)*
	Coastal Wetlands[1]	*Seagrass Beds[1]*	*Mud/ Sand*	*Gravel/ Shell*	*Hard Bottom[1]*	*Coral Reef*	*Mud/ Sand*	*Gravel/ Shell*	*Hard Bottom*		
	Substrate: Soft			*Inter-mediate*	*Hard[2]*		*Soft*	*Inter-mediate*	*Hard[2]*		
Range Complexes/Testing Ranges											
Northeast RC[3]	0.00%	0.01%	19.80%	9.82%	1.26%	0.00%	25.56%	6.45%	2.64%	34.46%	***201,135.11***
VACAPES RC	0.00%	0.00%	20.72%	11.31%	0.26%	0.00%	21.55%	0.34%	1.19%	44.64%	***102,536.37***
Navy Cherry Point RC	0.00%	0.00%	27.93%	0.47%	2.57%	0.00%	33.95%	2.14%	3.55%	29.39%	***69,110.53***
JAX RC	0.00%	0.00%	37.80%	0.45%	1.22%	0.00%	25.32%	13.19%	21.61%	0.41%	***180,222.36***
Key West RC	0.00%	0.00%	11.94%	4.83%	10.57%	1.87%	41.87%	2.94%	14.32%	11.67%	***77,969.04***
GOMEX RC[3]	0.00%	0.00%	36.33%	10.56%	1.97%	0.00%	41.27%	2.07%	3.20%	4.59%	***162,922.09***
NUWC Newport Testing Area[3]	0.01%	0.16%	72.12%	15.52%	2.71%	0.00%	8.37%	0.21%	0.89%	0.00%	***38,731.08***
SFOMF	0.01%	0.00%	3.80%	0.08%	0.07%	2.95%	16.40%	5.80%	66.63%	4.27%	***1,614.68***
NSWC Panama City Testing Area[3]	0.00%	0.00%	33.65%	19.86%	2.39%	0.00%	41.11%	2.60%	0.40%	0.00%	***78,527.72***
Other Areas											
Other AFTT Areas[3]	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	99.92%	***1,121,039.46***
SINKEX Box[3]	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	***272,439.44***
Northeast RC Inshore	0.05%	0.97%	94.97%	4.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	***366.45***
VACAPES RC Inshore	0.92%	0.00%	80.64%	18.35%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	***1,980.76***
JAX RC Inshore	17.21%	1.39%	81.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	***67.18***
Key West RC Inshore	0.14%	1.57%	75.02%	23.26%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	***0.04***
GOMEX RC Inshore	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%	99.92%	***1,137.20***

Table 3.3-1: Percent Coverage of Seafloor Habitats and Abiotic Substrate Types in Training and Testing Locations of the Study Area (continued)

Training and Testing Locations	Shallow Seafloor (0 to 95 m Depths)						Deep Seafloor (95 to 2,500 m Depths)			Bathyal-Abyssal Zone (>2,500 m Depths)	Total Area (km^2)
	Coastal Wetlands[1]	Seagrass Beds[1]	Mud/ Sand	Gravel/ Shell	Hard Bottom[1]	Coral Reef	Mud/ Sand	Gravel/ Shell	Hard Bottom		
	Substrate: Soft			Inter-mediate	Hard[2]		Soft	Inter-mediate	Hard[2]		
All Locations[4]	<0.01%	0.04%	10.93%	2.76%	1.00%	0.09%	11.06%	1.99%	2.84%	64.75%	***N/A***

[1] A habitat comprising "Submerged Aquatic Vegetation" (includes both seagrass and benthic macroalgae habitat).
[2] A habitat comprising "Live Hard Bottom."
[3] Includes some overlap with other locations.
[4] Average of percentages weighted by EIS/OEIS location area. Due to the overlap of locations, the areas cannot be simply added for the average.
Notes: % = percent; < = less than; > = greater than; AFTT = Atlantic Fleet Training and Testing; GOMEX = Gulf of Mexico; JAX = Jacksonville; km^2 = square kilometers; m = meters; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility Testing Range; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

3.3.2.1.2 Artificial Features

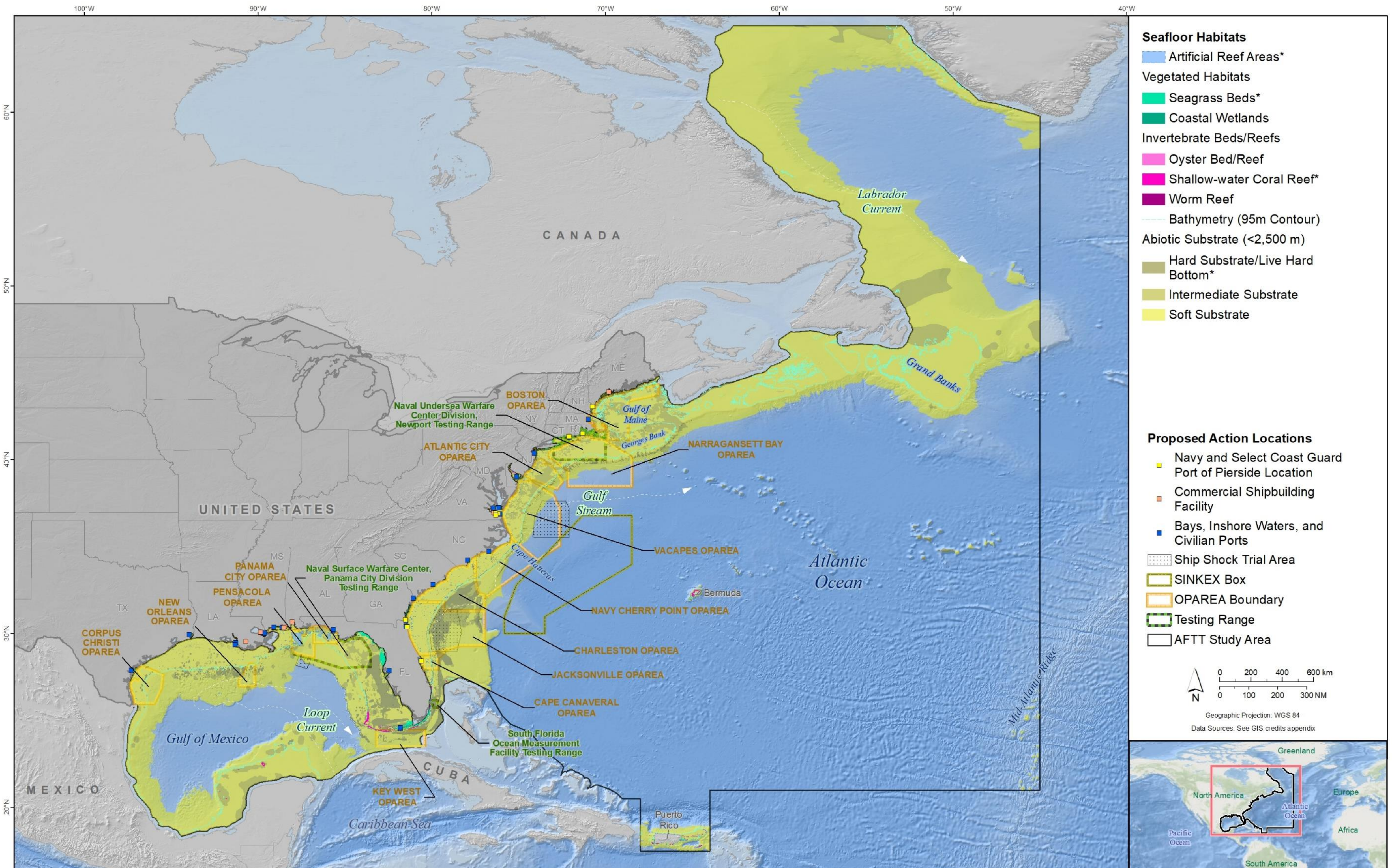
The distribution of fully submerged artificial features (shipwrecks and artificial reefs) varies among the training and testing locations in the Study Area, as summarized in Table 3.3-2 and depicted in Figure 3.3-1 through Figure 3.3-5 (artificial reef areas) and Figure 3.3-6 through Figure 3.3-10 (artificial feature points). Outside of national marine sanctuaries, the highest densities of both shipwrecks and artificial reefs are in the Naval Surface Warfare Center Panama City Testing Range. In the Study Area as a whole, there are close to 6,000 km^2 of designated artificial reef areas, and almost 17,000 mapped point features including 12,540 shipwrecks, 1,862 oil/gas platforms, 18 military towers, 6 wind turbines, and 2,632 unspecified obstructions (e.g., marker buoys). All of the inshore training areas and port/pier locations have artificial shoreline features (e.g., piers, seawalls).

Table 3.3-2: Shipwrecks and Designated Artificial Reefs in Training and Testing Locations of the Study Area

Training and Testing Locations	*Shipwreck <2,500 m Deep*		*Artificial Reef Areas*	
	Number	*Number per 100 km^2*	*Total Reef Area (km^2)*	*Percent of Location Area*
Range Complexes and Testing Ranges				
Northeast RC[1]	887	1.27	39.05	0.02%
VACAPES RC	563	3.71	77.24	0.08%
Navy Cherry Point RC	292	1.07	14.17	0.02%
JAX RC	372	0.35	545.95	0.30%
Key West RC	101	0.33	0.00	0.00%
GOMEX RC[1]	809	1.07	3,923.69	2.47%
NUWC Newport Testing Area[1]	728	2.87	7.79	0.02%
SFOMF	41	2.86	28.85	1.82%
NSWC Panama City Testing Area[1]	349	1.01	3,870.20	5.18%
Other Areas				
Other AFTT Areas[1]	0	0.00	0.00	0.00%
SINKEX Box[1]	N/A	N/A	0.00	0.00%
Northeast RC Inshore	91	24.83	0.00	0.00%
VACAPES RC Inshore	490	24.74	10.32	0.52%
JAX RC Inshore	23	N/A	0.00	0.00%
Key West RC Inshore	2	N/A	0.00	0.00%
GOMEX RC Inshore	125	10.99	0.34	0.03%

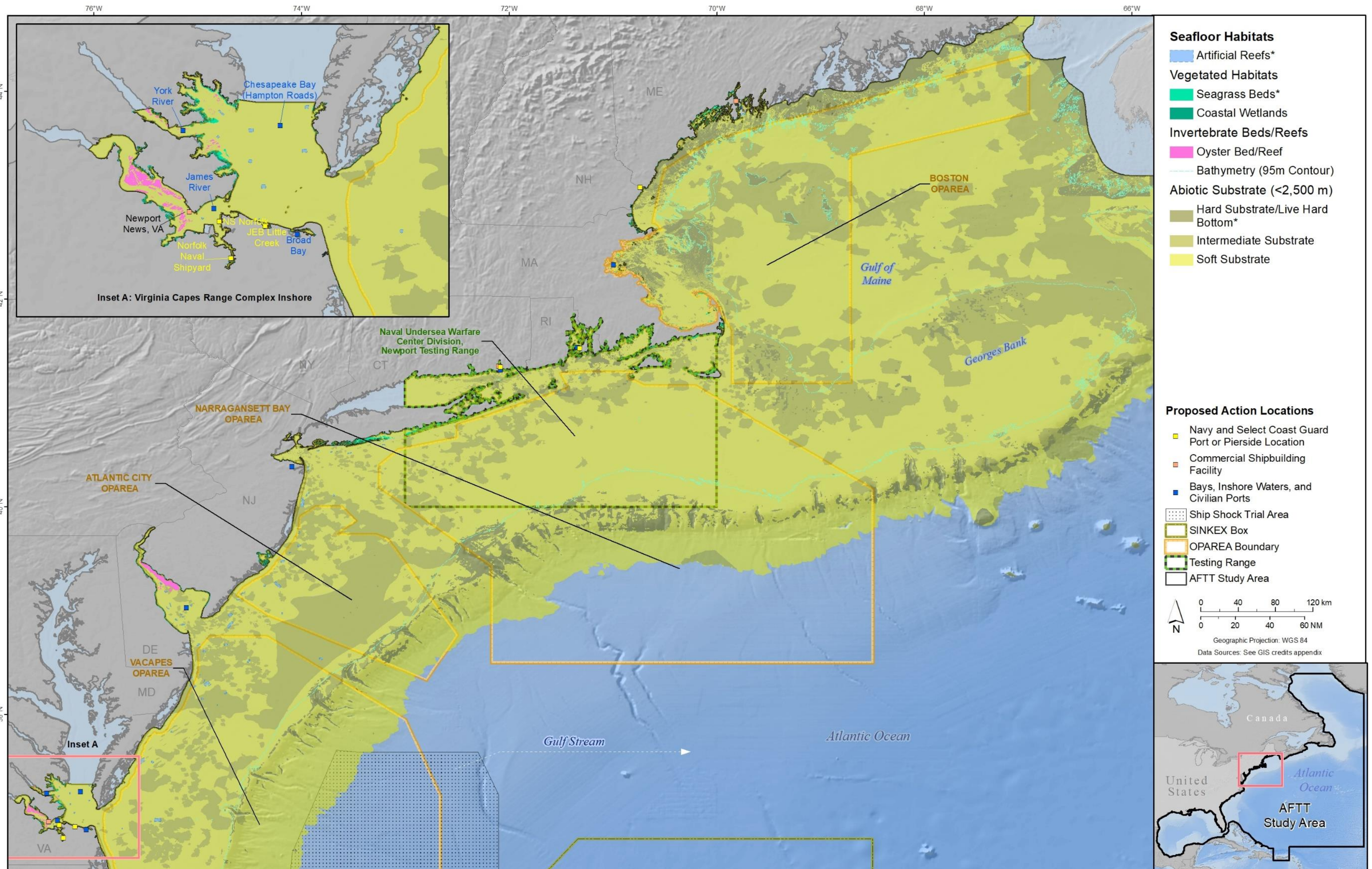
[1] Includes some overlaps with other locations.

Notes: % = percent; < = less than; AFTT = Atlantic Fleet Training and Testing; GOMEX = Gulf of Mexico; JAX = Jacksonville; km^2 = square kilometers; m = meters; N/A = not applicable (location area <100 km^2); NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility Testing Range; SINKEX = Sinking Exercise; VACAPES = Virginia Capes



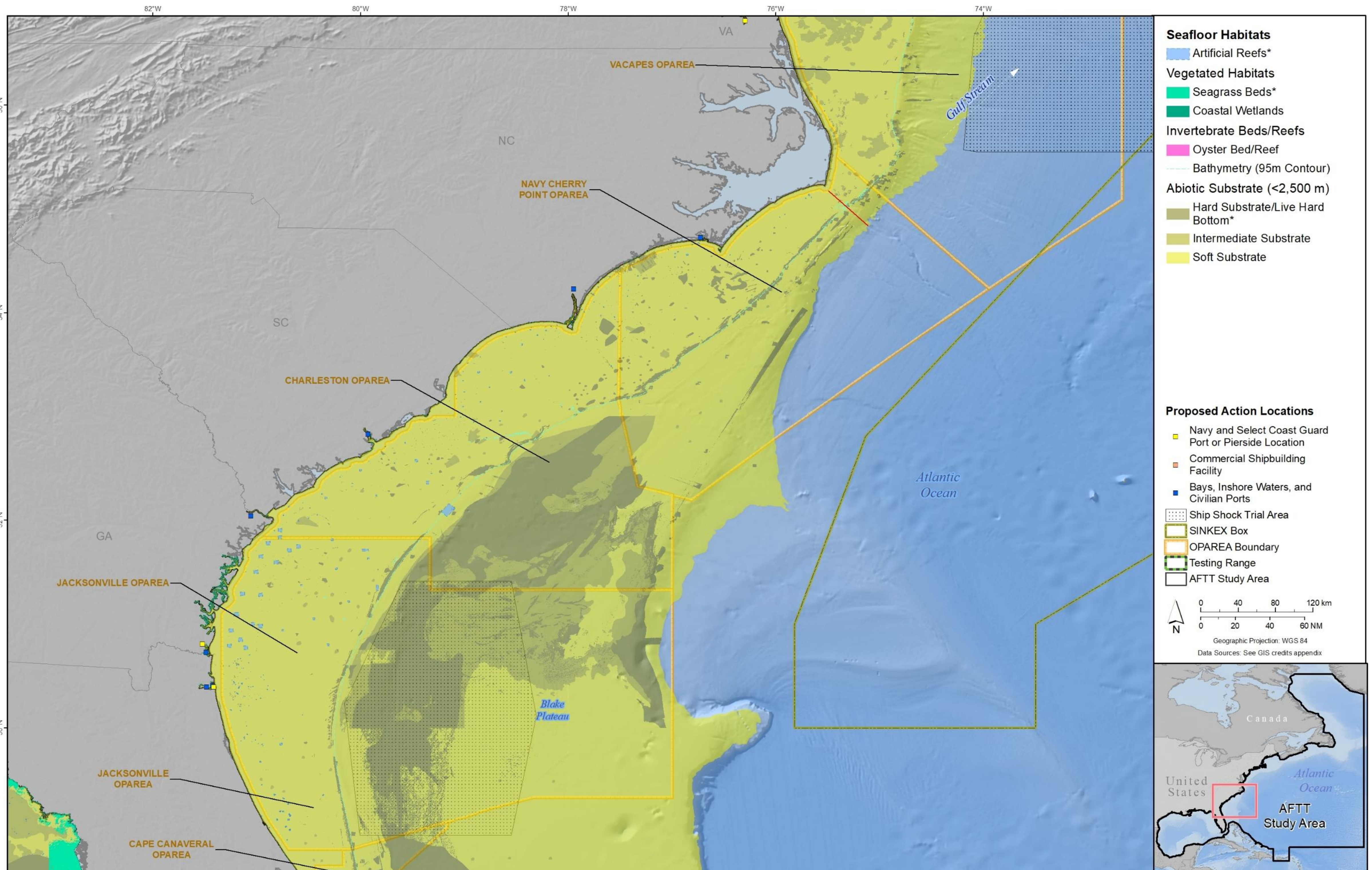
Notes: < = less than; * = Seafloor Resource Mitigation Area; AFTT = Atlantic Fleet Training and Testing; km = kilometer; m = meters; NM = nautical mile; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.3-1: Overview of Artificial Reef Areas and Bottom Habitats in the Study Area



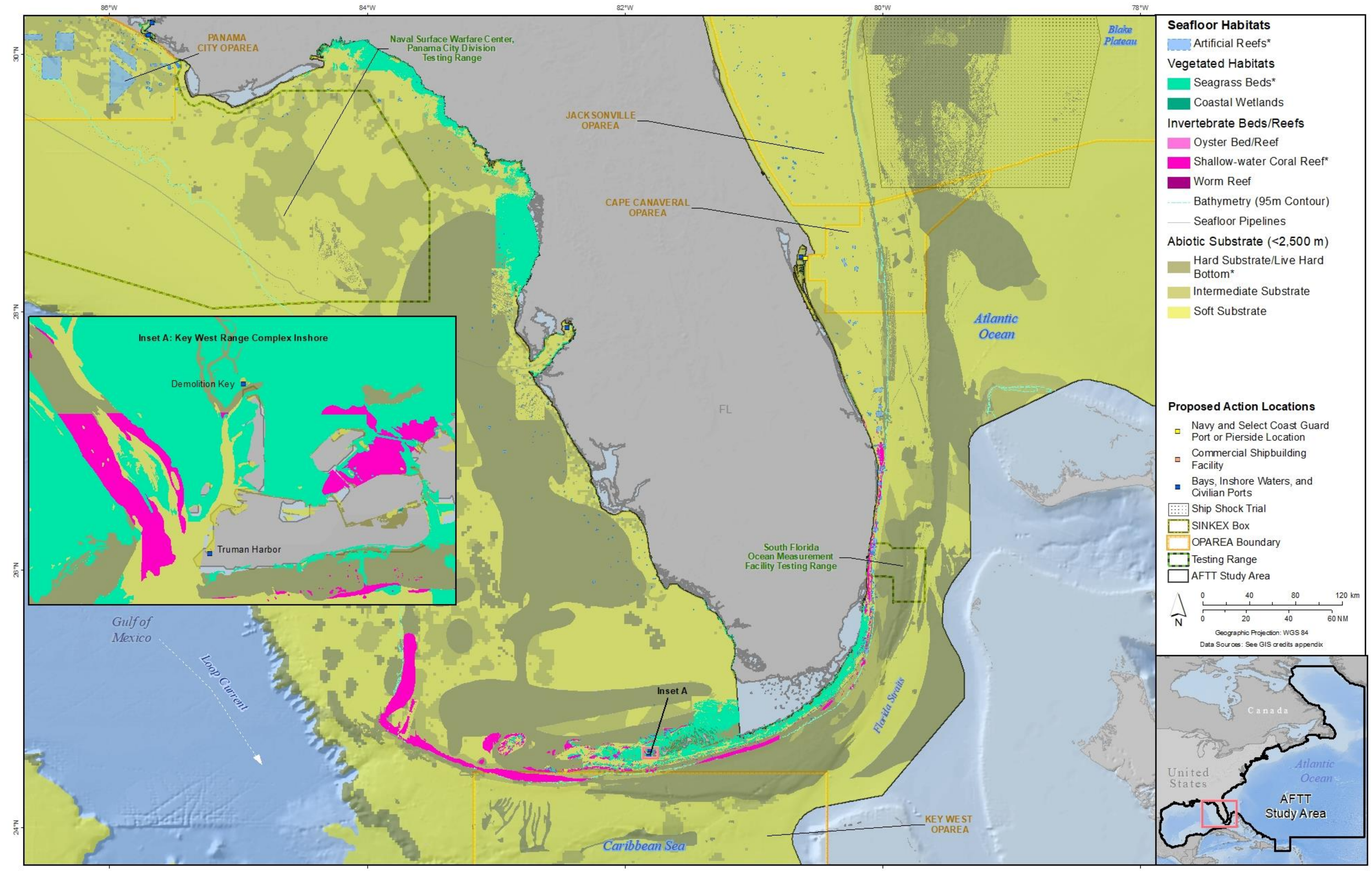
Notes: < = less than; * = Seafloor Resource Mitigation Area; AFTT = Atlantic Fleet Training and Testing; HAPCs = Habitat Areas of Particular Concern; km = kilometer; m = meters; NM = nautical mile; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.3-2: Artificial Reef Areas and Bottom Habitats in the Northeast Region of the Study Area



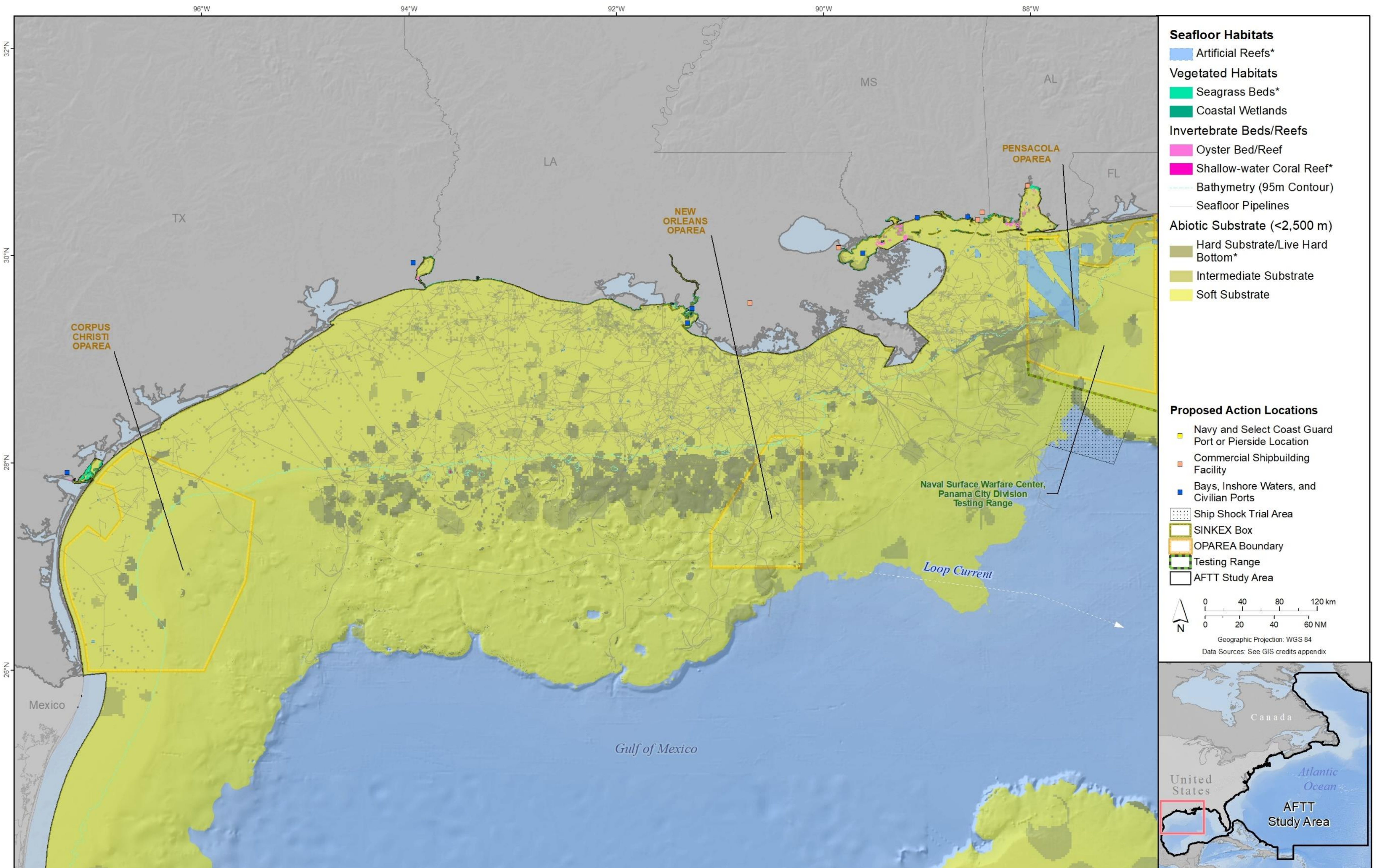
Notes: < = less than; * = Seafloor Resource Mitigation Area; AFTT = Atlantic Fleet Training and Testing; HAPCs = Habitat Areas of Particular Concern; km = kilometer; MPA = Marine Protected Area; m = meters; NM = nautical mile; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.3-3: Artificial Reef Areas and Bottom Habitats in the Southeast Region of the Study Area



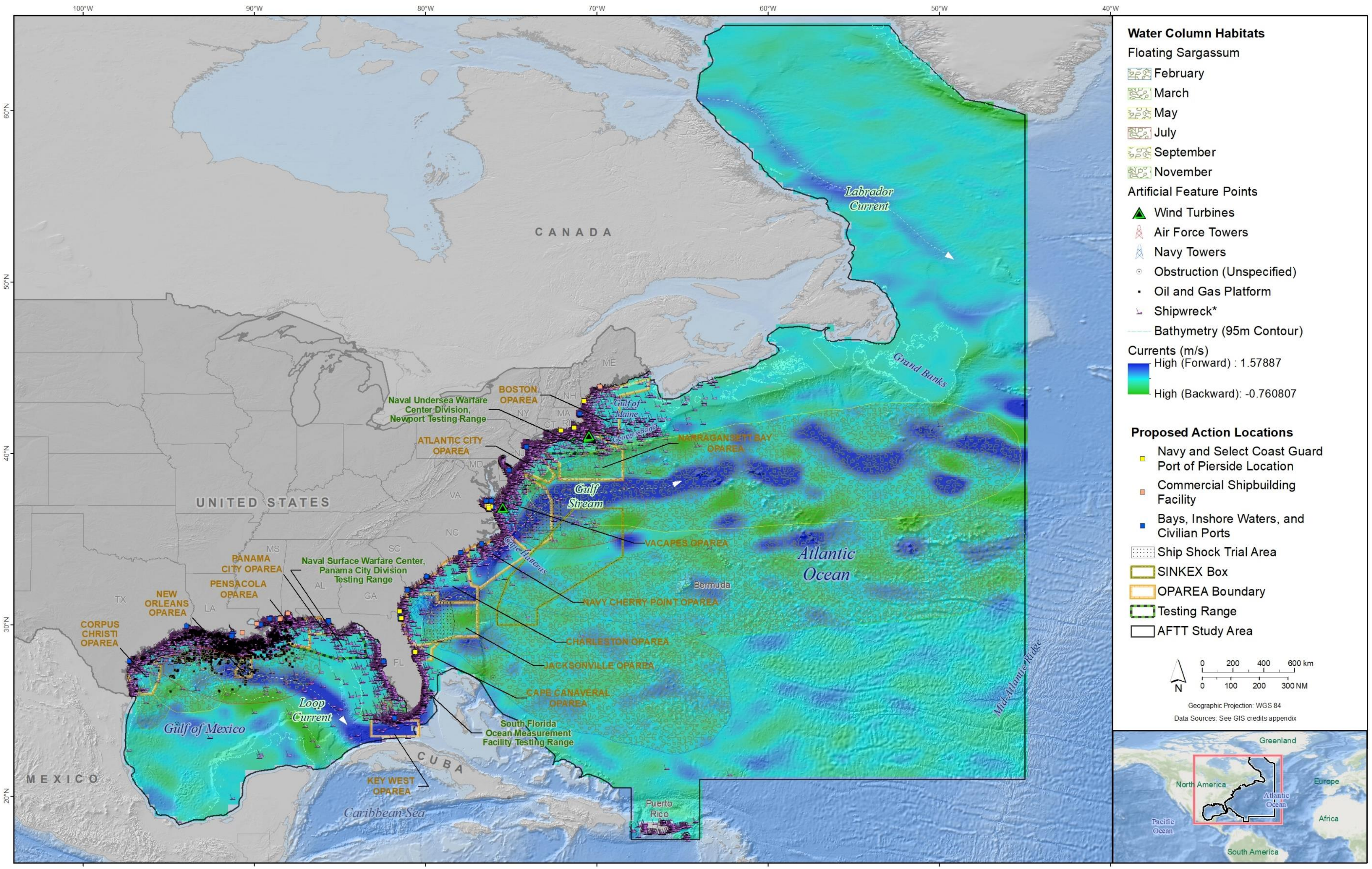
Notes: < = less than; * = Seafloor Resource Mitigation Area; AFTT = Atlantic Fleet Training and Testing; HAPCs = Habitat Areas of Particular Concern; km = kilometer; MPA = marine protected area; m = meters; NM = nautical mile; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.3-4: Artificial Reef Areas and Bottom Habitats in the South Florida Region of the Study Area



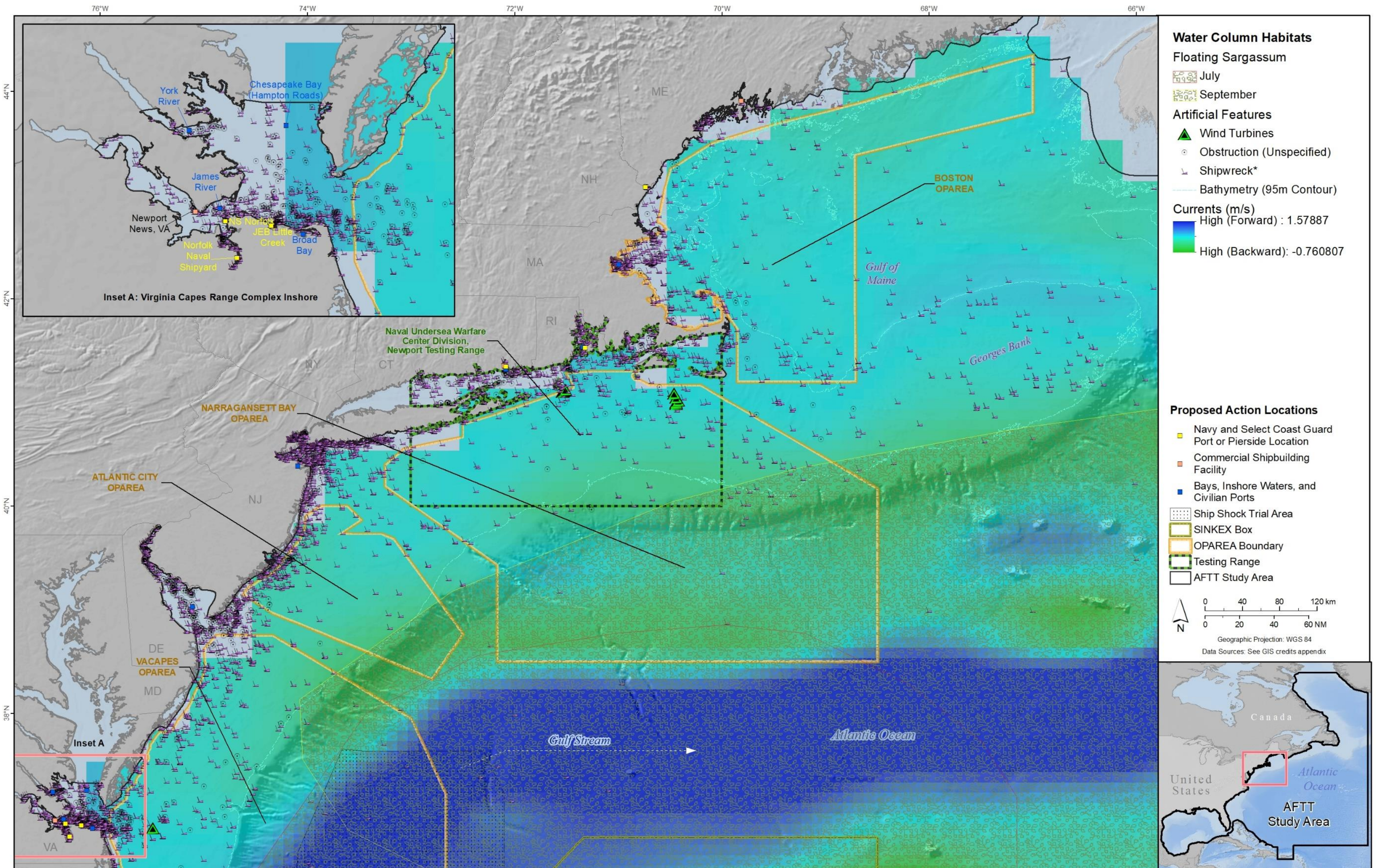
Notes: < = less than; * = Seafloor Resource Mitigation Area; AFTT = Atlantic Fleet Training and Testing; HAPCs = Habitat Areas of Particular Concern; km = kilometer; m = meters; NM = nautical mile; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.3-5: Artificial Reef Areas and Bottom Habitats in the Gulf of Mexico Region of the Study Area



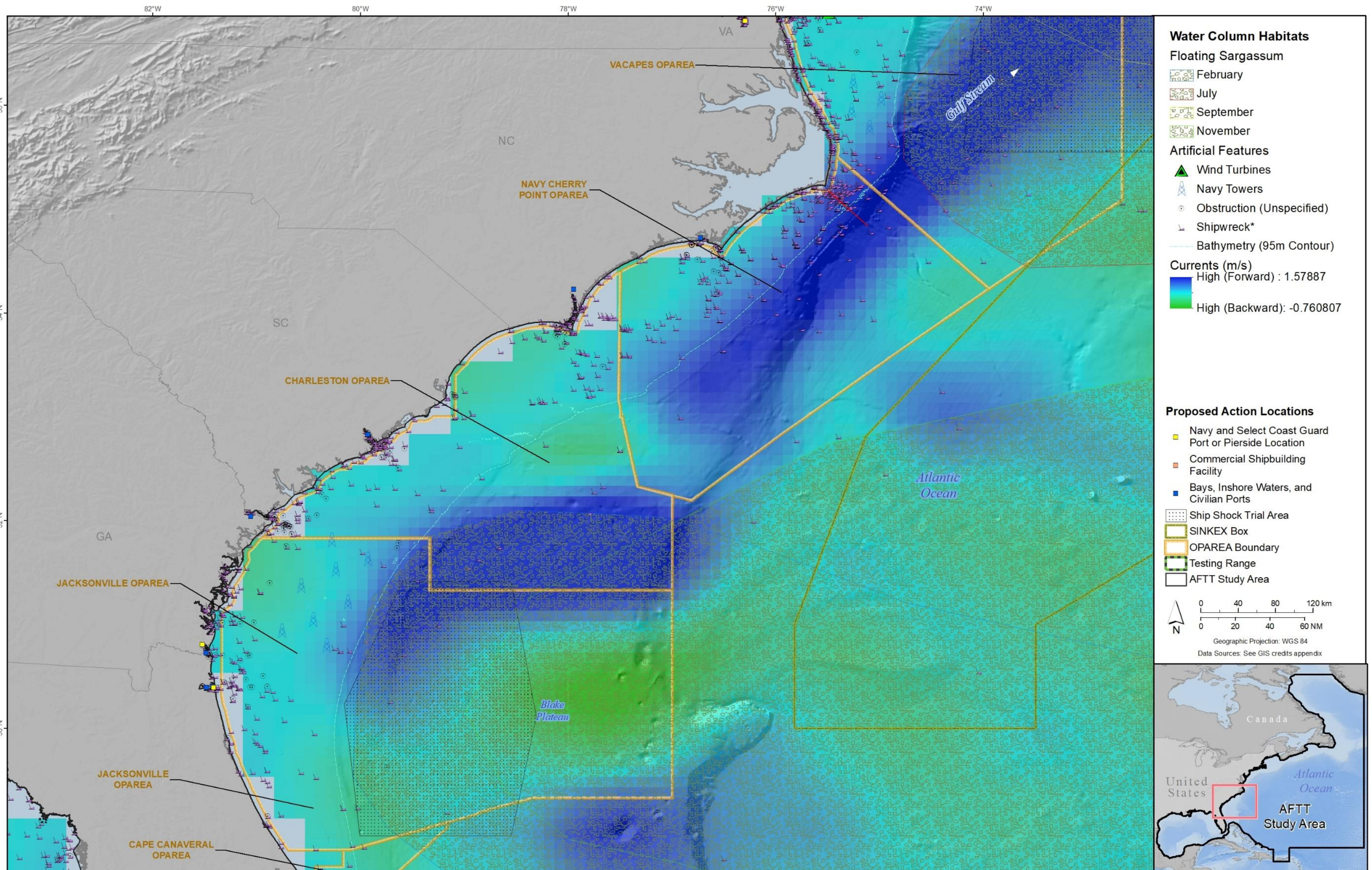
Notes: * = Seafloor Resource Mitigation Area; AFTT = Atlantic Fleet Training and Testing; km = kilometer; m = meters; m/s = meters per second; NM = nautical mile; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.3-6: Overview of Water Column Habitats and Artificial Features of the Study Area



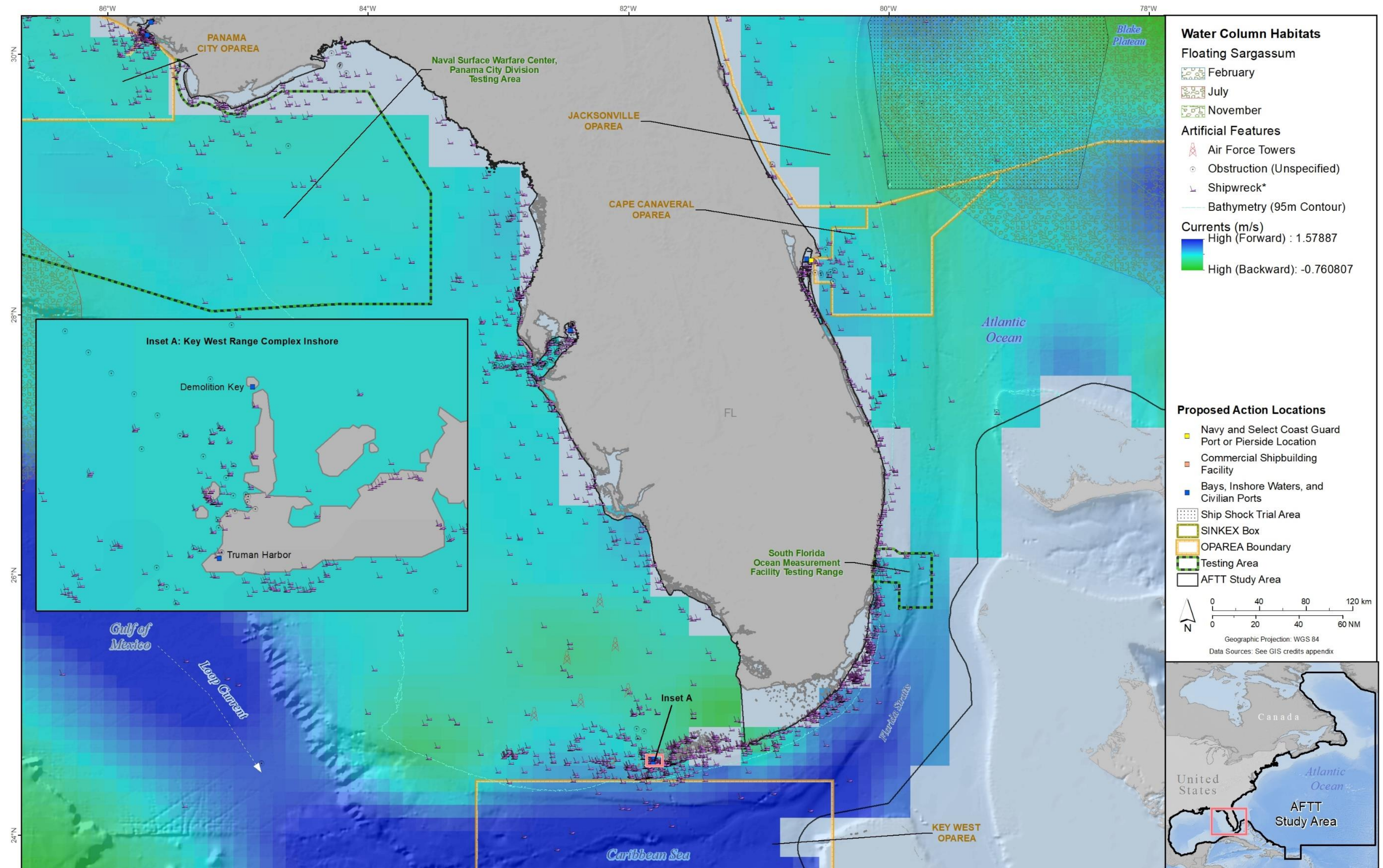
Notes: * = Seafloor Resource Mitigation Area; AFTT = Atlantic Fleet Training and Testing; m = meters; m/s = meters per second; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.3-7: Water Column Habitats and Artificial Features in the Northeast Region of the Study Area



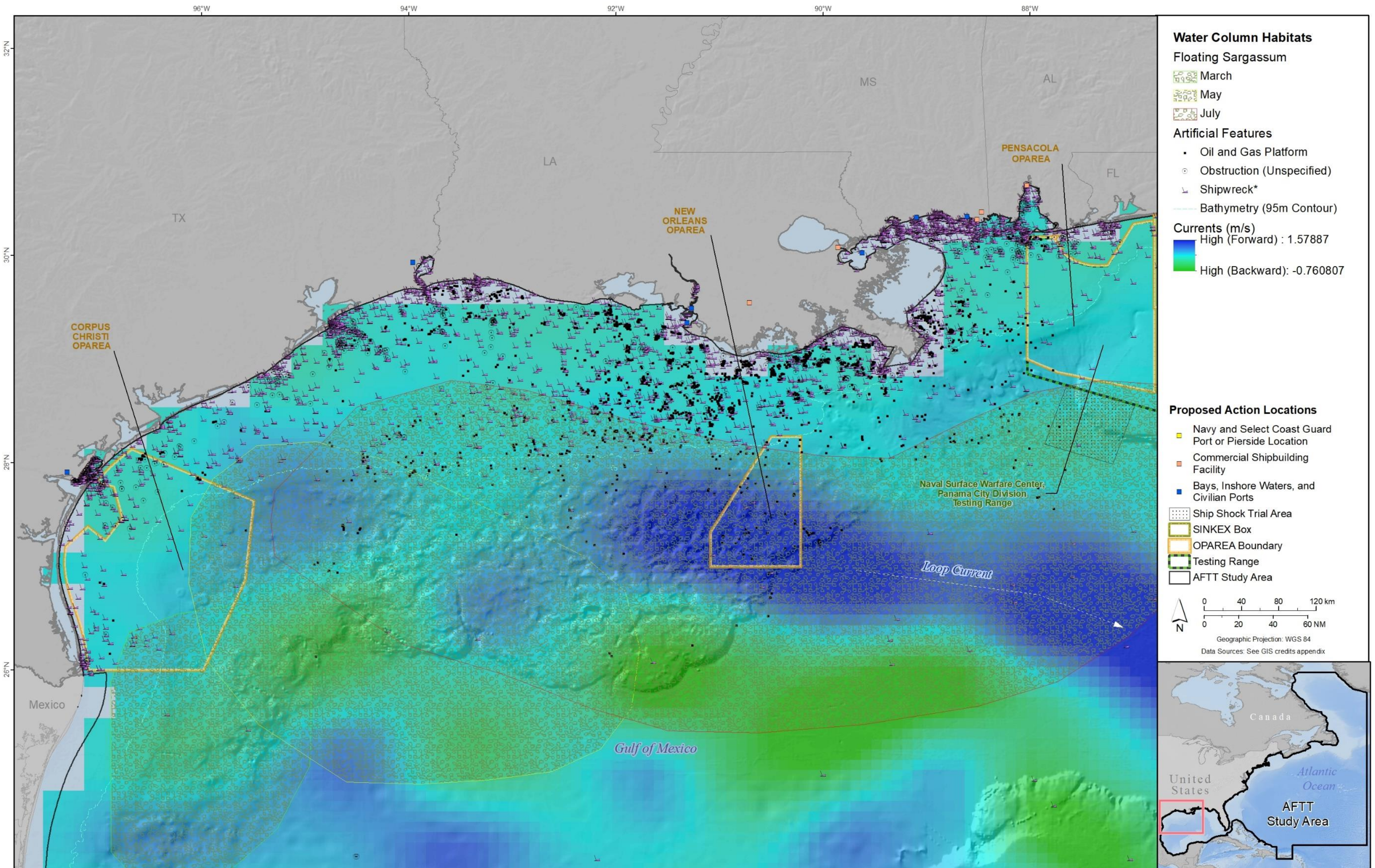
Notes: * = Seafloor Resource Mitigation Area; AFTT = Atlantic Fleet Training and Testing; km = kilometers; m = meters; m/s = meters per second; NM = nautical miles; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.3-8: Water Column Habitats and Artificial Features in the Southeast Region of the Study Area



Notes: * = Seafloor Resource Mitigation Area; AFTT = Atlantic Fleet Training and Testing; km = kilometers; m = meters; m/s = meters per second; NM = nautical mile; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.3-9: Water Column Habitats and Artificial Features in the South Florida Region of the Study Area



Notes: * = Seafloor Resource Mitigation Area; AFTT = Atlantic Fleet Training and Testing; km = kilometer; m = meters; m/s = meters per second; NM = nautical mile; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.3-10: Water Column Habitats and Artificial Features in the Gulf of Mexico Region of the Study Area

3.3.2.1.3 General Threats

The general threats to marine and estuarine habitats discussed in the 2018 Final EIS/OEIS include pressure from a variety of human activities, such as coastal development, shoreline stabilization, dredging, flood control and water diversion; destructive fishing practices; offshore energy and resource development and extraction; and global climate change. Updated information includes the following:

- Verification of numerous potential effects from the listed threats.
- The status of the listed threats, as well as emerging threats.

3.3.3 Environmental Consequences

Under the No Action Alternative, none of the proposed military readiness activities would be conducted. Therefore, baseline conditions of the existing environment for habitats would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities As a result, the No Action Alternative is not analyzed further in this section.

This following section describes and evaluates how and to what degree the activities and stressors described in Chapter 2 (Description of Proposed Action and Alternatives) and Section 3.0.3.3 (Identifying Stressors for Analysis) potentially impact abiotic habitats in the Study Area.

The stressors vary in intensity, frequency, duration, and location in the Study Area. The activities that involve each of the following stressors are identified in Appendix A (Activity Descriptions) and Appendix B (Activity Stressor Matrices). The stressors and substressors presented for analysis include the following:

- **explosives** (explosions in water)
- **physical disturbance and strikes** (vessels and in-water devices; military expended materials; seafloor devices; pile driving)

A discussion of the potential impacts of all the stressors combined is provided at the end of the section.

The stressors that are not analyzed further in this Supplemental EIS/OEIS include acoustic, energy, entanglement, and ingestion because they are relevant to only biological resources. The reasoning for not analyzing these stressors is summarized in the habitat synopsis with supporting details provided in the 2018 Final EIS/OEIS Section 3.05 (Habitats).

The analysis of potential impacts to habitat considers standard operating procedures and mitigation measures that would potentially provide protection to habitat. Standard operating procedures relevant to habitats (e.g., using explosives, operating vessels safely, placing seafloor devices for retrieval) are detailed in Appendix A (Section A.1.7, Standard Operating Procedures). Mitigation measures relevant to seafloor habitats are referenced in Table 3.3-3 and shown in Figure 3.3-2 to Figure 3.3-5. Details on all mitigation measures are provided in Chapter 5 (Mitigation).

Table 3.3-3: Mitigation Requirements Summary by Stressor for Habitats

Applicable Stressor	*Requirements Summary and Protection Focus*	*Section Reference*
Explosives	Restrictions on detonating explosives on or near the seafloor (e.g., explosive bottom-laid or moored mines) within a horizontal distance of 350 yards	Section 5.7.2 (Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck Mitigation Areas)

Table 3.3-3: Mitigation Requirements Summary by Stressor for Habitats (continued)

Applicable Stressor	*Requirements Summary and Protection Focus*	*Section Reference*
	from artificial reefs, live hard bottom[1], submerged aquatic vegetation, and shipwrecks.	
	Restrictions on detonating explosives use near shallow-water coral reefs is summarized in Section 3.5, (Invertebrates)[2]	Section 5.7.1 (Shallow-Water Coral Reef Mitigation Areas)
Physical disturbance and strike	Restrictions on: (1) setting vessel anchors (a seafloor device) within an anchor swing circle radius that overlaps artificial reefs, live hard bottom[1], submerged aquatic vegetation, and shipwrecks (except in designated anchorages) (2) placing other seafloor devices within a horizontal distance of 350 yards from artificial reefs, live hard bottom[1], submerged aquatic vegetation, and shipwrecks except in the South Florida Ocean Measurement Facility Seafloor Mitigation Area (3) deploying non-explosive ordnance against surface targets (including aerial-deployed mine shapes) within a horizontal distance of 350 yards from artificial reefs, live hard bottom[1], submerged aquatic vegetation, and shipwrecks	Section 5.7.1 (Shallow-Water Coral Reef Mitigation Areas)
	The Action Proponents will operate surface vessels in waters deep enough to avoid bottom scouring or prop dredging, with at least a 1-foot clearance between the deepest draft of the vessel (with the motor down) and the seafloor at mean low water.	Section 5.7.3 (Key West Range Complex Seafloor Mitigation Area)
	Requirements to: (1) operate surface vessels in waters deep enough to avoid bottom scouring or prop dredging, with at least a 1-foot clearance between the deepest draft of the vessel (with the motor down) and the seafloor at mean low water (2) use a real-time geographic information system and global positioning system (along with remote-sensing verification) during deployment, installation, and recovery of anchors and mine-like objects and during deployment of bottom-crawling unmanned underwater vehicles in waters deeper than 10 feet to avoid live hard bottom[1] (3) deploy seafloor devices from surface vessels while holding a relatively fixed position over the intended mooring or deployment location using a dynamic positioning navigation system with global positioning system (4) minimize surface vessel movement and drift in accordance with mooring installation and deployment plans and will conduct activities during	Section 5.7.4 (South Florida Ocean Measurement Facility Seafloor Mitigation Area)

Table 3.3-3: Mitigation Requirements Summary by Stressor for Habitats (continued)

Applicable Stressor	Requirements Summary and Protection Focus	Section Reference
	sea and wind conditions that allow vessels to maintain position and speed control during deployment, installation, and recovery of seafloor devices (5) not anchor surface vessels or moor over live hard bottom[1] (6) use semi-permanent anchoring systems that are assisted with riser buoys over soft bottom habitats to avoid contact of mooring cables any live hard bottom[1]	

[1] Includes shallow-water coral reefs as a type of live hard bottom.
[2] The mitigation was developed to protect shallow-water coral species, but also protects reef-associated species.

The criteria for determining the significance of an impact on habitats are described in Table 3.3-4. The abbreviated analysis under each substressor and alternative provides the technical support for these determinations, with reference to the 2018 Final EIS/OEIS or supporting appendices for details.

Table 3.3-4: Criteria for Determining the Significance of Proposed Action Stressors on Abiotic Habitats

Impact Descriptor	Context and Intensity	Significance Conclusions
Negligible	Impacts on habitat would be limited to temporary (lasting up to several hours) changes to physical characteristics of habitat (e.g., substrate distribution, topography, water flow). Impacts on habitat would not cause lasting damage or alteration.	Less than significant
Minor	Impacts would be temporary or short-term (lasting several days to several weeks) changes that would not be outside the natural range of variability in physical habitat characteristics. Impacts on habitat would be easily recoverable with no long-term or permanent damage or alteration.	Less than significant
Moderate	Impacts would be short-term or long-term (lasting several months or longer) changes that would be outside the natural range of variability in physical habitat characteristics. Habitat would be damaged or altered potentially over the long term but would continue to support the species dependent on it.	Less than significant
Major	Short-term or long-term changes well outside the limits of natural variability in physical habitat characteristics. Habitat would be degraded over the long term or permanently such that it would no longer possess sustainable habitat requirements.	Significant

With noted exceptions, the stressor background information and environmental consequences are not meaningfully different from what is described in the 2018 Final EIS/OEIS (Section 3.5.3, Environmental Consequences).

3.3.3.1 Explosive Stressors

Table 3.3-5 contains a brief summary of background information that is relevant to analyses of impacts from explosive stressors. Details on the updated information in general, as well as effects specific to each substressor, is provided in Appendix D (Acoustic and Explosive Impacts Supporting Information).

Table 3.3-5: Explosive Stressors Summary Background Information

Substressor	*Background Information Summary*
Explosions in the water	Explosions produce pressure waves with the potential to cause physical disturbance due to rapid pressure changes and other physical effects. • The physical properties of water column habitat could be impacted by in-water explosions, but only for instances in increased temperature and water motion within relatively small areas. The physical properties of shoreline habitats would be unaffected by explosives because they are not used on any shorelines in the Study Area. Bottom habitats could be impacted by in-water explosions on or near the bottom. • Most explosive detonations during training and testing involving the use of high-explosive munitions would occur in the air or near the water's surface outside of state coastal waters in water depths greater than 100 feet (30 meters) and would not impact the bottom. • In waters of the continental shelf, some explosive charges could occur near the surface, in the water column, or on the bottom and generally in specific locations devoid of underwater hazards. • An explosive charge would produce percussive energy that would be absorbed and reflected by the bottom. The specific size of explosive charge, crater depths, and crater widths would vary depending on the depth of the charge and substrate type. • On hard bottom, the explosive energy would be mostly reflected and there would be some conversion of hard substrate to soft or intermediate substrate. • On soft substrate types other than clay, the crater formed would be temporary (days to weeks), whereas craters in clay may persist for years.
Explosions in the air	Explosions in the air would not affect abiotic habitat due to the physical resilience of the medium (i.e., water, substrate) and lack of proximity to aquatic habitats.

The Action Proponents will implement mitigation measures tailored to reduce the impact of explosives in the water on abiotic habitats that feature sensitive living organisms, as identified in Table 3.3-3 and shown in Figure 3.3-1 through Figure 3.3-5. The proposed mitigation areas are shown in this section because they primarily address impacts on the seafloor habitat of biological resources.

3.3.3.1.1 Impacts from Explosives

Table 3.3-5 contains a summary of the background information used to analyze the potential impacts of explosives in the water on habitats. For information on explosive sizes and quantities for each alternative, see Table 3.0-5 (Explosive Sources Quantitatively Analyzed that Could Be Used Underwater or at the Water Surface).

In the unlikely event of underwater explosives use near unmapped hard bottom, some abiotic habitat for associated biological communities could be replaced with intermediate or soft bottom. The mitigation areas will reduce or eliminate the impact of bottom-placed explosives on hard substrate. Mapped sensitive habitat features within the Study Area only occur within mitigation areas (e.g., shallow-water coral reefs, live hard bottom), with the exception of Key West Range Complex Inshore. In those locations, the sensitive habitat features are not within a mitigation areas, but the explosive charges are very small and placed either on the seafloor or on a seafloor device (e.g., metal plate or steel frame) with the explosive energy directed upward.

3.3.3.1.1.1 Impacts from Explosives under Alternative 1

The use of explosives would generally decrease from the 2018 Final EIS/OEIS for both training and testing activities. Notably, for testing there would be no use of bin E17 (greater than 14,500 – 58,000 pounds [lb.] net explosive weight [NEW]) and reduced use of bin E16 (greater than 7,250 to 14,500 lb. NEW) for ship shock trials. There is also a reduction in use of most of the largest explosive bins for both training and testing, and an extremely large decrease in explosives associated with medium-caliber gunnery (bin E1 [0.1 to 0.25 lb. NEW]). Very few detonations would occur at inshore locations and would involve the use of smaller charge sizes (E5 or below). Additionally, small ship shock trials could occur in Virginia Capes, Jacksonville, or the Gulf of Mexico Range Complexes.

The annual impacts of explosive craters on shallow soft and intermediate substrate types from training and testing would be approximately 4.1 and 41.1 acres, respectively; for location-specific details, refer to Table I-1 (Potential Impact from Explosive Charges on or Near the Bottom for Military Readiness Activities under Alternative 1 and 2 in a Single Year) in Appendix I (Military Expended Materials and Direct Strike Impact Analysis). This represents less than a thousandth of one percent of available bottom habitat in any range complex. For comparison, the 2018 Final EIS/OEIS estimated 18 acres of impacted soft and intermediate substrate from training and testing annually. The craters created in mostly intermediate or soft substrate areas would disappear in less than a year. No mapped hard bottom would be impacted by bottom-placed explosives, per mitigation measures. Improvements in mapping have also reduced the potential for impacting unmapped hard bottoms.

Based on the relative footprint and location of underwater explosives use, and the general description of impacts, the effects of this substressor on abiotic habitats are not expected to result in significant changes in bottom habitat. Training events that include seafloor detonations would be infrequent, the percentage of the Study Area affected would be small, and the disturbed areas are likely soft bottom areas that recover relatively quickly from disturbance. Therefore, in-water explosions under Alternative 1 would mostly be limited to local and short-term impacts on abiotic habitats in the Study Area.

The analysis conclusions for underwater explosives use with training and testing activities under Alternative 1 are consistent with a moderate (due to potential damage to habitat) impact on abiotic habitats.

3.3.3.1.1.2 Impacts from Explosives under Alternative 2

Impacts from explosives in water under Alternative 2 are no different from Alternative 1 and therefore the impact conclusions are the same for both training and testing . The explosive sizes and numbers under Alternative 2 are the same as Alternative 1.

3.3.3.2 Physical Disturbance and Strike Stressors

Table 3.3-6 contains brief summaries of background information that is relevant to analyses of impacts for each physical disturbance and strike substressor (vessels and in-water devices, military expended materials, seafloor devices, and pile driving). The background information for physical disturbance and strike stressor effects on habitats in the Study Area as described in the 2018 Final EIS/OEIS (Section 3.4.3.4) has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS remains valid.

Table 3.3-6: Physical Disturbance and Strike Stressors Summary Background Information

Substressor	Background Information Summary
Aircraft and aerial targets	Impacts on aquatic habitats from aircraft and aerial targets are not applicable.
Vessels and in-water devices	In general, there would be a higher likelihood of vessels and in-water devices (e.g., unmanned underwater vehicles, recovered surface targets) impacting seafloor habitats in the coastal areas than in the open ocean portions of the Study Area because of the concentration of activities and the comparatively higher abundances of organisms in areas closer to shore. • In most cases, vessels and in-water devices would avoid contact with the bottom per standard operating procedures. The exception would be if the vessel/vehicle is designed to touch the bottom (e.g., amphibious vehicles). • Along more sheltered shorelines of bays and estuaries, vessels operating in shallow water can temporarily disturb sediments through propeller wash and actual contact with the bottom (Sargent et al., 1995; Stevenson et al., 1979); touching the bottom in shallow, soft bottom is a common practice among boaters that temporarily disturbs the substrate. • Along dynamic ocean shorelines where amphibious vehicles are used, the soft substrate (e.g., sand, shell) being disturbed would quickly recover to pre-disturbance conditions. • Wakes from small vessels in sheltered inshore waters may impact soft shorelines. For context, Navy vessels represent a small fraction of total maritime traffic (Mintz, 2016) and even less for Coast Guard vessels. For safety reasons, small vessels are not generally operated at excessive speeds close to shore and outside of navigation channels, and the wakes generated would have similar impacts as naturally occurring wind waves. • Neither propeller scarring nor erosion from vessel wakes are considered significant threats to marine or estuarine habitats compared to other threats (e.g., nutrient enrichment, shoreline development). For supporting information, refer to Appendix F (Biological Resources Supplemental Information), Section F.1 (Habitats).
Military expended materials	There is a wide range of military expended materials that may impact marine habitats due to settling or moving across the sea bottom. Before the item is buried or encrusted with marine growth, the impacts on abiotic habitat may include temporary increases in turbidity around the material and longer-term coverage of the underlying substrate with artificial materials. • In soft substrate the expended material may result in a depression, localized turbidity, or sediment redistribution resulting in scouring. Solid expended materials (e.g., bombs, shell casings) may also function as artificial hard bottom, although differences in texture and mineral content may result in species composition that is different from the surrounding area (e.g., more invasive species) (Perkol-Finkel et al., 2006; Ross et al., 2016). • On hard bottom or artificial structures, a direct strike is unlikely to occur with sufficient force to damage the substrate due to the dissipation of kinetic energy within the first few feet of the water column. • In shallower portions of the continental shelf, heavy materials would likely be covered by sediments in under a year (Inman & Jenkins, 2002). However, changes in the pattern of erosion and sedimentation on the bottom with intense storms and long-term shifts in currents can later expose military expended materials to some degree of mobility (e.g., World War II mines rolling up on beaches).

Table 3.3-6: Physical Disturbance and Strike Stressors Summary Background Information (continued)

Substressor	Background Information Summary
	• On deep ocean substrate under less energetic conditions, heavy expended materials would persist for longer on the substrate surface. The potential impact of such persistent materials on the deep ocean floor is minimized by a substantial decrease in size and density of benthic organisms as well as the relevance of structural differences in benthic habitat. For supporting information, refer to Appendix F (Biological Resources Supplemental Information), Section F.1 (Habitats). • Military expended materials that are less dense than the underlying substrate (e.g., decelerator/parachutes) have the potential to remain on the substrate surface for some time after sinking. The impact of lighter materials on substrates would be temporary and minor due to the mobility of such materials. The rare exception would be for some light materials (e.g., decelerator/parachute or wire/cable) that snag on structure bottom features. The potential for lighter materials to drift into shallow, inshore habitats from at-sea training and testing areas would be low based on the prevailing ocean currents depicted in Figure 3.3-6 through Figure 3.3-10. • Within the at-sea ranges, weapons firing and launch of munitions mostly occurs outside of state coastal waters. After striking the sea surface and falling relatively slowly through the water column, the impact of military expended materials on the seafloor would be on mostly soft substrate that is resilient to disturbance and would thus recover quickly in the event of a disturbance.
Seafloor devices	Seafloor devices are either stationary (e.g., mine shapes, anchors, bottom-placed instruments) or move very slowly along the bottom (e.g., bottom-crawling unmanned underwater vehicles) where they may temporarily disturb the bottom before being recovered. • Impacts may include temporary increases in turbidity around the device and temporary coverage and compaction of underlying substrate. • Although intentional placement of seafloor devices on bottom structure is avoided to ensure recovery, seafloor devices placed in depths less than about 2,500 meters may inadvertently impact habitat for live hard bottom communities. • Seafloor devices are most likely to impact habitats for soft and intermediate bottom communities that cover 84% of Study Area locations less than 2,500 meters deep (Table 3.3-1).
Pile driving	Pile driving and removal involves both impact and vibratory methods in soft substrate. Pile driving may have the potential to impact mostly benthic microalgae temporarily during driving, removal, and in the short term thereafter. The algae that grow on the pilings will also be removed when the piling is extracted.

Note: % = percent

The Action Proponents will implement mitigation measures tailored to reduce the impact of physical disturbance and strike on abiotic habitats that feature sensitive living organisms, as identified in Table 3.3-3 and shown in Figure 3.3-1 through Figure 3.3-5. The overlap of sensitive vegetation and mitigation areas varies by substressor, as described in the subsequent sections.

3.3.3.2.1 Impacts from Vessels and In-Water Devices

Table 3.3-6 contains a summary of the background information used to analyze the potential impacts of vessels and in-water devices on abiotic habitats. For information on the number of activities including vessels and in-water devices, see Table 3.0-9 (Number and Location of Activities Including Vessels) and Table 3.0-10 (Number and Location of Activities Including In-water Devices).

The mitigation requirements described in Table 3.3-3 for seafloor resources will reduce or eliminate the impact of vessel disturbance on or near shallow seafloor habitats in the Key West Range Complex (inshore and offshore locations) and the South Florida Ocean Measurement Facility Mitigation Areas.

3.3.3.2.1.1 Impacts from Vessels and In-Water Devices under Alternative 1

For both training and testing activities, vessel and in-water device activity decreased overall from the 2018 Final EIS/OEIS (Tables 3.0-9 and Table 3.0-10).

Under Alternative 1 for training:

- Vessel activity would occur in two locations that are new or not previously analyzed (Gulfport and Pascagoula, Mississippi, respectively). For all other locations, there would either be a decrease or similar amount of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in one location not previously analyzed (Northeast Range Complexes Inshore). For all other locations, there would either be a decrease, similar amount, or cessation of in-water device activity.

Under Alternative 1 for testing:

- Vessel activity would occur in five locations not previously analyzed (inshore locations of the Northeast, Virginia Capes, and Gulf of Mexico Range Complexes; Other AFTT Areas; Hampton Roads, Virginia). There would also be notable increases in vessel activity at the Naval Surface Warfare Center Panama City Division Testing Range, Naval Station Norfolk, and Pascagoula, Mississippi. For all other locations, there would either be a decrease or similar amount of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in four locations not previously analyzed (Gulf of Mexico Range Complex Inshore; Bath, Maine; Newport, Rhode Island; Pascagoula, Mississippi). For all other locations, there would either be a decrease or similar amount of in-water device activity.

For locations without a notable increase in vessel and in-water device activity, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.3.2 (Affected Environment) do not alter the analysis because the general distribution of substrate types among training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would remain valid because the infrequent and localized nature of vessel or in-water device activity remains an accurate characterization of the Proposed Action in those locations. Section 3.0 (Introduction) also describes high-speed vessel activity as similar to what was analyzed in the 2018 Final EIS/OEIS.

For the inshore testing locations that are new or not previously analyzed, standard operating procedures (e.g., vessel safety) and seafloor resource mitigation areas help reduce potential impacts in the shallow waters where more sensitive habitats are concentrated (e.g., oyster reefs in the Northeast Range Complexes Inshore). Furthermore, the locations not previously analyzed for testing were analyzed for training in the 2018 Final EIS/OEIS. The other locations not previously analyzed are port or pierside locations featuring artificial structures adjacent to bottom lacking sensitive habitats. These areas are also highly modified and disturbed due to human activity and frequent dredging.

Based on the relative amount and location of vessels and in-water devices and the general description of impacts, there would be (1) avoidance of artificial structures and hard bottom habitats; (2) quick recovery of soft bottom habitats that would likely be impacted; and (3) the short-term and localized disturbances of the water column (e.g., suspended sediment) and substrate (e.g., scarring) in shallow water.

The analysis conclusions for vessel and in-water device use with training and testing activities under Alternative 1 are consistent with a negligible impact on abiotic habitats.

3.3.3.2.1.2 Impacts from Vessels and In-Water Devices under Alternative 2

Impacts from vessels and in-water device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the impact conclusions are the same for both training and testing. The number of activities including vessels or in-water devices increases only slightly over that of Alternative 1.

3.3.3.2.2 Impacts from Military Expended Materials

Table 3.3-6 contains a summary of the background information used to analyze the potential impacts of military expended materials on abiotic habitats. For information on the type, number, and location of military expended materials, see Table 3.0-11 (Number and Location of Non-explosive Practice Munitions Expended during Military Readiness Activities), Table 3.0-12 (Number and Location of Explosives that May Result in Fragments during Military Readiness Activities), Table 3.0-13 (Number of Location of Targets Expended during Military Readiness Activities), Table 3.0-14 (Number and Location of Other Military Materials Expended during Military Readiness Activities), Table 3.0-17 (Number and Location of Wires and Cables Expended during Military Readiness Activities), and Table 3.0-18 (Number and Location of Activities Including Biodegradable Polymers during Testing).

The mitigation areas described in Table 3.3-3 will reduce or eliminate the potential impacts by locating some military expended materials away from reef-associated vegetation species in the Key West Range Complex (inshore and offshore locations) and South Florida Ocean Measurement Facility. Shallow-water coral reefs are also protected from direct strike in the South Florida Ocean Measurement Facility. Elsewhere in the Study Area, live hard bottom is not protected from strike from military expended materials. However, the impact is limited by the distance from shore (e.g., most heavy munitions limited to seaward of coastal waters) which places most impacts seaward of dynamic nearshore habitats.

3.3.3.2.2.1 Impacts from Military Expended Materials under Alternative 1

For both training and testing activities, the number of military expended materials decreased overall from the 2018 Final EIS/OEIS (Table 3.0-11 through Table 3.0-18).

Under Alternative 1 for training:

- Military expended materials would occur in one location not previously analyzed (Gulf of Mexico Range Complex Inshore), and there would be a notable increase in the Key West Range Complex Inshore from the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease, similar amount, or cessation of military expended materials.

Under Alternative 1 for testing:

- Military expended materials would occur in three locations not previously analyzed (Other AFTT Areas; Naval Submarine Base Kings Bay, and Port Canaveral, Florida) in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease or similar amount of military expended materials.

For locations without a notable increase in military expended materials, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.3.2 (Affected Environment) do not alter the analysis because the general distribution of substrate types among training and testing locations has not changed.

For locations not previously analyzed, the quantitative impact analysis that was conducted in the 2018 Final EIS/OEIS has been updated. Qualitative aspects of the analysis include the potential for lighter expended materials (e.g., decelerator/parachutes) to drift into sensitive marine habitats covered earlier in Table 3.3-6 both military readiness activities.

Impact analysis determined that the total bottom area affected by all military expended materials in all training areas would be about 69 and 77 acres annually for training and testing, respectively. The distribution of the impact footprints among habitat types is depicted in Figure 3.3-11. This represents less than a thousandth of one percent of available bottom habitat in any range complex. For comparison, the 2018 Final EIS/OEIS estimated 108 and 52 acres of impacted substrate from training and testing, respectively. The total area of each habitat type is estimated in Table 3.3-1 and the disturbed areas of each habitat type and location are estimated in Appendix I (Military Expended Materials and Direct Strike Impact Analysis, Tables I-2 and I-3, Potential Impacts to Bottom Habitat from Military Expended Materials for Training and Testing Activities under Alternative 1 in a Single Year). Expended material footprints coincide with relatively small areas of estuarine habitat within only the inshore training areas of the Northeast, Virginia Capes, and Gulf of Mexico Range Complexes.

Based on the relative amount, impact footprint, and location of military expended materials under Alternative 1 for training and testing and the general description of impacts, there would be (1) a limited spatial coincidence between impact footprints and the distribution of sensitive marine habitats (e.g., live hard bottom); (2) a quick recovery of the soft and intermediate substrate types that are more likely impacted; and (3) mostly short-term impacts from most local disturbances of the seafloor, with some temporary increase in suspended sediment in mostly soft bottom areas. The effects of this sub-stressor on abiotic substrate are therefore not expected to result in detectable changes in availability of abiotic habitats for biological resources.

The analysis conclusions for military expended materials from training activities under Alternative 1 are consistent with a negligible impact on abiotic habitats.

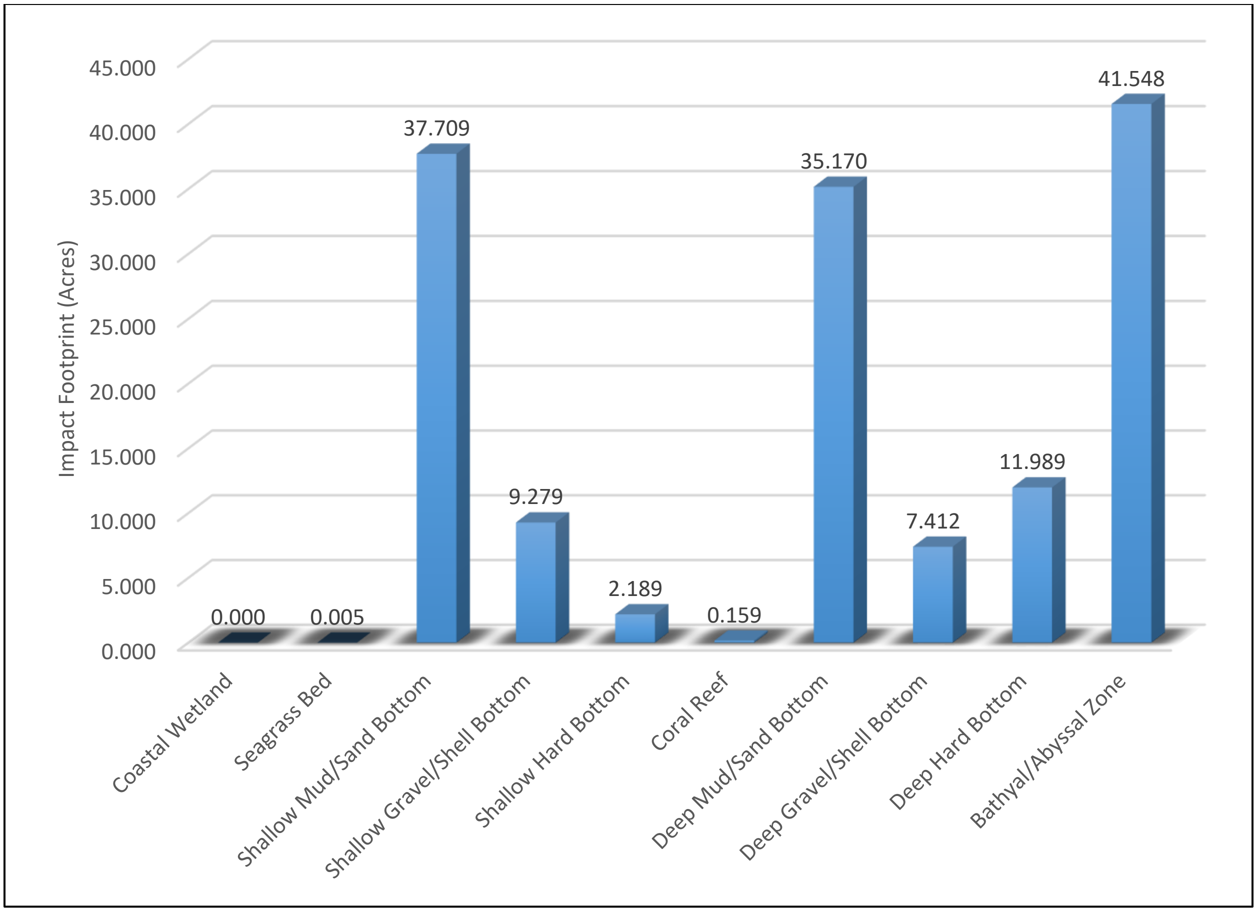


Figure 3.3-11: Total Footprint of Military Expended Materials Impacting Seafloor Habitats Among Study Area Locations from Training and Testing Activities under Alternative 1

3.3.3.2.2.2 Impacts from Military Expended Materials under Alternative 2

Impacts from military expended materials under Alternative 2 are not meaningfully different from Alternative 1 and therefore the impact conclusions are the same for both training and testing. The increase in footprint from Alternative 1 to 2 is only 0.026 acres and located mostly in the Gulf of Mexico Range Complex, with relatively small footprints in the other range complexes.

3.3.3.2.3 Impacts from Seafloor Devices

Table 3.3-5 contains a summary of the background information used to analyze the potential impacts of seafloor devices on abiotic habitats. For information on the type, number, and location of military expended materials, see Table 3.0-15 (Number and Location of Activities that Use Seafloor Devices).

The mitigation areas described in Table 3.3-3 will reduce or eliminate the potential impacts by locating most seafloor devices away from hard substrate habitats. Due to the prevalence of shallow-water hard coral species in the South Florida Ocean Measurement Facility, there is additional mitigation that ensures placement of seafloor devices away from sensitive habitats.

3.3.3.2.3.1 Impacts from Seafloor Devices under Alternative 1

For both training and testing activities, the proposed use of seafloor devices increased from the 2018 Final EIS/OEIS devices (Table 3.0-15).

Under Alternative 1 for training:

- Seafloor device use would occur in five locations that are new or not previously analyzed (Northeast Range Complexes; Other AFTT Areas; Jacksonville Range Complex Inshore, Naval Station Mayport, and Gulfport, Mississippi). There would also be notable increases in seafloor devices at the Virginia Capes Range Complex (offshore and inshore locations) and Key West Range Complex Inshore. For all other locations, there would either be a decrease, similar amount, or cessation of seafloor device use.

Under Alternative 1 for testing:

- Seafloor device use would occur in five locations not previously analyzed (Virginia Cape Range Complex Inshore, Key West Range Complex Inshore, Naval Submarine Base New London, Naval Station Mayport, and Port Canaveral, Florida). There would also be notable increases in seafloor devices in the Northeast and Jacksonville Range Complexes, and in the Naval Surface Warfare Center Panama City Division Testing Range. For all other locations, there would either be a decrease or similar amount of seafloor device use.

For locations without a notable increase in seafloor devices, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.3.2 (Affected Environment) do not alter the analysis because the general distribution of substrate types among training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of seafloor device activity remains an accurate characterization of the Proposed Action in those locations.

For the inshore locations not previously analyzed, standard operating procedures and seafloor resource mitigation areas help reduce potential impacts on sensitive marine habitats, as described earlier in this section (applies to mine shapes and other devices moored to the bottom). In the unlikely event of a seafloor device coinciding with live hard bottom, the impact would be negligible to the abiotic substrate.

Locations not previously analyzed include port or pierside locations. The new location of Gulfport, Mississippi, is a pierside location that is highly modified/disturbed due to human activity and frequent dredging and lack both seagrass beds and coastal wetlands.

Based on the relative amount, impact footprint, and location of seafloor device activity under Alternative 1 for training and testing and the general description of impacts, there would be: (1) a limited spatial coincidence between impact footprints and the distribution of sensitive marine habitats (e.g., live hard bottom); (2) a quick recovery of the soft and intermediate substrate types that are more likely impacted; and (3) only short-term impacts from most local disturbances of the seafloor, with some temporary increase in suspended sediment in mostly soft bottom areas. The effects of this substressor on abiotic substrate are therefore not expected to result in detectable changes in availability of abiotic habitats for biological resources.

The analysis conclusions for seafloor device use from training and testing activities under Alternative 1 are consistent with a negligible impact on abiotic habitats.

3.3.3.2.3.2 Impacts from Seafloor Devices under Alternative 2

Impacts from seafloor device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the impact conclusions are the same for both training and testing. The number of activities including seafloor devices under Alternative 2 would increase only slightly over Alternative 1.

3.3.3.2.4 Impacts from Pile Driving

Table 3.3-6 contains a summary of the background information used to analyze the potential impacts of pile driving on abiotic habitats. Only port damage repair training includes pile driving (see Table 3.0-4, Number of Piles/Sheets Quantitatively Analyzed under Pile Driving and Removal Training Activities).

3.3.3.2.4.1 Impacts from Pile Driving under Alternative 1

Under Alternative 1 for training:

- Pile driving would occur in one new location (Gulfport, Mississippi) that it did not occur in for the 2018 Final EIS/OEIS.
- Pile driving would no longer occur as part of the Elevated Causeway System at Joint Expeditionary Base Little Creek-Fort Story in the Virginia Capes Range Complex or Marine Corps Base Camp Lejeune in the Navy Cherry Point Range Complex.

There would be no pile driving or removal associated with testing activities.

While pile driving and removal may have the potential to impact soft bottom habitat, the impacts would be extremely limited since the number of piles is relatively small and the duration is short term. The activity would also occur in a highly disturbed estuarine habitat with mostly artificial shoreline which is dissimilar to the beach environments analyzed in the 2018 Final EIS/OEIS.

The analysis conclusions for pile driving for training under Alternative 1 are consistent with a minor impact on abiotic habitat.

3.3.3.2.4.2 Impacts from Pile Driving under Alternative 2

Impacts from pile driving during training under Alternative 2 are no different from Alternative 1 and therefore the impact conclusions are the same.

There would be no pile driving associated with testing activities.

3.3.3.3 Combined Stressors

As described in Section 3.0.3.5 (Resource-Specific Impacts Analysis for Multiple Stressors), this section evaluates the potential for combined impacts of all stressors from the Proposed Action. The analysis and conclusions for the potential impacts from each of the individual stressors are discussed in the sections above. Stressors associated with proposed military readiness activities do not typically occur in isolation but rather occur in some combination. For example, mine neutralization activities include elements of physical disturbance and explosive stressors that are all coincident in space and time. An analysis of the combined impacts of all stressors on abiotic habitat considers the potential consequences of additive stressors that were quantified in this section (i.e., explosive crater footprints, military expended materials footprints).

3.3.3.3.1 Combined Impacts of All Stressors under Alternative 1

The impact areas for in-water explosions and military expended materials were all much less than a thousandth of one percent of the total area of affected abiotic substrate types in any training or testing location over the course of a year, and the impacts are unlikely to persist beyond a year in most cases. Large and dense military expended materials (e.g., anchor blocks, large-caliber projectile casings, non-explosive bombs) settling on the bottom in deep water would be the most persistent on the substrate surface. In shallow, soft bottom habitats, heavier military expended materials would become buried in the shifting sediments in less than a year. Hard bottom habitats would recover over multiple years as the impacting military expended materials become overgrown with organisms from the surrounding environment.

The combined impact area of explosive and physical disturbance stressors proposed for training and testing events in Alternative 1 would have minimal impact on the ability of soft, intermediate, and hard substrate to serve their function as abiotic habitat. The total area of mapped live hard bottom in the Study Area (Figure 3.3-1 through Figure 3.3-5) dwarfs the estimated 14.3 acres of military expended material footprint impacting live hard bottom from both military readiness activities during a year (for location-specific details, refer to Appendix I, Military Expended Materials and Direct Strike Impact Analysis, Table I-4, Potential Impact to Bottom Habitat from Military Expended Materials for Military Readiness Activities Combined under Alternative 1 in a Single Year). For comparison, the 2018 Final EIS/OEIS estimated 17.5 acres of military expended material footprint impacting live hard bottom from both military readiness activities during a year. Explosive craters would not impact mapped live hard bottom, per mitigation measures covered earlier in this section.

Of the total 145-acre footprint of military expended materials from military readiness activities during a year, the vast majority would be to soft and intermediate substrate (90 acres) or the bathyal-abyssal zone (42 acres). For comparison, the 2018 Final EIS/OEIS estimated a 160-acre footprint of military expended materials during a year. Explosive craters would add approximately 47 acres for a total of 196 acres of impacted seafloor. The distribution of total impacts among habitat types is presented in Figure 3.3-12 (for location-specific details, refer to Appendix I, Military Expended Materials and Direct Strike Impact Analysis, Table I-1 through Table I-4). For comparison, the 2018 Final EIS/OEIS estimated a total impacted seafloor area of 178 acres. Whereas the differences between this Supplemental EIS/OEIS and the 2018 Final EIS/OEIS appear substantial, the explosive crater footprints are likely overestimated considering there is frequent overlap of footprints in specific locations typically used for associated activities (e.g., explosive ordnance disposal, mine neutralization).

The combined impact of all stressors from Alternative 1 are considered moderate (due to limited potential for damage to habitat) on abiotic habitats.

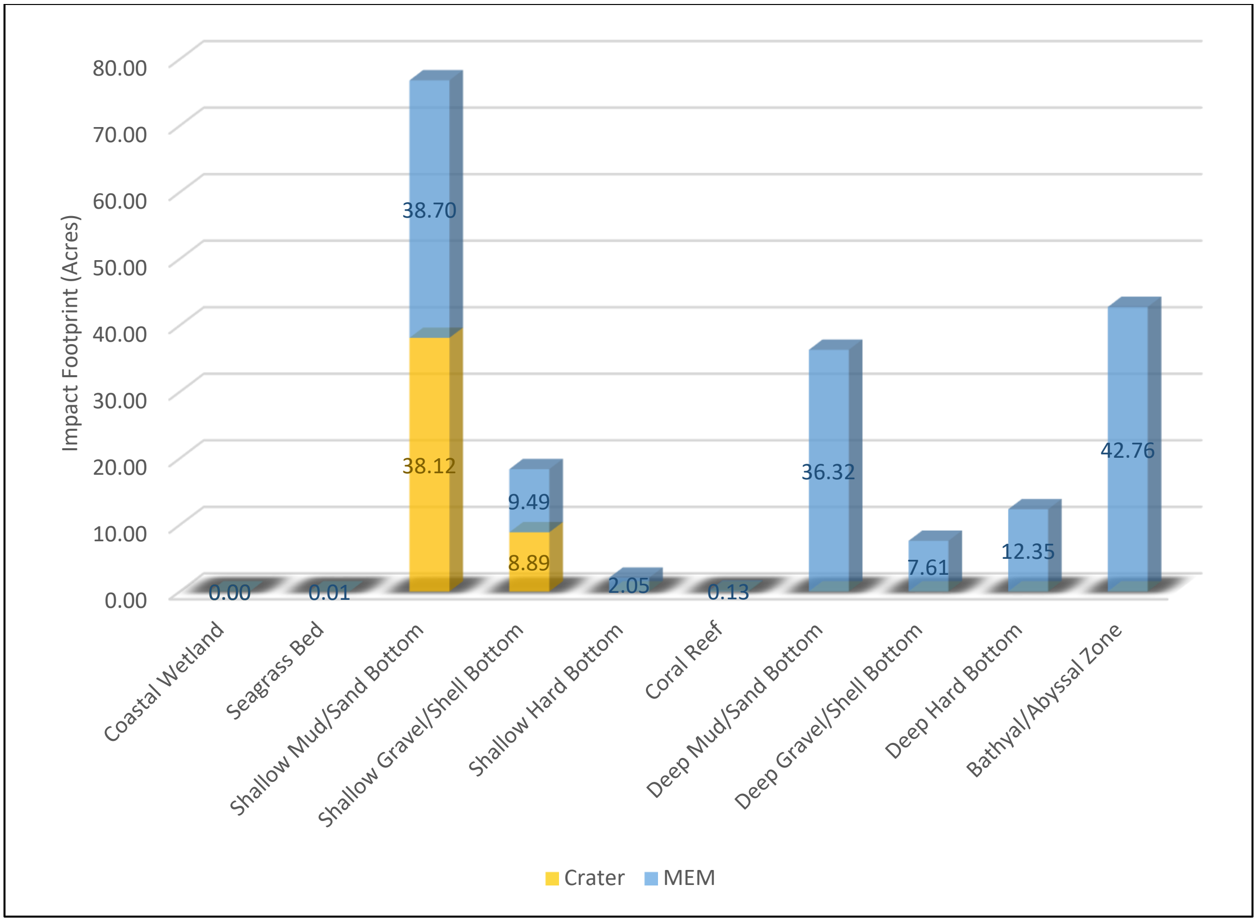


Figure 3.3-12: Total Combined Footprint of Military Expended Materials and Explosive Craters Impacting Seafloor Habitats Among Study Area Locations under Alternative 1

3.3.3.3.2 Combined Impacts of All Stressors under Alternative 2

The combined impacts of stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the impact conclusions are the same for both training and testing.

References

Allee, R. J., M. Dethier, D. Brown, L. Deegan, R. G. Ford, T. F. Hourigan, J. Maragos, C. Schoch, K. Sealey, R. Twilley, M. P. Weinstein, and M. Yoklavich. (2000). *Marine and Estuarine Ecosystem and Habitat Classification*. Silver Spring, MD: National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. (1979). *Classification of Wetlands and Deepwater Habitats of the United States*. Washington, DC: U.S. Fish and Wildlife Service.

Federal Geographic Data Committee. (2012). *Coastal and Marine Ecological Classification Standard*.

Inman, D. L. and S. A. Jenkins. (2002). *Scour and burial of bottom mines*. La Jolla, CA: Integrative Oceanography Division Scripps Institution of Oceanography University of California, San Diego.

Kendall, M. S., M. E. Monaco, K. R. Buja, J. D. Christensen, C. R. Kruer, M. Finkbeiner, and R. A. Warner. (2001). *Methods Used to Map the Benthic Habitats of Puerto Rico and the U.S. Virgin Islands*. Silver Spring, MD: National Oceanic and Atmospheric Administration, National Ocean Service, National Centers for Coastal Ocean Science Biogeography Program.

Mintz, J. D. (2016). *Characterization of Vessel Traffic in the Vicinities of HRC, SOCAL, and the Navy Operating Areas off the U.S. East Coast*. Alexandria, VA: Center for Naval Analyses.

Perkol-Finkel, S., N. Shashar, and Y. Benayahu. (2006). Can artificial reefs mimic natural reef communities? The roles of structural features and age. *Marine Environmental Research 61* 121–135. DOI:10.1016/j.marenvres.2005.08.001

Ross, S. W., M. Rhode, S. T. Viada, and R. Mather. (2016). Fish species associated with shipwreck and natural hard-bottom habitats from the middle to outer continental shelf of the Middle Atlantic Bight near Norfolk Canyon. *Fishery Bulletin 114* (1): 45–57. DOI:10.7755/FB.114.1.4

Sargent, F. J., T. J. Leary, D. W. Crewz, and C. R. Kruer. (1995). *Scarring of Florida's Seagrasses: Assessment and Management Options*. St. Petersburg, FL: Florida Department of Environmental Protection.

Stevenson, J., C. Piper, and N. Confer. (1979). *Decline of Submerged Plants in Chesapeake Bay*. U.S. Fish and Wildlife Service, Chesapeake Bay Field Office.

U.S. Department of the Navy. (2024). *Phase IV Atlantic Fleet Training and Testing: Marine Habitat Database Technical Report*.

United Nations Educational Scientific and Cultural Organization. (2009). *Global Open Oceans and Deep Seabed—Biogeographic Classification*. Paris, France: UNESCO - IOC.

Valentine, P. C., B. J. Todd, and V. E. Kostylev. (2005). Classification of Marine Sublittoral Habitats, with Application to the Northeastern North America Region. *American Fisheries Society Symposium 41* 183–200.

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3.4 Vegetation

VEGETATION SYNOPSIS

The Action Proponents considered the stressors to vegetation that could result from the Proposed Action in the Study Area. The following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Acoustics: There is no evidence that underwater acoustic stressors impact marine vegetation. Acoustic stressors, therefore, are not analyzed for vegetation.
- Explosives: Explosives could affect vegetation by destroying individual plants or damaging parts of plants; however, there would be no persistent or large-scale effects on the growth, survival, distribution or structure of vegetation due primarily to the avoidance of sensitive habitats (e.g., hard bottom/seaweed habitat, seagrass beds, floating *Sargassum*) and recovery of relatively small areas of disturbed vegetation.
- Energy: Energy stressors are not applicable to vegetation because vegetation has a limited sensitivity to energy stressors and therefore will not be analyzed further in this section.
- Physical disturbance and strike: Physical disturbance and strike could affect vegetation by destroying individual plants or damaging parts of plants; however, there would be no persistent or large-scale effects on the growth, survival, distribution or structure of vegetation due to relatively fast growth, resilience, abundance of the most affected species (e.g., microalgae, seaweed), and vessel clearance over sensitive habitats per mitigation area requirements.
- Entanglement: Entanglement stressors are not applicable to vegetation due to the non-mobile nature of plant-life and are not analyzed further in this section.
- Ingestion: Ingestion stressors are not applicable to vegetation that uses photosynthesis to obtain necessary nutrients. The many species of microscopic algae that ingest other algae (i.e., mixotrophic phytoplankton) would be unaffected due to their vast populations, fast growth, and resilience. Therefore, the ingestion stressors are not analyzed further in this section.

3.4.1 Introduction

The following sections describe the vegetation found in the Study Area and evaluate the potential impacts of the proposed military readiness activities on them. Impacts to vegetation from the Proposed Action were analyzed in the 2018 Final EIS/OEIS. The primary changes from the analysis are provided where they apply in subsequent sections.

3.4.2 Affected Environment

The affected environment provides the context for evaluating the effects of the Action Proponents' military readiness activities on marine vegetation. With noted exceptions, the general background for vegetation in the Study Area is not meaningfully different from what is described in the 2018 *Final*

Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement (hereinafter referred to as the 2018 Final EIS/OEIS) (Section 3.4.2.1, General Background). See Appendix F (Biological Resources Supplemental Information) for detailed information on the affected environment of vegetation.

The Study Area is generally consistent with that analyzed in the 2018 Final EIS/OEIS. Additions to the Study Area include pierside training and testing events and transit along established navigation channels from pierside locations to offshore range complexes in the Gulf of Mexico. United States (U.S.) Coast Guard activities are similar in nature to Navy activities and fall under the same stressor categories.

3.4.2.1 General Background

Vegetation in the Study Area comprises many thousands of species of plants spanning many taxonomic groups (taxonomy is a method of classifying and naming organisms).

There is updated information regarding the number and population status of species in the Study Area. However, a change in the number of species does not directly affect the analysis and conclusions.

3.4.2.1.1 Habitat Use

Habitat use varies by taxonomic groups and is described in terms of water column (e.g., phytoplankton, floating *Sargassum*), bottom (e.g., benthic macroalgae, seagrasses), or shores (e.g., coastal wetlands). A more detailed description of taxonomic groups and their location/habitat use in the Study Area is provided in Section 3.4.2.3 (Species Not Listed under the Endangered Species Act). Updated information includes the following:

- A refinement of the depth limits of vegetation in the Study Area; depth limits of benthic macroalgae and seagrass have been reduced from 200 and 90 meters (m) to 95 and 30 m, respectively (Clark et al., 2014; Duarte et al., 2007; Reed et al., 2019; Smith Jr., 1981; Vadas & Steneck, 1988).
- Inclusion of some additional data sources regarding the distribution of vegetated habitat types in the Study Area. Comprehensive mapping is provided in Section 3.3 (Habitats), Figure 3.3-1 through Figure 3.3-5 (showing seafloor habitats) or Figure 3.3-6 through Figure 3.3-10 (showing water column habitats).

3.4.2.1.2 General Threats

The general threats to marine vegetation include human activities (industrial, residential, and recreational activities) and natural occurrences (e.g., storms, surf, and tides). Human-caused stressors that act on marine vegetation include excessive nutrient input (such as fertilizers), siltation (the addition of fine particles to the ocean), pollution (oil, sewage, trash), climate change, fishing practices, shading from structures, habitat degradation from construction and dredging, and introduced or invasive species. Updated information includes the following:

- Verification of numerous potential effects from the listed threats.
- The status of the listed threats, as well as emerging threats.

3.4.2.2 Endangered Species Act-Listed Species

There are no vegetation species occurring in the Study Area that are listed under the Endangered Species Act (ESA) or officially proposed for listing. Previously listed Johnson's seagrass, *Halophila johnsonii*, was removed from listing under the ESA by the National Marine Fisheries Service (87 *Federal Register* 22137, May 16, 2022).

3.4.2.3 Species Not Listed under the Endangered Species Act

Table 3.4-1 provides general descriptions of major vegetation groups and their location/habitat use in the Study Area. Updated information on vegetation is provided in Appendix F (Biological Resources Supplemental Information). None of the updated information affects the analysis directly.

Table 3.4-1: Major Groups of Vegetation in the Study Area

Marine Vegetation Groups		***Habitats: Locations in the Study Area***		
Common Name[1] (Taxonomic Group)	***Description***	***Range Complex/Testing Range***	***Range Complex Inshore***	***Ports/Piers/ Coast Guard Stations***
Coccolithophores (phylum Haptophyta [Chrysophyta, Prymnesiophyceae])	Microalgae; single-celled marine phytoplankton	Water column < 200 meters: All locations	Water column: All locations	
Diatoms (phylum Ochrophyta [Heterokonta, Chrysophyta, Bacillariophyceae])			Water column and seafloor: All locations	
Blue-green algae (phylum Cyanobacteria)				
Dinoflagellates (phylum Dinophyta [Pyrrophyta])				
Red algae (phylum Rhodophyta)	Red microalgae	Water column < 200 meters: All locations	Water column and seafloor: All locations	
	Benthic macroalgae[2]; multi-celled large algae with leafy (i.e., seaweed) and layered growth forms	Hard bottom/Artificial structures < 95 meters: All locations	Hard bottom/Artificial structures: All locations	Artificial structures: All locations
Green algae (phylum Chlorophyta)	Green microalgae	Water column < 200 meters: All locations	Water column and seafloor: All locations	
	Benthic macroalgae[2] that form sheets or branching structures	Hard bottom/Artificial structures < 95 meters: All locations	Hard bottom/Artificial structures: All locations	Artificial structures: All locations
Brown algae (phylum Phaeophyta [Ochrophyta])	Floating macroalgae with only leafy growth forms (e.g., *Sargassum*)[2]	Water column Surface: All locations	Not present: All locations	
	Benthic macroalgae with only leafy or	Hard bottom/Artificial structures	Hard bottom/Artificial structures:	Artificial structures: Groton, CT

Table 3.4-1: Major Groups of Vegetation in the Study Area (continued)

Marine Vegetation Groups		***Habitats: Locations in the Study Area***		
Common Name[1] (Taxonomic Group)	***Description***	***Range Complex/Testing Range***	***Range Complex Inshore***	***Ports/Piers/ Coast Guard Stations***
	stringy growth forms (e.g., kelp)[2]	< 40 meters: Northeast RC NUWC Newport Testing Range	Northeast RC Inshore	Newport, RI Boston, MA Bath, ME
Vascular plants (phylum Tracheophyta)	Seagrasses[2]; grasses that grow fully submerged in sheltered waters of the Study Area	Soft seafloor < 30 meters: Key West RC	Soft seafloor < 5 meters: All Locations	Not present: All locations
	Coastal wetlands[2]; marsh grasses or mangroves bordering sheltered, inshore waters of the Study Area	Not present: All locations	Soft shores: all locations (mostly marsh grasses)	Not present: All locations

[1] Taxonomic groups are based on Roskov et al. (2015) and Ruggiero & Gordon (2015). Alternative classifications are in brackets. Phylum and division may be used interchangeably.
[2] Taxonomic group contains species forming Essential Fish Habitats.
Notes: < = less than; CT = Connecticut; GOMEX = Gulf of Mexico; MA = Massachusetts; ME = Maine; NUWC = Naval Undersea Warfare Center; RC = Range Complex; RI = Rhode Island; VACAPES = Virginia Capes

3.4.3 Environmental Consequences

Under the No Action Alternative, none of the proposed military readiness activities would be conducted. Therefore, baseline conditions of the existing environment for vegetation would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities As a result, the No Action Alternative is not analyzed further in this section.

This section describes and evaluates how and to what degree the activities and stressors described in Chapter 2 (Description of Proposed Action and Alternatives) and Section 3.0.3.3 (Identifying Stressors for Analysis) potentially impact vegetation known to occur in the Study Area.

The focus of the subsequent analysis will be on large, multicellular plants; the impact of the Proposed Action Alternatives on unicellular or multicellular microalgae was considered negligible due to their vast population, growth rate, resilience, and movement with the flows of water and sediment.

The stressors vary in intensity, frequency, duration, and location in the Study Area. The activities that involve each of the following stressors are identified in Appendix A (Activity Descriptions) and Appendix B (Activity Stressor Matrices). The stressors and substressors presented for analysis include the following:

- **explosives** (explosions in water)
- **physical disturbance and strikes** (vessels and in-water devices; military expended materials; seafloor devices; pile driving)

A discussion of secondary stressors, to include the potential impacts to habitat or prey availability, and the potential impacts of all the stressors combined are provided at the end of the section.

The stressors that are not analyzed further in this Supplemental EIS/OEIS include acoustic, energy, entanglement, and ingestion. The reasoning for not analyzing these stressors is summarized in the vegetation synopsis with supporting details provided in the 2018 Final EIS/OEIS. There is also some updated information regarding the operation of high-energy lasers in Section 3.0.3.3.3 (Identifying Stressors for Analysis, Energy Stressors) as well as acoustic and ingestion stressor effects on vegetation that is reviewed and discounted in Appendix D (Acoustic and Explosive Impacts Supporting Information) and Appendix G (Non-Acoustic Impacts Supporting Information), respectively.

The analysis of potential impacts to vegetation considers the standard operating procedures and mitigation measures that would potentially provide protection to vegetation. Standard operating procedures relevant to vegetation (e.g., using explosives, operating vessels safely, placing seafloor devices for retrieval) are detailed in Appendix A (Section A.2.7, Standard Operating Procedures). Details on mitigation measures relevant to vegetation are referenced in Table 3.3-3 (Mitigation Requirements Summary by Stressor for Habitats) of Section 3.3 (Habitats). Details on all mitigation measures are provided in Chapter 5 (Mitigation).

The criteria for determining the significance of an impact on vegetation are described in Table 3.4-2. The abbreviated analysis under each substressor and alternative provides the technical support for these determinations, with reference to the 2018 Final EIS/OEIS or supporting appendices for details.

Table 3.4-2: Criteria for Determining the Significance of Proposed Action Stressors on Vegetation

Impact Descriptor	*Context and Intensity*	*Significance Conclusions*
Negligible	Impacts on vegetation would be limited to temporary (lasting up to several hours) changes in terms of spatial, nutritional, physiological, or reproductive requirements in the Study Area. Impacts on vegetation would not cause lasting damage or alteration.	Less than significant
Minor	Impacts would be temporary or short-term (lasting several days to several weeks) changes that would not be outside the natural range of variability in terms of spatial, nutritional, physiological, or reproductive requirements in the Study Area. Impacts on vegetation would be easily recoverable with no long-term or permanent impact.	Less than significant
Moderate	Impacts would be short-term or long-term (lasting several months or longer) changes that would be outside the natural range of variability in terms of spatial, nutritional, physiological, or reproductive requirements in the Study Area. Some vegetation would be damaged or altered potentially over the long term but the remainder would continue to support the species dependent on it.	Less than significant
Major	Short-term or long-term changes well outside the limits of natural variability in terms of spatial, nutritional, physiological, or reproductive requirements in the Study Area. Vegetation would be degraded over the long term or permanently such that its population in an area would no longer be sustainable.	Significant

With noted exceptions, the stressor background information and environmental consequences are not meaningfully different from what is described in the 2018 Final EIS/OEIS (Section 3.3.3, Environmental Consequences).

3.4.3.1 Explosive Stressors

Table 3.4-3 contains a brief summary of background information that is relevant to analyses of impacts from explosive stressors. Details on the updated information in general, as well as effects specific to each substressor, are provided in Appendix D (Acoustic and Explosive Impacts Supporting Information).

Table 3.4-3: Explosive Stressors Background Information Summary

Substressor	*Background Information Summary*
Explosions in the water	Explosions produce pressure waves with the potential to cause physical disturbance due to rapid changes in pressure and other physical effects. Charges detonated underwater could affect vegetation by destroying individual plants or damaging parts of plants. • The majority of underwater explosions occur on the surface and typically during the day at offshore locations outside of state coastal waters in depths greater than 100 feet (30 meters), where only floating *Sargassum* would be impacted. • Explosions on or near the seafloor occur mostly in estuarine or shallow ocean waters where much of the benthic vegetation (benthic macroalgae) grows on hard bottom areas and artificial structures. • If floating *Sargassum* or benthic vegetation is in the immediate vicinity of an explosion, the taxa most likely impacted are resilient to fragmentation and damage due to lack of vital organs, fast growth rate, and asexual reproduction.
Explosions in the air	Explosions in the air would not affect vegetation on the surface or the seafloor, due to the resilience of vegetation, lack of proximity to aquatic habitats, and transmission loss of explosive impulses across the air-water interface.

The Action Proponents will implement mitigation tailored to reducing the impact of explosives in the water on sensitive habitats that feature living organisms, including vegetation in the mitigation areas identified in Table 3.3-3 (Mitigation Requirements Summary by Stressor for Habitats) of Section 3.3 (Habitats). The mitigation areas that are not specific to vegetation are mapped and described in Section 3.3 because they primarily address impacts on the seafloor habitat of vegetation and other biological resources (e.g., live hard bottom). The mitigation that is specific to vegetation includes the following:

- Near observed concentrations of floating *Sargassum*, the Action Proponents will not use explosive ordnance due to the association of floating vegetation and some ESA-listed species (e.g., sea turtles).
- Within 350 yards of mapped submerged aquatic vegetation (includes both seagrass beds and benthic macroalgae habitat), the Action Proponents will not detonate explosive mines.

3.4.3.1.1 Impacts from Explosives in Water

Table 3.4-3 contains a summary of the background information used to analyze the potential impacts of explosives in the water on marine vegetation. For information on explosive sizes and quantities for each alternative, see Table 3.0-5 (Explosive Sources Quantitatively Analyzed that Could Be Used Underwater or at the Water Surface).

In the unlikely event that underwater explosives are used near unmapped hard bottom (seaweed habitat) or floating *Sargassum* is overlooked by mitigation Lookouts, some individual plants could be dislodged or damaged. The mitigation areas will reduce or eliminate the impact of bottom-placed explosives on vegetation associated with live hard bottom (e.g., benthic macroalgae). Mapped sensitive habitat features within the Study Area only occur within mitigation areas (e.g., shallow-water coral reefs, live hard bottom), with the exception of Key West Range Complex Inshore. In those locations, the explosive charges are very small, and either placed on the seafloor or on seafloor devices (e.g., metal plates, steel frames) with the explosive energy directed upward.

3.4.3.1.1.1 Impacts from Explosives under Alternative 1

The use of explosives would generally decrease from the 2018 Final EIS/OEIS for both training and testing activities. Notably, for testing there would be no use of bin E17 (greater than 14,500 – 58,000 pounds [lb.] net explosive weight [NEW]) and reduced use of bin E16 (greater than 7,250 to 14,500 lb. NEW) for ship shock trials. There is also a reduction in use of most of the largest explosive bins for both training and testing, and an extremely large decrease in explosives associated with medium-caliber gunnery (bin E1 [0.1 to 0.25 lb. NEW]). Very few detonations would occur at inshore locations and would involve the use of smaller charge sizes (E5 or below). Additionally, small ship shock trials could occur in Virginia Capes, Jacksonville, or the Gulf of Mexico Range Complexes.

The majority of underwater explosions occur on the surface and typically in offshore locations beyond state waters and in depths greater than 100 feet (30 m), where growth of benthic macroalgae is generally low compared to estuarine and nearshore ocean waters. Relatively few activities including explosives underwater occur within state waters. The craters created in most intermediate or soft bottom areas would disappear in less than a year (refer to Section 3.3, Habitats, for details) and mostly benthic microalgae would be affected. Neither mapped seagrass beds nor benthic macroalgae associated with mapped hard bottom would be impacted by surface or bottom-placed explosives. Improvements in mapping have also reduced the potential for impacting these habitats.

Based on the relative footprint and location of explosives use under Alternative 1 for training and testing (refer to Section 3.3, Habitats, for analysis summary), and the general description of impacts, there would be (1) an unlikely spatial coincidence between explosive impacts and the distribution of sensitive vegetated habitats (e.g., seagrass beds, benthic macroalgae); (2) a quick recovery of vegetation types that are more likely impacted (e.g., floating *Sargassum,* seafloor microalgae); and (3) only short-term impacts from most local disturbances of the surface water or seafloor, with some temporary increases in suspended sediment in mostly shallow, soft bottom habitats. The effects of this substressor on marine macroalgae and vascular plants are therefore not expected to result in detectable changes in their growth, survival, or propagation and are not expected to result in population-level impacts or affect the distribution, abundance, or productivity of vegetation species; rare species are unlikely to be affected and common species could absorb impacts on relatively few individuals.

The analysis conclusions for underwater explosives use with training and testing activities under Alternative 1 are consistent with a moderate impact on vegetation populations.

3.4.3.1.1.2 Impacts from Explosives in Water under Alternative 2

Impacts from explosives in water under Alternative 2 are no different from Alternative 1 (Table 3.0-5: Explosive Sources Quantitatively Analyzed that Could Be Used Underwater or at the Water Surface) and therefore the impact conclusions are the same for both training and testing. The explosive sizes and numbers under Alternative 2 are the same as Alternative 1.

3.4.3.2 Physical Disturbance and Strike Stressors

Table 3.4-4 contains a brief summary of background information that is relevant to analyses of impacts from physical disturbance and strike stressors (vessels and in-water devices, military expended materials, seafloor devices, and pile driving). The background information for physical disturbance and strike stressor effects on vegetation in the Study Area as described in the 2018 Final EIS/OEIS (Section 3.3.3.4) has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS remains valid.

Table 3.4-4: Physical Disturbance and Strike Stressors Background Information Summary

Substressor	*Background Information Summary*
Vessels and in-water devices	In general, there would be a higher likelihood of vessel and in-water device disturbance or strike in coastal areas than in the open ocean portions of the Study Area because of the concentration of activities and the comparatively higher abundances of vegetation in areas closer to shore (e.g., benthic macroalgae, floating *Sargassum*). • In most cases, vessels and in-water devices would avoid contact with the bottom (and associated vegetation) per standard operating procedures unless the vessel/vehicle is designed to touch the bottom (e.g., amphibious vehicles). • Floating *Sargassum* around a passing vessel would be mostly displaced, rather than struck, as water flows around the vessel or device due to its hydrodynamic shape. For the small amount of floating *Sargassum* that is struck, the effect would be minimal; floating *Sargassum* mats can remain floating and regrow despite fragmentation from strikes (Zaitsev, 1971). • In coastal ocean areas, neither vessels nor in-water devices would normally strike benthic macroalgae because they avoid contact with the bottom. The disturbance of seaweeds and other macroalgae by propeller wash would be temporary and negligible; benthic macroalgae in coastal areas is highly resilient to natural disturbances, such as storms and extreme wave action (Mach et al., 2007). • The potential for vessels to affect vegetation on or near the bottom would occur mostly during inshore training locations. Vegetation in such areas could be affected by sediment disturbance or direct strike during vessel movement in shallow water (e.g., waterborne training, amphibious landings). • Although amphibious vehicles are designed to touch the bottom, they are generally used along ocean beaches and similar high-energy shorelines where the habitat is unsuitable for seagrass. Benthic microalgae that occur in soft bottom habitats associated with dynamic nearshore environments are also highly resilient to disturbance and recover relatively quickly. • Along more sheltered shorelines, vessel propulsion systems operating in shallow soft bottom areas can also disturb sediments and associated vegetation (e.g., seagrass) through propeller wash and actual contact with the bottom (Sargent et al., 1995); touching the bottom in shallow, soft bottom is a common practice among boaters that temporarily disturbs the sediment and associated vegetation. • Seagrass beds and coastal wetlands may be subject to recurring boat propeller- or wake-induced turbidity and erosion (Stevenson et al., 1979; Zabawa & Ostrom, 1980). For context, Navy vessels represent a small fraction of total maritime traffic (Mintz, 2016) and even less for Coast Guard vessels. For safety reasons, small vessels are not generally operated at excessive speeds close to shore, and the wakes generated would have similar impacts as naturally occurring wind waves. • Some seagrass species in the Study Area can take up to ten years to recover from propeller scarring (Dawes et al., 1997). However, neither propeller scarring nor erosion from vessel wakes is considered a significant threat to seagrass or coastal wetlands compared to other threats (e.g., nutrient enrichment, shoreline development) (Orth et al., 2010).
Aircraft and aerial targets	Impacts from aircraft and aerial targets are not applicable and will not be analyzed further in this section.

Table 3.4-4: Physical Disturbance and Strike Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
Military expended materials	Military expended materials deployed over water include a wide range of items that mostly pose a threat to vegetation located where the item settles or moves across the bottom. Before the item is buried or encrusted with marine growth, the impacts on vegetation may include crushing directly under the material, abrasion from movement of the material, temporary increases in turbidity around the material, and coverage of the underlying substrate. • Most release of military expended materials occurs in the confines of established at-sea training and testing areas far from shore, although there is some release of expended materials within inshore (e.g., marine markers in the VACAPES RC Inshore) and nearshore locations (e.g., Navy Cherry Point OPAREA). • The most heavily impacted areas are offshore where the potential for impacts to benthic macroalgae are relatively low to negligible due to the depth limits of macroalgae growth in the Study Area as well as dampening effect of water on sinking objects. • The dampening effect of water would reduce the impact of military expended materials on shallow seafloor habitats that are mostly soft or intermediate substrate vegetated primarily with benthic microalgae. Disturbance of benthic macroalgae on relatively rare hard substrate would be less likely and the plants are attached and resilient to disturbance. • Decelerators/parachutes could cover vegetated habitats and prevent photosynthesis if they landed on them in an open configuration. Prevailing currents and episodic storms would tend to dislodge the material until it is buried in soft substrate or snagged on hard substrate or artificial structures. The potential for expended decelerators/parachutes to drift into shallow, inshore habitats from at-sea training and testing areas would be low, based on the prevailing ocean currents depicted in Figure 3.3-6 through Figure 3.3-10 in Section 3.3 (Habitats). • Munitions and other military expended materials would be more likely to impact floating *Sargassum*, although the algae are resilient to fragmentation from explosives, which is far more damaging than the splash of expended materials. Strikes of floating *Sargassum* would therefore have little impact and would not likely result in the mortality of individual plants.
Seafloor devices	Seafloor devices are either stationary (e.g., mine shapes, anchors, bottom-placed instruments) or move very slowly along the bottom (e.g., bottom-crawling unmanned underwater vehicles) and mostly pose a threat to vegetation located where the device settles or moves across the bottom before being recovered. Impacts may include crushing directly under the seafloor device and temporary increases in turbidity around the device. • Although intentional placement of seafloor devices on rugged bottom features is avoided to ensure recovery, seafloor devices placed in shallow seafloor areas may inadvertently impact macroalgae attached to low-relief hard substrate (e.g., bedrock). A relatively high percentage of suitable hard substrate features macroalgae growth, although the percent coverage is variable in different regions and depths of the Study Area. • Seafloor devices are most likely to impact benthic microalgae inhabiting soft and intermediate bottom habitats that cover 91% of Study Area locations less than 95 meters deep (Table 3.3-1, Percent Coverage of Seafloor Habitats and Abiotic Substrate Types in Training and Testing Locations of the Study Area).
Pile driving	Pile driving and removal involves both impact and vibratory methods in soft substrate. Pile driving may have the potential to impact soft bottom habitats temporarily during pile driving, removal, and in the short term thereafter. There may also be some negligible loss of algae that colonizes the pilings when they are removed.

Notes: % = percent; OPAREA = operating area; RC = Range Complex; VACAPES = Virginia Capes

The Action Proponents will implement mitigation tailored to reducing the impact of physical disturbance and strike on sensitive habitats that feature vegetation, as summarized in Table 3.3-3 (Mitigation Requirements Summary by Stressor for Habitats) of Section 3.3 (Habitats). The mitigation area restrictions are mapped in Section 3.3 because they primarily address impacts on the seafloor habitat of vegetation and other biological resources.

The mitigation areas will reduce or eliminate the potential impacts by locating some physical disturbance and strike stressors away from floating *Sargassum*, seagrass beds, and benthic macroalgae habitat. The overlap of sensitive vegetation and mitigation areas varies by substressor, as described in the subsequent sections.

3.4.3.2.1 Impacts from Vessels and In-Water Devices

Table 3.4-4 contains a summary of the background information used to analyze the potential impacts of vessels and in-water devices on vegetation. For information on the number of activities including vessels and in-water devices, see Table 3.0-9 (Number and Location of Activities Including Vessels) and Table 3.0-10 (Number and Location of Activities include In-water Devices).

The mitigation areas described in Table 3.3-3 will reduce or eliminate the potential direct strike impacts in the Key West Range Complex (offshore and inshore locations) and South Florida Ocean Measurement Facility by requiring at least 1 foot of clearance over shallow-water habitats (refer to Section 3.3, Habitats, for a detailed mapping of the mitigation). In other shallow areas where vessel or in-water device use is proposed, the avoidance of features that could damage the vessel or in-water device (e.g., seafloor in general and hard substrate in particular) is part of standard operating procedures.

3.4.3.2.1.1 Impacts from Vessels and In-Water Devices under Alternative 1

For both training and testing activities, vessel and in-water device activity decreased overall from the 2018 Final EIS/OEIS (Tables 3.0-9 and Table 3.0-10).

Under Alternative 1 for training:

- Vessel activity would occur in two locations that are new or not previously analyzed (Gulfport and Pascagoula, Mississippi, respectively). For all other locations, there would either be a decrease or similar amount of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in one location not previously analyzed (Northeast Range Complexes Inshore). For all other locations, there would either be a decrease, similar amount, or cessation of in-water device activity.

Under Alternative 1 for testing:

- Vessel activity would occur in five locations not previously analyzed (inshore locations of the Northeast, Virginia Capes, and Gulf of Mexico Range Complexes; Other AFTT Areas; Hampton Roads, Virginia). There would also be notable increases in vessel activity at the Naval Surface Warfare Center Panama City Division Testing Range, Naval Station Norfolk, and Pascagoula, Mississippi. For all other locations, there would either be a decrease or similar amount of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in four locations not previously analyzed (Gulf of Mexico Range Complex Inshore; Bath, Maine; Newport, Rhode Island; Pascagoula, Mississippi). For all other locations, there would either be a decrease or similar amount of in-water device activity.

For locations without a notable increase in vessel and in-water device activity, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.4.2 (Affected Environment) do not alter the analysis because the general distribution of vegetation types among training and testing locations has not expanded.

For the inshore locations that are new or not previously analyzed, standard operating procedures (e.g., vessel and in-water device safety) and mitigation implemented in the seafloor resource mitigation areas help to avoid impacting shallow waters where sensitive species (e.g., seagrass) are concentrated (e.g., oysters on reefs in the Northeast Range Complexes Inshore). Furthermore, the locations not previously analyzed for testing were analyzed for training in the 2018 Final EIS/OEIS. The other new locations are port or pierside locations featuring artificial structures placed in soft bottom habitat with resilient soft bottom communities. These areas are also highly modified/disturbed due to human activity and frequent dredging and therefore lack both seagrass beds and coastal wetlands.

Based on the relative amount and location of vessels and in-water devices under Alternative 1 for training and testing and the general description of impacts, there would be (1) a relatively small area of spatial coincidence between vessel disturbance zones and the distribution of sensitive vegetation (e.g., seagrass beds, coastal wetlands); (2) a quick recovery of vegetation types in waters that are more likely impacted (e.g., floating *Sargassum,* seafloor microalgae); and (3) only short-term impacts from most vessel and in-water device movements and local disturbances of the surface water column, with some temporary increase in suspended sediment in shallow areas. The effects of this substressor on marine macroalgae and vascular plants are therefore not expected to result in detectable changes in their growth, survival, or propagation, and are not expected to result in population-level impacts or affect the distribution, abundance, or productivity of vegetation; rare species are unlikely to be affected and common species could absorb impacts on relatively few individuals.

The analysis conclusions for vessel and in-water device use with training and testing activities under Alternative 1 are consistent with a moderate (due to potential damage to vegetation) impact on vegetation populations.

3.4.3.2.1.2 Impacts from Vessels and In-Water Devices under Alternative 2

Impacts from vessels and in-water device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the impact conclusions are the same for both training and testing. The number of activities including vessels or in-water devices increases only slightly over that of Alternative 1.

3.4.3.2.2 Impacts from Military Expended Materials

Table 3.4-4 contains a summary of the background information used to analyze the potential impacts of military expended materials on marine vegetation. For information on the type, number, and location of military expended materials, see Table 3.0-11 (Number and Location of Non-explosive Practice Munitions Expended during Military Readiness Activities), Table 3.0-12 (Number and Location of Explosives that May Result in Fragments during Military Readiness Activities), Table 3.0-13 (Number of Location of Targets Expended during Military Readiness Activities), Table 3.0-14 (Number and Location of Other Military Materials Expended during Military Readiness Activities), Table 3.0-17 (Number and Location of Wires and Cables Expended during Military Readiness Activities), and Table 3.0-18 (Number and Location of Activities Including Biodegradable Polymers during Testing).

The mitigation areas described in Table 3.3-3 (Mitigation Requirements Summary by Stressor for Habitats) of Section 3.3 (Habitats) will reduce or eliminate the potential impacts by locating some military expended material releases away from reef-associated vegetation species in the Key West Range Complex (inshore and offshore locations) and South Florida Ocean Measurement Facility (refer to Section 3.3, for a detailed mapping of the mitigation). In other areas where military expended materials are proposed, the impact is limited by the distance from shore (e.g., most heavy munitions limited to areas outside of state coastal waters, which places most impacts seaward of seagrass beds, coastal wetlands, and some benthic macroalgae beds).

3.4.3.2.2.1 Impacts from Military Expended Materials under Alternative 1

For both training and testing activities, the number of military expended materials decreased overall from the 2018 Final EIS/OEIS (Table 3.0-11 through Table 3.0-14).

Under Alternative 1 for training:

- Military expended materials would occur in two locations not previously analyzed (Key West and Gulf of Mexico Range Complex Inshore) from the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease, similar amount, or cessation of military expended materials.

Under Alternative 1 for testing:

- Military expended materials would occur in three locations not previously analyzed (Other AFTT Areas; Naval Submarine Base Kings Bay, and Port Canaveral, Florida) in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease or similar amount of military expended materials.

For locations without a notable increase in military expended materials, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.4.2 (Affected Environment) do not alter the analysis because the general distribution of vegetation types among training and testing locations has not changed.

For locations not previously analyzed, the impact analysis that was conducted in the 2018 Final EIS/OEIS has been updated per quantitative analysis detailed in Section 3.3 (Habitats). Qualitative aspects of the analysis include the potential for lighter expended materials (e.g., decelerators/parachutes) to drift into vascular plant beds covered earlier in this section for military readiness activities.

Based on the quantitative analysis in Section 3.3 (Habitats), the total vegetated habitat (e.g., seagrass beds and benthic macroalgae habitat) affected annually by all military expended materials in all training and testing areas would be less than 2.2 acres. However, the area of impacted seagrass beds in nearshore ocean environments is overestimated due to the majority of military expended materials settling in the offshore environment where seagrass beds do not occur. This represents less than a thousandth of one percent of available vegetated habitat in any range complex. The majority of military expended material footprints would impact soft bottom communities or the bathyal/abyssal zone where vegetation does not occur. Expended material footprints coincide with seagrass beds within all the range complex inshore locations (refer to figures in Section 3.3, Habitats, for mapping). Coastal wetland areas do not coincide with any of the expended material footprints, though some lighter materials could drift into wetlands areas.

Based on the relative amount, impact footprint, and location of military expended materials under Alternative 1 for training and testing and the general description of impacts, there would be (1) a limited spatial coincidence between impact footprints and the distribution of sensitive vegetated habitats (e.g., seagrass beds, benthic macroalgae); (2) a quick recovery of vegetation types in waters that are more likely impacted (e.g., floating *Sargassum,* seafloor microalgae); and (3) only short-term impacts from most local disturbances of the surface water or seafloor, with some temporary increase in suspended sediment in mostly soft bottom areas. The effects of this substressor on marine macroalgae and vascular plants are therefore not expected to result in detectable changes in their growth, survival, or propagation and are not expected to result in population-level impacts or affect the distribution, abundance, or productivity of vegetation; rare species are unlikely to be affected and common species could absorb impacts on relatively few individuals.

The analysis conclusions for military expended materials from training and testing activities under Alternative 1 are consistent with a moderate (due to potential damage to vegetation) impact on vegetation populations.

3.4.3.2.2.2 Impacts from Military Expended Materials under Alternative 2

Impacts from military expended materials under Alternative 2 are not meaningfully different from Alternative 1 and therefore the impact conclusions are the same for both training and testing. The increase in footprint from Alternative 1 to 2 is only 0.026 acres and located mostly in the Gulf of Mexico Range Complex, with relatively small footprints in the other range complexes.

3.4.3.2.3 Impacts from Seafloor Devices

Table 3.4-4 contains a summary of the background information used to analyze the potential impacts of seafloor devices on marine vegetation. For information on the type, number, and location of military expended materials, see Table 3.0-15 (Number and Location of Activities that Use Seafloor Devices).

The mitigation areas described in Table 3.3-3 (Mitigation Requirements Summary by Stressor for Habitats) of Section 3.3 (Habitats) will reduce or eliminate the potential impacts by locating most seafloor devices away from vegetation covering live hard bottom. Due to the prevalence of shallow-water hard coral species in the South Florida Ocean Measurement Facility, there is additional mitigation that ensures placement of seafloor devices away from sensitive habitats.

3.4.3.2.3.1 Impacts from Seafloor Devices under Alternative 1

For both training and testing activities, the proposed use of seafloor devices increased from the 2018 Final EIS/OEIS devices (Table 3.0-15).

Under Alternative 1 for training:

- Seafloor device use would occur in five locations that are new or not previously analyzed (Northeast Range Complexes; Other AFTT Areas; Jacksonville Range Complex Inshore, Naval Station Mayport, and Gulfport, Mississippi). There would also be notable increases in seafloor devices at the Virginia Capes Range Complex (offshore and inshore locations) and Key West Range Complex Inshore. For all other locations, there would either be a decrease, similar amount, or cessation of seafloor device use.

Under Alternative 1 for testing:

- Seafloor device use would occur in five locations not previously analyzed (Virginia Cape Range Complex Inshore, Key West Range Complex Inshore, Naval Submarine Base New London, Naval Station Mayport, and Port Canaveral, Florida). There would also be notable increases in seafloor devices in the Northeast and Jacksonville Range Complexes, and in the Naval Surface Warfare Center Panama City Division Testing Range. For all other locations, there would either be a decrease or similar amount of seafloor device use.

For locations without a notable increase in seafloor devices, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.4.2 (Affected Environment) do not alter the analysis because the general distribution of vegetation types among training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would remain valid because the infrequent and localized nature of seafloor device activity remains an accurate characterization of the Proposed Action in those locations.

For the inshore locations not previously analyzed, standard operating procedures and seafloor resource mitigation measures that apply to mine shapes and other devices moored to the bottom, help to avoid impacting sensitive habitats for vegetation (e.g., live hard bottoms). In the unlikely event of a seafloor device coinciding with a seagrass or benthic macroalgae bed, the impact would be minimal and temporary (e.g., crushing/abrasion). No seafloor devices would be placed in coastal wetlands that occupy the intertidal margins of the Study Area.

The new location of Gulfport, Mississippi, is a pierside location, which feature artificial structures in soft bottom habitat with relatively resilient vegetation communities. These areas are highly modified/disturbed due to human activity and frequent dredging.

Based on the relative amount and location of seafloor device use under Alternative 1 for training and testing and the general description of impacts, there would be (1) a limited spatial coincidence between device disturbance zones and the distribution of vegetated seafloor habitats (e.g., seagrass beds, benthic macroalgae) and (2) only short-term impacts from most local disturbances of the seafloor, with some temporary increase in suspended sediment in mostly soft bottom areas. The effects of this substressor on marine macroalgae and vascular plants are therefore not expected to result in detectable changes in their growth, survival, or propagation, and are not expected to result in population-level impacts or affect the distribution, abundance, or productivity of vegetation; rare species are unlikely to be affected and common species could absorb impacts on relatively few individuals.

The analysis conclusions for use of seafloor devices with training and testing activities under Alternative 1 are consistent with a moderate (due to potential damage to vegetation) impact on vegetation populations.

3.4.3.2.3.2 Impacts from Seafloor Devices under Alternative 2

Impacts from seafloor device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the impact conclusions are the same for both training and testing. The number of activities including seafloor devices under Alternative 2 would increase only slightly over Alternative 1.

3.4.3.2.4 Impacts from Pile Driving

Table 3.4-4 contains a summary of the background information used to analyze the potential impacts of pile driving on marine vegetation. Only port damage repair training includes pile driving (Table 3.0-4, Number of Piles/Sheets Quantitatively Analyzed under Pile Driving and Removal Training Activities).

3.4.3.2.4.1 Impacts from Pile Driving under Alternative 1

Under Alternative 1 for training:

- Pile driving would occur in one new location (Gulfport, Mississippi) that it did not occur in for the 2018 Final EIS/OEIS.
- Pile driving would no longer occur as part of the Elevated Causeway System at Joint Expeditionary Base Little Creek-Fort Story in the Virginia Capes Range Complex or Marine Corps Base Camp Lejeune in the Navy Cherry Point Range Complex.

There would be no pile driving or removal associated with testing activities.

The effects of pile driving on vegetation would be temporary resuspension of sediment and the possible removal of relatively small amounts of colonizing vegetation during pile removal. Pile driving for pier maintenance typically occurs in soft bottom habitats with unconsolidated sediments that would allow pile installation and removal at a fairly rapid pace. In Gulfport, Mississippi, proposed pile driving would be conducted along an artificial shoreline bordering relatively deep soft bottom habitat. Such areas are not expected to support appreciable amounts of seagrass or coastal wetland plants, but micro- and macroalgae could quickly colonize the hard substrate of the pilings and would be removed when the pilings are removed. However, the impact of the losses of algae populations would be negligible for both action alternatives. Seagrass has also not been mapped in this area.

The analysis conclusions for pile driving for training under Alternative 1 are consistent with a moderate (due to removal of colonizing vegetation) impact on vegetation.

3.4.3.2.4.2 Impacts from Pile Driving under Alternative 2

Impacts from pile driving during training under Alternative 2 are no different from Alternative 1 and therefore the impact conclusions are the same.

There would be no pile driving associated with testing activities.

3.4.3.3 Secondary Stressors

This section analyzes potential impacts on vegetation exposed to stressors indirectly through impacts on their habitat (explosives and explosive byproducts, unexploded munitions, metals, chemicals) and/or prey availability. Details on updated information for secondary stressors is provided in Appendix G (Non-Acoustic Impacts Supporting Information). However, none of the updated information directly affects the analysis.

3.4.3.3.1 Impact of Secondary Stressors

3.4.3.3.1.1 Impacts from Secondary Stressors Under Alternative 1

The impacts of explosives and military expended materials in terms of abiotic substrate disturbance are described in Section 3.3 (Habitats). Most detonations would occur in waters greater than 200 ft. in depth, and greater than 3 NM from shore, although mine warfare, demolition, and some testing detonations would occur in shallow water close to shore. In deep waters, explosions would not likely damage habitat for marine vegetation because the explosion would not be on or proximate to the sea floor. These habitats include corals, seagrass beds, and other benthic habitats that are used by marine vegetation.

The assessment of potential sediment and water quality degradation on aquatic life, including representative marine vegetation, is covered in Section 3.2 (Sediment and Water Quality). Considering the literature on other marine vegetation does not suggest an elevated sensitivity to pollutants from the Proposed Action alternatives, the analysis of sediment and water quality degradation in Section 3.2 is sufficient to cover the impact on vegetation.

The analysis included in Section 3.3 (Habitats) determined that for Alternative 1, impacts to abiotic substrates from military expended materials would amount to 2.1 acres of habitat for coastal wetlands and seagrass beds that is not protected by standard operating procedures or mitigation measures. However, the area of impacted seagrass bed habitat in the nearshore ocean environment is overestimated due to the majority of military expended materials settling in the offshore environment where seagrass beds do not occur. Explosive craters would impact mostly microalgae growing in soft and intermediate substrate types, where there are no mitigation areas. The indirect impact due to substrate disturbance would be relatively minor and inconsequential because of the small areas of the seafloor that would be affected and the temporary nature of the impact. Substrate would be disturbed, but not removed, and hence would be available for recovery of disturbed vegetation.

The analysis included in Section 3.2 (Sediment and Water Quality) determined that neither state nor federal standards/guidelines for sediments nor water quality would be violated by the Proposed Action. Therefore, because these standards and guidelines are structured to protect human health and the environment, and the proposed activities do not violate them, no indirect impacts are anticipated on vegetation by military readiness activities proposed by Alternative 1.

The impacts of the Proposed Action on secondary stressors were considered negligible on vegetation populations.

3.4.3.3.1.2 Impacts from Secondary Stressors Under Alternative 2

Impacts from secondary stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the impact conclusions are the same for both training and testing.

3.4.3.4 Combined Stressors

As described in Section 3.0.3.5 (Resource-Specific Impacts Analysis for Multiple Stressors), this section evaluates the potential for combined impacts of all stressors from the Proposed Action. The analysis and conclusions for the potential impacts from each of the individual stressors are discussed in the sections above. Stressors associated with Action Proponents' military readiness activities do not typically occur in isolation but rather occur in some combination. For example, mine neutralization activities include elements of acoustic, physical disturbance and strike, entanglement, ingestion, and secondary stressors that are all coincident in space and time. An analysis of the combined impacts of all stressors considers the potential consequences of additive stressors from the Proposed Action, as described below.

There are generally two ways that marine vegetation could be exposed to multiple additive stressors. The first would be if the vegetation was exposed to multiple sources of stress from a single event or activity within a single training or testing event (e.g., a mine warfare event may include the use of a vessel, seafloor devices, and explosives). The potential for a combination of these impacts from a single activity would depend on the range to effects of each of the stressors and the response or lack of response to that stressor. Secondly, marine vegetation could be exposed to multiple military readiness activities over the course of its life; however, military readiness activities are generally separated in space and time in such a way that it would be unlikely that any individual plant would be exposed to stressors from multiple activities within a short timeframe.

3.4.3.4.1 Combined Impacts of All Stressors under Alternative 1

Activities described in this Supplemental EIS/OEIS under Alternative 1 that have potential impacts on marine vegetation are widely dispersed, and not all stressors would occur simultaneously in a given location. The stressors that have potential impacts on marine vegetation include physical disturbances or strikes (vessel and in-water devices, military expended materials, seafloor devices, and pile driving) and explosives. Unlike mobile organisms, vegetation cannot flee from stressors once exposed. Floating *Sargassum* is the type of marine vegetation most likely to be exposed to multiple stressors in combination because it occurs in large expanses and because more activities and their associated stressors occur at the surface than on the bottom. Floating *Sargassum* is also more likely to occur in offshore locations where there is a higher risk for impacts from activities. The potential for seagrasses and benthic macroalgae to be exposed to multiple stressors would be low because activities are not concentrated in nearshore and inshore waters where they are located. In the unlikely event of an impact, the combination of stressors could include bottom disturbance from a seafloor device (mine anchor) deployed from a vessel (surface disturbance) followed by the mine shape exploding. Considering the effect of explosives far exceeds that of an associated vessel or seafloor device, a combined effect on vegetation would be negligible.

Although potential impacts on vegetation from military readiness activities under Alternative 1 may include tissue damage, the combined impacts are not expected to lead to long-term consequences for plant populations. Based on the general description of impacts, the number of plants impacted is expected to be small relative to overall population sizes and would not be expected to yield any lasting effects on the survival, growth, recruitment, or reproduction of any plant species.

The combined impact of all stressors from Alternative 1 are considered moderate (due to limited potential for damage to vegetation) on vegetation populations.

3.4.3.4.2 Combined Impacts of All Stressors under Alternative 2

The combined impacts of stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the impact conclusions are the same for both training and testing.

References

Clark, R., J. Taylor, C. Buckel, and L. Kracker. (2014). *Fish and Benthic Communities of the Flower Garden Banks National Marine Sanctuary: Science to Support Sanctuary Management* (NOAA Technical Memorandum NOS NCCOS). Silver Spring, MD: NOAA National Centers for Coastal Ocean Science.

Dawes, C. J., J. Andorfer, C. Rose, C. Uranowski, and N. Ehringer. (1997). Regrowth of the seagrass, *Thalassia testudinum,* into propeller scars. *Aquatic Botany 59* (1–2): 139–155. DOI:10.1016/s0304-3770(97)00021-1

Duarte, C. M., N. Marbà, D. Krause-Jensen, and M. Sánchez-Camacho. (2007). Testing the predictive power of seagrass depth limit models. *Estuaries and Coasts 30* (4): 652–656. DOI:10.1007/BF02841962

Mach, K. J., B. B. Hale, M. W. Denny, and D. V. Nelson. (2007). Death by small forces: A fracture and fatigue analysis of wave-swept macroalgae. *The Journal of Experimental Biology 210* (13): 2231–2243. DOI:10.1242/jeb.001578

Mintz, J. D. (2016). *Characterization of Vessel Traffic in the Vicinities of HRC, SOCAL, and the Navy Operating Areas off the U.S. East Coast*. Alexandria, VA: Center for Naval Analyses.

Orth, R., S. Marion, K. Moore, and D. Wilcox. (2010). Eelgrass (*Zostera marina L.*) in the Chesapeake Bay Region of Mid-Atlantic Coast of the USA: Challenges in Conservation and Restoration. *Estuaries and Coasts 33* 139–150. DOI:10.1007/s12237-009-9234-0

Reed, J. K., S. Farrington, A. David, S. Harter, S. A. Pomponi, M. C. Diaz, J. D. Voss, K. D. Spring, A. C. Hine, and V. H. Kourafalou. (2019). Pulley Ridge, Gulf of Mexico, USA *Mesophotic Coral Ecosystems* (pp. 57-69). Cham, Switzerland: Springer International Publishing.

Roskov, Y., L. Abucay, T. Orrell, D. Nicolson, T. Kunze, A. Culham, N. Bailly, P. Kirk, T. Bourgoin, R. E. DeWalt, W. Decock, and A. De Weaver. (2015). *Species 2000 & ITIS Catalogue of Life, 2015 Annual Checklist*. Retrieved July 6, 2015, from http://www.catalogueoflife.org/annual-checklist/2015/.

Ruggiero, M. and D. Gordon. (2015, June 25). *ITIS Standard Report Page: Ochrophyta*. Retrieved June 25, 2015, from http://www.itis.gov/servlet/SingleRpt/SingleRpt.

Sargent, F. J., T. J. Leary, D. W. Crewz, and C. R. Kruer. (1995). *Scarring of Florida's Seagrasses: Assessment and Management Options*. St. Petersburg, FL: Florida Department of Environmental Protection.

Smith Jr., W. O. (1981). Photosynthesis and productivity of benthic macroalgae on the North Carolina continental shelf. *Botanica Marina 24* (5): 279–284. DOI:doi:10.1515/botm.1981.24.5.279

Stevenson, J., C. Piper, and N. Confer. (1979). *Decline of Submerged Plants in Chesapeake Bay*. U.S. Fish and Wildlife Service, Chesapeake Bay Field Office.

Vadas, R. L. and R. S. Steneck. (1988). Zonation of deep water benthic algae in the Gulf of Maine. *Journal of Phycology 24* (3): 338–346. DOI:https://doi.org/10.1111/j.1529-8817.1988.tb04476.x

Zabawa, C. and C. Ostrom. (1980). *Final Report on the Role of Boat Wakes in Shore Erosion in Anne Arundel County, Maryland*. Annapolis, MD: Maryland Department of Natural Resources.

Zaitsev, Y. P. (1971). *Marine Neustonology*. Jerusalem, Israel: Israel Program for Scientific Translations.

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3.5 Invertebrates

INVERTEBRATES SYNOPSIS

The Action Proponents considered the stressors to invertebrates that could result from the Proposed Action in the Study Area. The following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Acoustics: Available information indicates that invertebrate sound detection is primarily limited to low-frequency (less than 1 kilohertz [kHz]) particle motion and water movement that diminishes rapidly with distance from a sound source. The expected impact of noise would be mostly limited to offshore surface layers of the water column where zooplankton, squid, and jellyfish are prevalent at night when training and testing occur less frequently. In general, invertebrate populations are typically lower offshore, where most training and testing occurs, due to the scarcity of habitat structure and comparatively lower nutrient levels. At nearshore and inshore locations where occasional pierside sonar, air gun, or pile driving actions occur, the invertebrate communities are relatively resilient and occupy soft bottom or artificial (e.g., pier pilings) substrates. Because the number of individuals affected would be small relative to population numbers, population-level impacts are unlikely.
- Explosives: Explosives produce pressure waves that can harm invertebrates. Most explosives occur in offshore surface waters where zooplankton, squid, and jellyfish are most prevalent at night, which is when training and testing with explosives does not typically occur. Invertebrate populations are generally lower offshore than inshore due to the scarcity of habitat structure and comparatively lower nutrient levels. Exceptions occur where explosives are used on the bottom within nearshore or inshore waters on or near sensitive live hard bottom communities that are not mapped or otherwise protected. Soft bottom communities are resilient to occasional disturbances. Due to the relatively small number of individuals affected, population-level impacts are unlikely.
- Energy: The proposed activities would produce electromagnetic energy that briefly affects a very limited area of water, based on the relatively weak magnetic fields and mobile nature of the stressors. Whereas some invertebrate species can detect magnetic fields, the effect has only been documented at much higher field strength than what the proposed activities generate. High-energy lasers can damage invertebrates. However, the high-energy lasers of the Proposed Action are designed to turn off when they lose track of their target. Marine invertebrates would therefore not be exposed to the lasers.
- Physical disturbance and strike: Invertebrates could experience physical disturbance and strike impacts from vessels and in-water devices, military expended materials, seafloor devices, and pile driving. The most risk occurs offshore (where invertebrates are less abundant) and near the surface where relatively few invertebrates occur during the day when actions are typically

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INVERTEBRATES SYNOPSIS

occurring. Impacts on the bottom may also occur to relatively sparse deep-sea corals and sponges from military expended materials. Relatively few expended materials are used in nearshore and inshore bottom areas where invertebrates are the most abundant. Exceptions occur for actions taking place within inshore and nearshore waters over primarily soft bottom communities, such as vessel transits, inshore and nearshore vessel training, nearshore explosive ordnance disposal training, operation of bottom-crawling seafloor devices, and pile driving. Invertebrate communities in affected soft bottom areas are naturally resilient to occasional disturbances. Accordingly, population-level impacts are unlikely.

- Entanglement: Invertebrates could be entangled by various expended materials (wires, cables, decelerators/parachutes). Most entanglement risk occurs in offshore areas where invertebrates are relatively less abundant. The risk of entangling invertebrates is minimized by the typically linear and rigid nature of the expended structures (e.g., wires, cables), although decelerators/parachutes have mesh that could pose a risk to those invertebrates that are large and slow enough to be entangled (e.g., jellyfish). Accordingly, population-level impacts are unlikely.
- Ingestion: Small, expended materials and material fragments pose an ingestion risk to some invertebrates. However, most military expended materials are too large to be ingested, and many invertebrate species are unlikely to consume an item that does not visually or chemically resemble its natural food. Exceptions occur for materials fragmented by explosive charges or weathering, which could be ingested by filter- or deposit-feeding invertebrates. Ingestion of such materials would likely occur infrequently, and only invertebrates located very close to the fragmented materials would potentially be affected. Accordingly, population-level impacts are unlikely.

3.5.1 Introduction

The following sections describe the invertebrates found in the Study Area and evaluate potential impacts from proposed training and testing activities on these resources. Impacts to invertebrates from the Proposed Action were analyzed in the 2018 Final EIS/OEIS. The primary changes from the analysis are provided where they apply in subsequent sections.

3.5.2 Affected Environment

The affected environment provides the context for evaluating the effects of the Action Proponent's military readiness (training and testing) activities on marine invertebrates. With noted exceptions, the general background for invertebrates in the Study Area is not meaningfully different from what is described in the 2018 Final EIS/OEIS (Section 3.4.2, Affected Environment). See Appendix F (Biological Resources Supplemental Information) for updated details on the affected environment for invertebrates.

The Study Area is generally consistent with that analyzed in the 2018 Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement (hereinafter referred to as the 2018 Final EIS/OEIS). Additions to the Study Area include pierside training and testing events and transit along established navigation channels from pierside locations to offshore range complexes in the Gulf of Mexico. United States (U.S.) Coast Guard activities are similar in nature to Navy activities and fall under the same stressor categories.

3.5.2.1 General Background

Invertebrates represent the most abundant form of animal life on Earth. Relative to other animals, they are generally small and low on the food chain.

There is updated information regarding the number and population status of species in the Study Area. However, a change in the number of species does not directly affect the analysis and conclusions.

3.5.2.1.1 Habitat Use

Habitat use by marine invertebrates varies by taxonomic group and includes the water column (i.e., pelagic species), seafloor (i.e., benthic species), and shorelines. A more detailed description of taxonomic groups and their location/habitat use in the Study Area is provided in Section 3.5.2.3 (Species Not Listed under the Endangered Species Act). Updated information includes the following:

- The dominant soft bottom habitats and depth distribution of benthic invertebrate sizes and densities in the offshore ocean.
- The distribution of shallow-water coral reefs, live hard bottoms, and deep-sea coral or sponge habitats (refer to Section 3.3, Habitats, for comprehensive mapping).
- The typical percent coverage in living invertebrates on these habitats.

3.5.2.1.2 Movement and Behavior

Marine benthic invertebrates may be sessile, sedentary (limited mobility), or highly mobile (but typically slower than large vertebrates). Pelagic marine invertebrates include plankton (organisms that do not swim or generally cannot swim faster than water currents) and nekton (active swimmers that can generally swim faster than water currents). Many marine invertebrates undergo daily migrations to surface waters at dusk and return to deeper waters at dawn. This includes small, microscopic zooplankton and larvae, larger crustaceans (e.g., small shrimp), squid, and jellyfish. Planktonic organisms vary in their swimming abilities, ranging from weak (e.g., larvae) to substantial (e.g., box jellyfish). Nekton (e.g., shrimps, squid) have relatively strong swimming ability, although they are typically smaller and slower than most vertebrate animals.

There is updated information regarding the daily vertical migrations of many pelagic invertebrates in the marine environment and distribution of aerial insects in the Study Area (Appendix F, Biological Resources Supplemental Information).

3.5.2.1.3 Sound Sensing and Production

The background information for hearing/sound sensing and vocalization/production for invertebrates in the Study Area as described in the 2018 Final EIS/OEIS (Section 3.4.2.1.3) has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS remains valid.

3.5.2.1.4 General Threats

The general threats to marine invertebrates discussed in the 2018 Final EIS/OEIS include overexploitation and destructive fishing practices; habitat degradation from pollution and coastal development; disease; and invasive species, with compounding factors such as increasing temperature and decreasing pH of the ocean from effects linked to global climate change. New research and updates regarding general threats to invertebrates are provided in Appendix F (Biological Resources Supplemental Information). Updated information includes the following:

- Verification of numerous potential effects from the listed threats.
- The status of the listed threats, as well as emerging threats and threats to aerial insects.

3.5.2.2 Endangered Species Act-Listed Species

Table 3.5-1 shows the invertebrate species listed under the Endangered Species Act (ESA) in the Study Area. Designated critical habitat for ESA-listed invertebrate species in the Study Area is shown in Figure 3.5-1. Changes in the ESA listings and critical habitat designations since the 2018 Final EIS/OEIS include the following:

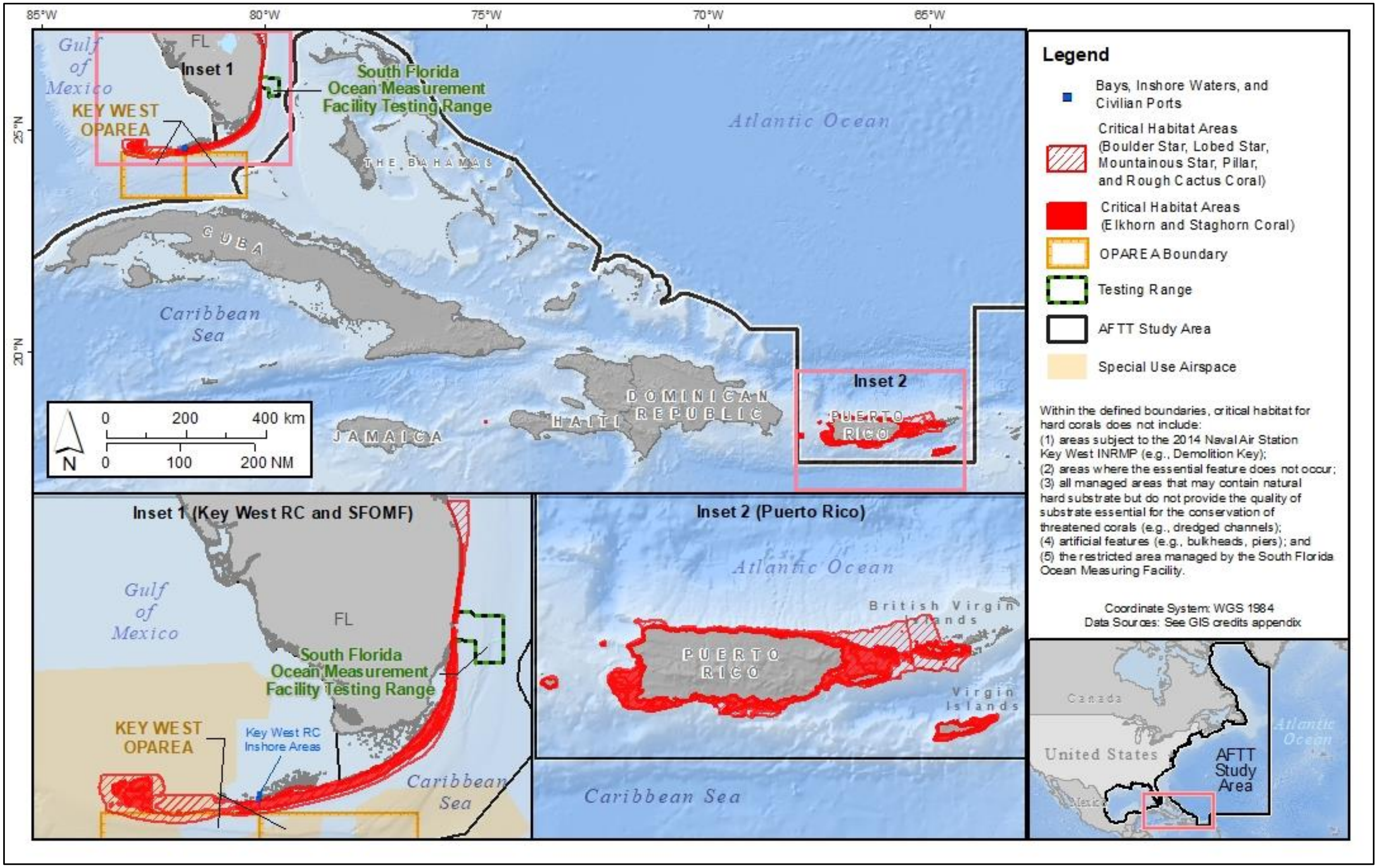
- Proposed listing of the queen conch (*Alger gigas*) as a threatened species on September 8, 2022 (87 *Federal Register* 55200; Horn et al., 2022), followed by listing as threatened on February 14, 2024 (89 *Federal Register* 11208).
- Designation of critical habitat for five Caribbean coral species on August 9, 2023 (88 *Federal Register* 54026). The critical habitat for these species extends into deeper water than the critical habitat for hard corals covered in the 2018 Final EIS/OEIS.
- Proposed Reclassification of pillar coral (*Dendrogyra cylindrus*) from Threatened to Endangered on August 29, 2023 (88 *Federal Register* 59494). The action was based on population declines and susceptibility to a recently emerged coral disease.

Detailed species descriptions, including status and management, habitat and geographic range, population trends, predator and prey interactions, and species-specific threats, are provided in Appendix F (Biological Resources Supplemental Information).

Table 3.5-1: Status and Occurrence of Endangered Species Act-Listed Invertebrate Species in the Study Area

Species Names and Regulatory Status			*Species Occurrence in the Study Area*		
Common Name	***Scientific Name***	***ESA Status/Critical Habitat***	***Range Complex/Testing Range***	***Range Complex Inshore Areas***	***Piers/Ports/ Coast Guard Stations***
Boulder star coral	*Orbicella franksi*	Threatened/Designated	SFOMF[1], Key West RC[1]	Key West RC Inshore[2]	Coast Guard Stations: Dania, FL; Miami, FL; Key West, FL
Elkhorn coral	*Acropora palmata*	Threatened/Designated			
Lobed star coral	*Orbicella annularis*	Threatened/Designated			
Mountainous star coral	*Orbicella faveolata*	Threatened/Designated			
Pillar coral	*Dendrogyra cylindrus*	Threatened (Proposed Endangered)/Designated			
Rough cactus coral	*Mycetophyllia ferox*	Threatened/Designated			
Staghorn coral	*Acropora cervicornis*	Threatened/Designated			
Queen conch	*Alger gigas*	Threatened	SFOMF[1], Key West RC[1]	Key West RC Inshore	Coast Guard Stations: Dania, FL; Miami, FL; Key West, FL

[1] Overlaps with species critical habitat.
[2] Mountainous star coral documented on artificial structures (HDR Environmental Operations and Construction Inc., 2013).
Notes: FL = Florida; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility Testing Range



Notes: AFTT: Atlantic Fleet Training and Testing; INRMP = Integrated Natural Resources Management Plan; OPAREA: operating area; RC = Range Complex

Figure 3.5-1: Critical Habitat for Elkhorn and Staghorn Coral and Five ESA-Listed Coral Species in the Study Area

3.5.2.3 Species Not Listed under the Endangered Species Act

Table 3.5-2 provides general descriptions of invertebrate groups and their location/habitat use in the Study Area. Updated information on hard coral species is provided in Appendix F (Biological Resources Supplemental Information), and pertains to habitat use.

Table 3.5-2: Major Taxonomic Groups of Marine Invertebrates in the Study Area

Marine Invertebrate Groups		*Habitats: Locations in the Study Area*		
Common Name (Classification)[1]	***Description***	***Range Complex/Testing Range***	***Range Complex Inshore***	***Piers/Ports/ Coast Guard Stations***
Foraminifera, radiolarians, ciliates (Kingdom Protozoa)	Planktonic or benthic single-celled organisms; shells typically made of calcium carbonate or silica	Water column or seafloor: All locations		
Sponges (Porifera)	Sessile (i.e., stationary) filter feeders; large species have calcium carbonate or silica structures embedded in cells to provide structural support	Hard bottom/artificial structures < 2,500 meters (m): All locations	Hard seafloor/artificial structures: All locations	
	Free-swimming larvae	Water column: All locations		
Corals, anemones, hydroids, jellyfish (Cnidaria)	Jellyfish.[2] Drifting filter feeders with gelatinous bodies and stinging cells	Water column: All locations		
	Shallow-water hard corals.[2,3] Sessile filter feeders that build complex structures on hard substrate in warm, shallow waters	Hard bottom/artificial structures < 90 m: SFOMF Key West RC	Hard seafloor/artificial structures: Key West RC Inshore	Coast Guard Stations: Dania, FL; Miami, FL; Key West, FL
	Deep-sea hard corals.[2] Sessile filter feeders that build piles of rubble on hard substrate in colder/deeper waters	Hard bottom/artificial structures < 2,500 m: All locations	Not present	
	Other sessile filter feeders with stinging cells (e.g., anemones, soft corals, hydroids)	Seafloor/artificial structures: All locations		
	Zooplankton and free-swimming larvae	Water column: All locations		
Flatworms (Platyhelminthes)	Non-segmented and soft-bodied marine worms	Water column or seafloor/artificial structures: All locations		
Ribbon worms (Nemertea)				
Roundworms (Nematoda)				

Table 3.5-2: Major Taxonomic Groups of Marine Invertebrates in the Study Area (continued)

Marine Invertebrate Groups		***Habitats: Locations in the Study Area***		
Common Name (Classification)[1]	***Description***	***Range Complex/Testing Range***	***Range Complex Inshore***	***Piers/Ports/ Coast Guard Stations***
Polychaetes (Annelida)	Segmented and soft-bodied marine worms; mostly deposit feeders	Seafloor/artificial structures: All locations		
Bryozoans (Bryozoa)	Colonial filter feeders with gelatinous or hard exteriors and a diverse array of growth forms and on a variety of substrates	Seafloor/artificial structures: All locations		
	Free-swimming larvae	Water column: All locations		
Cephalopods, bivalves, sea snails, chitons (Mollusca)	Squids. Soft-bodied pelagic and highly mobile predators	Water column: All locations		
	Snails.[3] Hard-shelled and slow-moving benthic predators, detritus feeders and herbivore grazers with a muscular foot	Seafloor/artificial structures: All locations		
	Oysters.[2] Hard-shelled, filter-feeding bivalves that form reefs	Not present	Hard seafloor/artificial structures: All locations	Artificial structures: Estuarine locations
	Other hard-shelled, filter-feeding bivalves (e.g., clams, scallops, mussels) and benthic cephalopods (e.g., octopus)	Seafloor/artificial structures: All locations		
	Free-swimming larvae	Water column: All locations		
Shrimp, crabs, lobsters, barnacles, copepods (Arthropoda), horseshoe crabs	Hard-shelled benthic predators, herbivores, scavengers, detritus feeders, and filter feeders; segmented bodies and external skeletons with jointed appendages	Seafloor/artificial structures: All locations		
	Zooplankton and free-swimming larvae	Water column: All locations		
Sea stars, sea urchins, sea cucumbers (Echinodermata)	Large benthic invertebrates with endoskeletons made of hard calcareous structures (plates, rods, spicules); five-sided radial symmetry; many species with tube feet; slow-moving	Seafloor/artificial structures: All locations		

Table 3.5-2: Major Taxonomic Groups of Marine Invertebrates in the Study Area (continued)

Marine Invertebrate Groups		*Habitats: Locations in the Study Area*		
Common Name (Classification)[1]	***Description***	***Range Complex/Testing Range***	***Range Complex Inshore***	***Piers/Ports/ Coast Guard Stations***
	predators, herbivores, detritus feeders, and suspension feeders			
	Free-swimming larvae	Water column: All locations		

[1] Major species groups (those with more than 1,000 species) are based on the World Register of Marine Species (World Register of Marine Species Editorial Board, 2015) and Catalogue of Life (Roskov et al., 2015).
[2] Taxonomic group contains species forming Essential Fish Habitats (refer to separate Essential Fish Habitat Assessments for more information).
[3] Taxonomic group contains ESA-listed species (refer to Section 3.5.2.2 for more information).
Notes: < = less than; FL = Florida; m = meters; RC = Range Complex; SFOMF = South Florida Ocean Measurement Facility Testing Range

3.5.3 Environmental Consequences

Under the No Action Alternative for all stressors and substressors, the Action Proponents would not conduct any of the proposed military readiness activities in the Study Area. Therefore, baseline conditions of the existing environment for invertebrates would either remain unchanged or would improve after cessation of ongoing military readiness activities. The No Action Alternative is not analyzed further in this section.

This section describes and evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) and stressors described in Section 3.0.3.3 (Identifying Stressors for Analysis) could potentially impact invertebrates known to occur in the Study Area.

The focus of analysis will be on multicellular marine invertebrates; the impact of the Proposed Action alternatives on unicellular invertebrates (Kingdom Protozoa) would be negligible due to their vast population, growth rate, resilience, and movement with the flows of water and substrate.

The stressors vary in intensity, frequency, duration, and location in the Study Area. The activities that involve each of the following stressors are identified in Appendix A (Activity Descriptions) and Appendix B (Activity Stressor Matrices). The stressors and substressors analyzed for invertebrates include the following:

- **acoustics** (sonar and other transducers; air guns; pile driving; vessel noise; aircraft noise; weapons noise)
- **explosives** (explosions in water)
- **energy** (in-water electromagnetic devices)
- **physical disturbance and strikes** (vessels and in-water devices; military expended materials; seafloor devices; pile driving)
- **entanglement** (wires and cables; decelerators/parachutes; biodegradable polymer)
- **ingestion** (military expended materials – munitions; military expended materials other than munitions)

A discussion of secondary stressors, to include the potential impacts to habitat or prey availability, and the potential impacts of all the stressors combined are provided at the end of the section.

The analysis of potential impacts to invertebrates considers standard operating procedures and mitigation measures that would potentially provide protection to invertebrates. Standard operating procedures relevant to invertebrates (e.g., using explosives, operating vessels safely, placing seafloor devices for retrieval) are detailed in Appendix A (Section A.2.7, Standard Operating Procedures). Details on mitigation measures relevant to invertebrates are referenced in Table 3.5-3. Mitigation measures specific to habitats that may include invertebrates (e.g., shallow-water coral reefs, live hard bottom) is referenced in Table 3.3-5 and shown in Figure 3.3-2 to Figure 3.3-5 of Section 3.3 (Habitats). Details on all mitigation measures are provided in Chapter 5 (Mitigation).

Table 3.5-3: Mitigation Requirement Summary by Stressor for Invertebrates

Applicable Stressor	*Requirements Summary and Protection Focus*	*Section Reference*
Explosives	Conduct visual observations for aggregations of jellyfish[1] during events involving explosive torpedoes and ship shock trials.	Section 5.6 (Visual Observations)
	Restrictions on detonating any in-water explosives within a horizontal distance from shallow-water coral reefs.	Section 5.7.1 (Shallow-Water Coral Reef Mitigation Areas)
	Restrictions on detonating explosives on or near the seafloor (e.g., explosive bottom-laid or moored mines) within a horizontal distance of 350 yards from artificial reefs, live hard bottom[2], submerged aquatic vegetation, and shipwrecks.	Section 5.7.2 (Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck Mitigation Areas)
Physical disturbance and strike	Restrictions on: (1) setting vessel anchors within an anchor swing circle radius that overlaps shallow-water coral reefs (except in designated anchorages) (2) placing other seafloor devices too close to shallow-water coral reefs except in South Florida Ocean Measurement Facility Seafloor Mitigation Area (3) deploying non-explosive ordnance against surface targets too close to shallow-water coral reefs	Section 5.7.1 (Shallow-Water Coral Reef Mitigation Areas)
	Requirement to operate surface vessels in waters deep enough to avoid bottom scouring or prop dredging, with at least a 1-foot clearance between the deepest draft of the vessel (with the motor down) and the seafloor at mean low water.	Section 5.7.3 (Key West Range Complex Seafloor Mitigation Area)
Entanglements	Requirements to: (1) operate surface vessels in waters deep enough to avoid bottom scouring or prop dredging, with at least a 1-foot clearance between the deepest draft of the vessel (with the motor down) and the seafloor at mean low water. (2) use a real-time geographic information system and global positioning system (along with remote-sensing verification) during deployment, installation, and recovery of anchors and mine-like objects and during deployment of bottom-crawling unmanned underwater vehicles in waters deeper than 10 feet to avoid live hard bottom[2]	Section 5.7.4 (South Florida Ocean Measurement Facility Seafloor Mitigation Area)

Table 3.5-3: Mitigation Requirement Summary by Stressor for Invertebrates (continued)

Applicable Stressor	*Requirements Summary and Protection Focus*	*Section Reference*
	(3) deploy seafloor devices from surface vessels while holding a relatively fixed position over the intended mooring or deployment location using a dynamic positioning navigation system with global positioning system (4) minimize surface vessel movement and drift in accordance with mooring installation and deployment plans and will conduct activities during sea and wind conditions that allow vessels to maintain position and speed control during deployment, installation, and recovery of seafloor devices (5) not anchor surface vessels or moor over live hard bottom[2] (6) use semi-permanent anchoring systems that are assisted with riser buoys over soft bottom habitats to avoid contact of mooring cables any live hard bottom[2].	

[1] The mitigation was developed to protect possible indicators of sea turtle or marine mammal presence, which includes description of invertebrates resource (e.g., jellyfish).
[2] Includes shallow-water coral reefs as a type of live hard bottom.

The criteria for determining the significance of Proposed Action stressors on invertebrates are described in Table 3.5-4. The abbreviated analysis under each substressor and alternative provides the technical support for these determinations, with reference to the 2018 Final EIS/OEIS or supporting appendices for details.

Table 3.5-4: Criteria for Determining the Significance of Proposed Action Stressors on Invertebrates

Impact Descriptor	*Context and Intensity*	*Significance Conclusions*
Negligible	Impacts to marine invertebrates would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual invertebrates found in the Study Area. Impacts on habitat would be temporary (e.g., temporary placement of an object on the sea floor or increased turbidity) with no lasting damage or alteration.	Less than significant
Minor	Impacts to marine invertebrates would be temporary or short term (lasting several days to several weeks) but would not be outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. This could include temporary or repeated short-term stress responses without permanent physiological damage. Behavioral responses to disturbance by some individuals, groups, populations, or colonies could be expected, but only temporary disturbance of breeding, feeding, or other activities would occur, without any impacts on population levels. Displacement would be short term and limited to the Study Area or its immediate surroundings. Impacts on habitat (e.g., short-term placement of an object on the sea floor, increased turbidity, or loss of a small area of vegetation) would be easily recoverable, with no long-term or permanent damage or alteration.	Less than significant
Moderate	Impacts to marine invertebrates would be short or long term (lasting several months or longer) and outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. This	Less than significant

Table 3.5-4: Criteria for Determining the Significance of Proposed Action Stressors on Invertebrates (continued)

Impact Descriptor	*Context and Intensity*	*Significance Conclusions*
	could include physiological injury to individuals, repeated stress responses, or mortality. Behavioral responses to disturbance by numerous individuals could be expected in the Study Area, its immediate surroundings, or beyond. These could include negative impacts to breeding, feeding, growth, or other factors affecting population levels, including population-level mortality or extended displacement (up to 1 year) of large numbers (e.g., population level) of invertebrates. However, they would not threaten the continued existence of a stock, population, or species. Habitat would be potentially damaged or altered over the long term but would continue to support the species reliant on it.	
Major	Impacts to marine invertebrates would be short or long term and well outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. Behavioral and stress responses would be repeated or permanent. Actions would affect any stage of a species' life cycle (i.e., breeding, feeding, growth, and maturity), alter population structure, genetic diversity, or other demographic factors, and/or cause mortality beyond a small number of individuals, resulting in a decrease in population levels. Displacement and stress responses would be short or long term within and well beyond the Study Area. Habitat would be degraded long term or permanently so that it would no longer support a sustainable fishery and/or would cause the population of a managed species to become stressed, less productive, or unstable.	Significant

With noted exceptions, the stressor background information and environmental consequences are not meaningfully different from what is described in the 2018 Final EIS/OEIS (Section 3.4.3, Environmental Consequences).

3.5.3.1 Acoustic Stressors

Table 3.5-5 contains brief summaries of background information that is relevant to the analyses of impacts for each acoustic substressor (sonar and other transducers, etc.) on invertebrates. Details on the updated information in general, as well as effects specific to each substressor, are provided in Appendix D (Acoustic and Explosive Impacts Supporting Information).

Table 3.5-5: Acoustic Stressors Background Information Summary

Substressor	*Background Information Summary*
All acoustic substressors	Most marine invertebrates do not have the capability to sense sound pressure; however, some are sensitive to nearby low-frequency sounds. • Invertebrates detect sound through particle motion, which diminishes rapidly with distance from the sound source. Therefore, the distance at which they may detect a sound is limited. Studies of continuous noise have found statocyst (small organ used for balance and orientation in some marine invertebrates) damage, stress, changes in larval development, masking of biologically relevant sounds, and behavioral reactions in marine invertebrates under generally extreme experimental conditions. • Noise exposure duration in many of the studies was far greater than that expected to occur during infrequent and localized activities.

Table 3.5-5: Acoustic Stressors Background Information Summary (continued)

Substressor	Background Information Summary
	• Masking of biologically relevant sounds by sounds generated from human activities could affect behaviors such as larvae settlement, communication, foraging, and predator avoidance. Invertebrates may also grow accustomed (i.e., habituate) to chronically elevated sound from human activities. Some studies indicate the potential for impacts to invertebrate larval development and masking resulting from extended exposure. • Recent research regarding the vertical distribution of most pelagic invertebrates suggests they are far below the surface during the daytime and less affected by daytime stressors in surface waters.
Sonar and other transducers	Sonar and other transducers produce continuous, non-impulsive sound in the water column at various frequencies. • Sonar and other transducer use in nearshore or inshore locations could expose more benthic invertebrates to higher intensity sounds, but the exposures from mobile platforms would be brief and intermittent and affect mostly pelagic invertebrates very close to the particle motion generated by the transducers. • Sessile species or species with limited mobility located near the activity would be exposed for the entire duration of sonar use at pierside locations. Species with greater mobility could potentially be exposed for shorter durations, depending on the time between testing events and the activity of individual animals. • The limited information available suggests that sessile marine invertebrates repeatedly exposed to sound could experience physiological stress or react behaviorally (e.g., shell closing) but there is also evidence to suggest their population is unaffected. • Direct injury from sonar and other transducers is highly unlikely and is not considered further in this analysis.
Air guns	Air guns produce shock waves when pressurized air is released into the water. The results of studies of the effects of seismic air guns on marine invertebrates suggest differences between taxonomic groups and life stages. • Physical injury has not been reported in relatively large crustaceans exposed to seismic air guns at received levels comparable to the source level of Navy air guns operated at full capacity, but one study reported injury and mortality for zooplankton. • Stress response was not found in crabs exposed to air gun noise but was reported for lobsters located near the source (where particle motion was likely detectable). • While behavioral reaction to air guns has not been documented for crustaceans, squid have exhibited startle and alarm responses at various sound levels. • Developmental effects were found for crab eggs and scallop larvae, but not for crab larvae. Air gun use could also result in substrate vibration, which could cause behavioral effects in nearby benthic invertebrates (e.g., shell closing or changes in foraging activity). • Compared to offshore areas where air gun use would primarily affect invertebrates in the water column, air gun use at pierside locations would potentially affect a greater number of benthic and sessile invertebrates due to proximity to the bottom and structures (e.g., pilings) that may be colonized by slow-moving or sessile invertebrates. • Air gun use in offshore areas would be unlikely to affect individuals of pelagic organisms (e.g., jellyfish, squid, and zooplankton) multiple times due to the relative mobility of invertebrates in the water column (passive/drifting and active movement) and the mobile nature of the sound source. • Exposure to air gun shots has not caused mortality, and invertebrates typically recovered from injuries in controlled laboratory settings.

Table 3.5-5: Acoustic Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
Pile driving	Pile driving and removal involves both impact and vibratory methods. Impact pile driving produces repetitive, impulsive, broadband sound with most of the energy in lower frequencies where invertebrate sound sensing capability is greater. Vibratory pile removal produces nearly continuous sound at a lower source level. • Available information indicates that invertebrates may respond to particle motion and substrate vibration produced by pile driving and removal. Investigations have found behavioral effects may vary among taxa or species. Most studies were conducted using small experimental tanks, where effects were observed very close to the sound sources. • Direct injury from vibratory pile driving, like other continuous sources, is highly unlikely and is not considered further in this analysis.
Vessel noise	Some invertebrates would likely be able to detect the low-frequency component of vessel noise. Several studies have found physiological responses (e.g., stress and changes in growth and reproduction) and behavioral responses (e.g., changes in feeding activity, shell closing) in some invertebrate species in response to vessel noise playback. Vessel noise may also contribute to acoustic masking. • Exposure to other types of non-impulsive noise has resulted in statocyst damage in squid and octopus, physiological stress, effects on larval development, and behavioral reactions. Noise exposure in several of the studies occurred to captive individuals for longer time durations than what is expected to occur during many training and testing activities, and therefore direct applicability of the results to the Proposed Action is uncertain. However, it is possible that invertebrates in the Study Area that are exposed to episodic vessel noise could exhibit similar reactions. • Marine invertebrates capable of sensing sound may alter their behavior or experience masking of other sounds if exposed to vessel noise. Because the distance over which most marine invertebrates are expected to detect sounds is limited, and because most vessel noise is transient or intermittent (or both), most behavioral reactions and masking effects from training and testing activities would likely be short term, ceasing soon after vessels leave an area. An exception could occur in and around port navigation channels and inshore waters that receive a high volume of ship or small craft traffic, where sound disturbance would be more frequent. • The relatively high frequency and intensity of vessel traffic in many inshore training and testing areas may have also given organisms an opportunity to adapt behaviorally to a noisier environment. For example, survey work by the Virginia Institute of Marine Science suggests that large populations of oysters inhabit Navy piers in the Chesapeake Bay that have persisted despite a history of chronic vessel noise. Without prolonged exposure to nearby sounds of relatively high intensity and generally low frequency, measurable impacts or behavioral adaptation are not expected. • Direct injury from vessel noise is highly unlikely and is not considered further in this analysis.
Aircraft noise	Invertebrates would likely only be temporarily affected by aircraft and missile overflight noise. • Impacts would likely be limited to pelagic invertebrates (e.g., squid, jellyfish, zooplankton) located near the surface. • Injury and physiological stress would not be likely because most invertebrates are relatively insensitive to underwater sounds. Behavioral reactions have been observed for squid but not for other invertebrates such as crustaceans, jellyfish, or zooplankton.
Weapon noise	Invertebrates would likely only be temporarily affected by noise produced by muzzle blasts and impact of large non-explosive practice munitions. • Impacts would likely be limited to pelagic invertebrates (e.g., squid, jellyfish, zooplankton) located near the surface. • Injury and physiological stress would not be likely because most invertebrates are relatively insensitive to underwater sounds. Behavioral reactions have been observed for squid but not for other invertebrates such as crustaceans, jellyfish, or zooplankton.

3.5.3.1.1 Impacts from Sonar and Other Transducers

Table 3.5-5 contains a summary of the background information used to analyze the potential impacts of sonar and other transducers on invertebrates. Many non-impulsive sounds associated with military readiness activities are produced by sonar. Other transducers include items such as acoustic projectors and countermeasure devices. For information on sonar and other transducers hours or counts proposed for each alternative, see Table 3.0-2 (Sonar and Transducer Sources Quantitatively Analyzed).

3.5.3.1.1.1 Impacts from Sonar and Other Transducers under Alternative 1

As discussed, in Section 3.0.3.3.1 (Acoustic Stressors), a detailed comparison of sonar quantities analyzed in the 2018 Final EIS/OEIS with sonar quantities under this Proposed Action is not feasible due to changes in the source binning process. However, the overall use of sonar and other transducers would decrease from the 2018 Final EIS/OEIS for both training and testing activities.

Under Alternative 1, changes from the 2018 Final EIS/OEIS for training activities using low-frequency sonar (in addition to other types of sonar) would include the following:

- There would be a small increase in unit-level anti-submarine warfare activities in the Gulf of Mexico Range Complex.

For all other locations, there would be a decrease or a similar number of activities that involve the use of low-frequency sonar to the 2018 Final EIS/OEIS.

Under Alternative 1, changes from the 2018 Final EIS/OEIS for testing activities using low-frequency sonars would include the following:

- Under anti-submarine warfare testing activities, there would be new events in the high seas, Gulf of Mexico Range Complex Inshore, Joint Expeditionary Base Little Creek, Naval Station Mayport, Naval Station Norfolk, Naval Submarine Base King Bay, and Naval Submarine Base New London.
- There would also be a notable increase in Anti-Submarine Warfare activities in Bath, Maine, and Pascagoula, Mississippi.

The greatest potential for measurable effects would be near the sources of low-frequency and high-intensity sonar described for Alternative 1 training activities in mostly the offshore marine environment. Sonar sources used primarily in the offshore environment would also be directed away from benthic habitats that are most productive in the nearshore environment. Per general description and location of impacts, the sonar and other transducer sounds associated with Alternative 1 training activities may result in brief, intermittent impacts to relatively few marine invertebrates close to low-frequency and high-intensity sound sources, but they are unlikely to impact survival, growth, recruitment, or reproduction of any marine invertebrate populations or subpopulations. Additionally, rare species are unlikely to be affected and common species could absorb impacts on relatively few individuals.

Pierside testing events generally occur over several hours of intermittent use. However, the intensity of testing activities in the offshore environment is generally lower than that of training activities.

Based on the updated background and analysis for training and testing under Alternative 1, sonar and other transducer impacts on invertebrates would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual invertebrates found within localized areas. This is consistent with a negligible impact on invertebrate populations.

The use of sonar and other transducers during training and testing activities under Alternative 1 may affect ESA-listed hard coral species and queen conch due to the overlap of the substressor with the species distribution in three locations (Key West Range Complex, Key West Range Complex Inshore, and

South Florida Ocean Measurement Facility). The Action Proponents are consulting with the National Marine Fisheries Service (NMFS) as required by section 7(a)(2) of the ESA.

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) will not be affected by sonar and other transducers (refer to Section 3.3, Habitats, for analysis of the impact of noise of abiotic substrate).

3.5.3.1.1.2 Impacts from Sonar and Other Transducers under Alternative 2

Under Alternative 2, sonar use during training activities would increase compared to Alternative 1:

- The maximum number of composite training exercises would occur each year, and an additional composite training exercise would occur in the Gulf of Mexico Range Complex.

Impacts from sonar and other transducers under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The quantities of sonar and other transducer activity (e.g., hours, counts) under Alternative 2 would increase only slightly over Alternative 1.

3.5.3.1.2 Impacts from Air Guns

Table 3.5-5 contains a summary of the background information used to analyze the potential impacts of air guns on invertebrates. For information on air gun counts proposed for each alternative, see Table 3.0-3 (Training and Testing Air Gun and Non-explosive Impulsive Sources Quantitatively Analyzed in the Study Area).

3.5.3.1.2.1 Impacts from Air Guns under Alternative 1

Air guns would not be used under training activities. The proposed use of air guns decreased overall for testing from the 2018 Final EIS/OEIS. Small air guns would be fired over a limited period within a single day. Air gun use would only occur in two testing activities: semi-stationary equipment testing and acoustic and oceanographic research. While air gun use during semi-stationary equipment testing may occur nearshore at Newport, Rhode Island, air gun use during acoustic and oceanographic research may occur in the Northeast, Virginia Capes, Jacksonville, and Gulf of Mexico Range Complexes.

Per general description and location of impacts, the air gun sounds associated with Alternative 1 testing activities may result in brief, intermittent impacts to relatively few marine invertebrates close to low-frequency and high-intensity sound sources, but they are unlikely to impact survival, growth, recruitment, or reproduction of any marine invertebrate populations or subpopulations. Additionally, rare species are unlikely to be affected and common species could absorb impacts on relatively few individuals.

Based on the updated background and analysis for testing under Alternative 1, air gun impacts on invertebrates would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual invertebrates found within localized areas. This is consistent with a negligible impact on invertebrate populations.

The use of air guns during testing activities under Alternative 1 is not applicable to ESA-listed hard coral species and queen conch due to lack of overlap with substressor locations.

Air guns used during testing activities are not applicable to critical habitat for ESA-listed coral species due to lack of overlap.

3.5.3.1.2.2 Impacts from Air Guns under Alternative 2

There would be no air gun use associated with training activities.

Impacts from air guns under Alternative 2 are not meaningfully different from Alternative 1 (Table 3.0-3, Training and Testing Air Gun and Non-Explosive Impulsive Sources Quantitatively Analyzed in the Study Area) and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for testing activities. Alternative 2 is the maximum number of air gun blasts that is included in the range of blasts for Alternative 1.

3.5.3.1.3 Impacts from Pile Driving

Table 3.5-5 contains a summary of the background information used to analyze the potential impacts of pile driving noise on invertebrates. Only port damage repair training includes pile driving. For information on pile driving quantities proposed for each alternative, see Table 3.0-4 (Number of Piles/Sheets Quantitatively Analyzed under Pile Driving and Removal Training Activities). The impact and vibratory pile driving hammers would expose invertebrates to impulsive and continuous non-impulsive broadband sounds, respectively.

3.5.3.1.3.1 Impacts from Pile Driving under Alternative 1

The activity type and location for pile driving activities for training have changed from the 2018 Final EIS/OEIS.

Under Alternative 1 for training:

- Pile driving would occur as part of Port Damage Repair training in Gulfport, Mississippi.
- Pile driving would no longer occur as part of the Elevated Causeway System at Joint Expeditionary Base Little Creek in the Virginia Capes Range Complex or Marine Corps Base Camp Lejeune in the Navy Cherry Point Range Complex.

There would be no pile driving or removal associated with testing activities.

Although some number of individuals would experience physiological and behavioral effects of pile driving in Gulfport, Mississippi, the activities would occur intermittently in very limited areas and would be of temporary duration. The activity is also occurring in a highly disturbed estuarine habitat that is different than the natural beach environments covered in the 2018 Final EIS/OEIS. The number of invertebrates affected in the highly altered locations would be small and resilient compared to overall population numbers. Pile driving and removal activities would be unlikely to impact survival, growth, recruitment, or reproduction of marine invertebrate populations or subpopulations. Additionally, rare species are unlikely to be affected due to chance encounters and common species could absorb impacts on relative few individuals.

Based on the updated background and analysis for training under Alternative 1, pile driving impacts on invertebrates would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual invertebrates found within localized areas. This is consistent with a negligible impact on invertebrate populations.

The use of pile driving during training activities under Alternative 1 is not applicable to ESA-listed hard coral species and queen conch due to the lack of overlap with the substressor location.

Pile driving noise is not applicable to the critical habitat for ESA-listed coral species due to lack of overlap with the substressor location.

3.5.3.1.3.2 Impacts from Pile Driving under Alternative 2

Impacts from pile driving during training under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance, ESA-listed species and critical habitat are the same.

There would be no pile driving or removal associated with testing activities.

3.5.3.1.4 Impacts from Vessel Noise

Table 3.5-5 contains a summary of the background information used to analyze the potential impacts of vessel noise on invertebrates. For information on the number of activities including vessel noise, see Table 3.0-9 (Number and Location of Activities Including Vessels) and Table 3.0-10 (Number and Location of Activities Including In-water Devices).

3.5.3.1.4.1 Impacts from Vessel Noise under Alternative 1

For both training and testing activities, vessel activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of vessel noise, so impacts would be expected to be similar or lesser than previously concluded.

Under Alternative 1 for training:

- Vessel noise would occur in two locations that are new or not previously analyzed (Gulfport and Pascagoula, Mississippi, respectively). For all other locations, there would either be a decrease or similar events including vessel activity.

Under Alternative 1 for testing:

- Vessel noise would occur in seven locations not previous analyzed (inshore locations of the Northeast, Virginia Capes, and Gulf of Mexico Range Complexes; Other AFTT Areas; Hampton Roads, Virginia). There would also be notable increases in vessel activity at the Naval Surface Warfare Center Panama City Division Testing Range, Naval Station Norfolk, and Pascagoula, Mississippi. For all other locations, there would either be a decrease or similar amount of vessel activity.

For locations without a notable increase in vessel activity, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.5.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of invertebrate taxa among training and testing locations has not changed.

For locations with a notable increase in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of vessels noise remains an accurate characterization of the Proposed Action in those locations.

For the inshore testing locations not previously analyzed, standard operating procedures (e.g., vessel and in-water device safety) and mitigation implemented in the seafloor resource mitigation areas help to avoid close proximity to shallow waters where sensitive species are concentrated (e.g., oysters on reefs in Northeast Range Complexes Inshore). Furthermore, the locations not previously analyzed for testing were analyzed for training in the 2018 Final EIS/OEIS. The other locations not previously analyzed are port or pierside locations featuring artificial structures placed in soft bottom habitat with resilient soft bottom communities. These areas are also highly modified/disturbed due to human activity and frequent dredging.

The intermittent vessel noise produced during training and testing activities may briefly impact some individuals within a limited area, but exposures are not expected to impact survival, growth, recruitment, or reproduction of marine invertebrate populations or subpopulations. Concentrated vessel operation in areas such as port navigation channels could result in repeated noise exposure and chronic physiological or behavioral effects to individuals of local invertebrate subpopulations, particularly sessile species, located near the sound source. However, vessel noise would not be expected to adversely affect the viability of common or widely distributed invertebrate species within navigation channels and near naval port facilities. An impact on rare species in these highly altered habitats would be unlikely.

Based on the updated background and analysis for training and testing under Alternative 1, vessel noise impacts on invertebrates would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual invertebrates found within localized areas. This is consistent with a negligible impact on invertebrate populations.

The vessel noise during training and testing activities under Alternative 1 may affect ESA-listed hard coral species and queen conch due to the overlap of the substressor with the species distribution in three locations (Key West Range Complex – inshore and offshore and South Florida Ocean Measurement Facility). The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) will not be affected by vessel noise (refer to Section 3.3, Habitats, for analysis of the impact of noise on abiotic substrate).

3.5.3.1.4.2 Impacts from Vessel Noise under Alternative 2

Impacts from vessel noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species and critical habitat are the same for both training and testing. The number of activities including vessels or in-water devices increases only slightly over that of Alternative 1.

3.5.3.1.5 Impacts from Aircraft Noise

Table 3.5-5 contains a summary of the background information used to analyze the potential impacts of aircraft noise on invertebrates. For information on the number of activities including aircraft noise, see Table 3.0-16 (Number and Location of Activities with Aircraft).

3.5.3.1.5.1 Impacts from Aircraft Noise under Alternative 1

For both training and testing activities, aircraft activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of aircraft noise, so impacts would be expected to be similar or lesser than previously concluded.

Under Alternative 1, the following changes exist from the 2018 Final EIS/OEIS for training activities:

- A notable increase in the Navy Cherry Point Range Complex.

Under Alternative 1, the following changes exist from the 2018 Final EIS/OEIS for testing activities:

- Aircraft use in the following area that was not previously analyzed: Other AFTT Areas.

Most pelagic invertebrates are present near the surface at night when aircraft noise occurs less often. There is also very low transmission of sound pressure across the air-water boundary. Aircraft noise typically occurs outside of state coastal waters in depths that would greatly reduce the sound reaching the bottom. Therefore, impacts to benthic invertebrates (e.g., deep-sea corals, bivalves, worms, and crabs) are not expected.

Per general description and location of impacts, the aircraft noise associated with Alternative 1 training and testing activities would be unlikely to impact survival, growth, recruitment, or reproduction of pelagic invertebrate populations or subpopulations. No impact of aircraft noise on benthic invertebrate population is expected. Additionally, rare species are unlikely to be affected due to chance encounters and common species could absorb impacts on relatively few individuals.

Based on the updated background and analysis for training and testing under Alternative 1, the impact of aircraft noise on invertebrates would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual invertebrates found within localized areas and near the surface. This is consistent with a negligible impact on pelagic invertebrate populations. Aircraft noise would not affect seafloor invertebrates where it typically occurs.

The aircraft noise during training and testing activities under Alternative 1 would not affect ESA-listed hard coral species and queen conch because they are seafloor invertebrates.

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) will not be affected by aircraft noise (refer to Section 3.3, Habitats, for analysis of the impact of noise on abiotic substrate).

3.5.3.1.5.2 Impacts from Aircraft Noise under Alternative 2

Impacts from aircraft noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species and critical habitat are the same for both training and testing. The number of activities including aircraft under Alternative 2 would increase only slightly over Alternative 1.

3.5.3.1.6 Impacts from Weapons Noise

Table 3.5-5 contains a summary of the background information used to analyze the potential impacts of weapons noise on invertebrates. For information on the number of activities including weapons noise, see Table 3.0-11 (Number and Location of Non-explosive Practice Munitions Expended During Military Readiness Activities).

3.5.3.1.6.1 Impacts from Weapons Noise under Alternative 1

For both training and testing activities, weapons activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of weapons noise, so impacts would be expected to be similar or lesser than previously concluded.

Most pelagic invertebrates are present near the surface at night when weapons firing and launch occurs less often. There is also very low transmission of sound pressure across the air-water boundary. Weapons firing and launch typically occurs outside of state coastal waters in depths that would greatly reduce the sound reaching the bottom. Therefore, impacts to benthic invertebrates (e.g., deep-sea corals, bivalves, worms, and crabs) are not expected.

Per general description and location of impacts, the weapons firing associated with Alternative 1 training and testing activities would be unlikely to impact survival, growth, recruitment, or reproduction of pelagic invertebrate populations or subpopulations. No impact of weapons noise on benthic invertebrate population is expected. Additionally, rare species are unlikely to be affected due to chance encounters and common species could absorb impacts on relatively few individuals.

Based on the updated background and analysis for training and testing under Alternative 1, the impact of weapon noise on invertebrates would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual invertebrates found within localized areas and near the surface. This is consistent with a negligible impact on pelagic invertebrate populations. Weapons noise would not affect seafloor invertebrates where it typically occurs.

The weapons noise during training and testing activities under Alternative 1 would not affect ESA-listed hard coral species and queen conch because they are seafloor invertebrates.

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) will not be affected by weapons noise (refer to Section 3.3, Habitats, for analysis of the impact of noise on abiotic substrate).

3.5.3.1.6.2 Impacts from Weapons Noise under Alternative 2

Impacts from weapons noise under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance, ESA-listed species and critical habitat are the same for both training and testing. The number of items generating weapons firing noise (e.g., non-explosive and explosive practice munitions) under Alternative 2 is the same as Alternative 1.

3.5.3.2 Explosive Stressors

This section summarizes the potential impacts of explosives used during military readiness activities within the Study Area. Table 3.5-6 contains a brief summary of background information that is relevant to analyses of impacts from explosive stressors. Details on the updated information in general, as well as effects specific to each substressor, is provided in Appendix D (Acoustic and Explosive Impacts Supporting Information).

Table 3.5-6: Explosive Stressors Background Information Summary

Substressor	***Background Information Summary***
Explosions in the water	Explosions produce pressure waves with the potential to cause injury or physical disturbance due to rapid pressure changes and other physical effects. Charges detonated in shallow water on or near the bottom could kill and injure marine invertebrates within hundreds of yards of the location. A blast on or near the bottom could also degrade hard substrate suitable for invertebrate colonization or form a crater in soft bottom. A blast in the vicinity of hard corals could cause direct impacts to coral polyps, or fragmentation and siltation of the corals. • Invertebrates that detect impulsive or non-impulsive sounds resulting from an explosion may experience stress or exhibit behavioral reactions. Any auditory masking of biologically relevant sounds would be very brief. • Charges detonated on or near shallow, soft bottom habitats affect invertebrate communities that are adapted to frequent disturbance from storms and associated sediment redistribution. Studies of the effects of large-scale sediment disturbance, such as dredging and sediment borrow projects, have found recovery of benthic communities over a period of weeks to years depending on multiple factors (e.g., substrate type, current speeds, and storm intensities). • With the exception of clay bottom, craters resulting from detonations in the soft bottom would be filled and smoothed by waves and long-shore currents over time, resulting in no long-term change to bottom profiles that could affect invertebrate species assemblages. Craters in clay bottom could persist for years.
Explosions in the air	In-air detonations at or near the water surface could transmit sound and energy into the water and impact invertebrates. Detonations that occur at higher altitudes would not propagate enough sound and energy into the water to result in impacts to invertebrates and therefore are not analyzed in this section.

The Action Proponents will implement mitigation tailored to reducing the impact of explosives in the water on sensitive habitats that feature living organisms, including ESA-listed coral species and queen conch in the mitigation areas identified in Table 3.5-4. The mitigation areas that are not specific to invertebrates are mapped and described in Section 3.3 (Habitats) because they primarily address impacts on the seafloor habitat of invertebrates and other biological resources (e.g., live hard bottom). The critical habitat for ESA-listed coral species depicted in Figure 3.5-1 encompasses the sensitive habitats noted as mitigation areas in Section 3.3.

3.5.3.2.1 Impacts from Explosives

Table 3.5-6 contains a summary of the background information used to analyze the potential impacts of explosives on invertebrates. For information on explosive sizes and quantities for each alternative, see Table 3.0-5 (Explosive Sources Quantitatively Analyzed that Could Be Used Underwater or at the Water Surface).

In the unlikely event that underwater explosives are used near unmapped hard bottom (hard coral and sponge habitat), some individual corals could be damaged. The mitigation areas will reduce or eliminate the impact of bottom-placed explosives on mapped shallow-water coral reefs and live hard bottom inhabited by ESA-listed coral species and queen conch, and other reef-associated invertebrates. All mapped sensitive habitat features within the Study Area occur completely within mitigation areas (e.g., shallow-water coral reefs, live hard bottom), with the exception of Key West Range Complex Inshore. In that location, though the sensitive habitat features are not within a mitigation area, explosive charges used there are very small and placed either on the seafloor or on a seafloor device (e.g., metal plate or steel frame) with the explosive energy directed upward.

The minimal overlap of critical habitats for coral and mitigation areas is due to how the critical habitat areas are mapped with only qualifiers for presence of hard substrate (refer to text in Figure 3.5-1). Jellyfish aggregations are not a stationary feature that can be estimated in terms of overlap and coverage.

3.5.3.2.1.1 Impacts from Explosives under Alternative 1

The use of explosives would generally decrease from the 2018 Final EIS/OEIS for both training and testing activities. Notably, for testing there would be no use of bin E17 (greater than 14,500 – 58,000 pounds [lb.] net explosive weight [NEW]) and reduced use of bin E16 (greater than 7,250 to 14,500 lb. NEW) for ship shock trials. There is also a reduction in use of most of the largest explosive bins for both training and testing, and an extremely large decrease in explosives associated with medium-caliber gunnery (bin E1 [0.1 to 0.25 lb. NEW]). Very few detonations would occur at inshore locations and would involve the use of smaller charge sizes (E5 or below). Additionally, small ship shock trials could occur in Virginia Capes, Jacksonville, or the Gulf of Mexico Range Complexes.

The majority of underwater explosions occur on the surface and typically in offshore locations beyond state waters and in depths greater than 100 feet (30 meters), where invertebrate size and abundance is generally low compared to estuarine and nearshore ocean waters. In addition, invertebrate abundances in offshore surface waters tend to be lower during the day, when surface explosions typically occur, than at night. Relatively few activities including explosives underwater occur within state waters.

Based on the relative footprints and location of explosives use under Alternative 1 for training and testing (refer to Section 3.3, Habitats, for analysis summary) and the general description of impacts, there would be: (1) an unlikely spatial coincidence between explosive impacts and the distribution of sensitive invertebrates (e.g., reef-building corals growing on shallow-water coral reefs); (2) a quick recovery of soft bottom communities that are more likely impacted (e.g., worms, clams); and (3) only short-term impacts from most local disturbances of the surface water or seafloor, with some temporary increases in suspended sediment in mostly shallow, soft bottom habitats. The effects of this substressor on marine invertebrates are therefore not expected to result in detectable changes in their growth, survival, or propagation, and are not expected to result in population-level impacts or affect the distribution, abundance, or productivity of invertebrate species; rare species are unlikely to be affected by chance encounters and common species could absorb impacts on relatively few individuals.

The analysis conclusions for underwater explosives use with training and testing activities under Alternative 1 are consistent with a moderate (due to limited potential injury/mortality) impact on invertebrate populations.

The use of explosives in water during training and testing activities under Alternative 1 may affect ESA-listed coral species and queen conch. The distribution of these species coincides with the stressor occurring in the Key West Range Complex (offshore and inshore locations). Queen conch would be relatively more vulnerable to explosives in water than ESA-listed coral species based on its more varied use of seafloor habitats. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Critical habitat for ESA-listed corals may be affected by explosives in water where there is unmapped natural hard substrate in the narrow band of critical habitat area overlapping the Key West Range Complex (Figure 3.5-1) (refer to Section 3.3, Habitats, for analysis of explosive impacts on hard substrate). Critical habitat is not designated is some areas of the Key West Range Complex Inshore that are subject to the Naval Air Station Key West Integrated Natural Resources Management Plan (within 50 yards of shore).

3.5.3.2.1.2 Impacts from Explosives under Alternative 2

Impacts from explosives in water under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The explosive sizes and numbers under Alternative 2 are the same as Alternative 1.

3.5.3.3 Energy Stressors

Table 3.5-7 contains brief summaries of the background information that is relevant to the analyses of impacts of in-water electromagnetic devices on invertebrates. The background information for energy stressor effects on invertebrates in the Study Area as described in the 2018 Final EIS/OEIS (Section 3.4.3.3) has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS remains valid.

Table 3.5-7: Energy Stressors Background Information Summary

Substressor	*Background Information Summary*
In-water electromagnetic devices	Available information suggests sensitivity to magnetic and electric fields in at least three marine invertebrate phyla: Mollusca, Arthropoda, and Echinodermata. • The primary potential effect on sensitive marine invertebrates would be temporary directional disorientation for individuals encountering a human-produced magnetic field. For example, an individual could be confused or change its movement direction while exposed to a field. However, a limited number of studies suggest that other effects, such as changes in embryo development, are possible within relatively strong fields for an extended time (10 to 150 minutes). • Given the exponential drop in field strength with distance and association with the physical presence of mobile in-water devices well above the bottom, the potential for effects on benthic invertebrates is unlikely. • For pelagic invertebrates, the effects would occur only at very close ranges and for a very short time.
In-air electromagnetic devices	In-air electromagnetic devices are not applicable to invertebrates because of the lack of transmission of electromagnetic radiation across the air/water interface and distant proximity to in-air sources. In-air electromagnetic energy effects will not be analyzed further in this section.
High-energy lasers	High-energy laser weapons are designed to disable surface targets and turn off when they lose track of the target. Marine invertebrates would therefore not be exposed to the laser.

3.5.3.3.1 Impacts from In-Water Electromagnetic Devices

Table 3.5-7 contains a summary of the background information used to analyze the potential impacts of in-water electromagnetic devices on invertebrates. The in-water devices producing an electromagnetic field are towed or unmanned mine countermeasure systems. The electromagnetic field is produced to simulate a vessel's magnetic field. In an actual mine-clearing operation, the intent is that the electromagnetic field would trigger an enemy mine designed to sense a vessel's magnetic field. In-water electromagnetic energy associated with the Proposed Action alternatives produce a strong enough field for effects on invertebrates within a few feet of their source. For information on the number of location of activities including in-water electromagnetic devices, see Table 3.0-6 (Number and Location of Activities Using In-water Electromagnetic Devices).

3.5.3.3.1.1 Impacts from In-Water Electromagnetic Devices under Alternative 1

For both training and testing activities, in-water electromagnetic device activity would decrease overall from the 2018 Final EIS/OEIS (Table 3.0-6, Number and Location of Activities Using In-water Electromagnetic Devices).

Under Alternative 1 for training:

- In-water electromagnetic devices would occur in two areas not previously analyzed (Key West Range Complex and Virginia Capes Range Complex Inshore). There would also be notable increases in in-water electromagnetic devices in the Virginia Capes and Gulf of Mexico Range Complexes. For all other locations, there would either be a decrease or similar amount of in-water electromagnetic devices.

Under Alternative 1 for testing:

- In-water electromagnetic devices would occur in two areas not previously analyzed (Northeast Range Complexes and Hampton Roads, Virginia) for the 2018 Final EIS/OEIS. There would also be a notable increase in in-water electromagnetic devices in the Naval Surface Warfare Center Panama City Testing Area. For all other locations, there would either be a decrease or cessation of in-water electromagnetic devices.

For locations without notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.5.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of invertebrate taxa among training and testing locations has not changed.

For locations with notable increase in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of in-water electromagnetic device activity remains an accurate characterization of the Proposed Action in those locations.

For the locations not previously analyzed, standard operating procedures (e.g., in-water device safety) will help reduce potential impacts to invertebrates. Sensitive invertebrates (e.g., jellyfish, mollusks) are also not likely to be affected by the distant and moving electromagnetic energy sources.

Based on the relative amount and location of in-water electromagnetic device use, and the general description of impacts, the potential exposure is not expected to yield any lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level. Additionally, rare species are unlikely to be affected due to chance encounters and common species could absorb impacts on relative few individuals.

The analysis conclusions for in-water electromagnetic device use with training and testing activities under Alternative 1 are consistent with a negligible impact on invertebrate populations.

The use of in-water electromagnetic devices during training and testing activities under Alternative 1 may affect ESA-listed coral species and queen conch due to their membership in a relatively sensitive taxonomic group.

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) would not be affected by in-water electromagnetic devices used for training (refer to Section 3.3, Habitats, for analysis of the impact of electromagnetic energy on abiotic substrate). Use of in-water devices for testing is not applicable to the critical habitat for ESA-listed corals due to lack of geographic overlap with the stressor.

3.5.3.3.1.2 Impacts from In-Water Electromagnetic Devices under Alternative 2

Impacts from in-water electromagnetic devices under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including use of in-water electromagnetic devices under Alternative 2 is the same as Alternative 1.

3.5.3.4 Physical Disturbance and Strike Stressors

Table 3.5-8 contains brief summaries of background information that is relevant to analyses of impacts for each physical disturbance and strike substressor (vessels and in-water devices, military expended materials, seafloor devices, and pile driving). The background information for physical disturbance and strike stressor effects on invertebrates in the Study Area as described in the 2018 Final EIS/OEIS (Section 3.4.3.4) has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS remains valid.

Table 3.5-8: Physical Disturbance and Strike Stressors Background Information Summary

Substressor	*Background Information Summary*
Vessels and in-water devices	In general, there would be a higher likelihood of vessel and in-water device disturbance or strike in the coastal areas than in the open ocean portions of the Study Area because of the concentration of activities and comparatively higher abundances of invertebrates in areas closer to shore. • In most cases, vessels and in-water devices would avoid contact with bottom (and associated invertebrates) per standard operating procedures unless the vessel/vehicle is designed to touch the bottom (e.g., amphibious vehicles). • Most invertebrates in the water column around a passing vessel would be disturbed, rather than struck, as water flows around a vessel or device due to the hydrodynamic shape. • Propeller wash and turbulent water flow could damage or kill zooplankton and invertebrate gametes, eggs, embryonic stages, or larvae. Even if some tiny invertebrates were affected, their populations are vast, with short life cycles and naturally high mortality rates. Many squid and zooplankton species also migrate far from the surface during the day, reducing the overall potential for strikes or even disturbance. • The potential for vessels to disturb invertebrates on or near the bottom and along the shoreline would occur mostly during nearshore and inshore military readiness activities, and along navigation channels. Invertebrates in such areas (e.g., shrimp, crab, oysters, clams, worms) could be affected by sediment disturbance or direct strike during vessel movement in shallow water (e.g., waterborne training, amphibious landings). Touching the bottom in shallow, soft bottom is a common practice among boaters that does not necessarily damage the vessel.

Table 3.5-8: Physical Disturbance and Strike Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
	• Although amphibious vehicles are designed to touch the bottom, they are generally used along ocean beaches and similar high-energy shorelines where the invertebrates present are small and resilient to frequent disturbance. • Invertebrates inhabiting shallow bottoms and shoreline (e.g., oysters, mussels, snails) may be subject to recurring wake-induced turbidity and erosion (Zabawa & Ostrom, 1980). For context, Navy vessels represent a small fraction of total maritime traffic (Mintz, 2016) and the wakes generated by small Navy vessels which, for safety reasons are not generally operated at excessive speeds close to shore, are similar to wind waves that naturally occur.
Aircraft and aerial targets	Impacts from aircraft and aerial targets are not applicable and will not be analyzed further in this section. The presence of aerial invertebrates (e.g., butterflies) over open waters of the Study Area is discounted in Appendix F (Biological Resources Supplemental Information).
Military expended materials	Military expended materials deployed over water include a wide range of items that may affect invertebrates upon initial impact or may occur when items reach the seafloor to settle or be moved along the bottom by water currents or gravity. • Most release of military expended materials occurs in the confines of established at-sea training and testing areas far from shore, although there is some release of expended materials within inshore (e.g., marine markers in the VACAPES RC Inshore) and nearshore locations (e.g., Navy Cherry Point Range Complex). • The effects of expended materials at the surface would be minimal because many invertebrates are absent from surface waters during the day, which is when most military readiness activities occur. Compared to surface waters and offshore areas, a greater number of macroinvertebrates typically occurs on the bottom and closer to shore, where relatively few materials are expended. • After striking the surface or being launched underwater, military expended materials passing nearby may disturb individuals and cause a stress response or behavioral reaction. Expended items may bury or smother organisms when they reach the seafloor. Expended items could also increase turbidity that could temporarily affect filter-feeding species nearby. • The dampening effect of water would reduce the impact of military expended materials on mostly soft or intermediate bottom communities (84% of the Study Area locations less than 2,500 meters [m] deep; see Table 3.3-1, Percent Coverage of Seafloor Habitats and Abiotic Substrate Types in Training and Testing Locations of the Study Area) that are resilient to disturbance and would thus recover quickly in the unlikely event of a disturbance or strike. • Whereas some benthic invertebrates have hard, resilient shells (e.g., clams, snails), other species (e.g., sponges and soft corals) have fragile structures and sensitive body parts that could be damaged or covered by military expended materials. Heavy expended materials could also break hard structures such as coral skeletons and mussel beds. Shallow- and deep-water corals that build complex or fragile structures could be particularly susceptible to breakage or abrasion. Expended items may also provide new colonization sites for benthic invertebrates, although species composition on artificial substrates often differs from that of the surrounding natural community. • Military expended materials that are less dense than the underlying substrate (e.g., decelerators/parachutes) will likely remain on the substrate surface for some time after sinking. The impact of lighter materials on benthic invertebrates would also be

Table 3.5-8: Physical Disturbance and Strike Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
	temporary and minor due to the mobility of such materials. The rare exception would be for light materials that snag on structure bottom features (e.g., decelerator/parachute or wire/cable on reef-building corals). The potential for lighter materials to drift into shallow, inshore habitats from at-sea training and testing areas would be low based on the prevailing ocean currents depicted in Figure 3.3-6 through Figure 3.3-10 (water column figures). • Potential impacts on deep-water corals and sponges present the greatest risk of long-term damage compared with resilient soft bottom communities. The probability of striking deep-water corals or other sensitive invertebrates located on hard bottom habitat is also relatively low given their typically low percent coverage on suitable habitat (Appendix F, Biological Resources Supplemental Information).
Seafloor devices	Seafloor devices are either stationary (e.g., mine shapes, anchors, bottom-placed instruments) or move very slowly along the bottom (e.g., bottom-crawling unmanned underwater vehicles) where they may temporarily disturb the bottom before being recovered. • Seafloor device impacts pose little threat to highly mobile organisms (e.g., squid, shrimp) in the water column. Impacts to pelagic invertebrates resulting from movement of a device through the water column before it reaches the seafloor would likely consist of only temporary displacement as the object passes by. • Impacts to sessile or less mobile benthic organisms (e.g., corals, sponges, snails) may include injury or mortality due to direct strike, disturbance, smothering, and temporary impairment of respiration or filter feeding due to increased sedimentation and turbidity. The severity of the impact would be greater for relatively fragile invertebrate parts (e.g., coral polys). • Although intentional placement of seafloor devices on bottom structure is avoided to ensure recovery, seafloor devices placed in depths less than about 2,500 m may inadvertently impact deep-water corals and other invertebrates associated with live hard bottom (e.g., sponges, anemones). The probability of striking deep-water corals or other sensitive invertebrates located on hard substrate is also relatively low given their typically low percent coverage on suitable habitat (Appendix F, Biological Resources Supplemental Information). • Seafloor devices are most likely to impact invertebrates inhabiting soft and intermediate bottom habitats. The benthic invertebrates living in these vast areas of the seafloor (84% of Study Area locations less than 2,500 m deep; see Table 3.3-1, Percent Coverage of Seafloor Habitats and Abiotic Substrate Types in Training and Testing Locations of the Study Area) tend to be softer bodied and resilient to disturbance (e.g., deposit-feeding worms) than invertebrates growing on relatively scarce hard bottom.
Pile driving	Pile driving and removal involves both impact and vibratory methods in soft substrate. Pile driving may have the potential to impact estuarine soft bottom communities temporarily during driving, removal, and in the short term thereafter. The impacts to benthic invertebrates include displacement in the footprint of the pilings, sediment disturbances during driving and extraction, and loss of sessile invertebrates that colonize the pilings prior to removal.

Notes: % = percent; m = meters; OPAREA = operating area; RC = Range Complex; VACAPES = Virginia Capes

The Action Proponents will implement mitigation tailored to reducing the impact of physical disturbance and strike on sensitive habitats that feature invertebrates, including ESA-listed coral species and queen conch in the mitigation areas identified in Table 3.5-4. The mitigation area restrictions are mapped and described in Section 3.3 (Habitats) because they primarily address impacts on the seafloor habitat of invertebrates and other biological resources. The critical habitat for ESA-listed coral species depicted in Figure 3.5-1 encompasses the sensitive habitats in Key West Range Complex (offshore and inshore locations) and the South Florida Ocean Measurement Facility shown in Section 3.3.

3.5.3.4.1 Impacts from Vessels and In-Water Devices

Table 3.5-8 contains a summary of the background information used to analyze the potential impacts of vessels and in-water devices on invertebrates. For information on the number of activities including vessels and in-water devices, see Table 3.0-9 (Number and Location of Activities Including Vessels) and Table 3.0-10 (Number and Location of Activities include In-water Devices).

The seafloor resource mitigation identified in Table 3.5-4 will reduce or eliminate the potential impacts from vessel disturbance on ESA-listed coral species and queen conch, and other shallow-water habitats in the Key West Range Complex and South Florida Ocean Measurement Facility (refer to Section 3.3, Habitats, for a detailed mapping of the mitigation). Mitigation areas relevant to these species cover nearly all of the locations where training and testing occurs. In other shallow areas where vessel or in-water device use is proposed, the avoidance of features that could damage the vessel or in-water device (e.g., seafloor in general and hard substrate in particular) is part of standard operating procedures.

3.5.3.4.1.1 Impacts from Vessels and In-Water Devices under Alternative 1

For both training and testing activities, vessel and in-water device activity would decrease overall from the 2018 Final EIS/OEIS (Tables 3.0-9, Number and Location of Activities Including Vessels, and Table 3.0-10, Number and Location of Activities Including In-water Devices).

Under Alternative 1 for training:

- Vessel activity would occur in two locations that are new or not previously analyzed (Gulfport and Pascagoula and Gulfport, Mississippi, respectively). For all other locations, there would either be a decrease or similar amount of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in one location not previously analyzed (Northeast Range Complexes Inshore). For all other locations, there would either be a decrease, similar amount, or cessation of in-water device activity.

Under Alternative 1 for testing:

- Vessel activity would occur in seven locations not previously analyzed (inshore locations of the Northeast, Virginia Capes, and Gulf of Mexico Range Complexes; Other AFTT Areas; Hampton Roads, Virginia). There would also be notable increases in vessel activity at the Naval Surface Warfare Center Panama City Division Testing Range, Naval Station Norfolk, and Pascagoula, Mississippi. For all other locations, there would either be a decrease or similar amount of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in four locations not previously analyzed (Gulf of Mexico Range Complex Inshore; Bath, Maine; Newport, Rhode Island; Pascagoula, Mississippi). For all other locations, there would either be a decrease or similar amount of in-water device activity.

For locations without a notable increase in vessel and in-water device activity, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.5.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of invertebrate taxa among training and testing locations has not changed.

For locations with a notable increase in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of vessels activity remains an accurate characterization of the Proposed Action in those locations.

For the inshore locations that are new or not previously analyzed, standard operating procedures (e.g., vessel and in-water device safety) and mitigation implemented in the seafloor resource mitigation areas would help to avoid impacting shallow waters where sensitive species are concentrated (e.g., oysters on reefs in the Northeast Range Complexes Inshore). Furthermore, the locations not previously analyzed for testing were analyzed for training in the 2018 Final EIS/OEIS. The other locations that are new or not previously analyzed are port or pierside locations featuring artificial structures placed in soft bottom habitat with resilient soft bottom communities. These areas are also highly modified/disturbed due to human activity and frequent dredging.

Based on the relative amount and location of vessels and in-water devices under Alternative 1 for training and testing and the general description of impacts, there would be (1) avoidance of sensitive invertebrates growing on hard substrate, per standard operating procedures and mitigation measures; (2) a quick recovery of invertebrate taxa in waters that are more likely impacted (e.g., shallow soft bottom communities); and (3) only short-term impacts from most vessel and in-water device movements and local disturbances of the surface water column, with some temporary increase in suspended sediment in shallow areas. The effects of this substressor on marine invertebrates are therefore not expected to result in detectable changes in their growth, survival, or propagation, and are not expected to result in population-level impacts or affect the distribution, abundance, or productivity of invertebrates; rare species are unlikely to be affected due to chance encounters and common species could absorb impacts on relatively few individuals.

The analysis conclusions for vessel and in-water device use with training and testing activities under Alternative 1 are consistent with a moderate (due to limited potential for injury/mortality) impact on invertebrate populations.

The use of vessels and in-water devices during training and testing activities under Alternative 1 may affect ESA-listed coral species and queen conch where the species are using shallow-water habitats in the Key West Range Complex – inshore and offshore locations, and in the South Florida Ocean Measurement Facility.

Critical habitat for ESA-listed corals (natural hard substrate; Figure 3.5-1) will not be affected by vessels and in-water devices (refer to Section 3.3, Habitats, for analysis of physical disturbance and strike potential on hard abiotic substrate) due to standard operating procedures over features that could damage the vessel or in-water device.

3.5.3.4.1.2 Impacts from Vessels and In-Water Devices under Alternative 2

Impacts from vessels and in-water device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including vessels or in-water devices increases only slightly over that of Alternative 1.

3.5.3.4.2 Impacts from Military Expended Materials

Table 3.5-8 contains a summary of the background information used to analyze the potential impacts of military expended materials on invertebrates. For information on the type, number, and location of military expended materials, see Table 3.0-11 (Number and Location of Non-explosive Practice Munitions Expended During Military Readiness Activities), Table 3.0-12 (Number and Location of Explosives that May Result in Fragments During Military Readiness Activities), Table 3.0-13 (Number of Location of Targets Expended During Military Readiness Activities), Table 3.0-14 (Number and Location of Other Military Materials Expended During Military Readiness Activities), Table 3.0-17 (Number and Location of Wires and Cables Expended During Military Readiness Activities), and Table 3.0-18 (Number and Location of Activities Including Biodegradable Polymers during Testing).

The mitigation measures identified in Table 3.5-4 will reduce or eliminate the potential impacts by locating some military expended materials away from ESA-listed coral species and reef-associated species (refer to Section 3.3, Habitats, for detailed mapping of the mitigation). Mapped sensitive habitat features (e.g., shallow-water coral reefs) within the Study Area only occur within mitigation areas. In other areas where military expended materials are proposed, the impact is limited by the distance from shore (e.g., most heavy munitions limited to areas outside of state waters) which places most impacts seaward of dynamic and productive nearshore habitats.

The combination of mitigation areas for shallow-water coral reefs and agreement to follow national marine sanctuary regulations protects nearly all seafloor habitats and associated invertebrates less than 30 m deep in the Key West Range Complex (offshore and inshore locations) from the direct strike potential from most military expended materials.

3.5.3.4.2.1 Impacts from Military Expended Materials under Alternative 1

For both training and testing activities, the number of military expended materials would decrease overall from the 2018 Final EIS/OEIS (Table 3.0-11, Number and Location of Non-explosive Practice Munitions Expended during Military Readiness Activities, through Table 3.0-18, Number and Location of Activities Including Biodegradable Polymers during Testing).

Under Alternative 1 for training:

- Military expended materials would occur in one location not previously analyzed (Gulf of Mexico Range Complex Inshore), and there would be a notable increase in the Key West Range Complex Inshore from the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease, similar amount, or cessation of military expended materials.

Under Alternative 1 for testing:

- Military expended materials would occur in three locations not previously analyzed (Other AFTT Areas; Naval Submarine Base Kings Bay, and Port Canaveral, Florida) in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease or similar amount of military expended materials.

For locations without a notable increase in military expended materials, the analysis from the 2018 Final EIS/OEIS remains valid, and the updates to the affected environment noted in Section 3.5.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of invertebrate taxa among training and testing locations has not changed.

For locations not previously analyzed and notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS has been updated per quantitative analysis detailed in Section 3.3 (Habitats). Qualitative aspects of the analysis include the potential for lighter expended materials (e.g., decelerators/parachutes) to drift into shallow, inshore habitats covered earlier in this section for military readiness activities.

Based on quantitative analysis, the total shallow-water coral reef area impacted by military expended materials in the Key West Range Complex and South Florida Ocean Measurement Facility would be less than 0.13 acre annually. However, the area of impacted shallow-water coral reefs is overestimated due to mitigation measures that apply to a subset of military expended materials. This area represents less than one thousandth of one percent of available shallow-water coral reef habitat in Study Area locations (refer to figures in Section 3.3, Habitats, for mapping). The majority of military expended material footprints would impact soft bottom communities or the bathyal/abyssal zone where invertebrates are relatively sparse. Expended material footprints coincide with oyster beds/reefs in the range complex inshore locations of the Northeast, Virginia Capes, and Gulf of Mexico Range Complexes. Expended material footprints associated with port and pierside locations impact mostly resilient soft bottom communities.

Whereas it is possible for a portion of expended items to impact hard substrate and associated sensitive invertebrate communities, the number of exposed individuals would not likely affect the overall viability of populations or species. While the potential for overlap between proposed activities and invertebrates is reduced for those species living sparsely in relatively rare habitats, if overlap does occur, any potential impacts would be amplified. Within the far greater area of soft bottom habitat, the impact of military expended materials is likely to cause injury or mortality to individual benthic invertebrates. However, the number of individuals affected would be small relative to the total population, the area exposed to the stressor is extremely small relative to the area of both suitable and occupied habitats, the activities are dispersed such that few individuals would likely be exposed to more than one event, and exposures would be localized and would cease when the military expended material becomes part of the bottom (e.g., buried or encrusted with sessile organisms).

Based on the relative amount, impact footprint, and location of material expended and the general description of impacts, activities involving military expended materials are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level. Additionally, rare species are unlikely to be affected due to the low chance of encounter, and common species could absorb impacts on relatively few individuals.

The analysis conclusions for military expended material associated with training and testing activities under Alternative 1 are consistent with a moderate (due to limited potential for injury/mortality) impact on invertebrate populations.

The military expended materials associated with training and testing activities under Alternative 1 may affect both ESA-listed coral species and queen conch, as the distribution of the stressor coincides with these species in the Key West Range Complex (offshore and inshore locations) and South Florida Ocean Measurement Facility. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) may be affected by military expended materials (refer to Section 3.3, Habitats, for analysis of physical disturbance and strike potential on hard abiotic substrate).

3.5.3.4.2.2 Impacts from Military Expended Materials under Alternative 2

Impacts from military expended materials under Alternative 2 are not meaningfully different from Alternative 1 and therefore the impact conclusions are the same for both training and testing. The increase in footprint from Alternative 1 to 2 is only 0.026 acres and located mostly in the Gulf of Mexico Range Complex, with relatively small footprints in the other range complexes.

3.5.3.4.3 Impacts from Seafloor Devices

Table 3.5-8 contains a summary of the background information used to analyze the potential impacts of seafloor devices on invertebrates. For information on the type, number, and location of military expended materials, see Table 3.0-15 (Number and Location of Activities that Use Seafloor Devices).

Proposed mitigation identified in Table 3.5-4 will reduce or eliminate the potential impacts by locating most seafloor devices away from ESA-listed coral species and other invertebrates inhabiting live hard bottom (refer to Section 3.3, Habitats, for detailed mapping and description of the mitigation). Due to the prevalence of shallow-water hard coral species in the South Florida Ocean Measurement Facility, there is additional mitigation that ensures placement of seafloor devices away from any sensitive habitats.

The combination of mitigation areas for shallow-water coral reefs and agreement to follow national marine sanctuary regulations protects nearly all seafloor habitats and associated invertebrates less than 30 m deep in the Key West Range Complex (offshore and inshore locations) from the direct strike potential from seafloor devices.

3.5.3.4.3.1 Impacts from Seafloor Devices under Alternative 1

For both training and testing activities, the proposed use of seafloor devices would increase from the 2018 Final EIS/OEIS devices (Table 3.0-15, Number and Location of Activities that Use Seafloor Devices).

Under Alternative 1 for training:

- Seafloor device use would occur in four locations that are new or not previously analyzed (Northeast Range Complexes; Other AFTT Areas; Jacksonville Range Complex Inshore, Naval Station Mayport, and Gulfport, Mississippi). There would also be notable increases in seafloor devices at the Virginia Capes Range Complex (offshore and inshore locations) and Key West Range Complex Inshore. For all other locations, there would either be a decrease, similar amount, or cessation of seafloor device use.

Under Alternative 1 for testing:

- Seafloor device use would occur in five locations not previously analyzed (Virginia Cape Range Complex Inshore, Key West Range Complex Inshore, Naval Submarine Base New London, Naval Station Mayport, and Port Canaveral, Florida). There would also be notable increases in seafloor devices in the Northeast and Jacksonville Range Complexes, and in the Naval Surface Warfare Center Panama City Division Testing Range. For all other locations, there would either be a decrease or similar amount of seafloor device use.

For locations without a notable increase in seafloor devices, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.5.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of invertebrate taxa among training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of seafloor device activity remains an accurate characterization of the Proposed Action in those locations.

For the inshore locations not previously analyzed, standard operating procedures and seafloor resource mitigation measures that apply to mine shapes and other devices moored to the bottom would help to avoid impacting sensitive habitats for invertebrates (e.g., oyster bed/reefs, shallow-water coral reefs, live hard bottoms). In the unlikely event of a seafloor device coinciding with sensitive invertebrates, the impact is expected to be minimal and temporary (e.g., crushing/abrasion).

Other new locations include port or pierside locations, which feature artificial structures in soft bottom habitat with relatively resilient invertebrate communities. These areas are highly modified/disturbed due to human activity and frequent dredging.

Based on the relative amount and location of seafloor device use under Alternative 1 for training and testing and the general description of impacts, there would be (1) a limited spatial coincidence between device disturbance zones and the distribution of sensitive invertebrates; and (2) only short-term impacts from most local disturbances of the seafloor, with some temporary increase in suspended sediment in mostly soft bottom areas. The effects of this substressor on marine invertebrates are therefore not expected to result in detectable changes in their growth, survival, or propagation, and are not expected to result in population-level impacts or affect the distribution, abundance, or productivity of invertebrates; rare species are unlikely to be affected due to chance encounters and common species could absorb impacts on relatively few individuals.

The analysis conclusions for seafloor devices use with training and testing activities under Alternative 1 are consistent with a moderate (due to limited potential for injury/mortality) impact on sessile or slow-moving invertebrate populations.

The use of seafloor devices during training and testing activities under Alternative 1 may affect both ESA-listed coral species and queen conch. The distribution of the stressor coincides with these species in three locations (Key West Range Complex—offshore and inshore locations and South Florida Ocean Measurement Facility). Queen conch would be relatively more vulnerable to seafloor device impacts than ESA-listed coral species based on its more varied use of seafloor habitats. ESA-listed coral species habitats are protected by applicable standard operating procedures, mitigation measures, and national marine sanctuary regulations. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) may be affected by seafloor devices (refer to Section 3.3, Habitats, for analysis of physical disturbance and strike potential on hard abiotic substrate).

3.5.3.4.3.2 Impacts from Seafloor Devices under Alternative 2

Impacts from seafloor device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including seafloor devices under Alternative 2 would increase only slightly over Alternative 1.

3.5.3.4.4 Impacts from Pile Driving

Table 3.5-8 contains a summary of the background information used to analyze the potential impacts of pile driving on invertebrates. Only port damage repair training includes pile driving (Table 3.0-4, Number of Piles/Sheets Quantitatively Analyzed under Pile Driving and Removal Training Activities).

3.5.3.4.4.1 Impacts from Pile Driving under Alternative 1

Under Alternative 1 for training:

- Pile driving would occur in one new location (Gulfport, Mississippi) that it did not occur in for the 2018 Final EIS/OEIS.
- Pile driving would no longer occur as part of the Elevated Causeway System at Joint Expeditionary Base Little Creek in the Virginia Capes Range Complex or Marine Corps Base Camp Lejeune in the Navy Cherry Point Range Complex.

There would be no pile driving or removal associated with testing activities.

Installation and removal of piles could crush or injure invertebrates due to direct physical impact. Direct impacts would be most likely for sessile or slow-moving species. Individuals located near the activities but not directly impacted could be disturbed and show behavioral reactions. Bottom disturbance resulting from pile installation and removal would also result in sediment displacement and episodes of turbidity. Suspended sediment particles may affect respiratory organs or impair the ability of filter-feeding invertebrates to obtain food. During the relatively short duration that piles are in the water, limited colonization of the piles by fast-growing, sedentary invertebrates would likely occur. Adults of mobile species such as crabs could use the piles for foraging or refuge. Removal of the piles would result in mortality to limited mobility and attached sessile species, and displacement and possibly injury to more mobile species.

Compared to overall population size, only a very small number of individuals would be affected by the proposed pile driving along an artificial shoreline in Gulfport, Mississippi. In addition, pile driving events would occur infrequently, and impacts to the resilient soft substrate in an already highly modified environment would be recoverable. Effects to overall invertebrate populations would not be discernable. Additionally, rare species are unlikely to be affected due to chance encounters and common species could absorb impacts on relatively few individuals.

The analysis conclusions for pile driving for training under Alternative 1 are consistent with a moderate (due to limited potential for injury/mortality) impact on invertebrate populations.

The pile driving associated with training activities under Alternative 1 is not applicable to either ESA-listed coral species or queen conch due to lack of coincidence with the substressor location.

An impact on critical habitat for ESA-listed corals by pile driving is not applicable due to lack of coincidence with the substressor location.

3.5.3.4.4.2 Impacts from Pile Driving under Alternative 2

Impacts from pile driving during training under Alternative 2 are no different from Alternative 1 and therefore the conclusions for ESA-listed species, critical habitat, and significance are the same.

There would be no pile driving associated with testing activities.

3.5.3.5 Entanglement Stressors

Most expended materials do not have the characteristics required to entangle marine species. Wires and cables, decelerators/parachutes, and biodegradable polymer are the expended materials most likely to entangle marine invertebrates.

Table 3.5-9 contains brief summaries of background information that is relevant to analyses of impacts for each entanglement substressor (wires and cables, decelerators/parachutes, and biodegradable polymer).

The background information for entanglement stressor effects on invertebrates in the Study Area as described in the 2018 Final EIS/OEIS (Section 3.4.3.5) has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS remains valid.

Table 3.5-9: Entanglement Stressors Background Information Summary

Substressor	*Background Information Summary*
Wires and cables	Fiber-optic cables, torpedo guidance wires, sonobuoy wires, and expendable bathythermograph wires would be expended during military readiness activities. • A marine invertebrate with some degree of mobility could become temporarily entangled and escape unharmed, be held tightly enough that it could be injured during its struggle to escape, be preyed upon while entangled, or starve while entangled. However, the impact of wires and cables on marine invertebrates is not likely to cause injury or mortality to individuals because of the linear and somewhat rigid nature of the material. • Once the items reach the bottom, they could be moved into different shapes or could loop around objects due to water currents, but the items are not expected to form tight coils. Fiber-optic cables are also relatively brittle and easily broken. • The wires and cables would eventually become buried in sediment or encrusted by marine growth. Benthic and sessile invertebrates would be physically disturbed rather than entangled by a wire or cable.
Decelerators/ parachutes	At water impact, the decelerator/parachute assembly is expended and sinks away from the unit. • Small and medium decelerator/parachute assemblies may remain at the surface for 5 to 15 seconds before drifting to the bottom, where it becomes flattened and more of a physical disturbance stressor than an entanglement stressor. • Large and extra-large decelerators/parachutes may remain at the surface or suspended in the water column for a longer time due to the lack of weights, but eventually also sink to the bottom and become flattened. • A decelerator/parachute with attached lines sinking through the water column are unlikely to affect pelagic invertebrates; most pelagic invertebrates would be too small to be ensnared, the lines would be relatively straight during descent, and there are large openings between the cords. Small decelerator/parachute lines may also be detached and incapable of entangling an invertebrate.
Biodegradable polymer	Biodegradable polymer materials are configured into a non-woven mat that can be deployed on the water surface. Once wet, the fiber mats turn into more of a viscous fiber material which increases its ability to adhere to surfaces. The materials would degrade into smaller pieces within a few days to weeks, after which time the entanglement potential would cease. • Impacts to pelagic invertebrates would most likely be limited to temporary displacement as the biodegradable polymer material floats past an animal. • Although it is unlikely that most invertebrates would become entangled in the biodegradable polymer material, entanglement is conceivable for both small and large invertebrates that occur in the water column (e.g., zooplankton, jellyfish, and squid). • Entanglement impacts to benthic species are not expected due to the buoyancy and relatively rapid degradation of the items.

3.5.3.5.1 Impacts from Wires and Cables

Table 3.5-9 contains a summary of the background information used to analyze the potential impacts of wires and cables on invertebrates. Table 3.0-17 (Number and Location of Wires and Cables Expended During Military Readiness Activities) indicates the number and location of wires and cables expended during military readiness activities for Alternatives 1 and 2.

3.5.3.5.1.1 Impacts from Wires and Cables under Alternative 1

For training activities, the use of wires and cables would increase overall from the 2018 Final EIS/OEIS, and for testing activities, the use of wires and cables would decrease overall (Table 3.0-17, Number and Location of Wires and Cables Expended during Military Readiness Activities).

Under Alternative 1 for training:

- The use of wires and cables would occur in one location not previously analyzed (Key West Range Complex). There would also be a notable increase in the use of wires and cables in the Virginia Capes and Jacksonville Range Complexes. For all other locations, there would be a similar amount of wires and cables.

Under Alternative 1 for testing

- The use of wires and cables would occur in one area not previously analyzed (Other AFTT Areas) for the 2018 Final EIS/OEIS. There would also be a notable increase in wires and cables in the Virginia Capes and Key West Range Complexes. For all other locations, there would either be a decrease or similar amount of wires and cables.

For locations without a notable increase in wires and cables, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.5.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of invertebrate taxa among training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of wire and cable releases remains an accurate characterization of the Proposed Action in those locations.

Although activities will occur in locations not previously analyzed, there would be no change in the impact analysis conducted in the 2018 Final EIS/OEIS because the likelihood of invertebrates encountering a wire or cable and becoming entangled remains low for mobile species (e.g., jellyfish, sea snails, lobsters) and is not applicable for sessile species (e.g., hard corals, sponges).

Based on the relative amount and location of wires and cables and the general description of effects, the impact on individuals and populations would be inconsequential because the area exposed to the stressor is extremely small relative to the distribution ranges of most marine invertebrates, the activities are dispersed such that few individuals would likely be exposed to more than one event, and exposures would be localized. In addition, marine invertebrates are not particularly susceptible to entanglement stressors though they could be temporarily disturbed. Activities involving wires and cables are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at individual or population levels. This is especially true where benthic invertebrate sizes and densities are relatively low (e.g., Other AFTT Areas).

The analysis conclusions for wires and cables as an entanglement stressor associated with training and testing activities under Alternative 1 are consistent with a minor (due to limited potential for entanglement and injury) impact on mobile invertebrate populations.

The entangling aspect of wires and cables associated with training and testing activities under Alternative 1 may affect ESA-listed queen conch. The effect of wire and cables on ESA-listed corals species was covered under physical disturbance and strike; the entangling aspect of wires and cables will have no effect on ESA-listed coral species. The distribution of the stressor coincides with queen conch in two locations (Key West Range Complex and South Florida Ocean Measurement Facility). The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) will not be affected by entanglement from wires and cables. The effect of wires and cables on critical habitat for ESA-listed corals was covered under physical disturbance and strike.

3.5.3.5.1.2 Impacts from Wires and Cables under Alternative 2

Impacts from wires and cables under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of wires and cables used under Alternative 2 would increase only slightly over Alternative 1.

3.5.3.5.2 Impacts from Decelerators/Parachutes

Table 3.5-9 contains a summary of the background information used to analyze the potential impacts of decelerators/parachutes on invertebrates. Table 3.0-14 (Number and Location of Other Military Materials Expended during Military Readiness Activities) indicates the number and location of decelerators/parachutes expended during military readiness activities for Alternatives 1 and 2.

3.5.3.5.2.1 Impacts from Decelerators/Parachutes under Alternative 1

For both training and testing activities, decelerator/parachute use would increase from the 2018 Final EIS/OEIS (Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities).

Under Alternative 1 for training:

- Decelerators/parachutes would be used in the same locations as for the 2018 Final EIS/OEIS. However, there would be notable increases in the Virginia Capes and Jacksonville Range Complexes. For all other locations, there would be a similar amount of decelerators/parachutes.

Under Alternative 1 for testing:

- Decelerators/parachutes would be used in one area (Other AFTT Areas) that was not previously analyzed, and there would be notable increases in the Northeast, Virginia Capes, and Key West Range Complexes. For all other locations, there would either be a decrease or similar amount of decelerators/parachutes.

For locations without a notable increase in decelerators/parachutes, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.5.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of invertebrate taxa among training and testing locations has not changed.

Although Other AFTT Areas is a location not previously analyzed for testing and there would be notable increases in decelerators/parachutes in some locations, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of invertebrates encountering a decelerator/parachute and becoming entangled remains low for mobile species (e.g., jellyfish, sea snails, lobsters) and is not applicable for sessile species (e.g., hard corals, sponges). This is especially true where benthic invertebrate sizes and densities are relatively small and low (e.g., Other AFTT areas).

Based on the relative amount and location of decelerators/parachutes, most marine invertebrates would not encounter a decelerator/parachute. In the unlikely event of a coincidence of decelerators/parachutes and susceptible invertebrates, the impact is not likely to cause injury or mortality to individuals based on the general description of impacts, and population-level impacts would be inconsequential because the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges, the activities are dispersed such that few individuals would likely be exposed to more than one event, and exposures would be localized. In addition, marine invertebrates are not particularly susceptible to entanglement stressors, as most would avoid entanglement due to size. Activities involving decelerators/parachutes are also not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at individual or population levels.

The analysis conclusions for decelerators/parachutes as an entanglement stressor associated with training and testing activities under Alternative 1 are consistent with a minor (due to limited potential for entanglement and injury) impact on mobile invertebrate populations.

The entangling aspect of decelerators/parachutes associated with training and testing activities under Alternative 1 may affect ESA-listed queen conch. The effect of decelerators/parachutes on ESA-listed corals species was covered under physical disturbance and strike; the entangling aspect of decelerators/parachutes will have no effect on ESA-listed coral species. The distribution of the stressor coincides with queen conch in two locations (Key West Range Complex and South Florida Ocean Measurement Facility). The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) will not be affected by entanglement from decelerators/parachutes. The effect of decelerators/parachutes on critical habitat for ESA-listed corals was covered under physical disturbance and strike.

3.5.3.5.2.2 Impacts from Decelerators/Parachutes under Alternative 2

Impacts from decelerators/parachutes under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of decelerators/parachutes used under Alternative 2 would increase only slightly over Alternative 1.

3.5.3.5.3 Impacts from Biodegradable Polymer

Table 3.5-9 contains a summary of the background information used to analyze the potential impacts of biodegradable polymer on invertebrates. Table 3.0-18 (Number and Location of Activities Including Biodegradable Polymers during Testing) indicates the number and location of activities including biodegradable polymers for Alternatives 1 and 2. Section 3.0.3.3.5 (Entanglement Stressors) describes a new type of biodegradable polymer vessel stopping technology not analyzed in the 2018 Final EIS/OEIS.

3.5.3.5.3.1 Impacts from Biodegradable Polymer under Alternative 1

There would be no use of biodegradable polymers associated with training activities.

The proposed use of biodegradable polymer would decrease overall for testing from the 2018 Final EIS/OEIS (Table 3.0-18, Number and Location of Activities Including Biodegradable Polymers during Testing).

Under Alternative 1 for testing:

- Activities using biodegradable polymer would occur in three locations not previously analyzed (Northeast Range Complexes, Navy Cherry Point Range Complex, and Joint Expeditionary Base Little Creek). For all other locations, there would be a decrease in the activities using biodegradable polymer.

For locations with a decrease in biodegradable polymer use, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.5.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of invertebrate taxa among these locations has not changed.

Although activities will occur in locations not previously analyzed, these changes would not affect the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of invertebrates encountering a biodegradable polymer and becoming entangled remains low for mobile species (e.g., jellyfish, sea snails, lobsters) and, not applicable for sessile benthic species (e.g., hard corals, sponges).

Based on the relative amount and location of biodegradable polymer use, the vast majority of marine invertebrates would not encounter a biodegradable polymer regardless of the configuration being used. In the unlikely event of a coincidence of stressor and susceptible invertebrates, it is conceivable that a pelagic invertebrate such as zooplankton or jellyfish could be temporarily entangled in biodegradable polymer material, although the probability is low due to the polymer designs. The most likely effect would be temporary displacement as the material floats past an animal. Impacts to benthic species would not be expected. Activities involving biodegradable polymer as an entanglement risk would be unlikely to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at individual or population levels.

The analysis conclusions for biodegradable polymer as an entanglement stressor associated with testing activities under Alternative 1 are consistent with a minor (due to limited potential for entanglement and injury) impact on mobile invertebrate populations.

The entangling aspect of biodegradable polymers associated with testing activities under Alternative 1 may affect ESA-listed queen conch if it reaches the bottom intact. The distribution of the stressor coincides with queen conch in one location (Key West Range Complex). The entangling aspect of biodegradable polymer would have no effect on ESA-listed coral species.

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) will not be affected by entanglement from biodegradable polymers. The effect of biodegradable polymers on critical habitat for ESA-listed corals was covered under physical disturbance and strike.

3.5.3.5.3.2 Impacts from Biodegradable Polymer under Alternative 2

There would be no use of biodegradable polymers associated with training activities.

Impacts from biodegradable polymer use during testing under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same. The number of events using biodegradable polymer under Alternative 2 is the same as Alternative 1.

3.5.3.6 Ingestion Stressors

The analysis of ingestion stressors on marine invertebrates is differentiated by munitions and expended materials other than munitions.

The difference between the military expended materials categories is related to shape and material composition; munitions are aero- and/or hydrodynamic and composed of mostly hard metal or concrete whereas other types of military expended materials can be composed of a great variety of materials (e.g., metal, concrete, plastic, rubber, silicon, fabric) and components (e.g., circuit boards, batteries, electric motors). Both material categories break down through time and use of explosives, which is of greater concern to filter- or deposit-feeding invertebrates than intact items or components. Synthetic bio-inspired slime is a new type of biodegradable polymer that may present an ingestion risk to some marine invertebrates.

Table 3.5-10 contains brief summaries of background information that is relevant to analyses of impacts for each ingestion substressor (military expended materials that are munitions and military expended materials other than munitions). The background information for ingestion stressor effects on invertebrates in the Study Area as described in the 2018 Final EIS/OEIS (Section 3.4.3.6) has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS remains valid.

Table 3.5-10: Ingestion Stressors Background Information Summary

Substressor	*Background Information Summary*
Military expended materials – munitions	Ingestion of intact military expended materials that are munitions is not likely for most types of expended items because they are too large to be ingested by most marine invertebrates. Though ingestion of intact munitions or large fragments is conceivable in some circumstances, such a scenario is unlikely due to the animal's ability to discriminate between food and non-food items. Indiscriminate deposit- and detritus-feeding invertebrates could potentially ingest munitions fragments that have degraded to sediment size. Metal particles in the water column may be taken up by suspension feeders, although metal concentrations in the water are typically much lower than concentrations in sediments.
Military expended materials other than munitions	Most military expended materials other than munitions would sink to the bottom, while some could persist at the surface or in the water column for some time. • Ingestion is not likely for most military expended materials because they are too large to be consumed by most marine invertebrates. Though ingestion of intact items on the bottom is conceivable in some circumstances, such a scenario is unlikely due to the animal's ability to discriminate between food and non-food items. Similarly, it is unlikely that an invertebrate at the surface or in the water column would ingest a relatively large, expended item as it floats or sinks through the water column. • Degradation of plastic materials could result in microplastic particles being released into the marine environment over time. Eventually, deposit-feeding, detritus-feeding, and filter-feeding invertebrates could ingest these particles. Ingestion of plastic particles may result in negative physical and chemical effects to invertebrates. Porter et al., found microplastic burden to be highest in the omnivores, predators, and deposit feeders. • Marine invertebrates may occasionally encounter and incidentally ingest chaff fibers when they ingest prey or water, but chaff poses little environmental risk to marine

Table 3.5-10: Ingestion Stressors Background Information Summary (continued)

Substressor	Background Information Summary
	organisms at concentrations that could reasonably occur from military training and testing. • As biodegradable polymers break down into smaller pieces, they may be consumed by indiscriminate filter feeders in the water column. As a natural substance that is normally produced by biodegradable polymer to ward off potential predators (Taylor et al., 2023), the consumption of tiny bits of organic slime is not likely to have adverse effects on a consumer.

3.5.3.6.1 Impacts from Military Expended Materials – Munitions

Table 3.5-10 contains a summary of the background information used to analyze the potential impacts of military expended materials that are munitions on invertebrates. For more information on the location and number of military expended materials that are ingestible munitions see Table 3.0-11, (Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities) and Table 3.0-12 (Number and Location of Explosives that May Result in Fragments Used during Military Readiness Activities).

3.5.3.6.1.1 Impacts from Military Expended Materials – Munitions under Alternative 1

For both training and testing activities, military expended materials - munitions would decrease from the 2018 Final EIS/OEIS (Table 3.0-11, Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities, and Table 3.0-12, Number and Location of Explosives that May Result in Fragments Used during Military Readiness Activities).

Under Alternative 1 for training:

- Ingestible munitions (including fragments from explosive munitions) would occur in the same locations as they did in the 2018 Final EIS/OEIS. There would be a notable increase in the Key West Range Complex Inshore, but for all other locations, there would either be a decrease, similar amount, or cessation of ingestible munitions.

Under Alternative 1 for testing:

- Ingestible munitions would occur in one location not previously analyzed (Naval Undersea Warfare Center Division, Newport Testing Area). For all other locations, there would be a decrease in the amount of ingestible munitions.

For both training and testing, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.5.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of invertebrate taxa among training and testing locations has not changed.

Although there are locations not previously analyzed and there would be a notable increase in military expended materials – munitions in one location, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of invertebrates encountering a munition or munition fragment and consuming it remains low for indiscriminate feeders (e.g., deposit feeders, omnivores) and is negligible for discriminant feeders (e.g., squid, crabs, filter feeders).

The heavy materials comprising munitions would degrade into fragments that remain in the sediment posing an ingestion risk to only deposit feeders. Based on the relative amount and location of expended munitions and the general description of effects, an impact on individual invertebrates is unlikely, and impacts on populations would probably not be detectable.

The analysis conclusions for ingestible munitions or munition fragments associated with training and testing activities under Alternative 1 are consistent with a minor (due to limited potential for ingestion and injury) impact on invertebrate populations.

The ingestible munitions or munition fragments associated with training and testing activities under Alternative 1 may affect ESA-listed coral species and queen conch when munitions fragments are suspended in the water column or on the bottom. The distribution of the stressor coincides with these species in two locations (Key West Range Complex and Key West Range Complex Inshore).

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) will not be affected by ingestion of military expended materials that are munitions. The effect of military expended materials on critical habitat for ESA-listed corals was covered under physical disturbance and strike.

3.5.3.6.1.2 Impacts from Military Expended Materials – Munitions under Alternative 2

Impacts from military expended materials – munitions under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of ingestible munitions or munition fragments used under Alternative 2 would increase only slightly over Alternative 1.

3.5.3.6.2 Impact from Military Expended Materials Other Than Munitions

Table 3.5-10 contains a summary of the background information used to analyze the potential impacts of military expended materials other than munitions on invertebrates. For more information on the location and number of military expended materials that are ingestible munitions see Table 3.0-14, (Number and Location of Other Military Materials Expended during Military Readiness Activities).

3.5.3.6.2.1 Impacts from Military Expended Materials Other Than Munitions under Alternative 1

For both training and testing activities, military expended materials other than munitions, would decrease from the 2018 Final EIS/OEIS (Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities).

Under Alternative 1 for training:

- Ingestible military expended materials other than munitions would no longer occur at one location (Virginia Capes Range Complex Inshore) that they did in the 2018 Final EIS/OEIS. However, there would be a notable increase in military expended materials other than munitions at the Virginia Capes Range Complex and the Key West Range Complex. For all other locations, there would either be a decrease or similar amount of military expended materials other than munitions.

Under Alternative 1 for testing:

- Ingestible military expended materials other than munitions would occur in one location not previously analyzed (Other AFTT Areas). For all other locations, there would either be a decrease or similar amount of military expended materials other than munitions.
- Activities using biodegradable polymer would occur in three locations not previously analyzed (Northeast Range Complexes, Navy Cherry Point Range Complex, and Joint Expeditionary Base Little Creek) for the 2018 Final EIS/OEIS. For all other locations, there would be a decrease in the

activities using biodegradable polymer (Table 3.0-18, Number and Location of Activities Including Biodegradable Polymers during Testing).

For locations without a notable increase in ingestible military expended materials other than munitions, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.5.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of invertebrate taxa among training and testing locations has not changed.

Although there is a location not previously analyzed for testing, overall, there would be a decrease in expended materials in the Study Area. The impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid because the likelihood of invertebrates encountering ingestible military expended material other than munitions and consuming it remains low for indiscriminate feeders (e.g., omnivores, deposit feeders) and negligible for discriminant feeders (e.g., squid, crabs, filter feeders).

In addition to metal or concrete fragments in the sediment, small plastic (or otherwise light) fragments may be consumed by a wide variety of invertebrates with indiscriminate feeding methods (filter feeders and suspension feeders) in the water column or on the bottom. Adverse effects due to metal pieces on the bottom or in the water column are unlikely. Microplastic particles could affect individuals. Although the potential effects on invertebrate populations due to microplastic ingestion are currently uncertain, Action Proponent activities would result in a small number of plastic particles introduced to the marine environment compared to other sources. In the unlikely event of a coincidence of biodegradable polymers and susceptible invertebrates, it is conceivable that an indiscriminate feeder (e.g., jellyfish, filter-feeding zooplankton, deposit-feeding worm) could ingest a fragment of polymer. Considering the organic and non-toxic composition of the material, the effect would likely be negligible. Activities involving biodegradable polymer as an ingestion risk would be unlikely to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at individual or population levels. Overall, impacts on invertebrate populations due to military expended materials other than munitions would probably not be detectable.

The analysis conclusions for ingestible non-munitions other than munitions associated with training and testing activities under Alternative 1 are consistent with a minor (due to limited potential for ingestion and injury) impact on invertebrate populations.

The ingestible military expended materials other than munitions associated with training and testing activities under Alternative 1 may affect both ESA-listed coral species and queen conch because they are filter and deposit feeders, respectively. The distribution of the stressor coincides with these species in two locations (Key West Range Complex and South Florida Ocean Measurement Facility). The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) will not be affected by ingestion of military expended materials other than munitions. The effect of military expended materials on critical habitat for ESA-listed corals was covered under physical disturbance and strike.

3.5.3.6.2.2 Impacts from Military Expended Materials Other Than Munitions under Alternative 2

Impacts from military expended materials other than munitions under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance impacts, ESA-listed species and critical habitat are the same for both training and testing. The number of ingestible non-munitions under Alternative 2 is the same as Alternative 1.

3.5.3.7 Secondary Stressors

This section analyzes potential impacts on invertebrates exposed to stressors indirectly through impacts on their habitat (explosives and explosive byproducts, unexploded munitions, metals, chemicals) and/or prey availability. Table 3.5-11 contains brief summaries of background information that is relevant to the analyses of impacts for each substressor (explosives via habitat, etc.). The background information for secondary stressor effects on invertebrates in the Study Area as described in the 2018 Final EIS/OEIS (Section 3.4.3.7) has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS remains valid.

Table 3.5-11: Secondary Stressor Background Information Summary

Indirect Links	*Substressors*	*Background Information Summary*
Habitat	Explosives	• Explosions on or near the bottom in areas of soft substrate would not cause an overall reduction in the surface area or volume of sediment available to benthic invertebrates. • Activities that inadvertently result in explosions on or near hard bottom habitat or reefs could break hard structures and reduce the amount of colonizing surface available to encrusting organisms (e.g., corals, sponges). Refer to Section 3.3 (Habitats) for a more comprehensive summary of direct impacts to habitat.
	Explosive byproducts and unexploded munitions	• High-order explosions consume most of the explosive material, and byproducts would therefore not degrade sediment or water quality or result in indirect stressors to marine invertebrates. • Low-order detonations and unexploded munitions may result in the presence of explosive material in sediments or the water column. However, toxicity and other effects are generally associated with exposure to higher concentrations than those expected to occur due to military readiness activities. • Munitions constituents and degradation products in sediments would likely be detectable only within a few feet, and the range of toxic sediment conditions could be less (inches). Due to low solubility and dilution, invertebrates would be exposed to chemical byproducts in the water column only in the immediate vicinity of degrading explosives (inches or less).
	Chemicals	• Potentially harmful chemicals introduced into the marine environment consist mostly of propellants and combustion products, other fuels, polychlorinated biphenyls in target vessels, other chemicals associated with munitions, and simulants. • Ammonium perchlorate (a rocket and missile propellant) is the most common chemical used. Other representative chemicals with potential to affect invertebrates include propellant combustion products such as hydrogen cyanide and ammonia. • Most propellants are consumed during normal operations, and the failure rate of munitions using propellants and other combustible materials is low. • Most byproducts occur naturally in seawater and are readily degraded by biotic and abiotic processes. All chemicals are quickly diluted by water movement. • Target vessels are selected from a list of Navy-approved vessels that have been cleaned in accordance with U.S. Environmental Protection Agency guidelines. This procedure minimizes the

Table 3.5-11: Secondary Stressor Background Information Summary (continued)

Indirect Links	*Substressors*	*Background Information Summary*
		amount of polychlorinated biphenyls entering the marine environment. • Overall, concentrations of chemicals in sediment and water are not likely to cause injury or mortality to marine invertebrates, gametes, eggs, or larvae.
	Metals	• Metals are introduced into seawater and sediments as a result of military readiness activities involving vessel hulks, targets, munitions, and other military expended materials. • Secondary effects may occur when marine invertebrates are exposed to concentrations above background levels by contact with the metal, contact with trace amounts in the sediment or water, and ingestion of contaminated sediments. • Because metals tend to precipitate out of seawater and often concentrate in sediments, potential adverse indirect impacts are much more likely via sediment than water. However, studies have found the concentrations of metals in the sediments within military ranges or munitions disposal sites, where deposition of metals is very high, to be localized and rarely above biological effects levels. • Impacts to invertebrates, eggs, or larvae would likely be limited to exposure in the sediment within a few inches of the object. • Concentrations of metals in sea water related to training and testing activities are unlikely to be high enough to cause injury or mortality to marine invertebrates.
Prey availability	All stressors	The potential for primary stressors to impact invertebrate prey populations is directly related to their impacts on biological resources consumed by invertebrates (e.g., mostly vegetation and other invertebrates but also fish and other animal carcasses).

3.5.3.7.1 Impact of Secondary Stressors

3.5.3.7.1.1 Impacts from Secondary Stressors Under Alternative 1

The impacts of explosives and military expended materials in terms of abiotic substrate disturbance are described in Section 3.3 (Habitats). Most detonations would occur in waters greater than 200 feet in depth, and greater than 3 nautical miles from shore, although mine warfare, demolition, and some testing detonations would occur in shallow water close to shore. In deep waters, explosions would not likely damage habitat because the explosion would not be on or proximate to the sea floor. These habitats include corals, seagrass beds, and other benthic habitats that are used by resources. The assessment of potential sediment and water quality degradation on aquatic life, including representative marine invertebrates, is covered in Section 3.2 (Sediment and Water Quality). Considering the literature on other marine invertebrates does not suggest an elevated sensitivity to pollutants from the Proposed Action alternatives, the analysis of sediment and water quality degradation in Section 3.2 is sufficient to cover the impact on invertebrates.

Impacts on invertebrate prey availability from the Proposed Action alternatives would likely be negligible to moderate overall based on the analysis conclusions for the direct stressors on their food resources (e.g., vegetation, other invertebrates, fish, other animal carcasses).

The impact of the Proposed Action on secondary stressors were considered negligible to moderate (depending on the primary stressor) on invertebrate populations.

The secondary stressors associated with training and testing activities under Alternative 1 may affect both ESA-listed coral species and queen conch. The distribution of the secondary stressors coincides with these species in three locations (Key West Range Complex – Inshore and Offshore and South Florida Ocean Measurement Facility). The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) may be affected by secondary stressor (via explosive byproducts and military expended materials).

3.5.3.7.1.2 Impacts from Secondary Stressors Under Alternative 2

Impacts from secondary stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

3.5.3.8 Combined Stressors

As described in Section 3.0.3.5 (Resource-Specific Impacts Analysis for Multiple Stressors), this section evaluates the potential for combined impacts of all stressors from the Proposed Action. The analysis and conclusions for the potential impacts from each of the individual stressors are discussed in the sections above. Stressors associated with proposed military readiness activities do not typically occur in isolation but rather occur in some combination. For example, mine neutralization activities include elements of acoustic, physical disturbance and strike, entanglement, ingestion, and secondary stressors that are all coincident in space and time. An analysis of the combined impacts of all stressors considers the potential consequences of additive and synergistic stressors from the Proposed Action, as described below.

There are generally two ways that an invertebrate could be exposed to multiple additive stressors. The first would be if an invertebrate were exposed to multiple sources of stress from a single event or activity within a single training or testing event (e.g., a mine warfare event may include the use of a sound source and a vessel). The potential for a combination of these impacts from a single activity would depend on the range to effects of each of the stressors and the response or lack of response to that stressor. Secondly, an invertebrate could be exposed to multiple military readiness activities over the course of its life; however, training and testing activities are generally separated in space and time in such a way that it would be unlikely that any individual invertebrate would be exposed to stressors from multiple activities within a short timeframe. However, animals with a home range intersecting an area of concentrated activity have elevated exposure risks relative to animals that simply transit the area through a migratory corridor.

Multiple stressors may also have synergistic effects. For example, invertebrates that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors via a decreased ability to detect and avoid threats. Invertebrates that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to entanglement and physical strike stressors via malnourishment and disorientation. These interactions are speculative, and without data on the combination of multiple stressors, the synergistic impacts from the combination of stressors are difficult to predict in any meaningful way.

The following analysis makes the reasonable assumption that the majority of exposures to individual stressors are non-lethal, and instead focuses on consequences potentially impacting invertebrate fitness (e.g., physiology, behavior, reproductive potential).

3.5.3.8.1 Combined Impacts of All Stressors under Alternative 1

Most of the activities proposed under Alternative 1 generally involve the use of moving platforms (e.g., ships, torpedoes) that may produce one or more stressors; therefore, if invertebrates were within the effects range of those activities, they may be introduced to multiple stressors at different times. The minimal effects of far-reaching stressors (e.g., sound pressures, particle motion) may also trigger some animals to leave the area ahead of a more damaging impact (e.g., physical disturbance or strike). Individual stressors that would otherwise have minimal to no impact may combine to have a measurable effect. Due to the wide dispersion of stressor sources, speed of the platforms, and general dynamic movement of many military readiness activities, it is unlikely that highly mobile invertebrates would occur in the potential effects range of multiple sources or sequential exercises. Impacts would be more likely to occur to sessile and slow-moving species in areas where military readiness activities are concentrated and consistently located.

Although potential impacts on invertebrates from military readiness activities under Alternative 1 may include injury and mortality, in addition to other effects such as physiological stress, masking, and behavioral effects, the combined impacts are not expected to lead to long-term consequences for invertebrate populations. Based on the general description of impacts, the number of invertebrates impacted is expected to be small relative to overall population sizes and would not be expected to yield any lasting effects on the survival, growth, recruitment, or reproduction of any invertebrate species.

The combined impact of all stressors from Alternative 1 are considered moderate (due to limited potential for injury/mortality) on invertebrate populations.

Critical habitat for ESA-listed corals (e.g., natural hard substrate; Figure 3.5-1) may be affected by combined stressors that are individually applicable (e.g., explosives, physical disturbance and strike).

3.5.3.8.2 Combined Impacts of All Stressors under Alternative 2

The combined impacts of stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing.

3.5.4 ENDANGERED SPECIES ACT DETERMINATIONS

The Action Proponents have concluded that military readiness activities may affect the ESA-listed coral species and queen conch described in Section 3.5.2.2 (Endangered Species Act-Listed Species) for Alternative 1. The Action Proponents have also concluded that military readiness activities may affect designated critical habitat for the ESA-listed coral species listed in Table 3.5-1. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA. The summary of effects determinations for each ESA-listed species is provided in Table 3.5-12 for training and testing.

Table 3.5-12: Invertebrate Species Determinations for Military Readiness Activities under Alternative 1 (Preferred Alternative)

Species	DPS/Critical Habitat	Effect Determinations by Stressor: Acoustic						Explosive		Energy			Physical Disturbance and Strike						Entanglement			Ingestion		
		Sonar and Other Transducers	Air Guns	Pile Driving Noise	Vessel Noise	Aircraft Noise	Weapons Noise	Explosions in Air	Explosions in Water	In-Air Electromagnetic Devices	In-water Electromagnetic Devices	High-Energy Lasers	Vessels	In-Water Devices	Aircraft and Aerial Targets	Military Expended Materials	Seafloor Devices	Pile Driving	Wires and Cables	Decelerators/Parachutes	Biodegradable Polymer[1]	Military Expended Materials-Munitions	Military Expended Materials - Other[1]	Secondary
Training Activities																								
Boulder star, lobed star, mountainous star, pillar, and rough cactus coral	ESA-listed threatened species	MA	N/A	N/A	MA	NE	NE	N/A	MA	N/A	MA	N/A	MA	MA	N/A	MA	MA	N/A	NE	NE	N/A	MA	MA	MA
	Critical habitat (hard substrate)	NE	N/A	N/A	NE	NE	NE	N/A	MA	N/A	NE	N/A	NE	NE	N/A	MA	MA	N/A	NE	NE	N/A	NE	NE	MA
Elkhorn and staghorn coral	ESA-listed threatened species	MA	N/A	N/A	MA	NE	NE	N/A	MA	N/A	MA	N/A	MA	MA	N/A	MA	MA	N/A	NE	NE	N/A	MA	MA	MA
	Critical habitat (hard substrate)	NE	N/A	N/A	NE	NE	NE	N/A	MA	N/A	NE	N/A	NE	NE	N/A	MA	MA	N/A	NE	NE	N/A	NE	NE	MA
Queen conch	ESA-listed threatened species	MA	N/A	N/A	MA	NE	NE	N/A	MA	N/A	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
Testing Activities																								
Boulder star, lobed star, mountainous star, pillar, and rough cactus coral	ESA-listed threatened species	MA	N/A	N/A	MA	NE	NE	N/A	MA	N/A	N/A	N/A	MA	MA	N/A	MA	MA	N/A	NE	NE	NE	MA	MA	MA
	Critical habitat (hard substrate)	NE	N/A	N/A	NE	NE	NE	N/A	MA	N/A	N/A	N/A	NE	NE	N/A	MA	MA	N/A	NE	NE	NE	NE	NE	MA
Elkhorn and staghorn coral	ESA-listed threatened species	MA	N/A	N/A	MA	NE	NE	N/A	MA	N/A	N/A	N/A	MA	MA	N/A	MA	MA	N/A	NE	NE	NE	MA	MA	MA
	Critical habitat (hard substrate)	NE	N/A	N/A	NE	NE	NE	N/A	MA	N/A	N/A	N/A	NE	NE	N/A	MA	MA	N/A	NE	NE	NE	NE	NE	MA
Queen conch	ESA-listed threatened species	MA	N/A	N/A	MA	NE	NE	N/A	MA	N/A	N/A	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA

[1] Includes new material (biodegradable polymer).

Notes: ESA = Endangered Species Act; MA = may affect; N/A = not applicable, either because the activity does not coincide with species range or does not occur with any training or testing events (e.g., there are no testing activities that involve the use of pile driving); NE = no effect. The determinations for likelihood of adverse effects are pending consultation with the National Marine Fisheries Service.

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References

HDR Environmental Operations and Construction Inc. (2013). *Benthic habitat characterization of Naval Air Station, Key West, Florida*. Norfolk, VA: Naval Facilities Engineering Command Atlantic.

Mintz, J. D. (2016). *Characterization of Vessel Traffic in the Vicinities of HRC, SOCAL, and the Navy Operating Areas off the U.S. East Coast*. Alexandria, VA: Center for Naval Analyses.

Roskov, Y., L. Abucay, T. Orrell, D. Nicolson, T. Kunze, A. Culham, N. Bailly, P. Kirk, T. Bourgoin, R. E. DeWalt, W. Decock, and A. De Weaver. (2015). *Species 2000 & ITIS Catalogue of Life, 2015 Annual Checklist*. Retrieved July 6, 2015, from http://www.catalogueoflife.org/annual-checklist/2015/.

Taylor, L., G. Chaudhary, G. Jain, A. Lowe, A. Hupe, A. Negishi, Y. Zeng, R. H. Ewoldt, and D. S. Fudge. (2023). Mechanisms of gill-clogging by hagfish slime. *Journal of the Royal Society Interface 20* (200): 20220774. DOI:doi:10.1098/rsif.2022.0774

World Register of Marine Species Editorial Board. (2015). *Towards a World Register of Marine Species*. Retrieved 07/06/2015, 2016, from http://www.marinespecies.org/about.php.

Zabawa, C. and C. Ostrom. (1980). *Final Report on the Role of Boat Wakes in Shore Erosion in Anne Arundel County, Maryland*. Annapolis, MD: Maryland Department of Natural Resources.

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Supplemental Environmental Impact Statement/ Overseas Environmental Impact Statement Atlantic Fleet Training and Testing

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3.6 FISHES

FISHES SYNOPSIS

The Action Proponents considered the stressors to fishes that could result from the Proposed Action within the Study Area. The following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Acoustic: The use of each acoustic substressor (sonar and other transducers, air guns, pile driving, vessel noise, aircraft noise, and weapons noise) could result in impacts on fishes. Some sonars, vessel and weapons noise could result in masking, physiological responses, or behavioral reactions. Aircraft noise would not likely result in impacts other than brief, mild behavioral responses in fishes that are close to the surface. Each of these substressors would be unlikely to result in temporary threshold shift. Air guns and pile driving have the potential to result in mortality, injury, or hearing loss at very short ranges (tens of meters) in addition to the effects listed above. Most impacts are expected to be temporary and infrequent as most activities involving acoustic stressors would be temporary, localized, and infrequent resulting in short-term and mild to moderate impacts. More severe impacts (e.g., mortality) could lead to permanent effects for individuals but, overall, long-term consequences for fish populations are not expected.
- Explosives: The use of explosives could result in impacts on fishes within the Study Area. Sound and energy from explosions can cause mortality, injury, hearing loss, masking, physiological stress, or behavioral responses. The time scale of individual explosions is very limited, and military readiness activities involving explosions are dispersed in space and time, therefore, repeated exposure of individuals is unlikely. Most effects such as hearing loss or behavioral responses are expected to be short term and localized. More severe impacts (e.g., mortality) could lead to permanent effects for individuals but, overall, long-term consequences for fish populations are not expected.
- Energy: The use of electromagnetic devices may elicit brief behavioral or physiological stress responses only in those exposed fishes that are able to detect electromagnetic properties. The impacts are expected to be temporary, minor, and limited to highly localized areas. Population-level impacts are unlikely.
- Physical Disturbance and Strike: The use of vessels, in-water devices, military expended materials, and seafloor devices present a risk for collision, stress response, or impacts caused by sediment disturbance, particularly near coastal areas and bathymetric features where fish densities are higher. Most fishes are mobile and have sensory capabilities that enable them to detect and avoid vessels and other items. Behavioral and stress responses would be temporary.

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- Entanglement*:* Fishes could be exposed to multiple entanglement stressors. The potential for impacts is dependent on the physical properties of the expended materials and the likelihood that a fish would encounter a potential entanglement stressor and then become entangled in it. Physical characteristics of wires and cables, decelerators/parachutes, and biodegradable polymers, combined with the sparse distribution of these items throughout the Study Area, suggests a low potential for fishes to encounter and become entangled in them. Because of the low numbers of fish potentially impacted by entanglement stressors, population-level impacts are unlikely.
- Ingestion*:* Military expended materials from munitions and military expended materials other than munitions present an ingestion risk to fishes that forage at the surface, in the water column, and on the seafloor. The likelihood that expended items would be ingested and cause an adverse effect would depend on the size and feeding habits of a fish, the rate at which a fish would encounter items, and the composition and physical characteristics of the item. Because of the low numbers of fish potentially impacted by ingestion stressors, population-level impacts are unlikely.

3.6.1 Introduction

The following sections describe the fishes in the Study Area and the potential impacts of the proposed training and testing activities on these resources. Impacts to fishes from the Proposed Action were analyzed in the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (hereinafter referred to as the "2018 Final EIS/OEIS"). The primary changes from the analysis are provided where they apply in subsequent sections.

3.6.2 Affected Environment

The affected environment provides the context for evaluating the effects of the Action Proponent's military readiness (training and testing) activities on fishes. With noted exceptions, the general background for fishes in the Study Area is not meaningfully different from what is described in the 2018 Final EIS/OEIS (Section 3.6.2, Affected Environment). See Appendix F (Biological Resources Supplemental Information) for updated details on the affected environment for fishes. The details are specified in this section when they directly affect the analysis.

The Study Area is generally consistent with that analyzed in the 2018 Final EIS/OEIS. Additions to the Study Area include pierside training and testing events and transit along established navigation channels from pierside locations to offshore range complexes in the Gulf of Mexico. United States (U.S.) Coast Guard activities are similar in nature to Navy activities and fall under the same stressor categories.

3.6.2.1 General Background

Fishes are the most numerous and diverse of the vertebrate groups in the Study Area (Fricke et al., 2023). Fishes in the affected environment comprise species from many different families, use many different habitats, and have diverse behaviors. Additional or updated information from the 2018 Final EIS/OEIS includes:

- Modeling results that indicate the biomass of mesopelagic fish (depths of 200 to 1,000 meters [m]) is likely much greater than the biomass of fish that occur in waters less than 200 m (Irigoien et al., 2014).
- Survey results showing the average daytime density of rays, sharks, and large bony fishes is low (1.66 per square kilometer) in surface waters from the Virginia Capes Range Complex to the Jacksonville Range Complex (Willmott et al., 2021).

Section F.4 (Fishes) of Appendix F (Biological Resources Supplemental Information) provides additional and updated information regarding the number of marine and estuarine fish species worldwide and species richness in different parts of the Study Area.

3.6.2.1.1 Habitat Use

Habitat use varies by fish taxonomic group and includes the shoreline, water surface, water column, and seafloor. An abbreviated description of taxonomic groups including their habitat use and location in the Study Area is provided in Section 3.6.2.3 (Species Not Listed under the Endangered Species Act). Additional or updated information in Appendix F (Biological Resources Supplemental Information) regarding bottom habitat use includes the following:

- Hard bottom habitats typically support higher fish densities and species richness than soft bottom habitat (Flávio et al., 2023), although the degree of association may vary considerably.
- Most substrate in the Study Area is soft bottom; however, benthic fishes in deep ocean areas (depths greater than about 1,500 m) are generally widely dispersed and tend to ignore differences in bottom type (Milligan et al., 2016; Ross et al., 2015).

There is also updated information regarding the fish communities associated with various types of live hard bottom, the composition of soft bottom habitats, and the presence of mesophotic reefs in the Study Area.

3.6.2.1.2 Movement and Behavior

The general movement and behavior for fishes include foraging, navigation, reproduction, and predator avoidance. Examples of common types of behavior include vertical and horizontal migration, schooling, feeding, and resting. Migratory behavior consists of mass movements from one place to another. Daily or seasonal migrations are typically for feeding and/or predator avoidance. Some common movement patterns include coastal migrations, open-ocean migrations, onshore/offshore movements, vertical water column movements, and life stage-related migrations. Fishes may at times occur in a shoal or school. A shoal is a group of fishes that remains together for social reasons, while a school is a synchronized shoal. Schooling may occur when traveling, feeding, resting, reproducing, or avoiding predators. Feeding behavior of fishes is influenced by many factors, including characteristics of the environment, the predators, and prey. Updated information in Appendix F (Biological Resources Supplemental Information) includes:

- Study results showing that although daily vertical migration in many fish species results in lower densities near the surface during the day than at night, there are exceptions to this pattern, including reverse diel migration and oscillatory movements (Andrzejaczek et al., 2019; Urmy & Benoit-Bird, 2021).
- Some fish species rely on visual cues while feeding while others, particularly benthic species, also rely on taste. Fishes that rely on visual cues are more likely to ingest non-food items that visually resemble natural food than those that primarily rely on taste (Roch et al., 2020).

There is also updated information regarding schooling behavior.

3.6.2.1.3 General Threats

General threats to fishes included human-induced threats that can be divided into four components: habitat alteration, exploitation, introduction of non-native species, and pollution. These threats often act on fish populations simultaneously. Additional threats to fish populations include development and human activities, disease and parasites, and climate change. Updated information on threats is provided in Appendix F (Biological Resources Supplemental Information) and generally includes trends and the potential effects of pollution, commercial fishing, aquaculture, and other fish stressors.

3.6.2.2 Endangered Species Act-Listed Species

Table 3.6-1 shows the fish species listed under the Endangered Species Act (ESA) and occurring in the Study Area. Designated critical habitat for ESA-listed fish species in the Study Area is shown in Figure 3.6-1 through Figure 3.6-6. Changes in the ESA listings and critical habitat designations since the 2018 Final EIS/OEIS include:

- National Marine Fisheries Service (NMFS) finalized critical habitat for the Nassau grouper (*Epimetheus striatus*) on January 2, 2024. The critical habitat is located off the coasts of southeastern Florida, Puerto Rico, Navassa, and the U.S. Virgin Islands.
- Smalltail shark (*Carcharhinus porosus*) has been added to the list of candidate species for protection under the ESA.
- Alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), cusk (*Brosme brosme*), and dwarf seahorse (*Hippocampus zosterae*) have been removed from the list of candidate species for protection under the ESA.

Additional information on ESA-listed species is provided in Appendix F (Biological Resources Supplemental Information).

Table 3.6-1: Status and Occurrence of Endangered Species Act-Listed Fish Species in the Study Area

Species Name and Regulatory Status				*Species Occurrence in the Study Area*		
Common Name	***Scientific Name***	***Distinct Population Segment/Stock***	***ESA Status/Critical Habitat***	***Range Complex/ Testing Range***	***Range Complex Inshore Areas***	***Piers/Ports/Coast Guard Stations***
Atlantic salmon	*Salmo salar*	Gulf of Maine	Endangered/ Designated	Northeast Range Complexes	Northeast RC Inshore	Pierside NS Newport, Portsmouth Naval Shipyard, NSB New London Civilian Ports Bath, ME[1]; Boston, MA Coast Guard Stations Boston, MA; New London, CT
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	Gulf of Maine	Threatened/ Designated	Northeast Range Complexes, Naval Undersea Warfare Center Division, Newport Testing Area, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF	Northeast RC Inshore; VACAPES RC Inshore[1], JAX RC Inshore[2]	Pierside Portsmouth Naval Shipyard[2], NSB New London, NS Newport, NS Norfolk, JEB Little Creek, Norfolk Naval Shipyard, NSB Kings Bay, NS Mayport, Port Canaveral Civilian Ports Bath, ME[2]; Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC; Wilmington, NC[2]; Kings Bay, GA; Savannah, GA[2]; Mayport, FL; Port Canaveral, FL Coast Guard Stations Boston, MA; New London, CT; Newport, RI; Virginia Beach, VA; Portsmouth, VA; Elizabeth City, NC; Charleston, SC[2]; Mayport, FL; Cape Canaveral, FL
		New York Bight, Chesapeake Bay, Carolina, South Atlantic	Endangered/ Designated			

Table 3.6-1: Status and Occurrence of Endangered Species Act-Listed Fish Species in the Study Area (continued)

Species Name and Regulatory Status				*Species Occurrence in the Study Area*		
Common Name	***Scientific Name***	***Distinct Population Segment/Stock***	***ESA Status/Critical Habitat***	***Range Complex/ Testing Range***	***Range Complex Inshore Areas***	***Piers/Ports/Coast Guard Stations***
Shortnose sturgeon	*Acipenser brevirostrum*	Not applicable	Endangered	Northeast Range Complexes, Naval Undersea Warfare Center Division, Newport Testing Area, VACAPES RC, Navy Cherry Point RC, JAX RC	Northeast RC Inshore, VACAPES RC Inshore, JAX RC Inshore	Pierside Portsmouth Naval Shipyard, NSB New London, NS Newport, NS Norfolk, JEB Little Creek, Norfolk Naval Shipyard, NSB Kings Bay, NS Mayport Civilian Ports Bath, ME; Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC; Wilmington, NC; Kings Bay, GA; Savannah, GA; Mayport, FL Coast Guard Stations Boston, MA; New London, CT; Newport, RI; Virginia Beach, VA; Portsmouth, VA; Elizabeth City, NC; Charleston, SC; Mayport, FL
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	Not applicable	Threatened/ Designated	Naval Surface Warfare Center, Panama City Division Testing Area[3], GOMEX RC[3]	GOMEX RC Inshore	Civilian Ports Pascagoula, MS[3] Coast Guard Stations Pensacola, FL[3]; New Orleans, LA[3]

Table 3.6-1: Status and Occurrence of Endangered Species Act-Listed Fish Species in the Study Area (continued)

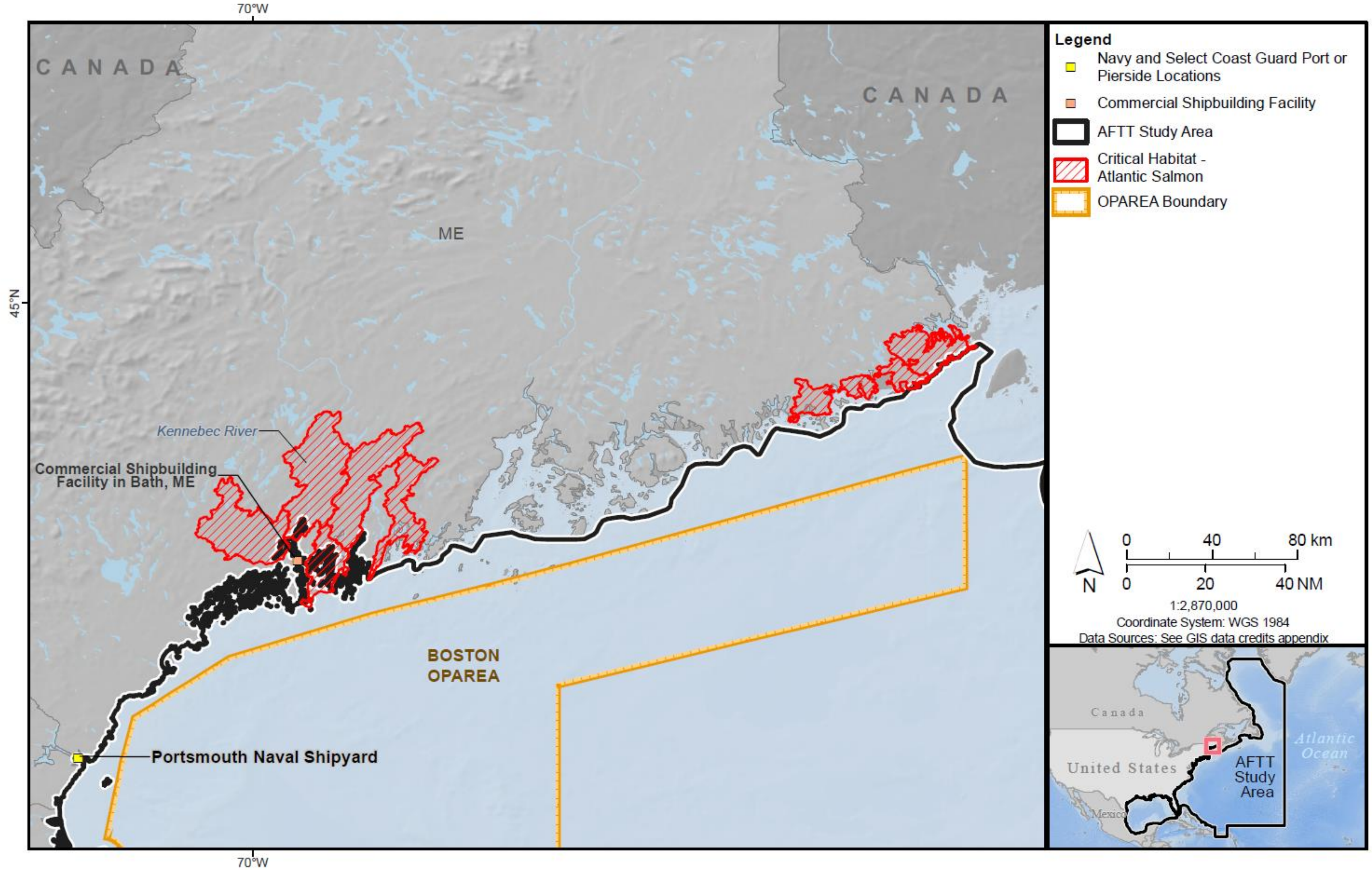
Species Name and Regulatory Status				***Species Occurrence in the Study Area***		
Common Name	***Scientific Name***	***Distinct Population Segment/Stock***	***ESA Status/Critical Habitat***	***Range Complex/ Testing Range***	***Range Complex Inshore Areas***	***Piers/Ports/Coast Guard Stations***
Smalltooth sawfish	*Pristis pectinata*	United States	Endangered/ Designated	JAX RC, SFOMF, Key West RC, Naval Surface Warfare Center, Panama City Division Testing Area	JAX RC Inshore, Key West RC Inshore, GOMEX RC Inshore	<u>Pierside</u> NS Mayport; Port Canaveral, FL <u>Civilian Ports</u> Tampa, FL; Mobile, AL; Pascagoula, MS; Gulfport, MS <u>Coast Guard Stations</u> Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL; Key West, FL; St. Petersburg, FL; Pensacola, FL
Giant manta ray	*Mobula birostris*	Not applicable	Threatened/ None	Northeast Range Complexes, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC[1], Naval Surface Warfare Center Panama City Division Testing Area, GOMEX RC	JAX RC Inshore, Key West RC Inshore, Gulf of Mexico Inshore	<u>Pierside</u> NS Mayport, Port Canaveral <u>Civilian Ports</u> Mayport, FL; Port Canaveral, FL; Tampa, FL; Gulfport, MS; Beaumont, TX; Corpus Christi, TX; Pascagoula, MS <u>Coast Guard Stations</u> Charleston, SC; Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL; Key West, FL; St. Petersburg, FL; Pensacola, FL; New Orleans, LA; Corpus Christi, TX
Nassau grouper	*Epinephelus striatus*	Not applicable	Threatened/ Designated	SFOMF, Key West RC[4]	Key West RC Inshore	<u>Coast Guard Stations</u> Miami, FL

Table 3.6-1: Status and Occurrence of Endangered Species Act-Listed Fish Species in the Study Area (continued)

Species Name and Regulatory Status				*Species Occurrence in the Study Area*		
Common Name	***Scientific Name***	***Distinct Population Segment/Stock***	***ESA Status/Critical Habitat***	***Range Complex/ Testing Range***	***Range Complex Inshore Areas***	***Piers/Ports/Coast Guard Stations***
Oceanic whitetip shark	*Carcharhinus longimanus*	Not applicable	Threatened/ None	Northeast Range Complexes, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, Naval Surface Warfare Center Panama City Division Testing Area, GOMEX RC	Not present	Not present
Scalloped hammerhead shark	*Sphyrna lewini*	Central and Southwest Atlantic	Threatened/ None	SFOMF, Key West RC	Not present	Not present
Smalltail shark	*Carcharhinus porosus*	Not applicable	Candidate[5]/ None	Naval Surface Warfare Center, Panama City Division Testing Area, GOMEX RC	GOMEX RC Inshore	<u>Civilian Ports</u> Tampa, FL; Beaumont, TX; Corpus Christi, TX; Pascagoula, MS <u>Coast Guard Stations</u> Pensacola, FL; New Orleans, LA; New Orleans, LA; Corpus Christi, TX

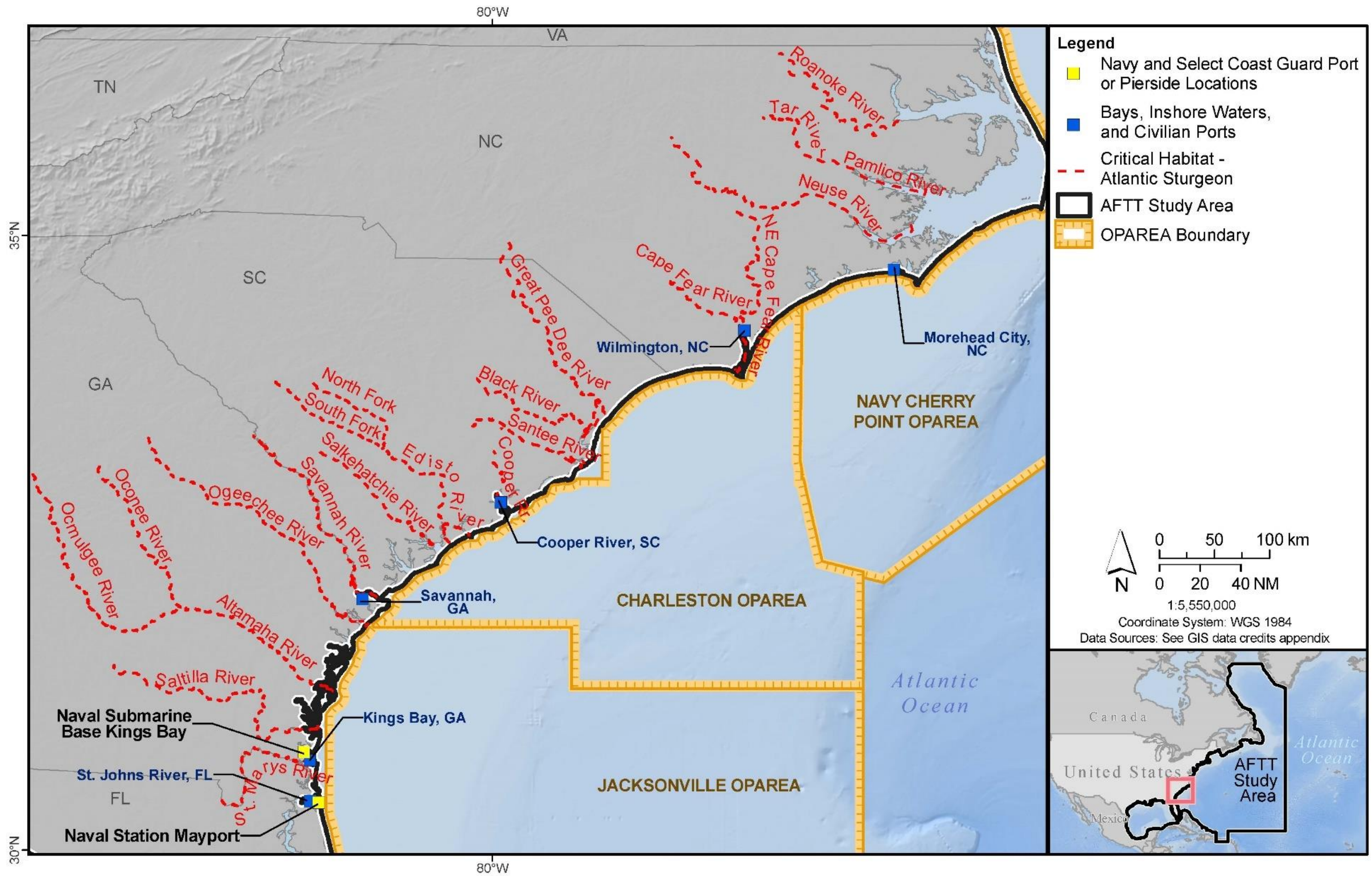
[1] Intersects with species critical habitat as shown in Figure 3.6-1
[2] Intersects with species critical habitat as shown in Figure 3.6-2 and Figure 3.6-3
[3] Intersects with species critical habitat as shown in Figure 3.6-4
[4] Intersects with species critical habitat as shown in Figure 3.6-6
[5] Candidate species are any species that are undergoing a status review to determine whether they warrant listing under the ESA. Candidate status does not carry any procedural or substantive protections under the ESA but is provided for informational purposes.

Notes: DE = Delaware; ESA = Endangered Species Act; FL = Florida; GA = Georgia; GOMEX = Gulf of Mexico; JAX = Jacksonville; JEB = Joint Expeditionary Base; MA = Massachusetts; ME = Maine; MS = Mississippi; NA = not applicable; NC = North Carolina; NJ = New Jersey; NS = Naval Station; NSB = Naval Submarine Base; OPAREA = operating area; RC = Range Complex; RI = Rhode Island; SFOMF = South Florida Ocean Measurement Facility Testing Range; TX = Texas; VA = Virginia; VACAPES = Virginia Capes



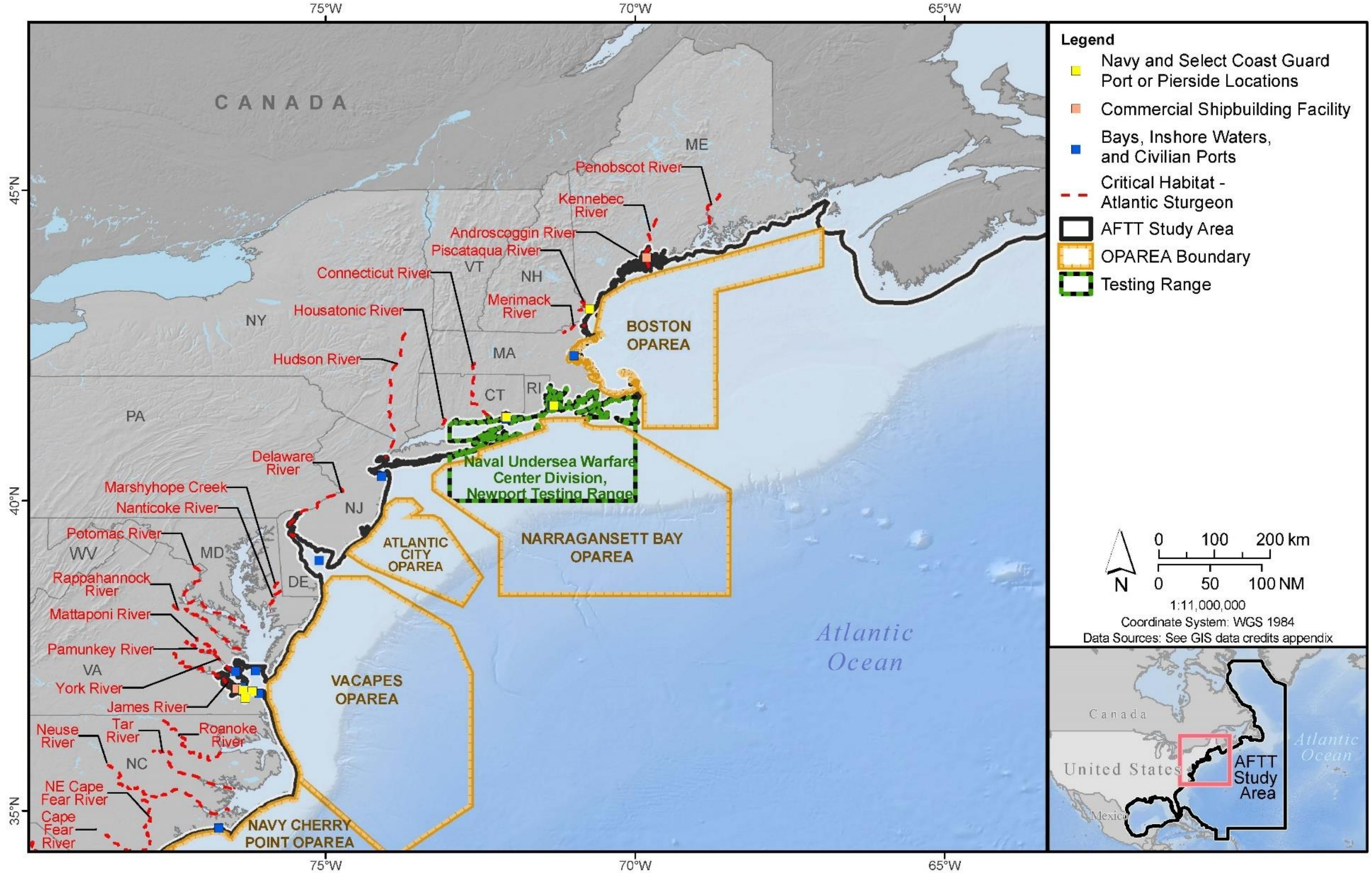
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.6-1: Critical Habitat for ESA-Listed Atlantic Salmon Designated in the Study Area



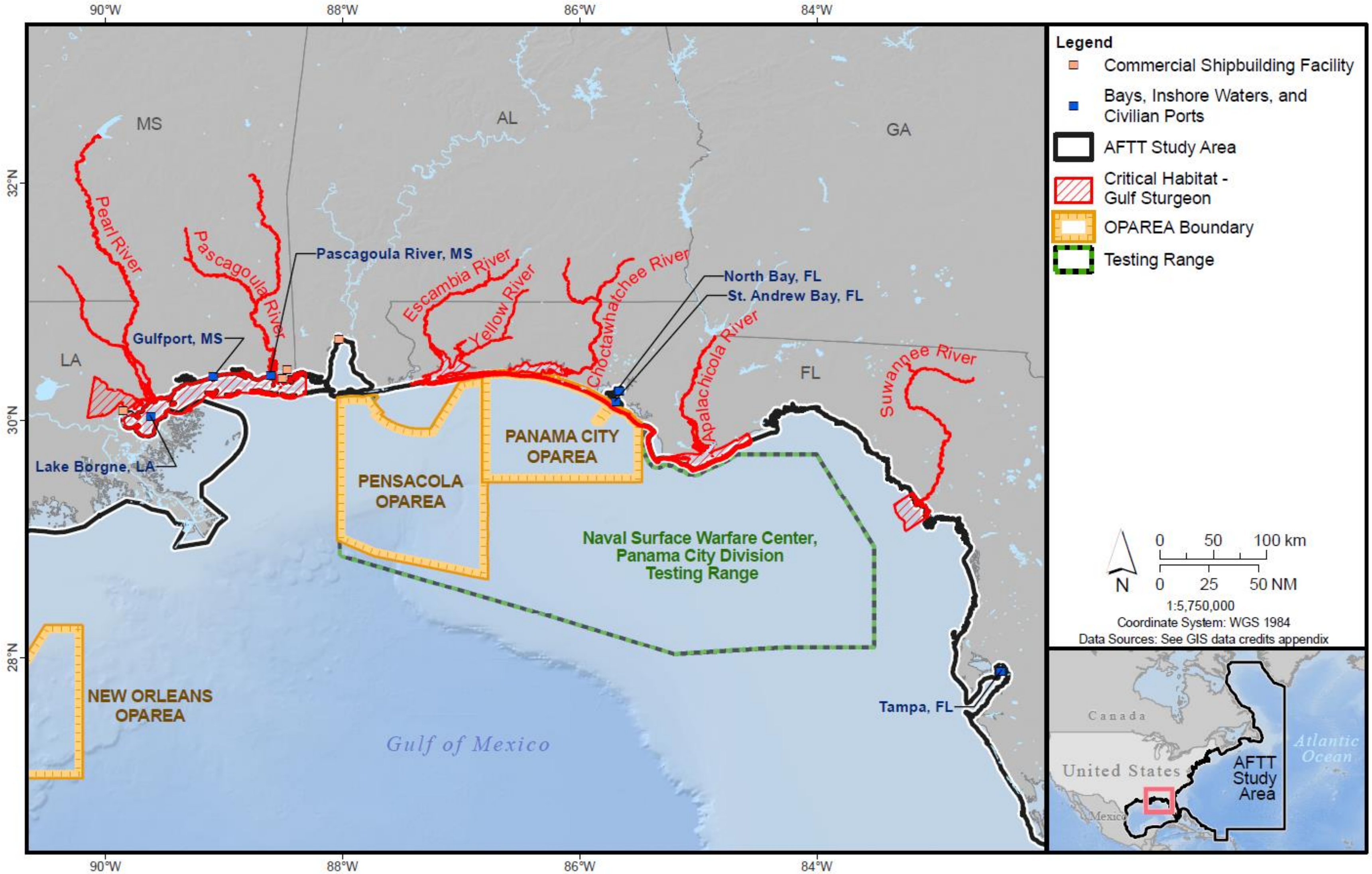
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.6-2: Critical Habitat for ESA-Listed Atlantic Sturgeon Designated in the Southern Portion of the Study Area



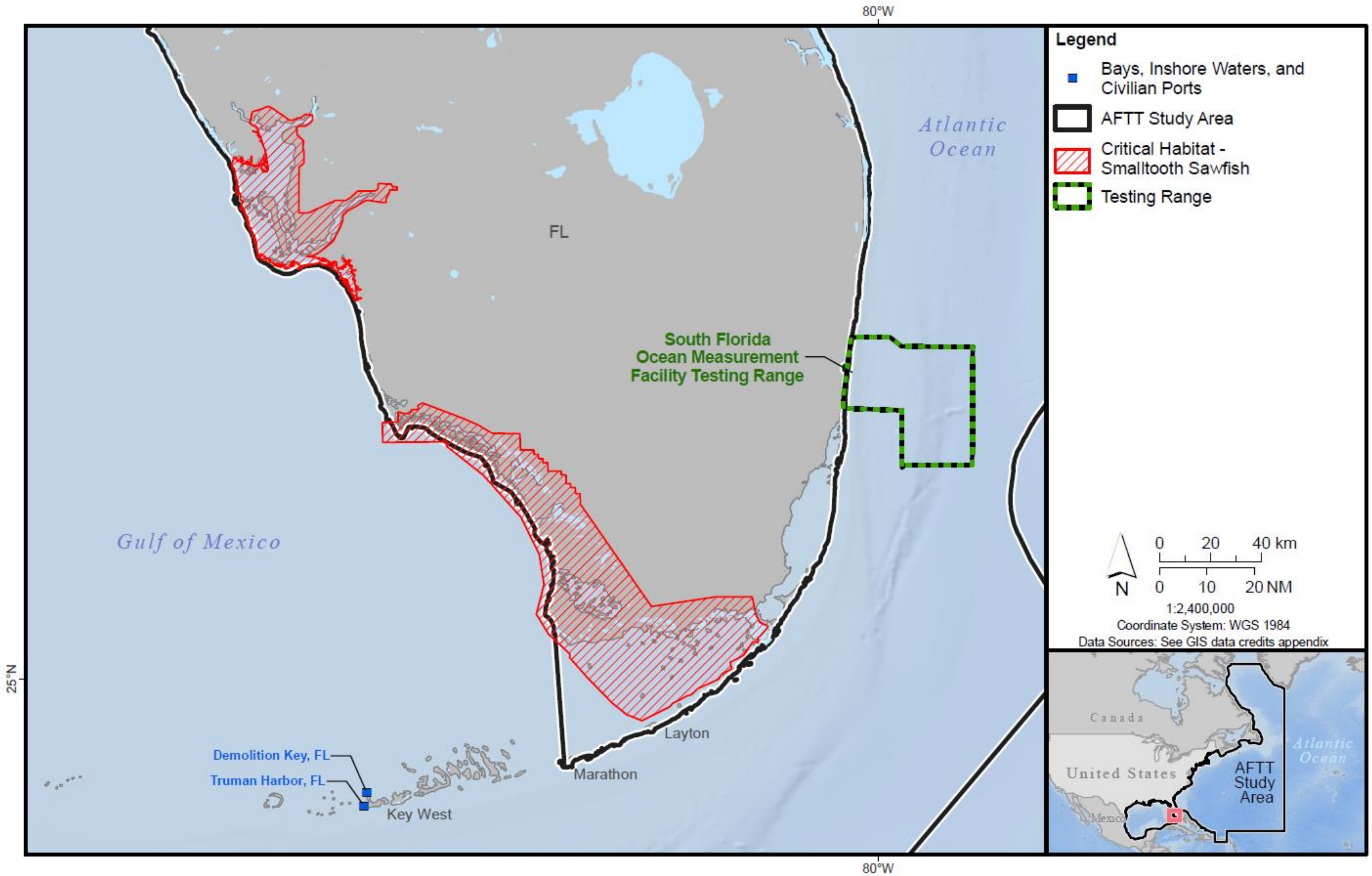
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; VACAPES = Virginia Capes

Figure 3.6-3: Critical Habitat for ESA-Listed Atlantic Sturgeon Designated in the Northern Portion of the Study Area



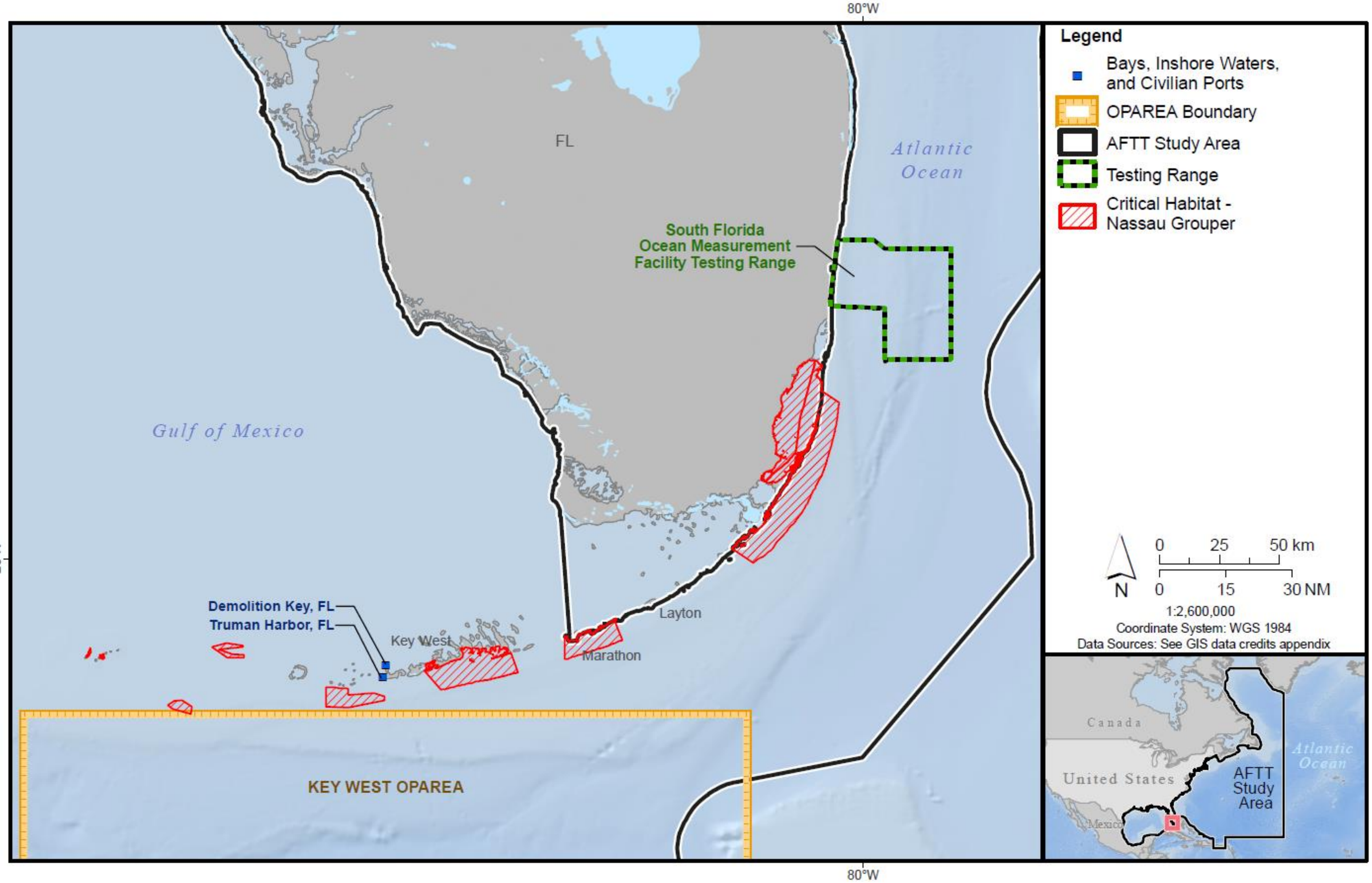
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.6-4: Critical Habitat for ESA-Listed Gulf Sturgeon Designated in the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing

Figure 3.6-5: Critical Habitat for ESA-Listed Smalltooth Sawfish Designated in the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.6-6: Critical Habitat for ESA-Listed Nassau Grouper Designated in the Study Area

3.6.2.3 Species Not Listed under the Endangered Species Act

Table 3.6-2 provides general descriptions of fishes and their location/habitat use in the Study Area. The general background information for each taxonomic group described in the 2018 Final EIS/OEIS has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS Section 3.6.2.3 (Species Not Listed under the Endangered Species Act) remains valid.

Table 3.6-2: Description and Occurrence of Major Taxonomic Groups of Fishes in the Study Area

Resource Groups		*Occurrence in Study Area[1]*		
Common Name (Classification)	*Description*	*Range Complex/ Testing Range*	*Range Complex Inshore*	*Piers/Ports/Coast Guard Stations*
Jawless fishes (Orders Myxiniformes and Petromyzontiformes)	Primitive, cartilaginous, eel-like vertebrates, parasitic or feed on dead fish	Seafloor	Water column, seafloor	Water column, seafloor
Ground Sharks, Mackerel Sharks, Carpet Sharks, and Bullhead Sharks (Orders Carcharhiniformes, Lamniformes, Orectolobiformes, and Heterodontiformes)[2]	Cartilaginous, two dorsal fins or first large, an anal fin, and five gill slits	Water column, seafloor	Water column, seafloor	Water column
Frilled and Cow Sharks, Sawsharks, Dogfish, and Angel Sharks (Orders Hexanchiformes, Pristiophoriformes, Squaliformes, and Squatiniformes)	Cartilaginous, anal fin and nictitating membrane absent, 6-7 gill slits	Water column, seafloor	Water column, seafloor	Water column, seafloor
Stingrays, Sawfishes, Skates, Guitarfishes, and Electric Rays (Orders Myliobatiformes, Pristiformes, Rajiformes, and Torpediniformes)[2]	Cartilaginous, flat-bodied, usually five gill slits	Water column, seafloor	Water column, seafloor	Water column, seafloor
Ratfishes (Order Chimaeriformes).	Cartilaginous, placoid scales	Water column, seafloor	Not present	Not present
Sturgeons (Order Acipenseriformes)[2]	Primitive, ray-finned, cartilaginous, bony plates, heterocercal tail	Surface, water column, seafloor	Surface, water column, seafloor	Surface, water column, seafloor, all locations except: Civilian Ports Tampa, FL; Beaumont, TX; Corpus Christi, TX Coast Guard Stations Fort Pierce, FL; Dania, FL; Miami, FL; Key West, FL; Petersburg, FL; Corpus Christi, TX

Table 3.6-2: Description and Occurrence of Major Taxonomic Groups of Fishes in the Study Area (continued)

Resource Groups		*Occurrence in Study Area[1]*		
Common Name (Classification)	***Description***	***Range Complex/ Testing Range***	***Range Complex Inshore***	***Piers/Ports/Coast Guard Stations***
Gars (Order Lepisosteiformes)	Primitive, slender body. ganoid scales, heterocercal tail; needle-like teeth	Not present	Surface, water column, all locations except Northeast Range Complex Inshore	Surface, water column, all locations except: <u>Pierside</u> Portsmouth Naval Shipyard, Naval Submarine Base New London, Naval Station Newport <u>Civilian Ports</u> Bath, ME; Boston, MA; Earle, NJ; New London, CT; Newport, RI <u>Coast Guard Stations</u> Boston, MA; New London, CT; Newport, RI
Herrings and allies (Order Clupeiformes)	Silvery, Lateral line on body and fin spines absent, usually scutes along ventral profile	Surface, water column	Surface, water column	Surface, water column
Tarpons and allies (Orders Elopiformes, and Albuliformes)	Body encased in silvery scales, mouth large, mostly a single dorsal fin, some with tapered tail fin, spines absent	Water column, seafloor	Surface, water column, seafloor	Surface, water column, seafloor
Eels and allies (Orders Anguilliforms, Notacanthiformes, and Saccopharyngiformes)	Body very elongate, usually scaleless with pelvic fins and fin spines absent	Water column, seafloor	Water column, seafloor	Water column, seafloor
Salmonids (Order Salmoniformes)[2]	Silvery body, adipose fin present	Surface, water column, Northeast Range Complexes	Surface, water column, Northeast Range Complex Inshore	Surface, water column, <u>Pierside</u> NS Newport, Portsmouth Naval Shipyard, NSB New London <u>Civilian Ports</u> Bath, ME; Boston, MA <u>Coast Guard Stations</u> Boston, MA; New London, CT
Argentines and allies (Order Argentiniformes)	Body silvery, and elongate; fin spines absent, adipose fin sometimes present, pelvic fins and ribs sometimes absent	Water column, seafloor	Not present	Not present

Table 3.6-2: Description and Occurrence of Major Taxonomic Groups of Fishes in the Study Area (continued)

Resource Groups		*Occurrence in Study Area[1]*		
Common Name (Classification)	***Description***	***Range Complex/ Testing Range***	***Range Complex Inshore***	***Piers/Ports/Coast Guard Stations***
Catfishes (Order Siluriformes)	Barbels on head, spines on dorsal and pectoral fins, scaleless, adipose fin present	Seafloor, all locations except Northeast Range Complexes	Seafloor, all locations except Northeast Range Complex Inshore	Seafloor, all locations except: Pierside Portsmouth Naval Shipyard, Naval Submarine Base New London, Naval Station Newport Civilian Ports Bath, ME; Boston, MA; Earle, NJ; New London, CT; Newport, RI Coast Guard Stations Boston, MA; New London, CT; Newport, RI
Bristlemouths and allies (Orders Stomiiformes)	Photophores present, adipose and chin barbels fin sometimes present	Water column, seafloor	Not present	Not present
Greeneyes and allies (Order Aluopiformes)	Upper jaw protrusible adipose fin present, forked tail usually present	Water column, seafloor	Not present	Not present
Lanternfishes and allies (Order Myctophiformes)	Small-sized, adipose fin, forked tail and photophores usually present	Water column, seafloor	Not present	Not present
Hakes and allies (Order Gadiformes)	Long dorsal and anal fins; no true spines, spinous rays present in dorsal fin, barbels present	Water column, seafloor	Surface, water column, seafloor	Surface, water column, seafloor
Brotulas and allies (Order Ophidiiformes)	Pelvic absent or far forward and filamentous, no sharp spines, Dorsal and anal fins joined to caudal fins	Water column, seafloor	Not present	Not present
Toadfishes and allies (Order Batrachoidiformes)	Body compressed; head large, mouth large with tentacles; two dorsal fins, the first with spines	Seafloor	Seafloor	Seafloor
Anglerfishes and allies (Order Lophiiformes)	Body globulose, first spine on dorsal fin usually modified, pelvic fins usually absent	Water column, seafloor	Not present	Not present
Flying Fishes (Order Beloniformes)	Jaws extended into a beak; pelvic fins very large wing-like; spines absent	Surface, water column	Surface, water column	Surface, water column

Table 3.6-2: Description and Occurrence of Major Taxonomic Groups of Fishes in the Study Area (continued)

Resource Groups		***Occurrence in Study Area[1]***		
Common Name (Classification)	***Description***	***Range Complex/ Testing Range***	***Range Complex Inshore***	***Piers/Ports/Coast Guard Stations***
Killifishes (Order Cyprinodontiformes)	Protrusible upper jaw; fin spines rarely present; single dorsal fin	Not present	Surface, water column	Surface, water column
Silversides (Order Atheriniformes)	Small-sized, silvery stripe on sides, pectoral fins high, first dorsal fin with flexible spine, pelvic fin with one spine	Surface, water column	Surface, water column	Surface, water column
Opahs and allies (Order Lampriformes)	Upper jaw protrusible; pelvic fins forward on body, below or just behind insertion of pectoral fins	Water column	Not present	Not present
Squirrelfishes and allies (Order Beryciformes)	Body usually round, one dorsal fin often set far back, pelvic fins absent, fin spines often present	Water column, seafloor	Not present	Not present
Dories and allies (Order Zeiformes)	Body deeply compressed, protrusible jaws, spines in dorsal fin, pelvic fin spines sometimes present	Water column, seafloor	Not present	Not present
Pipefishes (Order Syngnathiformes)	Snout tube-like, mouth small, scales often modified bony plates	Water column, seafloor	Water column, seafloor	Water column, seafloor
Sticklebacks (Order Gasterosteiformes)	Mouth small, scales often modified bony plates	Water column, seafloor	Water column, seafloor	Water column, seafloor
Scorpionfishes (Order Scorpaeniformes)	Usually strong spines on head and dorsal fin; cheeks with bony struts, pectoral fins usually rounded	Water column, seafloor	Water column, seafloor	Water column, seafloor
Mullets (Order Mugiliformes)	Streamline body, forked tail, hard angled mouth, large scales	Surface, water column, seafloor	Surface, water column, seafloor	Surface, water column, seafloor
Perch-like Fishes and Allies (Order Perciformes)[2]	Deep bodied, to moderately elongate, 1-2 dorsal fins, large mouth and eyes, and thoracic pelvic fins	Surface, water column, seafloor	Surface, water column, seafloor	Water column, seafloor
Wrasses and Allies (Order Perciformes)	Compressed body, scales large, well- developed teeth, usually colorful	Water column, seafloor	Water column, seafloor	Water column, seafloor
Eelpouts and Allies (Order Perciformes)	Eel-like body, long dorsal and anal fins, pelvic fins usually absent	Seafloor	Seafloor	Seafloor

Table 3.6-2: Description and Occurrence of Major Taxonomic Groups of Fishes in the Study Area (continued)

Resource Groups		*Occurrence in Study Area*[1]		
Common Name (Classification)	***Description***	***Range Complex/ Testing Range***	***Range Complex Inshore***	***Piers/Ports/Coast Guard Stations***
Stargazers (Order Perciformes)	Body elongated, lower jaw usually projecting beyond upper jaw, pelvic and anal fins with spines	Seafloor	Seafloor	Seafloor
Blennies, Gobies, and Allies (Order Perciformes)	Body eel-like to sculpin-like, pelvic fins reduced or fused	Seafloor	Seafloor	Seafloor
Surgeonfishes (Order Perciformes)	Body deeply compressed laterally, mouth small, scales usually small, pelvic fins with spines	Water column, seafloor	Not present	Not present
Tunas and Allies (Order Perciformes)	Large mouth, inlets and keels usually present, pelvic fins often absent or reduced, fast swimmers	Surface, water column	Juvenile barracudas only	Juvenile barracudas only, all locations except: Pierside Portsmouth Naval Shipyard Civilian Ports Bath, ME
Butterfishes (Order Perciformes)	Snout blunt and thick, teeth small, maxilla mostly covered by bone	Surface, water column, seafloor	Not present	Not present
Flatfishes (Order Pleuronectiformes)	Body flattened; eyes on one side of body	Seafloor	Seafloor	Seafloor
Pufferfishes (Order Tetraodontiformes)	Skin thick or rough sometimes with spines or scaly plates, pelvic fins absent or reduced, small mouth with strong teeth coalesced into biting plate	Surface, water column, seafloor	Surface, water column, seafloor	Surface, water column, seafloor

[1] Fishes in each group can occur in all locations, unless specifically indicated.
[2] Taxonomic group contains ESA-listed (or proposed for listing) species (refer to Section 3.6.2.2, Endangered Species Act-Listed Species, for more information).

3.6.3 Environmental Consequences

Under the No Action Alternative, none of the proposed military readiness activities would be conducted. Therefore, baseline conditions of the existing environment for fishes would either remain unchanged or would improve after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further within this section.

This section describes and evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) and stressors described in Section 3.0.3.3 (Identifying Stressors for Analysis) could potentially impact fishes known to occur within the Study Area.

The stressors vary in intensity, frequency, duration, and location within the Study Area. The activities that involve each of the following stressors are identified in Appendix A (Activity Descriptions) and Appendix B (Activity Stressor Matrices). The stressors and substressors analyzed for fishes include the following:

- **acoustics** (sonar and other transducers; air guns; pile driving; vessel noise; aircraft noise; and weapons noise)
- **explosives** (explosions in water; explosions in air)
- **energy** (in-water electromagnetic devices)
- **physical disturbance and strikes** (vessels and in-water devices; military expended materials; seafloor devices; pile driving)
- **entanglement** (wires and cables; decelerators/parachutes; biodegradable polymers)
- **ingestion** (military expended materials – munitions; military expended materials other than munitions)

A discussion of secondary stressors, to include the potential impacts to habitat or prey availability, and the potential impacts of all the stressors combined are provided at the end of the section.

The analysis of potential impacts to fishes considers standard operating procedures and mitigation measures that would potentially provide protection to fishes. Standard operating procedures are detailed in Section A.1.7 (Standard Operating Procedures) of Appendix A (Activity Descriptions). Mitigation measures relevant to fishes are referenced in Table 3.6-3 and in Section 3.3 (Habitats). Details on all mitigation measures are provided in Chapter 5 (Mitigation). Mitigation areas within the Study Area for fishes are shown in Figure 3.6-7 and Figure 3.6-8. The Panama City Gulf Sturgeon and Sea Turtle Mitigation Area overlaps a portion of Gulf sturgeon nearshore marine critical habitat.

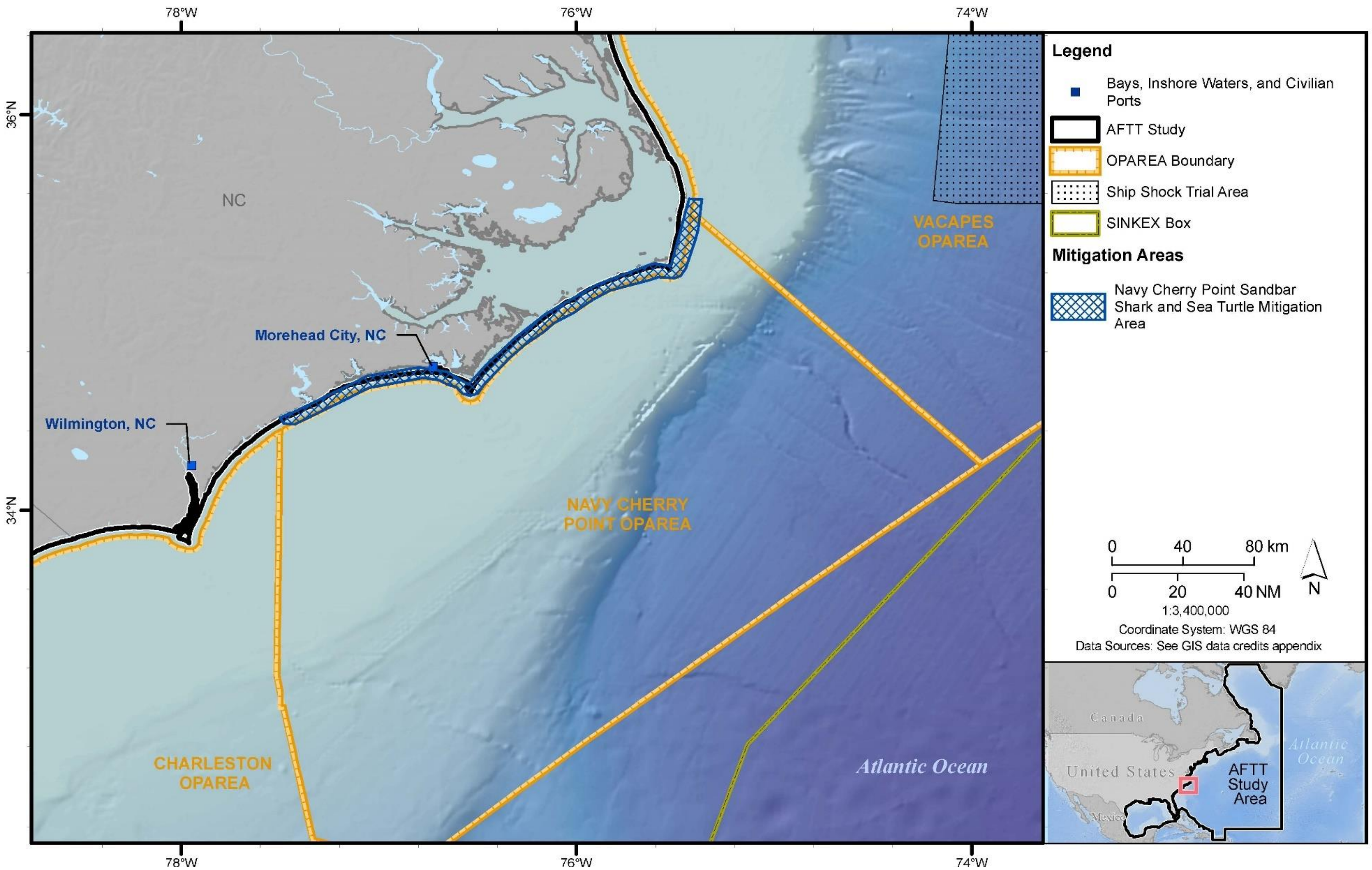
Table 3.6-3: Mitigation Requirements Summary by Stressor for Fishes

Applicable Stressor	*Requirements Summary and Protection Focus*	*Section Reference*
Explosives	Restrictions on the use of explosives within a horizontal distance from shallow-water coral reefs.	Section 5.7.1 (Shallow-Water Coral Reef Mitigation Areas)[1]
	Restrictions on the use of explosives within a horizontal distance from artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks, except in designated locations where these resources will be avoided to the maximum extent practicable.	Section 5.7.2 (Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck Mitigation Areas)[1]
	Restrictions on the use of explosives from March 1 to September 30 during mine neutralization events, and on all other explosives to the maximum extent practicable.	Section 5.7.5 (Nearshore North Carolina Sandbar Shark and Sea Turtle Mitigation Area))
	Restrictions on line charge testing at night from March 1 to September 30, and from October 1 to March 31 (except within a designated location on Santa Rosa Island).	Section 5.7.6 (Panama City Gulf Sturgeon and Sea Turtle Mitigation Area)
	Conduct visual observations for floating vegetation (detached kelp paddies and *Sargassum*). During events with the largest net explosive weights involving ship shock trials, conduct observations for jellyfish aggregations, large schools of fish, or flocks of seabirds.	Section 5.6 (Visual Observations)[2]

Table 3.6-3: Mitigation Requirements Summary by Stressor for Fishes (continued)

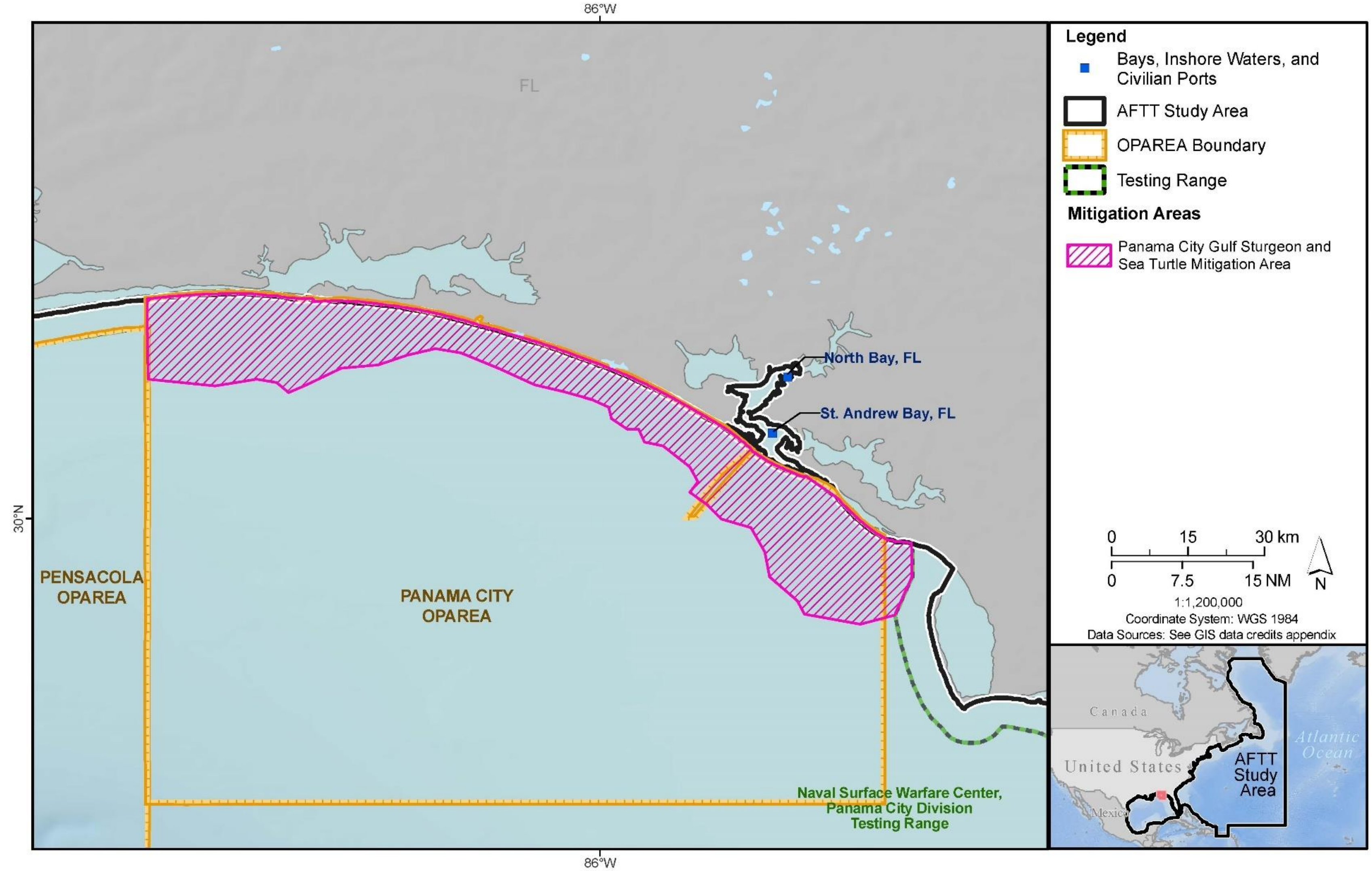
Applicable Stressor	*Requirements Summary and Protection Focus*	*Section Reference*
Physical disturbance and strike	Avoid shallow-water coral reefs during training and testing activities.	Section 5.7.1 (Shallow-Water Coral Reef Mitigation Areas)[1]
	Avoid Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck Mitigation Areas during training and testing activities.	Section 5.7.2 (Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck Mitigation Areas)[1]
	Mitigation for vessel disturbance and strike is summarized in Section 3.3 (Habitats)[1] including shallow-water coral reefs.	Section 5.7.3 (Key West Range Complex Seafloor Mitigation Area)[1] and Section 5.7.4 (South Florida Ocean Measurement Facility Seafloor Mitigation Area)[1]

[1] The mitigation was developed to protect specific habitats, which also protects fish that are associated with those habitats.
[2] The mitigation was developed to protect possible indicators of marine mammal presence, which includes large schools of fish.



Notes: AFTT = Atlantic Fleet Training and Testing; HAPC = habitat area of particular concern; OPAREA = operating area

Figure 3.6-7: Mitigation Areas for Fishes in the Study Area (Nearshore North Carolina Sandbar Shark and Sea Turtle Mitigation Area)



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.6-8: Mitigation Areas for Fishes in the Study Area (Panama City Gulf Sturgeon and Sea Turtle Mitigation Area)

The criteria for determining the significance of Proposed Action stressors on fishes are described in Table 3.6-4. The abbreviated analysis under each substressor and alternative provides the technical support for these determinations, with reference to the 2018 Final EIS/OEIS or supporting appendices for details.

Table 3.6-4: Criteria for Determining the Significance of Proposed Action Stressors on Fishes

Impact Descriptor	*Context and Intensity*	*Significance Conclusions*
Negligible	Impacts to fishes would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual fish or schools of fish found within the Study Area. Impacts on habitat would be temporary (e.g., temporary placement of object on the sea floor or increased turbidity) with no lasting damage or alteration.	Less than significant
Minor	Impacts to fishes would generally be temporary or short term (lasting several days to several weeks), but would not be outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. This could include temporary threshold shift of hearing or repeated, short-term stress responses without permanent physiological damage, but could also include physiological injury or mortality to a relatively small number of individuals of common species. Behavioral responses to disturbance by some individuals or a school of fish could be expected, but only temporary disturbance of breeding, feeding, or other activities would occur, without any impacts on population levels. Displacement would be short term and limited to the Study Area or its immediate surroundings. Impacts on habitat (e.g., short-term placement of objects on the sea floor which increases turbidity or causes loss of a small area of vegetation) would be easily recoverable, with no long-term or permanent damage or alteration.	Less than significant
Moderate	Impacts to fishes would be short term or long term (lasting several months or longer) and outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. This could include physiological injury to individuals in the form of temporary or permanent hearing threshold shift, repeated stress responses, or mortality. Behavioral responses to disturbance by numerous individuals could be expected in the Study Area, its immediate surroundings, or beyond. These could include negative impacts to breeding, feeding, growth, or other factors affecting population levels, including population-level mortality to, or extended displacement (up to a year) of, large numbers (i.e., population level) of fish. However, they would not threaten the continued existence of a stock, population, or species. Habitat would be potentially damaged or altered over the long term but would continue to support the species reliant on it.	Less than significant
Major	Impacts to fishes would be short or long term and well outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. Behavioral and stress responses would be repeated, and hearing threshold shifts would be permanent. Actions would affect any stage of a species' life cycle (i.e., breeding, feeding, growth, and maturity), alter population structure, genetic diversity, or other demographic factors, and/or cause mortality beyond a small number of individuals, resulting in a decrease in population levels. Displacement and stress responses would be short or long term within and well beyond the Study Area. Habitat would be degraded long term or permanently so that it would no longer support a sustainable fishery and would cause the population of a managed species to become stressed, less productive, or unstable.	Significant

With noted exceptions, the stressor background information and environmental consequences are not meaningfully different from what is described in the 2018 Final EIS/OEIS Section 3.6.3 (Environmental Consequences).

3.6.3.1 Acoustic Stressors

This section summarizes the potential impacts of acoustic stressors used during military readiness activities within the Study Area. The acoustic substressors included for analysis are (1) sonar and other transducers, (2) air guns, (3) pile driving, (4) vessel noise, (5) aircraft noise, and (6) weapons noise. Table 3.6-5 contains brief summaries of background information that is relevant to the analyses of impacts for each acoustic substressor (sonar and other transducers, etc.) on fishes. Detailed information on acoustic impact categories in general, as well as effects specific to each substressor, are provided in Appendix D (Acoustic and Explosive Impacts Supporting Information). For a listing of the types of activities that use or produce acoustic stressors, refer to Appendix A (Activity Descriptions) and Appendix B (Activity Stressor Matrices). The types and quantities of sonar sources, air guns, and pile driving, the number of events using vessels and aircrafts, and the locations of those events under each alternative are shown in Section 3.0.3.3.1 (Acoustic Stressors).

Due to updated criteria and thresholds used to assess impacts, and acoustic effects modeling, the quantitative analysis of impacts due to sonars and other transducers, air guns, and pile driving (i.e., ranges to effects) provided in this section supplant the analyses in the 2018 Final EIS/OEIS. The detailed assessment of these acoustic stressors under this Proposed Action is in Appendix E (Acoustic and Explosives Impact Analysis). Potential changes in the predicted acoustic impacts are due to the following:

- Updates to criteria used to determine if acoustic stressors may cause impacts.
- Revisions to the modeling of explosive effects in the Navy Acoustic Effects Model. See the technical report Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing (U.S. Department of the Navy, 2024).
- Changes in the locations, numbers, and types of modeled military readiness activities as described in Chapter 2 (Description of Proposed Action and Alternatives), and associated quantities (hours and counts) of acoustic stressors shown in Section 3.0.3.3.1 (Acoustic Stressors).

Table 3.6-5: Acoustic Stressors Background Information Summary

Substressor	*Background Information Summary*
All acoustic substressors	Fishes are not equally sensitive to sound at all frequencies. • Most fishes are hearing generalists and primarily detect particle motion at frequencies below 2 kilohertz (kHz). • Hearing specialists can detect low frequencies but also possess anatomical specializations to enhance hearing and are capable of sound pressure detection up to 10 kHz, or over 100 kHz in some species. • Fishes with a swim bladder are generally more susceptible to temporary threshold shift (TTS) than those without a swim bladder, regardless of the sound source.
Sonar and other transducers	Sonar and other transducers may result in hearing loss, masking, physiological stress, or behavioral reactions. • Most low-frequency sonars have relatively low source levels (see Table 3.0-2, Sonar and Transducer Sources Quantitatively Analyzed, in Section 3.0.3.3.1, Acoustic Stressors, for the quantities of low-frequency sonars with source

Table 3.6-5: Acoustic Stressors Background Information Summary (continued)

Substressor	***Background Information Summary***
	levels < 205 dB) and would not result in TTS. If TTS did occur, it would occur within near to intermediate distances from a sound source (a few to tens of meters) from systems with the highest possible source levels, or those that are operated at high duty cycles or continuously. • Although masking is possible for sources that fish can hear, the narrow bandwidth and intermittent nature of most sonar signals would result in only a limited probability of impacts. • Available research showed very little response of both captive and wild Atlantic herring (hearing specialists) to sonar (e.g., no avoidance). Such data suggests sonar poses little risk to populations of herring and that there is a low probability of behavioral reactions to sonar for most fishes. • Direct injury from sonar and other transducers is highly unlikely and is not considered further in this analysis.
Air guns	Exposure to air guns could result in hearing loss, masking, physiological stress, or behavioral reactions, and in some cases, injury. • Hair cell loss and TTS have been reported in fishes exposed to air guns, though fishes typically recovered from these effects in controlled laboratory settings. • Although masking could occur, air gun pulses are typically brief (fractions of a second) and biological sounds can be detected between pulses within close distances to the source. Masking could also indirectly occur because of repetitive impulsive signals where the repetitive sounds and reverberations over distance may create a more continuous noise exposure. • Fish may react behaviorally to any impulsive sound source within near and intermediate distances (tens to hundreds of meters), with decreasing probability of reaction at increasing distances. Examples of reported behavioral reactions to impulsive sources include startle response, changes in swimming speeds and movement patterns, avoidance of the sound source, and no observed response. • Exposure to air gun shots has not caused mortality, and fishes typically recovered from injuries in controlled laboratory settings.
Pile driving	Pile driving and removal involves both impact and vibratory methods. Exposure to pile driving could result in hearing loss, masking, physiological stress, or behavioral reactions, and in some cases, injury. • Hair cell loss and TTS have been reported in fishes exposed to impact pile driving, though fishes typically recovered from these effects in controlled laboratory settings. • Although masking could occur, impact pile driving pulses are typically brief (fractions of a second) and biological sounds can be detected between pulses within close distances to the source. Masking could also indirectly occur because of repetitive impulsive signals where the repetitive sounds and reverberations over distance may create a more continuous noise exposure. • Vibratory pile driving could result in reductions in auditory sensitivity and masked biological signals. The relative risk of masking due to vibratory pile driving is highest in the near and moderate distances from the source (up to hundreds of meters) but decreases with increasing distance. • Fish may react behaviorally to any impulsive sound source within near and intermediate distances (tens to hundreds of meters), with decreasing probability of reaction at increasing distances. Examples of reported behavioral reactions to impulsive sources include startle response, changes in swimming

Table 3.6-5: Acoustic Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
	speeds and movement patterns, avoidance of the sound source, and no observed response. • Exposure to impact pile driving has not caused mortality, and fishes typically recovered from injuries in controlled laboratory settings. • Direct injury from vibratory pile driving, like other continuous sources, is highly unlikely and is not considered further in this analysis.
Vessel disturbance (including vessel noise)	Vessel disturbance (including the production of noise) may result in hearing loss, masking, physiological stress, or behavioral reactions. In some more industrialized or populated areas, vessel noise is a chronic and frequent stressor. • Behavioral responses to vessels can be caused by multiple factors (e.g., visual cues) as vessel sound exposure is rarely decoupled from the physical presence of a vessel. • Fishes with hearing specializations are more susceptible to TTS from long duration continuous noise (e.g., 12 hours). However, it is less likely that TTS would occur in fishes that are hearing generalists. • The probability of masking, physiological responses, and behavioral reactions from vessel noise is higher at near to moderate distances from the source (up to hundreds of meters) but decreases with increasing distance. • Direct injury from vessel noise is highly unlikely and is not considered further in this analysis.
Aircraft disturbance (including aircraft noise)	Aircraft noise may result in masking, physiological stress, or behavioral reactions in fishes near the surface as aircrafts pass overhead. • Aircraft sound exposure is rarely decoupled from the physical presence of an aircraft therefore responses may be due to multiple factors (e.g., visual cues). • Most aircraft activities are transient resulting in brief periods of exposure (seconds to minutes), with fewer instances where aircraft noise would persist for longer periods (e.g., hovering helicopters, which are accompanied by other disturbance factors such as shadows and water displacement). • Sound from an overhead aircraft would only be transmitted into the water in a narrow beam directly below the source, minimizing the total energy that enters the water and limiting the total ensonified area. • Documented reactions by fishes to aircraft noise is limited, however fishes would be expected to react to aircraft noise as they would react to other transient sounds (e.g., vessel noise).
Weapons noise	Weapons noise may result in hearing loss, masking, physiological stress, or behavioral reactions. • Weapons noise is rarely decoupled from the physical presence of a vessel or object (e.g., projectiles) therefore responses may be due to multiple factors (e.g., visual cues). • Sound from weapons firing would only be transmitted into the water directly below the firing source, transiting projectile, or at the area of impact, minimizing the total energy that enters the water and limiting the total ensonified area. • Reactions by fishes to weapons noise is limited; however, fishes would be expected to react to weapons noise as they would react to other transient sounds (e.g., vessel noise). • Documented reactions by fishes to aircraft noise is limited, however fishes would be expected to react to weapons noise as they would react to other impulsive sounds (e.g., impact pile driving or air guns).

Notes: < = less than; dB = decibels; kHz = kilohertz; TTS = temporary threshold shift

3.6.3.1.1 Impacts from Sonar and Other Transducers

Table 3.6-5 contains a summary of the background information used to analyze the potential impacts of sonar and other transducers on fishes. For information on sonar and other transducers hours or counts proposed for each alternative, see Table 3.0-2 (Sonar and Transducer Sources Quantitatively Analyzed).

3.6.3.1.1.1 Impacts from Sonar and Other Transducers under Alternative 1

As discussed in Section 3.0.3.3.1 (Acoustic Stressors), a detailed comparison of sonar quantities analyzed in the 2018 Final EIS/OEIS with sonar quantities under this Proposed Action is not feasible due to changes in the source binning process. However, the overall use of sonar and other transducers would decrease from the 2018 Final EIS/OEIS for both training and testing activities.

Under Alternative 1, changes from the 2018 Final EIS/OEIS for training activities using low-frequency sonar (in addition to other types of sonar) would include the following:

- There would be a small increase in unit-level anti-submarine warfare activities in the Gulf of Mexico Range Complex and pierside location Naval Station Mayport.

For all other locations, there would be a decrease or a similar number of activities that involve the use of low-frequency sonar to the 2018 Final EIS/OEIS.

Under Alternative 1, changes from the 2018 Final EIS/OEIS for testing activities using low-frequency sonars would include the following:

- Under anti-submarine warfare testing activities, there would be new events in the high seas, Gulf of Mexico Range Complex Inshore, Joint Expeditionary Base Little Creek, Naval Station Mayport, Naval Station Norfolk, Naval Submarine Base King Bay, and Naval Submarine Base New London.
- There would also be a notable increase in Anti-Submarine Warfare activities in Bath, Maine, and Pascagoula, Mississippi.

Although some marine fishes are considered hearing specialists (e.g., shad) and could be impacted by mid- or high-frequency sources, sound from these systems do not propagate as far as other sonars limiting the range these sources would be detectable, and therefore minimizing potential risk of impacts. Most marine fishes (hearing generalists) would not detect most mid- or high-frequency sonars and therefore would not experience impacts from these systems.

All fishes can detect low frequencies, therefore, most impacts would be limited to a subset of activities that utilize low-frequency sonars in the offshore portions of the Study Area. Some impacts may also occur during a small number of equipment testing activities conducted at pierside locations (e.g., Naval Submarine Base New London and Naval Station Norfolk). Range complexes with the highest quantities of low-frequency sonar, listed in descending order, include the Jacksonville, Virginia Capes, Northeast, Gulf of Mexico, and Navy Cherry Point Range Complexes, though these sources could also be used in other portions of the Study Area (e.g., in the Naval Surface Warfare Center Panama City, Naval Underwater Warfare Center Newport, and South Florida Ocean Measurement Facility Testing Range). Generally, low-frequency sonars are operated less often than mid- or high-frequency sources throughout the Study Area. Sonar is used more often during testing than training activities, resulting in slightly more potential impacts from testing activities.

Fishes may only detect the most powerful systems within a few kilometers; and most other, less powerful systems, at shorter ranges. Overall, temporary threshold shift (TTS) is not anticipated to occur in fishes exposed to low-frequency sonars as these systems generally lack the power necessary to generate hearing loss. Although unlikely, hearing specialists in proximity (tens of meters) to some mid-frequency systems may experience TTS. These individuals may experience a reduced ability to detect biologically relevant sounds until their hearing recovers (likely within a few minutes to hours depending on the amount of threshold shift).

Most sonars do not have the potential to substantially mask key environmental sounds due to the limited time of exposure resulting from the moving sound sources and variable duty cycles. Although available research has shown a lack of behavioral reactions to military sonar by hearing specialists (herring) (e.g., Sivle et al., 2012), it is possible that fish exposed to sonar could show some physiological or behavioral responses, especially in fish or schools of fish located close to the source (hundreds of meters). However, these impacts, if any, would be localized and infrequent, only lasting a few seconds or minutes due to the transient nature of most sonar operations.

Based on the updated background and analysis for training and testing under Alternative 1, sonar impacts on fishes would be limited to brief (seconds to minutes) periods of physiological or behavioral reactions to individual fish found within localized areas. This is consistent with a negligible impact on fish populations as defined in Table 3.6-4.

The use of sonar and other transducers during training and testing activities as described under Alternative 1 may affect ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta rays, Nassau grouper, oceanic whitetip sharks, and scalloped hammerhead sharks due to overlap of the substressor with the species distributions throughout the Study Area. Sonar use is not applicable to smalltooth sawfish critical habitat due to lack of overlap with the stressor. Designated Atlantic salmon, Atlantic sturgeon, Gulf sturgeon, or Nassau grouper critical habitat will not be affected by sonar because sound would not affect the physical and biological features associated with the habitat. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

3.6.3.1.1.2 Impacts from Sonar and Other Transducers under Alternative 2

Under Alternative 2, sonar use during training activities would increase compared to Alternative 1:

- The maximum number of composite training exercises would occur each year, and an additional composite training exercise would occur in the Gulf of Mexico Range Complex.

Impacts from sonar and other transducers under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The quantities of sonar and other transducer activity (e.g., hours, counts) under Alternative 2 would increase only slightly over Alternative 1.

3.6.3.1.2 Impacts from Air Guns

Table 3.6-5 contains a summary of the background information used to analyze the potential impacts of air guns on fishes. For information on air gun counts proposed for each alternative, see Table 3.0-3 (Training and Testing Air Gun and Non-Explosive Impulsive Sources Quantitatively Analyzed in the Study Area).

3.6.3.1.2.1 Impacts from Air Guns under Alternative 1

Air guns would not be used under training activities. The proposed use of air guns decreased overall for testing from the 2018 Final EIS/OEIS. Small air guns would be fired over a limited period within a single day. Air gun use would only occur in two testing activities: semi-stationary equipment testing and acoustic and oceanographic research. While air gun use during semi-stationary equipment testing may occur nearshore at Newport, Rhode Island, air gun use during acoustic and oceanographic research may occur in the Northeast, Virginia Capes, Jacksonville, and Gulf of Mexico Range Complexes.

A quantitative analysis was performed to estimate range to effects for fishes exposed to air guns. However, calculated ranges to effects indicate injury and hearing loss would only occur within a short distance (less than 20 m). Exposure to air guns could also result in masking, physiological response, or behavioral reactions. These impacts are expected to be brief (seconds to minutes) due to the short pulse length (approximately 0.1 second) and intermittent use of air guns throughout the Study Area.

Based on the updated background and analysis for training and testing under Alternative 1, air gun impacts on fishes would be limited to temporary (minutes to hours) physiological and behavioral responses, and some instances of TTS or direct injury (though this would be rare) in individual fishes found within localized areas. This is consistent with a minor impact on fish populations.

The use of air guns during testing activities as described under Alternative 1 may affect ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, Giant manta ray, and oceanic whitetip shark due to the overlap of the substressor with the species distribution throughout the Study Area. The use of air guns is not applicable regarding ESA-listed Nassau grouper or scalloped hammerhead shark as well as designated critical habitat for Atlantic salmon, Atlantic sturgeon, Gulf sturgeon, smalltooth sawfish, and Nassau grouper due to lack of overlap with the stressor. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

3.6.3.1.2.2 Impacts from Air Guns under Alternative 2

Air guns would not be used during training activities. Impacts from air guns under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for testing activities. Alternative 2 is the maximum number of air gun blasts that is included in the range of blasts for Alternative 1.

3.6.3.1.3 Impacts from Pile Driving

Table 3.6-5 contains a summary of the background information used to analyze the potential impacts of pile driving noise on fishes. Only Port Damage Repair training includes pile driving. For information on pile driving quantities proposed for each alternative, see Table 3.0-4 (Number of Piles/Sheets Quantitatively Analyzed under Pile Driving and Removal Training Activities). The impact and vibratory pile driving hammers would expose fishes to impulsive and continuous non-impulsive broadband sounds, respectively.

3.6.3.1.3.1 Impacts from Pile Driving under Alternative 1

Pile driving or removal would not occur under testing activities. The activity type and location for pile driving activities for training have changed from the 2018 Final EIS/OEIS.

Under Alternative 1 for training:

- Pile driving would occur as part of Port Damage Repair activities in Gulfport, Mississippi.

- Pile driving would no longer occur as part of the Elevated Causeway System at Joint Expeditionary Base Little Creek in the Virginia Capes Range Complex or Marine Corps Base Camp Lejeune in the Navy Cherry Point Range Complex.

Impact and vibratory pile driving during Port Damage Repair training activities can occur throughout the year over five days, and up to four times per year (20 days total) in Gulfport, Mississippi. Pile driving activities would occur intermittently in very limited areas and would be of temporary duration. The activity is also occurring in a highly disturbed estuarine habitat that is different than the natural beach environments covered in the 2018 Final EIS/OEIS.

A quantitative analysis was performed to estimate range to effects for fishes exposed to pile driving. Calculations resulted in ranges of zero or one for injury or mortality and very short, estimated ranges to TTS (15 m or less for a single day exposure). Considering these extremely small footprints and standard operating procedure for soft starts, mortality or injury in fishes exposed to impact pile driving is so unlikely as to be discountable. Although TTS could occur at farther ranges (tens of meters) for the longer of the exposure periods, available research suggest fishes are more likely to startle or avoid the immediate area surrounding a pile driving activity or, in some cases, would habituate and return to normal behaviors after initial exposure. In the rare event some individuals remain in the area for a full day and receive TTS, these fish may experience a reduced ability to detect biologically relevant sounds until their hearing recovers (likely within a few minutes to days depending on the amount of threshold shift).

Fishes exposed to vibratory extraction would not experience mortality, injury, or TTS based on the low source level and limited duration of these activities. Based on the predicted noise levels, fishes may exhibit other responses such as temporary masking, physiological response, or behavioral reactions such as increasing their swimming speed, moving away from the source, or not responding at all. Individual fish that avoid the pile driving location would likely find similar suitable habitat in adjacent areas or would return to the location after cessation of the noise, reducing the potential for long-term effects.

Based on the updated background and analysis for training under Alternative 1, pile driving impacts on fishes would be limited to temporary (minutes to hours) physiological and behavioral responses, and some instances of TTS (though this would be rare) in individual fishes found within localized areas. This is consistent with a minor impact on fish populations.

The use of pile driving during training activities as described under Alternative 1 may affect ESA-listed Gulf sturgeon, smalltooth sawfish, and giant manta rays due to overlap of the substressor with the species distribution in the Gulf of Mexico. The use of pile driving is not applicable regarding Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Nassau grouper, oceanic whitetip sharks, and scalloped hammerhead sharks as well as designated critical habitat for Atlantic salmon, Atlantic sturgeon, smalltooth sawfish, and Nassau grouper due to the lack of overlap with the substressor. Designated Gulf sturgeon critical habitat may be affected by pile driving due to potential impacts to prey items within the habitat. The use of pile driving is not applicable to designated Atlantic salmon, Atlantic sturgeon, smalltooth sawfish, and Nassau grouper critical habitat due to lack of overlap with the stressor. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

3.6.3.1.3.2 Impacts from Pile Driving under Alternative 2

There would be no pile driving or removal associated with testing activities. Impacts from pile driving during training under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same.

3.6.3.1.4 Impacts from Vessel Noise

Table 3.6-5 contains a summary of the background information used to analyze the potential impacts of vessel noise on fishes. For information on the number of activities including vessel noise, see Table 3.0-9 (Number and Location of Activities Including Vessels) and Table 3.0-10 (Number and Location of Activities Including In-Water Devices).

3.6.3.1.4.1 Impacts from Vessel Noise under Alternative 1

For both training and testing activities, vessel activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of vessel noise, so impacts would be expected to be similar or lesser than previously concluded.

Under Alternative 1 for training:

- Vessel noise would occur in two locations that are new or not previously analyzed (Gulfport and Pascagoula, Mississippi, respectively). For all other locations, there would either be a decrease or similar events including vessel activity.

Under Alternative 1 for testing:

- Vessel noise would occur in five locations not previous analyzed (inshore locations of the Northeast, Virginia Capes, and Gulf of Mexico Range Complexes; Other AFTT Areas; Hampton Roads, Virginia). There would also be notable increases in vessel activity at the Naval Surface Warfare Center Panama City Division Testing Range, Naval Station Norfolk, and Pascagoula, Mississippi. For all other locations, there would either be a decrease or similar amount of vessel activity.

Based on the updated background and previous analysis for training and testing under Alternative 1, vessel noise impacts on fishes would be limited to temporary (hours) behavioral and stress-startle responses to individual fish found within localized areas. This is consistent with a negligible impact on fish populations.

The production of vessel noise during training and testing activities as described under Alternative 1 may affect ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta rays, Nassau grouper, oceanic whitetip sharks, and scalloped hammerhead sharks due to the overlap of the substressor with the species distribution throughout the Study Area. Designated Atlantic salmon, Atlantic sturgeon, Gulf sturgeon, smalltooth sawfish, and Nassau grouper critical habitat will not be affected by vessel noise because sound would not affect the physical and biological features associated with the habitat. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

3.6.3.1.4.2 Impacts from Vessel Noise under Alternative 2

Impacts from vessel noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including vessels or in-water devices increases only slightly over that of Alternative 1.

3.6.3.1.5 Impacts from Aircraft Noise

Table 3.6-5 contains a summary of the background information used to analyze the potential impacts of aircraft noise on fishes. For information on the number of activities including aircraft noise, see Table 3.0-16, Number and Location of Activities with Aircraft).

3.6.3.1.5.1 Impacts from Aircraft Noise under Alternative 1

For both training and testing activities, aircraft activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of aircraft noise, so impacts would be expected to be similar or lesser than previously concluded.

Under Alternative 1, the following changes exist from the 2018 Final EIS/OEIS for training activities:

- A notable increase in the Navy Cherry Point Range Complex.

Under Alternative 1, the following changes exist from the 2018 Final EIS/OEIS for testing activities:

- Aircraft use in the following area that was not previously analyzed: Other AFTT Areas.

Based on the updated background and previous analysis for training and testing under Alternative 1, aircraft noise impacts on fishes would be limited to brief (seconds to minutes) behavioral and stress-startle responses to individual fish found within localized areas. This is consistent with a negligible impact on fish populations.

The production of aircraft noise during training and testing activities as described under Alternative 1 may affect ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta rays, Nassau grouper, oceanic whitetip sharks, and scalloped hammerhead sharks due to the overlap of the substressor with the species distribution throughout the Study Area. Designated Atlantic sturgeon, Gulf sturgeon, smalltooth sawfish, and Nassau grouper critical habitat will not be affected by aircraft noise because sound would not affect the physical and biological features associated with the habitat. Aircraft noise is not applicable to designated Atlantic salmon and Atlantic sturgeon critical habitat due to lack of geographic overlap. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

3.6.3.1.5.2 Impacts from Aircraft Noise under Alternative 2

Impacts from aircraft noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including aircraft under Alternative 2 would increase only slightly over Alternative 1.

3.6.3.1.6 Impacts from Weapons Noise

Table 3.6-5 contains a summary of the background information used to analyze the potential impacts of weapons noise on fishes. For information on the number of activities including weapons noise, see Table 3.0-11 (Number and Location of Non-explosive Practice Munitions Expended during Military Readiness Activities).

3.6.3.1.6.1 Impacts from Weapons Noise under Alternative 1

For both training and testing activities, weapons activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of aircraft noise, so impacts would be expected to be similar or lesser than previously concluded.

Based on the updated background and previous analysis for training and testing under Alternative 1, weapons noise impacts on fishes would be limited to brief (seconds to minutes) behavioral and stress-startle responses to individual fish found within localized areas. This is consistent with a negligible impact on fish populations.

The production of weapons noise during training and testing activities as described under Alternative 1 may affect ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta rays, Nassau grouper, oceanic whitetip sharks, and scalloped hammerhead sharks due to the overlap of the substressor with the species distribution throughout the Study Area. Designated Atlantic salmon, Atlantic sturgeon, Gulf sturgeon, smalltooth sawfish, and Nassau grouper critical habitat will not be affected by weapons noise because sound would not affect the physical and biological features associated with the habitat. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

3.6.3.1.6.2 Impacts from Weapons Noise under Alternative 2

Impacts from weapons noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of items generating weapons firing noise (e.g., non-explosive and explosive practice munitions) under Alternative 2 is the same as Alternative 1.

3.6.3.2 Explosive Stressors

This section summarizes the potential impacts of explosives used during military readiness activities within the Study Area. Table 3.6-6 summarizes background information that is relevant to the analyses of impacts for explosives. New applicable and emergent best available science regarding explosive impacts is presented in Appendix D (Acoustic and Explosive Impacts Supporting Information).

Due to updates to acoustic effects modeling, criteria and thresholds used to assess impacts, and changes to proposed use of explosives, the analysis of impacts due to explosives provided in this section supplant the analyses in the 2018 Final EIS/OEIS. The detailed assessment of explosive stressors under this Proposed Action is in Appendix E (Acoustic and Explosives Impact Analysis). Changes in the predicted explosive impacts are due to the following:

- Updates to criteria used to determine if an exposure to explosive energy may cause impacts.
- Revisions to the modeling of explosive effects in the Navy Acoustic Effects Model. See the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (U.S. Department of the Navy, 2024).
- Changes in the locations, numbers, and types of modeled military readiness activities as described in Chapter 2 (Description of Proposed Action and Alternatives), and associated quantities of explosives (counts) shown in Section 3.0.3.3.2 (Explosive Stressors).

As discussed in Section 3.6.3 (Environmental Consequences), the Action Proponents will implement mitigation under Alternative 1 and Alternative 2 to reduce potential impacts from explosives on fish. Mitigation will include visual observations for large schools of fish during ship shock trials, and restrictions on the use of certain explosives within important Gulf sturgeon and sandbar shark habitats as well as within certain seafloor habitats used by fish for important life processes (e.g., in proximity to shallow-water coral reefs).

Table 3.6-6: Explosive Stressors Background Information Summary

Substressor	*Background Information Summary*
Explosives in water	Sound and energy from explosives in water pose the greatest potential threats for injury and mortality in marine fishes and may also cause hearing loss, masking, physiological stress, or behavioral responses. • Fishes without a swim bladder, adult fishes, and larger species would generally be less susceptible to injury and mortality from sound and energy associated with explosive activities than fishes with a swim bladder, small, juvenile, or larval fishes. • Sound and energy from explosions could result in mortality, injury, and temporary threshold shift, on average, for hundreds or even thousands of meters from some of the largest explosions. • Generally, the size of the explosive correlates to the ranges to effects (i.e., larger charges produce longer ranges). Observed effects also depend on the geometry of the exposure (e.g., distance and depth relationship to the receiver). • Though hearing loss has never been measured in fishes exposed to explosives, fish may respond to explosives similarly to other impulsive sources. • Masking would be unlikely due to the intermittent nature of explosions. If masking were to occur, it would only occur during the duration of the signal. • Without specific data, it is assumed that fishes with similar hearing capabilities show similar behavioral reactions to all impulsive sounds (e.g., air guns and impact pile driving) outside the zone for hearing loss and injury.
Explosives in air	In-air detonations at or near the water surface could transmit sound and energy into the water and impact fishes. However, detonations within a few tens of meters of the surface are analyzed as if detonating completely underwater and the background information described above would also apply. Detonations that occur at higher altitudes would not propagate enough sound and energy into the water to result in impacts to fishes and therefore are not analyzed in this section.

3.6.3.2.1 Impacts from Explosives

Table 3.6-6 contains a summary of the background information used to analyze the potential impacts of explosives on fishes. Potential impacts from explosive energy and sound include non-auditory injury (including mortality), auditory effects (auditory injuries and TTS), behavioral reactions, physiological response, and masking. Ranges to effects for mortality, non-auditory injury, and auditory effects are shown in Appendix E (Acoustic and Explosives Impact Analysis). For information on explosive sizes and quantities for each alternative, see Table 3.0-5 (Explosive Sources Quantitatively Analyzed that Could Be Used Underwater or at the Water Surface).

3.6.3.2.1.1 Impacts from Explosives under Alternative 1

The use of explosives would generally decrease from the 2018 Final EIS/OEIS for both training and testing activities. Notably, for testing there would be no use of bin E17 (greater than 14,500 – 58,000 pounds [lb.] net explosive weight [NEW]) and reduced use of bin E16 (greater than 7,250 to 14,500 lb. NEW) for ship shock trials. There is also a reduction in use of most of the largest explosive bins for both training and testing, and an extremely large decrease in explosives associated with medium-caliber gunnery (bin E1 [0.1 to 0.25 lb. NEW]).

Most activities involving large-caliber naval gunfire, or the launching of targets, missiles, bombs, or other munitions are conducted more than three nautical miles from shore. Very few detonations would occur at inshore locations and would involve the use of smaller charge sizes (E5 or below). Additionally, small ship shock trials could occur in Virginia Capes, Jacksonville, or the Gulf of Mexico Range Complexes.

The death of an animal would eliminate them from the population and impact future reproductive potential. Exposures that result in non-auditory injuries may limit an animal's ability to find food, communicate with other animals, interpret the surrounding environment, or detect and avoid predators. Impairment of these abilities can decrease an individual's chance of survival or affect its ability to reproduce depending on the severity of the impact. Though TTS can impair an animal's abilities, individuals may recover quickly with little lasting effect depending on the amount of threshold shift.

Fishes may also experience brief periods of masking, physiological response, or behavioral reactions, depending on the level and duration of exposure. However, due to the short duration of single explosive detonations, these effects are expected to be brief (seconds to minutes). Although multiple shots conducted during large events could lead to prolonged or repeated exposures within a short period of time (hours), military readiness activities involving explosions are generally dispersed in space and time. Consequently, repeated exposures over the course of a day or multiple days are unlikely and most behavioral effects are expected to be brief (seconds or minutes) and localized, regardless of the size of the explosion, and fish would likely return to their natural behavior shortly after exposure.

Based on the updated background and analysis for training and testing under Alternative 1, explosive impacts on fishes could result in the death or injury of a small number of individual fish, as well as brief (seconds to minutes) periods of physiological or behavioral reactions of fish found within localized areas. This is consistent with a moderate (due to limited potential injury/mortality to some individuals) impact on fish populations.

The use of explosives during training and testing activities as described under Alternative 1 may affect ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta rays, Nassau grouper, oceanic whitetip sharks, and scalloped hammerhead sharks due to overlap of the substressor with the species distributions throughout the Study Area. Designated sturgeon, Gulf sturgeon and Nassau grouper critical habitat may be affected by explosives due to potential impacts to prey items within the habitat for Gulf sturgeon and due to alteration of some physical features for Atlantic sturgeon and Nassau grouper. Explosives effects to designated Atlantic salmon and smalltooth sawfish critical habitat are not applicable due to lack of overlap with the stressor. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

3.6.3.2.1.2 Impacts from Explosives under Alternative 2

Impacts from explosives in water under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The explosive sizes and numbers under Alternative 2 are the same as Alternative 1.

3.6.3.3 Energy Stressors

Table 3.6-7 contains brief summaries of the background information that is relevant to analyses of impacts for each energy substressor (in-water electromagnetic devices) on fishes. The background information for energy stressor effects on fishes in the Study Area as described in the 2018 Final EIS/OEIS Section 3.6.3.3 (Energy Stressors) has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS remains valid.

3.6.3.3.1 Impacts from In-Water Electromagnetic Devices

Table 3.6-7 contains a summary of the background information used to analyze the potential impacts of in-water electromagnetic devices on fishes. The in-water devices producing an electromagnetic field are towed or unmanned mine countermeasure systems. The electromagnetic field is produced to simulate a vessel's magnetic field. In an actual mine-clearing operation, the intent is that the electromagnetic field would trigger an enemy mine designed to sense a vessel's magnetic field. In-water electromagnetic energy associated with the Proposed Action alternatives produce a strong enough field for effects on fishes within a few feet of their source. For information on the number of location of activities including in-water electromagnetic devices, see Table 3.0-6 (Number and Location of Activities Using In-Water Electromagnetic Devices).

Table 3.6-7: Energy Stressors Background Information Summary

Substressor	*Background Information Summary*
In-water electromagnetic devices	Although many fish groups (particularly sharks and rays as well as salmonids) are sensitive to electric and magnetic fields, the range to effects would be small (likely overlapped with/by physical disturbance effects) and adverse physiological and behavioral impacts would be unlikely at field strengths encountered by most individuals during proposed military readiness activities: • The potential response of various species to electric fields and electrical pulses may include no reaction, avoidance, habituation, changes in activity level, or attraction, but effects would only occur near the source. • Some shark and ray species have demonstrated behavioral reactions to magnetic fields (including avoidance), and some freshwater species have shown developmental and physiological effects, but the experimental field intensities were much greater than those associated with proposed activities. • Salmon navigate using Earth's magnetic field (Scanlan et al., 2018), and electromagnetic fields can alter their magnetic orientation (Naisbett-Jones et al., 2020). • A recent review of the effects of power cables and other energized devices found an overall relatively low risk of physiological and behavioral effects on fish (Copping et al., 2021). • Due to the relatively low field intensity, highly localized impact area, and limited duration of the activities (hours), exposure is not likely to impact the health of resident or migratory populations or have lasting effects on survival, growth, recruitment, or reproduction at the population level.
In-air electromagnetic devices	In-air electromagnetic devices are not applicable to fishes because of the lack of transmission of electromagnetic radiation across the air/water interface and distant proximity to in-air sources. In-air electromagnetic energy effects are not analyzed further in this section.
High-energy lasers	While analyzed in the 2018 Final EIS/OEIS, the Action Proponents determined that there is no potential for fishes to be affected by high-energy lasers. This conclusion was based on additional information on the employment and function of high-energy lasers. High-energy lasers directed at surface targets cease projecting laser light when no longer on target, precluding any effects from energy from striking the water or a fish near the water surface. High-energy laser effects are not analyzed further in this section. • High-energy laser weapons training and testing involves the use of up to 30 kilowatts of directed energy as a weapon against small surface vessels and airborne targets which are deployed from surface ships and helicopters and directed at targets in open-ocean areas where fish may be present.

Table 3.6-7: Energy Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
	• The primary concern for high-energy weapons training and testing is the potential for a fish to be struck by a high-energy laser beam at or near the water's surface, which could result in injury or death from traumatic burns from the beam. • The potential for exposure to a high energy laser beam decreases as the water depth increases. Because laser platforms are typically helicopters and ships, fish at sea would likely move away in response to other stressors, such as ship or aircraft noise, although some fish would not exhibit a response to an oncoming vessel or aircraft, increasing the risk of contact with the laser beam. • High-energy laser weapons are designed to disable surface targets and turn off when they lose track of the target. Therefore, the likelihood of a fish being exposed to the laser would be minimal.

Notes: EIS = Environmental Impact Statement; OEIS = Overseas Environmental Impact Statement

3.6.3.3.1.1 Impacts from In-Water Electromagnetic Devices under Alternative 1

For both training and testing activities, in-water electromagnetic device activity decreased overall from the 2018 Final EIS/OEIS (Table 3.0-6, Number and Location of Activities Using In-Water Electromagnetic Devices).

Under Alternative 1 for training:

- In-water electromagnetic devices would occur in two locations not previously analyzed (Key West Range Complex and Virginia Capes Complex Inshore) in the 2018 Final EIS/OEIS. There would also be notable increases in in-water electromagnetic devices in the Virginia Capes and Gulf of Mexico Range Complexes. For all other locations, there would either be a decrease or similar amount of in-water electromagnetic devices.

Under Alternative 1 for testing:

- In-water electromagnetic devices would occur in two locations (Northeast Range Complexes and Hampton Roads, Virginia) not previously analyzed in the 2018 Final EIS/OEIS. There would also be a notable increase in in-water electromagnetic devices in the Naval Surface Warfare Center Panama City Testing Range. For all other locations, there would either be a decrease or cessation of in-water electromagnetic devices.

For locations without notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.6.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of fishes among training and testing locations has not changed.

For locations with notable increase in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of in-water electromagnetic device activity remains an accurate characterization of the Proposed Action in those locations.

For the locations not previously analyzed, standard operating procedures (e.g., in-water device safety) will help reduce potential impacts to fishes. Potential impacts would be limited to temporary behavioral and stress-startle responses to individual sensitive fishes within localized areas. The ESA-listed Atlantic salmon's range includes the Northeast Range Complexes, a testing location not previously analyzed for in-water electromagnetic devices.

Based on the relative amount and location of in-water electromagnetic device use, and the general description of impacts, the potential exposure is not expected to result in detectable changes in the survival, growth, recruitment, or reproduction of fish species at the population level.

The analysis conclusions for in-water electromagnetic device use with training and testing activities under Alternative 1 are consistent with a negligible impact on fish populations.

The use of in-water electromagnetic devices during training and testing activities as described under Alternative 1 may affect the ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta ray, oceanic whitetip shark, and scalloped hammerhead shark (training only) due to temporary behavioral and stress-startle responses to individual fishes found within localized areas. Because Nassau grouper are not sensitive to electromagnetic energy, Alternative 1 would have no effect on this species. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Critical habitat for ESA-listed Atlantic sturgeon, Gulf sturgeon, and Nassau grouper would not be affected by in-water electromagnetic devices because the substressors would have no effect on the biological and physical features associated with critical habitat. The use of in-water electromagnetic devices during training and testing activities is not applicable to designated critical habitat for Atlantic salmon, Nassau grouper, and smalltooth sawfish.

3.6.3.3.1.2 Impacts from In-Water Electromagnetic Devices under Alternative 2

Impacts from in-water electromagnetic devices under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including use of in-water electromagnetic devices under Alternative 2 is the same as Alternative 1.

3.6.3.4 Physical Disturbance and Strike Stressors

Table 3.6-8 contains brief summaries of background information that is relevant to analyses of impacts for each physical disturbance and strike substressor (vessels and in-water devices, military expended materials, seafloor devices, and pile driving). Details on updated information relevant to physical disturbance and strike potential are provided in Appendix G (Non-Acoustic Impacts Supporting Information). Details on physical disturbance and strike stressors in general, as well as effects specific to each substressor, are provided in the 2018 Final EIS/OEIS Section 3.6.3.4 (Physical Disturbance and Strike Stressors).

The Action Proponents will implement mitigation tailored to reducing the impact of physical disturbance and strike on sensitive habitats that feature fishes, including the ESA-listed smalltooth sawfish, giant manta ray, and Nassau grouper, within the mitigation areas identified in Table 3.6-3. The mitigation area restrictions are mapped and described in Section 3.3 (Habitats) because they primarily address impacts on the seafloor habitat of fishes and other biological resources. The critical habitat for ESA-listed fish species depicted in Figure 3.6-1 to Figure 3.6-6 encompasses the sensitive habitats shown in Section 3.3.

Table 3.6-8: Physical Disturbance and Strike Stressor Background Information Summary

Substressor	Background Information Summary
Vessels and in-water devices	Most fishes would detect and avoid vessels and in-water devices and therefore, with the exception of certain slow-moving species located near the surface, strikes would be unlikely: • Fishes generally respond to an approaching vessel or in-water device with lateral or downward avoidance, although some fishes are attracted to them. • Most in-water devices move slowly or are closely monitored by observers. • Early life stages of most fishes could be displaced by a moving vessel and then entrained by the vessel's propeller movement or propeller wash rather than struck. • Large slow-moving fishes such as whale sharks, manta rays, and sturgeon may occur near the surface, making them susceptible to strikes.
Aircraft and aerial targets	Impacts from aircraft and aerial targets are not applicable and will not be analyzed further in this section.
Military expended materials	Fishes could be struck by military expended materials at the surface and on the seafloor as items settle on the bottom and could also be disturbed by materials sinking through the water column. • Direct strike potential is greatest at or near the surface, but the number of fishes at the surface is typically low, particularly during the day when most activities would occur. • Most missiles and projectiles are fired at and hit their targets, so only a very small portion hit the water with maximum velocity and force. • Expended aerial targets and aerial target fragments hit the water surface with relatively high velocity and force, although they fall rather than being fired or propelled. • Disturbance or strike as expended materials sink through the water column is possible but not likely because most objects sink slowly and can be avoided. • Fishes on the seafloor where an item settles could be struck or displaced, but small numbers of individuals would likely be affected. • Propelled fragments produced by an exploding bomb are large and decelerate rapidly, posing little risk to fishes. • Sediment disturbance and turbidity caused by materials settling on the seafloor would be temporary and affect a small area.
Seafloor devices	Seafloor devices are either stationary (e.g., mine shapes, anchors, bottom-placed instruments) or move very slowly along the bottom (e.g., bottom-crawling unmanned underwater vehicles) where they may temporarily disturb the bottom before being recovered. • Items dropped into the water could strike fishes, but the probability would be low based on the low number of fish at the surface and the ability of fish to avoid sinking objects. • Few individuals would likely be affected by items deployed on the bottom, and many fishes, even if they were attracted to the device or to invertebrate prey exposed by sediment disturbance, would be able to avoid strikes by unmanned vehicles, including vehicles in close proximity to the fishes (e.g., bottom-crawling vehicles).
Pile driving	A relatively small number of fishes could be disturbed during pile installation and removal, primarily by sediment disturbance: • Fishes would not likely be struck by a piling due to their mobility. • Sediment disturbance and turbidity could affect fishes behaviorally and physiologically, including eggs and larvae, but the effects would be minor, temporary, and localized.

3.6.3.4.1 Impacts from Vessels and In-Water Devices

Table 3.6-8 contains a summary of the background information used to analyze the potential impacts of vessels and in-water devices on fishes. For information on the number of activities including vessels and in-water devices, see Table 3.0-9 (Number and Location of Activities Including Vessels) and Table 3.0-10 (Number and Location of Activities Including In-Water Devices).

The seafloor resource mitigation measures identified in Table 3.6-3 will reduce or eliminate the potential impacts from vessel disturbance on some ESA-listed species and other shallow-water habitats in the Key West Range Complex and South Florida Ocean Measurement Facility (refer to Section 3.3, Habitats, for detailed mapping of the mitigation). In other shallow areas where vessel or in-water device use is proposed, the avoidance of features that could damage the vessel or in-water device (e.g., seafloor in general and hard substrate in particular) is part of standard operating procedures.

3.6.3.4.1.1 Impacts from Vessels and In-Water Devices under Alternative 1

For both training and testing activities, vessel and in-water device activity decreased overall from the 2018 Final EIS/OEIS (Table 3.0-9 and Table 3.0-10).

Under Alternative 1 for training:

- Vessel activity would occur in two locations that are new or not previously analyzed (Gulfport and Pascagoula, Mississippi, respectively). For all other locations, there would either be a decrease or similar amount of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in one location not previously analyzed (Northeast Range Complex Inshore). For all other locations, there would either be a decrease, similar amount, or cessation of in-water device activity.

Under Alternative 1 for testing:

- Vessel activity would occur in five locations not previously analyzed (inshore locations of the Northeast, Virginia Capes, and Gulf of Mexico Range Complexes; Other AFTT Areas; Hampton Roads, Virginia). There would also be notable increases in vessel activity at the Naval Surface Warfare Center Panama City Division Testing Range, Naval Station Norfolk, and Pascagoula, Mississippi. For all other locations, there would either be a decrease or similar amount of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in four locations not previously analyzed (Gulf of Mexico Range Complex Inshore; Bath, Maine; Newport, Rhode Island; and Pascagoula, Mississippi). For all other locations, there would either be a decrease or similar amount of in-water device activity.

For locations without notable increases in vessel and in-water device activity, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.6.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of fishes among training and testing locations has not changed.

For locations with notable increase in vessel activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the risk of strike would remain low.

For the new and not previously analyzed Study Area-Inshore Locations, standard operating procedures (e.g., vessel and in-water device safety) and mitigation implemented in the seafloor resource mitigation areas help to avoid impacting shallow waters and associated fishes. The addition of Other AFTT Areas would not meaningfully change the potential for physical disturbance or strike to fishes. The other new/not previously analyzed locations are port or pierside locations featuring artificial structures in areas that are highly modified/disturbed by human activity and frequent dredging.

Based on the relative amount and location of vessels and in-water devices under Alternative 1 and the general description of impacts, the analysis that was conducted in the 2018 Final EIS/OEIS remains valid because the risk of a strike is low, effects would primarily be limited to temporary behavioral and stress-startle responses to individual fishes found within localized areas, and the number of eggs and larvae entrained by propellers would be low compared to overall numbers of eggs and larvae. It is likely that any mortality arising from this stressor is within the natural range of species' populations. This conclusion is generally applicable to ESA-listed species in new areas and areas with notable increases in activity. There would be relatively greater risk of vessel strike to ESA-listed species that may occur near the surface in applicable locations (Table 3.6-1), primarily Atlantic sturgeon. However, the effects of this substressor on fishes are not expected to result in detectable changes in the survival, growth, recruitment, or reproduction of fish species at the population level.

The analysis conclusions for vessel and in-water device use with training and testing activities under Alternative 1 are consistent with a minor to moderate (due to limited potential for injury/mortality) impact on fish populations.

The use of vessels and in-water devices during training and testing activities as described under Alternative 1 may affect the ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta ray, Nassau grouper, oceanic whitetip shark, and scalloped hammerhead shark due to the potential for temporary behavioral and stress-startle responses and limited mortality. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Critical habitat for ESA-listed Atlantic salmon, Atlantic sturgeon, Gulf sturgeon, and Nassau grouper would not be affected by vessels and in-water devices because the substressors would have no effect on the biological and physical features associated with critical habitat designations. Vessel and in-water device use during training and testing activities is not applicable to critical habitat for smalltooth sawfish.

3.6.3.4.1.2 Impacts from Vessels and In-Water Devices under Alternative 2

Impacts from vessels and in-water device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including vessels or in-water devices increases only slightly over that of Alternative 1.

3.6.3.4.2 Impacts from Military Expended Materials

Table 3.6-8 contains a summary of the background information used to analyze the potential impacts of military expended materials on fishes. For information on the type, number, and location of military expended materials, see Table 3.0-11 (Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities), Table 3.0-12 (Number and Location of Explosives that May Result in Fragments during Military Readiness Activities), Table 3.0-13 (Number of Location of Targets Expended during Military Readiness Activities), Table 3.0-14 (Number and Location of Other Military Materials Expended during Military Readiness Activities), Table 3.0-17 (Number and Location of Wires and Cables Expended during Military Readiness Activities), and Table 3.0-18 (Number and Location of Activities Including Biodegradable Polymers during Testing).

The mitigation measures identified in Table 3.6-3 will reduce or eliminate potential impacts by locating some military expended materials away from ESA-listed coral species and reef-associated fishes (refer to Section 3.3, Habitats, for detailed mapping of the mitigation). Mapped sensitive habitat features (e.g., shallow-water coral reefs) within the Study Area only occur within mitigation areas. In other areas where military expended materials are proposed, the impact is limited by the distance from shore (e.g., most heavy munitions limited to areas outside of state coastal waters).

The combination of mitigation areas for shallow-water coral reefs and Action Proponents abiding by national marine sanctuary regulations (with agreed-upon exceptions) protects nearly all seafloor habitats and corresponding fishes less than 30 m deep in the Key West Range Complex (offshore and inshore locations) from direct strike from the direct strike of most military expended materials.

3.6.3.4.2.1 Impacts from Military Expended Materials under Alternative 1

For both training and testing activities, the number of military expended materials would decrease overall from the 2018 Final EIS/OEIS (Table 3.0-11 through Table 3.0-14).

Under Alternative 1 for training:

- Military expended materials would occur in one location not previously analyzed (Gulf of Mexico Range Complex Inshore), and there would be a notable increase in the Key West Range Complex Inshore from the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease, similar amount, or cessation of military expended materials.

Under Alternative 1 for testing:

- Military expended materials would occur in three locations not previously analyzed (Other AFTT Areas; Naval Submarine Base Kings Bay, and Port Canaveral, Florida) in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease or similar amount of military expended materials.

For locations without a notable increase in military expended materials, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.6.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of fishes among training and testing locations has not changed.

For locations not previously analyzed, and notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS has changed because the analysis is mostly quantitative. Qualitative aspects of the analysis include the potential for lighter expended materials (e.g., decelerators/parachutes) to drift into shallow, inshore habitats.

Based on the quantitative analysis in Section 3.3 (Habitats), the total shallow-water coral reef area, along with associated fishes, impacted by military expended materials in the Key West Range Complex and South Florida Ocean Measurement Facility would be less than 0.13 acres annually. However, the area of impacted shallow-water coral reefs is overestimated due to mitigation measures that apply to a subset of military expended materials. For location-specific details, refer to Appendix I (Military Expended Materials and Direct Strike Impact Analysis) Table I-1 (Potential Impact from Explosive Charges on or near the Bottom for Military Readiness Activities under Alternative 1 in a Single Year). This area represents less than one thousandth of 1 percent of available shallow-water coral reef habitat in Study Area locations (refer to figures in Section 3.3 for mapping). Most military expended material footprints would impact soft bottom habitat or the bathyal/abyssal zone where fishes are relatively dispersed. Expended material footprints associated with port and pierside locations impact mostly shallow soft bottom habitat where fish abundance is typically less relative to hard substrate.

Whereas it is possible for a portion of expended items to impact hard substrate and associated fish communities, the number of exposed individuals would not likely affect the overall viability of populations or species. While the potential for overlap between proposed activities and fish is reduced for those species living in relatively rare habitats, if overlap does occur, any potential impacts would be amplified. Within the far greater area of soft bottom habitat, the impact of military expended materials is likely to cause injury or mortality to individual fish. However, the number of individuals affected would be small relative to total population, the area exposed to the stressor is extremely small relative to the area of available habitat, the activities are dispersed such that few individuals would likely be exposed to more than one event, and exposures would be localized and would cease when the military expended material becomes part of the bottom (e.g., buried or encrusted with sessile organisms).

Based on the relative amount, impact footprint, and location of material expended and the general description of impacts, impacts on fishes from activities involving military expended materials would consist of temporary behavioral and stress-startle responses and limited injury/mortality to individuals found within localized areas. The effects of this substressor on fishes are not expected to result in detectable changes in the survival, growth, recruitment, or reproduction of fish species at the population level.

The analysis conclusions for military expended materials associated with training and testing activities under Alternative 1 are consistent with a minor to moderate (due to limited potential for injury or mortality) impact on fish populations.

The military expended materials associated with training and testing activities as described under Alternative 1 may affect the ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta ray, Nassau grouper, oceanic whitetip shark, and scalloped hammerhead shark because there is a risk of strike to these species. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Critical habitat for ESA-listed Atlantic sturgeon may be affected by military expended materials because they may temporarily cover suitable substrate (e.g., sand, mud) habitat between river mouths and spawning sites that is used for juvenile foraging and physiological development. Critical habitat for ESA-listed Nassau grouper may be affected by military expended materials because lighter materials could drift into critical habitat (e.g., sonobuoy decelerators/parachutes, flares) depending on the oceanic currents. Military expended materials from training and testing activities may affect designated critical habitat for Gulf sturgeon because they may affect the abundance of prey items, an identified biological feature of the designated critical habitat for subadult and adult life stages. Critical habitat is not applicable for ESA-listed Atlantic salmon and smalltooth sawfish because the military expended material stressor would not occur within their critical habitat.

3.6.3.4.2.2 Impacts from Military Expended Materials under Alternative 2

Impacts from military expended materials under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The increase in footprint from Alternative 1 to 2 is only 0.026 acres and located mostly in the Gulf of Mexico Range Complex, with relatively small footprints in the other range complexes.

3.6.3.4.3 Impacts from Seafloor Devices

Table 3.6-8 contains a summary of the background information used to analyze the potential impacts of seafloor devices on fishes. For information on the type, number, and location of military expended materials, see Table 3.0-15 (Number and Location of Activities that Use Seafloor Devices).

Proposed mitigation identified in Table 3.6-3 will reduce or eliminate the potential impacts on some fishes by locating most seafloor devices away from shallow-water coral reefs and other sensitive bottom habitats (refer to Section 3.3, Habitats, for detailed mapping and description of the mitigation). Due to the prevalence of shallow-water hard corals in the South Florida Ocean Measurement Facility, there is additional mitigation that ensures placement of seafloor devices outside of sensitive habitats. This mitigation will reduce or eliminate impacts on associated fishes.

3.6.3.4.3.1 Impacts from Seafloor Devices under Alternative 1

For both training and testing activities, the proposed use of seafloor devices increased overall from the 2018 Final EIS/OEIS devices (Table 3.0-15, Number and Location of Activities that Use Seafloor Devices).

Under Alternative 1 for training:

- Seafloor device use would occur in five locations that are new or not previously analyzed (Northeast Range Complexes; Other AFTT Areas; Jacksonville Range Complex Inshore, Naval Station Mayport, and Gulfport, Mississippi). There would also be notable increases in seafloor devices at the Virginia Capes Range Complex (offshore and inshore locations) and Key West Range Complex Inshore. For all other locations, there would either be a decrease, similar amount, or cessation of seafloor devices.

Under Alternative 1 for testing:

- Seafloor device use would occur in five locations not previously analyzed (Virginia Cape Range Complex Inshore, Key West Range Complex Inshore, Naval Submarine Base New London, Naval Station Mayport, and Port Canaveral, Florida). There would also be notable increases in seafloor devices in the Northeast and Jacksonville Range Complexes, and in the Naval Surface Warfare Center Panama City Division Testing Range. For all other locations, there would either be a decrease or similar amount of seafloor device use.

For locations without a notable increase in seafloor devices, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.6.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of fishes among training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of seafloor device activity remains an accurate characterization of the Proposed Action in those locations. Few fish would potentially be struck by deployed devices and most fish would be able to avoid unmanned vehicles (e.g., bottom-crawling vehicles).

For new locations and locations not previously analyzed, standard operating procedures and seafloor resource mitigation measures that apply to mine shapes and other devices moored to the bottom help to avoid impacting sensitive habitats that support fishes (e.g., oyster bed/reefs, shallow-water coral reefs, live hard bottoms). The new pierside location features artificial structures in soft bottom habitat that is highly modified/disturbed due to human activity and frequent dredging. Fish abundance in such shallow, soft bottom habitats is typically less relative to areas of hard substrate.

Based on the relative amount and location of seafloor device use and the general description of impacts, impacts from seafloor devices would be limited to infrequent and temporary behavioral and stress-startle responses to individual fishes found within localized areas. The effects of this substressor on fishes are not expected to result in detectable changes in the survival, growth, recruitment, or reproduction of fish species at the population level.

The analysis conclusions for seafloor device use with training and testing activities under Alternative 1 are consistent with a minor to moderate impact on fish populations.

The use of seafloor devices during training and testing activities as described under Alternative 1 may affect the ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta ray, Nassau grouper, oceanic whitetip shark, and scalloped hammerhead shark because of temporary effects such as stress or behavioral disruptions. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Critical habitat for ESA-listed Atlantic sturgeon may be affected by seafloor devices because they may temporarily cover soft substrate (e.g., sand, mud) critical habitat between river mouths and spawning sites that is used for juvenile foraging and physiological development. Critical habitat for ESA-listed Gulf sturgeon may be affected by seafloor devices because they may affect the abundance of prey items. Critical habitat for ESA-listed Nassau grouper may be affected by seafloor devices due to the prevalence of shallow-water hard corals in the South Florida Ocean Measurement Facility which overlaps Nassau grouper critical habitat. The use of seafloor devices during training and testing activities is not applicable to designated critical habitat for Atlantic salmon and smalltooth sawfish.

3.6.3.4.3.2 Impacts from Seafloor Devices under Alternative 2

Impacts from seafloor device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including seafloor devices under Alternative 2 would increase only slightly over Alternative 1.

3.6.3.4.4 Impacts from Pile Driving

Table 3.6-8 contains a summary of the background information used to analyze the potential impacts of pile driving on fishes. Only Port Damage Repair training includes pile driving (Table 3.0-4, Number of Piles/Sheets Quantitatively Analyzed under Pile Driving and Removal Training Activities).

3.6.3.4.4.1 Impacts from Pile Driving under Alternative 1

Under Alternative 1 for training:

- Pile driving would occur in one new location (Gulfport, Mississippi) where it did not occur in for the 2018 Final EIS/OEIS.
- Pile driving would no longer occur as part of the Elevated Causeway System at Joint Expeditionary Base Little Creek Fort Story in the Virginia Capes Range Complex or Marine Corps Base Camp Lejeune in the Navy Cherry Point Range Complex.

There would be no pile driving or removal associated with testing activities.

Most fish are mobile enough to avoid piling strikes. Impacts on fishes would be limited to infrequent, temporary (lasting up to several hours) behavioral and stress-startle responses to individual fish or schools of fish in localized areas. Associated sediment disturbance could cause physiological effects (e.g., gill clogging) and behavioral effects (e.g., avoiding turbidity plumes), but the impacts would be temporary and localized and would affect a small number of fish.

The analysis conclusions for pile driving for training under Alternative 1 are consistent with a negligible impact on fish populations.

The pile driving associated with training activities as described under Alternative 1 may affect the ESA-listed Gulf sturgeon, smalltooth sawfish, and giant manta ray due to their potential presence during pile driving activities and temporary behavioral and stress-startle responses. Alternative 1 pile driving associated with training activities is not applicable to the ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Nassau grouper, oceanic whitetip shark, and scalloped hammerhead shark. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Pile driving activities may affect critical habitat for the ESA-listed Gulf sturgeon due to temporarily increased water turbidity. The effects would be infrequent, temporary, and localized with no lasting damage or alteration. The use of pile driving during training activities is not applicable to designated critical habitat for Atlantic salmon, Atlantic sturgeon, smalltooth sawfish, and Nassau grouper.

3.6.3.4.4.2 Impacts from Pile Driving under Alternative 2

Impacts from pile driving during training under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same.

There would be no pile driving associated with testing activities.

3.6.3.5 Entanglement Stressors

Most expended materials do not have the characteristics required to entangle marine species. Wires and cables, decelerators/parachutes, and biodegradable polymer are the expended materials most likely to entangle fish.

Table 3.6-9 contains brief summaries of background information that is relevant to analyses of impacts for each entanglement substressor (wires and cables, decelerators/parachutes, and biodegradable polymer). The background information for entanglement stressor effects on fishes in the Study Area as described in the 2018 Final EIS/OEIS Section 3.6.3.5 (Entanglement Stressors) has not changed appreciably. As such, the information presented in the 2018 Final EIS/OEIS remains valid.

Table 3.6-9: Entanglement Stressors Background Information Summary

Substressor	*Background Information Summary*
Wires and cables	Fiber-optic cables, guidance wires, bathythermograph wires, and sonobuoy components would pose a generally low potential entanglement risk to susceptible fishes, although the potential would be higher for sonobuoy components than for wires and cables: • Fiber-optic cables do not easily form loops, are not anchored, are brittle, and break easily if bent. • Guidance wires typically sink immediately after release and remain on the seafloor and would not likely form loops because of their size and rigidity. • The encounter rate for fiber-optic cables and guidance wires would be extremely low, as few would be expended. • Most sonobuoys are expended in offshore areas where large open-ocean species (e.g., manta rays) could become entangled in vertical cable. • Smaller species could become entangled in components such as plastic mesh. • Fish species with protruding physical features, such as sawfish, hammerhead sharks, manta rays, and billfishes, would be more susceptible to entanglement in wires and cables than other types of fish.

Table 3.6-9: Entanglement Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
Decelerators/ parachutes	Decelerators/parachutes pose a potential entanglement risk to fishes (the risk is higher for decelerators/parachutes on the seafloor), although the number of fish affected would likely be low: • During activities that involve recoverable targets, the target and any associated decelerators or parachutes are recovered to the maximum extent practical. • Decelerators/parachutes are relatively large and visible, reducing the chance that fish would accidentally become entangled. • Once a decelerator/parachute is on the bottom, a fish could become entangled in the item or its attachment lines while diving and feeding, especially at night or in deeper waters. • If a decelerator/parachute dropped in an area of strong bottom currents, it could billow open and pose a short-term entanglement threat to large fish feeding on the bottom. • Most smooth-bodied fishes would not become entangled, but fish with spines or other protrusions would be more susceptible.
Biodegradable polymers	The potential for fish to become entangled in biodegradable polymers would be low because of the materials' characteristics and level of use: • Biodegradable polymers begin to degrade and lose strength within hours and would break down to small pieces within a few days to weeks. • The materials can be easily broken within several hours of immersion. • The materials would ultimately sink. • The concentration of biodegradable polymers in the Study Area would be low, and the encounter rate and entanglement risk for fishes would be extremely low.

3.6.3.5.1 Impacts from Wires and Cables

Table 3.6-9 contains a summary of the background information used to analyze the potential impacts of wires and cables on fishes. Table 3.0-17 (Number and Location of Wires and Cables Expended During Military Readiness Activities) indicates the number and location of wires and cables expended during military readiness activities for Alternatives 1 and 2.

3.6.3.5.1.1 Impacts from Wires and Cables under Alternative 1

For training activities, the use of wires and cables would increase overall from the 2018 Final EIS/OEIS, and for testing activities, the use of wires and cables would decrease overall (Table 3.0-17, Number and Location of Wires and Cables Expended during Military Readiness Activities).

Under Alternative 1 for training:

- The use of wires and cables would occur in one location not previously analyzed (Key West Range Complex). There would also be a notable increase in the use of wires and cables in the Virginia Capes and Jacksonville Range Complexes. For all other locations, there would be a similar amount of wires and cables.

Under Alternative 1 for testing:

- The use of wires and cables would occur in one location not previously analyzed (Other AFTT Areas) for the 2018 Final EIS/OEIS. There would also be a notable increase in wires and cables in the Virginia Capes and Key West Range Complexes. For all other locations, there would either be a decrease or similar amount of wires and cables.

For locations without a notable increase in wires and cables, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.6.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of fishes among training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of wire and cable releases remains an accurate characterization of the Proposed Action in those locations.

Although activities will occur in locations not previously analyzed, there would be no change in the impact analysis conducted in the 2018 Final EIS/OEIS because the likelihood of fish encountering a wire or cable and becoming entangled would be low. Impacts from wires and cables on more abundant fish species would potentially be higher, though still considered low for the reasons listed in Table 3.6-9. If a fish were to become entangled, the impacts could be short term or long term, potentially including physiological injury or mortality. Behavioral responses would be uncommon and would consist only of temporary disturbance. Expended wires and cables are not expected to substantially change habitat characteristics.

Based on the relative amount and location of wires and cables and the general description of effects, the impact on individuals and populations would be low because the area exposed to the stressor is small relative to the distribution ranges of most fishes, the activities are dispersed such that few individuals would likely be exposed to more than one event, and exposures would be localized. Activities involving wires and cables are not expected to result in detectable changes in the survival, growth, recruitment, or reproduction of fish species at the population level.

The analysis conclusions for wires and cables as an entanglement stressor associated with training and testing activities under Alternative 1 are consistent with a minor to moderate (due to limited potential for entanglement and injury) impact on fish populations.

In regard to the potential for entanglement, the entangling aspect of wires and cables during training and testing activities as described under Alternative 1 may affect the ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta ray, Nassau grouper, oceanic whitetip shark, and scalloped hammerhead shark due to the potential for these species to become entangled and suffer physiological injury or mortality. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

The entanglement stressor is not applicable to critical habitat for ESA-listed Atlantic salmon, Atlantic sturgeon, Gulf sturgeon, smalltooth sawfish, and Nassau grouper.

3.6.3.5.1.2 Impacts from Wires and Cables under Alternative 2

Impacts from wires and cables under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of wires and cables used under Alternative 2 would increase only slightly over Alternative 1.

3.6.3.5.2 Impacts from Decelerators/Parachutes

Table 3.6-9 contains a summary of the background information used to analyze the potential impacts of decelerators/parachutes on fishes. Table 3.0-14 (Number and Location of Other Military Materials

Expended during Military Readiness Activities) indicates the number and location of decelerators/parachutes expended during military readiness activities for Alternatives 1 and 2.

3.6.3.5.2.1 Impacts from Decelerators/Parachutes under Alternative 1

For both training and testing activities, decelerator/parachute use would increase overall from the 2018 Final EIS/OEIS (see Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities).

Under Alternative 1 for training:

- Decelerators/parachutes would be used in the same locations as for the 2018 Final EIS/OEIS. However, there would be notable increases in the Virginia Capes and Jacksonville Range Complexes. For all other locations, there would be a similar amount of decelerators/parachutes.

Under Alternative 1 for testing:

- Decelerators/parachutes would be used in one area (Other AFTT Areas) that was not previously analyzed, and there would be notable increases in the Northeast, Virginia Capes, and Key West Range Complexes. For all other locations, there would either be a decrease or similar amount of decelerators/parachutes.

For locations without a notable increase in decelerators/parachutes, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.6.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of fishes among training and testing locations has not changed.

Although activities will occur in locations not previously analyzed, there would be no change in the impact analysis conducted in the 2018 Final EIS/OEIS because, although the increased number of decelerators/parachutes expended would cause a corresponding increase in the potential for entanglement, the probability would remain low relative to population numbers. Impacts from decelerators/parachutes on fishes would be short-term or long-term entanglement effects, potentially including physiological injury or mortality, although a low number of individuals would likely be affected. Behavioral responses would consist only of temporary disturbance. Expended decelerators/parachutes would not significantly change habitat characteristics.

Based on the relative amount and location of decelerators/parachutes and the general description of effects, most fish would not encounter a decelerator/parachute. In the event of a coincidence of decelerators/parachutes and susceptible fish (e.g., species with rigid protruding features), the impact on populations would be low because the area exposed to the stressor is small relative to the distribution ranges of most fishes, the activities are dispersed such that few individuals would likely be exposed to more than one event, and exposures would be localized. Activities involving decelerators/parachutes are not expected to result in detectable changes in the survival, growth, recruitment, or reproduction of fish species at the population level.

The analysis conclusions for decelerators/parachutes as an entanglement stressor associated with training and testing activities under Alternative 1 are consistent with a minor to moderate (due to limited potential for entanglement, injury, and mortality) impact on fish populations.

The entangling aspect of decelerators/parachutes during military readiness activities as described under Alternative 1 may affect the ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta ray, Nassau grouper, oceanic whitetip shark, and scalloped hammerhead shark due to the potential for these species to become entangled and suffer physiological injury or mortality. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

The entanglement stressor is not applicable to critical habitat for ESA-listed Atlantic salmon, Atlantic sturgeon, Gulf sturgeon, smalltooth sawfish, and Nassau grouper.

3.6.3.5.2.2 Impacts from Decelerators/Parachutes under Alternative 2

Impacts from decelerators/parachutes under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of decelerators/parachutes used under Alternative 2 would increase only slightly over Alternative 1.

3.6.3.5.3 Impacts from Biodegradable Polymers

Table 3.6-9 contains a summary of the background information used to analyze the potential impacts of biodegradable polymer on fishes. Table 3.0-18 (Number and Location of Activities Including Biodegradable Polymers during Testing) indicates the number and location of activities including biodegradable polymers for Alternatives 1 and 2. Section 3.0.3.3.5 (Entanglement Stressors) describes a new type of biodegradable polymer vessel stopping technology not analyzed in the 2018 Final EIS/OEIS.

3.6.3.5.3.1 Impacts from Biodegradable Polymers under Alternative 1

There would be no use of biodegradable polymers associated with training activities.

The proposed use of biodegradable polymer decreased overall for testing from the 2018 Final EIS/OEIS (Table 3.0-18, Number and Location of Activities Including Biodegradable Polymers during Testing).

Under Alternative 1 for testing:

- Activities using biodegradable polymer would occur in three locations not previously analyzed (Northeast Range Complexes, Navy Cherry Point Range Complex, and Joint Expeditionary Base Little Creek Fort Story). For all other locations, there would be a decrease in activities using biodegradable polymer.

For locations with a decrease in biodegradable polymer use, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.6.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of fishes among these locations has not changed.

Although activities will occur in locations not previously analyzed, there would be no change in the impact analysis conducted in the 2018 Final EIS/OEIS because the likelihood of fishes encountering a biodegradable polymer and becoming entangled remains low.

Based on the relative amount and location of biodegradable polymer use, most fish would not encounter a biodegradable polymer. In the unlikely event of an encounter, it is conceivable that a pelagic fish could be temporarily entangled in biodegradable polymer material, although the probability is low due to the polymer designs. The most likely effect would be temporary displacement as the material floats past an animal. Impacts to benthic fish species would not be expected. Activities involving biodegradable polymer as an entanglement risk would be unlikely to yield any detectable changes in the survival, growth, recruitment, or reproduction of fish species at the population level.

The analysis conclusions for biodegradable polymer as an entanglement stressor associated with testing activities under Alternative 1 are consistent with a negligible impact on fish populations.

The entangling aspect of biodegradable polymers during testing activities as described under Alternative 1 may affect the ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta ray, Nassau grouper, oceanic whitetip shark, and scalloped hammerhead shark due to the potential for these species to encounter the biodegradable polymer and experience behavioral responses (primarily displacement). The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

The entanglement stressor is not applicable to critical habitat for ESA-listed Atlantic salmon, Atlantic sturgeon, Gulf sturgeon, smalltooth sawfish, and Nassau grouper.

3.6.3.5.3.2 Impacts from Biodegradable Polymers under Alternative 2

There would be no use of biodegradable polymers associated with training activities.

Impacts from biodegradable polymer use during testing under Alternative 2 are the same as those under Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same. The number of events using biodegradable polymer under Alternative 2 is the same as Alternative 1.

3.6.3.6 Ingestion Stressors

The analysis of ingestion stressors on fishes is differentiated by munitions and expended materials other than munitions.

The difference between the military expended materials categories is related to shape and material composition; munitions are aero- and/or hydrodynamic and composed of mostly hard metal or concrete whereas other types of military expended materials can be composed of a great variety of materials (e.g., metal, concrete, plastic, rubber, silicon, fabric) and components (e.g., circuit boards, batteries, electric motors). Both material categories break down through time and use of explosives. Synthetic bio-inspired slime is a new type of biodegradable polymer that may present an ingestion risk to some fishes.

Table 3.6-10 contains brief summaries of background information that is relevant to the analyses of impacts for each ingestion substressor (military expended materials that are munitions and military expended materials other than munitions) on fishes. Details on updated information relevant to ingestion potential are provided in Appendix G (Non-Acoustic Impacts Supporting Information). Details on ingestion stressors in general, as well as effects specific to each substressor, are provided in the 2018 Final EIS/OEIS Section 3.6.3.6 (Ingestion Stressors). The potential for fish to ingest various types of military expended materials is influenced by their feeding strategy (Table 3.6-11).

Table 3.6-10: Ingestion Stressors Background Information Summary

Substressor	*Background Information Summary*
Military expended materials – munitions	Fishes may potentially ingest non-explosive practice munitions (small- or medium-caliber projectiles) and high-explosives munitions fragments, but the number of individuals adversely affected would be low in the context of population size: • Military expended materials from munitions could be ingested by fishes at the surface, in the water column, and on the seafloor. • The potential for ingestion would depend on the size and shape of the expended item and the size, feeding method, and typical food of the fish. • Ingested items might pass through the digestive tract without causing harm or might cause effects such as tissue cutting or digestive tract blockage. • Some fishes could reject potentially ingestible items because of their size, shape, color, or smell.

Table 3.6-10: Ingestion Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
Military expended materials other than munitions	Fishes in the water column and at the seafloor could purposely or inadvertently ingest many types of expended materials with potentially adverse effects, but the number of individuals affected would be low in the context of population size: • Plastic items are possibly the most commonly ingested materials and may cause digestive or toxicity issues. • Large filter-feeding fishes (e.g., whale sharks) could inadvertently ingest small or medium decelerators/parachutes. • Chaff fibers would not impact fishes because of the low concentration and their small size. • Fishes may ingest chaff cartridge and flare components; encounters would mostly occur on the seafloor except for the relatively few items that float or become entangled in floating vegetation. • Biodegradable polymers would only effect fish if the expended polymer was large enough to block the throat or impact the digestive system. • Biodegradable polymers would break down to small pieces within a few days to weeks.

Table 3.6-11: Ingestion Stressors Potential for Impact on Fishes Based on Feeding Guild

Feeding Guild	*Representative Species*	*Endangered Species Act-Protected Species*	*Overall Potential for Impact*
Open-ocean predators	Dolphinfishes, most shark species, tuna, mackerel, wahoo, jacks, billfishes, swordfishes	Atlantic salmon, Scalloped hammerhead sharks, Oceanic whitetip sharks	These fishes may eat floating or sinking expended materials, but the encounter rate would be extremely low. May result in individual injury or death but is not anticipated to have population-level effects.
Open-ocean plankton eaters (Planktivores)	Atlantic herrings, Atlantic menhaden, basking shark, whale shark	Giant manta rays	These fishes may ingest floating expended materials incidentally as they feed in the water column, but the encounter rate would be extremely low. May result in individual injury or death but is not anticipated to have population-level effects.
Coastal bottom-dwelling predators	Atlantic cod, skates, cusks, and rays	Atlantic salmon, Scalloped hammerhead sharks, Nassau grouper	These fishes may eat expended materials on the seafloor, but the encounter rate would be extremely low. May result in individual injury or death but is not anticipated to have population-level effects.
Coastal bottom-dwelling foragers and scavengers	Skates and rays, flounders	Sturgeon species, Smalltooth sawfish	These fishes could incidentally eat some expended materials while foraging, especially in muddy waters with limited visibility. May result in individual injury or death but is not anticipated to have population-level effects.

Notes: The scientific names of species not yet given are as follows: Atlantic cod (*Hippoglossus hippoglossus*), Atlantic herring (*Clupea harengus*), Atlantic menhaden (*Brevoortia tyrannus*), basking shark (*Cetorhinus maximus*), cusk (*Brosme brosme*), dolphinfish (*Coryphaena hippurus*), flounders (*Bothidae*), hammerhead sharks (*Sphyrna* spp.), rays (*Dasyatidae*), skates (*Amblyraja* spp.), wahoo (*Acanthocybium solandri*), and whale shark (*Rhincodon typus*).

3.6.3.6.1 Impacts from Military Expended Materials – Munitions

Table 3.6-10 contains a summary of the background information used to analyze the potential impacts of military expended materials that are munitions on fishes. For more information on the location and number of military expended materials that are ingestible munitions see Table 3.0-11, (Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities) and Table 3.0-12 (Number and Location of Explosives that May Result in Fragments Used during Military Readiness Activities).

3.6.3.6.1.1 Impacts from Military Expended Materials – Munitions under Alternative 1

For both training and testing activities, military expended materials - munitions would decrease from the 2018 Final EIS/OEIS.

Under Alternative 1 for training:

- Ingestible munitions (including fragments from explosive munitions) would occur in the same locations they did in the 2018 Final EIS/OEIS. There would be a notable increase in the Key West Range Complex Inshore, but for all other locations there would either be a decrease, similar amount, or cessation of ingestible munitions.

Under Alternative 1 for testing:

- Ingestible munitions would occur in one location not previously analyzed (Naval Undersea Warfare Center Division, Newport Testing Range). For all other locations, there would be a decrease in the amount of ingestible munitions.

For locations without a notable increase in military expended materials from munitions, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.6.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of fishes among training and testing locations has not changed.

Although activities will occur in a location not previously analyzed, there would be no change in the impact analysis conducted in the 2018 Final EIS/OEIS because the likelihood of fishes encountering a munition or munition fragment and consuming it remains low.

The heavy materials comprising munitions would degrade into fragments that remain in the sediment posing an ingestion risk mostly to bottom-dwelling foragers and scavengers. Based on the relative amount and location of expended munitions and the general description of effects, an impact on individual fish is unlikely, and impacts on populations would probably not be detectable.

The analysis conclusions for ingestible munitions or munition fragments associated with training and testing activities under Alternative 1 are consistent with a minor to moderate (due to limited potential for ingestion and injury) impact on fish populations.

The ingestible munitions or munition fragments associated with training and testing activities as described under Alternative 1 may affect the ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta ray, Nassau grouper, oceanic whitetip shark, and scalloped hammerhead shark due to the potential for ingestion and associated physiological injury or mortality. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Because ingestible munitions and fragments from training and testing activities are not anticipated to impact any of the physical and biological features associated with critical habitats, ingestion of military expended materials - munitions from training and testing activities would have no effect on critical habitat designated for Gulf sturgeon and Nassau grouper. Because ESA-listed Atlantic salmon, Atlantic sturgeon, and smalltooth sawfish designated critical habitat does not overlap stressor locations, the ingestion stressor is not applicable to critical habitat for these species.

3.6.3.6.1.2 Impacts from Military Expended Materials – Munitions under Alternative 2

Impacts from military expended materials – munitions under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of ingestible munitions or munition fragments used under Alternative 2 would increase only slightly over Alternative 1.

3.6.3.6.2 Impacts from Military Expended Materials Other Than Munitions

Table 3.6-10 contains a summary of the background information used to analyze the potential impacts of military expended materials other than munitions on fishes. For more information on the location and number of military expended materials that are ingestible munitions see Table 3.0-14 (Number and Location of Other Military Materials Expended during Military Readiness Activities).

3.6.3.6.2.1 Impacts from Military Expended Materials Other Than Munitions under Alternative 1

For both training and testing activities, military expended materials other than munitions would decrease from the 2018 Final EIS/OEIS (Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities).

Under Alternative 1 for training:

- Ingestible military expended materials other than munitions would no longer occur at one location (Virginia Capes Range Complex Inshore) that they did in the 2018 Final EIS/OEIS. However, there would be a notable increase in military expended materials other than munitions at the Virginia Capes Range Complex and the Key West Range Complex. For all other locations, there would either be a decrease or similar amount of military expended materials other than munitions.

Under Alternative 1 for testing:

- Ingestible military expended materials other than munitions would occur in one location not previously analyzed (Other AFTT Areas). For all other locations, there would either be a decrease or similar amount of military expended materials other than munitions.
- Activities using biodegradable polymer would occur in three locations not previously analyzed Northeast Range Complexes, Navy Cherry Point Range Complex, and Joint Expeditionary Base Little Creek Fort Story). For all other locations, there would be a decrease in the activities using biodegradable polymer (Table 3.0-18, Number and Location of Activities Including Biodegradable Polymers during Testing).

For locations without a notable increase in ingestible non-munitions and target fragments, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.6.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of fishes among training and testing locations has not changed.

Although activities will occur in locations not previously analyzed, there would be no change in the impact analysis conducted in the 2018 Final EIS/OEIS because the likelihood of fishes encountering an ingestible military expended material or target fragment and consuming it remains low.

In addition to metal or concrete fragments in the sediment, small plastic (or otherwise light) fragments may be consumed by fishes in the water column or on the bottom, but most likely by pelagic species that rely on vision for feeding. Adverse effects due to metal pieces on the bottom or in the water column are unlikely. Microplastic particles could affect individuals. Although the potential effects on fish populations due to microplastic ingestion are currently uncertain, Action Proponent activities would result in a small number of plastic particles introduced to the marine environment compared to other sources. It is conceivable that a fish could ingest a fragment of biodegradable polymer in the unlikely event of an encounter. Considering the biodegradable polymer is composed of synthetic proteins that mimic hagfish slime and because hagfish slime is not toxic (Fudge et al., 2005), the effect would likely be negligible. The potential for one type of biodegradable polymer (bio-inspired slime) to block a fish's throat if ingested soon after expenditure could be greater than that of other polymers because of its tacky nature. However, the material would break down within hours to days after deployment and the encounter rate would be low. Overall, impacts on fish populations due to military expended materials other than munitions and target fragments would probably not be detectable.

The analysis conclusions for ingestible non-munitions or target fragments associated with training and testing activities under Alternative 1 are consistent with a minor to moderate (due to limited potential for ingestion and injury) impact on fish populations.

The ingestible military expended materials other than munitions or target fragments associated with training and testing activities as described under Alternative 1 may affect the ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta ray, Nassau grouper, oceanic whitetip shark, and scalloped hammerhead shark due to the potential for these species to ingest expended items and suffer physiological injury or mortality. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Because ingestible materials and fragments from training and testing activities are not anticipated to impact any of the physical and biological features associated with critical habitats, ingestion of military expended materials other than munitions from training and testing activities will have no effect on critical habitat designated for Gulf sturgeon and Nassau grouper. Because ESA-listed Atlantic salmon, Atlantic sturgeon, and smalltooth sawfish designated critical habitat does not overlap stressor locations, the ingestion stressor is not applicable to critical habitat for these species.

3.6.3.6.2.2 Impacts from Military Expended Materials Other Than Munitions under Alternative 2

Impacts from military expended materials other than munitions under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of ingestible non-munitions under Alternative 2 is the same as Alternative 1.

3.6.3.7 Secondary Stressors

This section analyzes potential impacts on fishes exposed to stressors indirectly through impacts on their habitat (explosives and explosive byproducts, unexploded munitions, metals, chemicals) and/or prey availability. Table 3.6-12 contains brief summaries of background information that is relevant to the analyses of impacts for each substressor (explosives via habitat, etc.). Details on secondary stressors in general, as well as effects specific to each substressor, are provided in the 2018 Final EIS/OEIS Section 3.6.3.7 (Secondary Stressors).

Table 3.6-12: Secondary Stressor Background Information Summary

Indirect Links	*Substressors*	*Background Information Summary*
Habitat	Explosives	Explosions would temporarily affect soft bottom sediments and could potentially damage hard structures, but the effects would likely be undetectable in the context of impacts on fish populations: • Most explosions would occur in the air or at the surface. • Sediment disturbance from explosions in soft bottom habitat would be smoothed or filled over time by water movement and would affect a miniscule percentage of habitat in the Study Area. • Turbidity would be temporary and localized. • Explosions would not purposely occur near hard bottom habitat or reefs.
	Explosive byproducts and unexploded munitions	Explosive byproducts and unconsumed explosives may potentially affect habitat, but the effects would likely be undetectable in the context of impacts on fish populations because of extremely low concentrations and dilution of these materials in the Study Area: • Explosion byproducts associated with high-order detonations present no indirect stressors to fishes through sediment or water. • Fishes may be exposed to explosives and byproducts from low-order detonations and unexploded munitions through contact with contaminants in the sediment or water, and ingestion of contaminated sediments, potentially experiencing toxic effects. • Due to the low solubility of most explosives and their degradation products, concentrations in the marine environment are low and are readily diluted in the water column.
	Metals	Some metals are toxic to fishes at high concentrations, but effects would likely be undetectable in the context of impacts on fish populations because of the low concentrations of these materials in the Study Area: • Some metals bioaccumulate, and physiological impacts begin to occur only after several trophic transfers concentrate the materials. • Concentrations of metals in seawater are orders of magnitude lower than concentrations in marine sediments.
	Chemicals	Chemicals may potentially affect habitat, but the effects would likely be undetectable in the context of impacts on fish populations because of extremely low concentrations and dilution of these materials in the Study Area: • Properly functioning flares, missiles, rockets, and torpedoes combust most of their propellants, leaving benign or readily diluted soluble combustion byproducts. • Propellants released because of operational failures are generally diluted or degraded in the water column and sediments.
Prey availability	All stressors	The potential for primary stressors to impact fish prey populations is directly related to their impacts on biological resources consumed by fishes (e.g., vegetation, invertebrates, other fish, and other animal carcasses).

3.6.3.7.1 Impact of Secondary Stressors

3.6.3.7.1.1 Impacts from Secondary Stressors Under Alternative 1

The impacts of explosives and military expended materials in terms of abiotic substrate disturbance are described in Section 3.3 (Habitats). The assessment of potential sediment and water quality degradation on aquatic life is described in Section 3.2 (Sediment and Water Quality). Considering that the literature on fishes does not suggest an elevated sensitivity to pollutants from the Proposed Action, the analysis of impacts on abiotic and biotic fish habitats in the sections identified above is sufficient to cover the impact on fishes. The analysis determined that neither state nor federal standards/guidelines for sediments nor water quality would be violated by Alternative 1. Therefore, because these standards and guidelines are structured to protect human health and the environment, and the proposed activities do not violate them, no indirect impacts are anticipated on fish habitat by military readiness activities proposed by under Alternative 1. The assessments of biotic habitats that may be used by fishes are described in Section 3.4 (Vegetation) and Section 3.5 (Invertebrates).

Impacts on fish prey availability from the Proposed Action would likely be less than significant overall based on the analysis conclusions for the direct stressors on their food resources (e.g., invertebrates, vegetation, other fish, and animal carcasses). In the context of predation, disproportionate effects of the Proposed Action on marine mammals, birds, and bats could result in a marginal beneficial impact on fishes. However, as discussed in Section 3.7 (Marine Mammals) and Section 3.9 (Birds and Bats), impacts on these taxa would be less than significant and there would not likely be detectable changes to fish predation.

The impact of the Proposed Action on secondary stressors were considered negligible to moderate (depending on the primary stressor) impact on linked fish populations.

The secondary stressors associated with training and testing activities as described under Alternative 1 may affect the ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta ray, Nassau grouper, oceanic whitetip shark, and scalloped hammerhead shark. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

Because the physical (e.g., substrate type and composition, water quality) and biological features (e.g., prey species) that comprise critical habitat may be impacted by secondary stressors associated with training and testing activities, Alternative 1 may affect Atlantic salmon, Atlantic sturgeon, Gulf sturgeon, and Nassau grouper designated critical habitat. Secondary stressors are not applicable to smalltooth sawfish critical habitat.

3.6.3.7.1.2 Impacts from Secondary Stressors under Alternative 2

Impacts from secondary stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

3.6.3.8 Combined Stressors

As described in Section 3.0.3.5 (Resource-Specific Impacts Analysis for Multiple Stressors), this section evaluates the potential for combined impacts of all stressors from the Proposed Action. The analysis and conclusions for the potential impacts from each of the individual stressors are discussed in the sections above. Stressors associated with proposed military readiness activities do not typically occur in isolation but rather occur in some combination. For example, mine neutralization activities include elements of acoustic, physical disturbance and strike, entanglement, ingestion, and secondary stressors that are all coincident in space and time. An analysis of the combined impacts of all stressors considers the potential consequences of additive and synergistic stressors from the Proposed Action, as described below.

There are generally two ways that a fish could be exposed to multiple additive stressors. The first would be if a fish were exposed to multiple sources of stress from a single event or activity within a single training or testing event (e.g., a mine warfare event may include the use of a sound source and a vessel). The potential for a combination of these impacts from a single activity would depend on the range to effects of each of the stressors and the response or lack of response to that stressor. Secondly, a fish could be exposed to multiple military readiness activities over the course of its life, however, military readiness activities are generally separated in space and time in such a way that it would be unlikely that any individual fish would be exposed to stressors from multiple activities within a short timeframe. However, animals with a home range intersecting an area of concentrated activity have elevated exposure risks relative to animals that simply transit the area through a migratory corridor.

Multiple stressors may also have synergistic effects. For example, fishes that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors via a decreased ability to detect and avoid threats. Fishes that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to entanglement and physical strike stressors via malnourishment and disorientation. These interactions are speculative, and without data on the combination of multiple stressors, the synergistic impacts from the combination of stressors are difficult to predict in any meaningful way.

The following analysis makes the reasonable assumption that most exposures to individual stressors are non-lethal, and instead focuses on consequences potentially impacting fish fitness (e.g., physiology, behavior, reproductive potential).

3.6.3.8.1 Combined Impacts of All Stressors under Alternative 1

Most of the activities proposed under Alternative 1 generally involve the use of moving platforms (e.g., ships, torpedoes) that may produce one or more stressors; therefore, if fishes were within the effects range of those activities, they may be introduced to multiple stressors at different times. The minimal effects of far-reaching stressors (e.g., sound pressures, particle motion) may also trigger some animals to leave the area ahead of a more damaging impact (e.g., physical disturbance or strike). Individual stressors that would otherwise have minimal to no impact may combine to have a measurable effect. Due to the wide dispersion of stressor sources, speed of the platforms, and general dynamic movement of many military readiness activities, it is unlikely that a highly mobile fish would occur in the potential affects range of multiple sources or sequential exercises. Impacts would be more likely to occur to slow-moving species or species with relatively small ranges in areas where military readiness activities are concentrated and consistently located.

Although potential impacts on fishes from military readiness activities under Alternative 1 may include injury and mortality, in addition to other effects such as physiological stress, masking, and behavioral effects, the combined impacts are not expected to lead to long-term consequences for fish populations. Based on the general description of impacts, the number of fishes impacted is expected to be small relative to overall population sizes and would not be expected to yield any lasting effects on the survival, growth, recruitment, or reproduction of any fish species.

The combined impact of all stressors from Alternative 1 are considered minor to moderate (due to limited potential for injury/mortality) impacts on linked biological resources for both action alternatives.

The combined stressors associated with training and testing activities as described under Alternative 1 may affect Atlantic sturgeon and Gulf sturgeon designated critical habitat but would have no effect on designated critical habitat for Nassau grouper. The combined stressors are not applicable to Atlantic salmon and smalltooth sawfish critical habitat.

3.6.3.8.2 Combined Impacts of All Stressors under Alternative 2

The combined impacts of stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing.

3.6.4 Endangered Species Act Determinations

Pursuant to the ESA, the Action Proponents have concluded that military readiness activities may affect the ESA-listed Atlantic salmon, Atlantic sturgeon, shortnose sturgeon, Gulf sturgeon, smalltooth sawfish, giant manta ray, Nassau grouper, oceanic whitetip shark, and scalloped hammerhead shark described in Section 3.6.2.2 (Endangered Species Act-Listed Species) for Alternative 1. The Action Proponents have also concluded that military readiness activities will not affect designated critical habitat for Atlantic salmon, and smalltooth sawfish but may affect designated critical habitat for Atlantic sturgeon, Gulf sturgeon, and Nassau grouper. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA. The summary of effects determinations for each ESA-listed species are shown in Table 3.6-13 for training and testing.

Table 3.6-13: Fishes ESA Effect Determinations for Military Readiness Activities under Alternative 1 (Preferred Alternative)

Species	DPS/ Critical Habitat	*Effect Determinations by Stressor*																						
		Acoustic						*Explosives*		*Energy*			*Physical Disturbance and Strike*						*Entanglement*			*Ingestion*		
		Sonar and Other Transducers	*Air Guns*	*Pile Driving*	*Vessel Noise*	*Aircraft Noise*	*Weapons Noise*	*Explosions in Air*	*Explosions in Water*	*In-Air Electromagnetic Devices*	*In-Water Electromagnetic Devices*	*High-Energy Lasers*	*Vessels*	*In-Water Devices*	*Aircraft and Aerial Targets*	*Military Expended Materials[1]*	*Seafloor Devices*	*Pile Driving*	*Wires and Cables*	*Decelerators/Parachutes*	*Biodegradable Polymers[1]*	*Military Expended Materials-Munitions*	*Military Expended Materials- Other[1]*	*Secondary Stressors*
Training Activities																								
Atlantic salmon	Gulf of Maine DPS	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
	Critical Habitat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Atlantic sturgeon	Gulf of Maine DPS	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
	New York Bight DPS	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
	Chesapeake Bay DPS	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
	Carolina DPS	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
	South Atlantic DPS	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
	Critical habitat	NE	N/A	N/A	NE	NE	NE	N/A	MA	N/A	NE	N/A	NE	NE	N/A	MA	MA	N/A	N/A	N/A	N/A	N/A	N/A	MA
Shortnose sturgeon	Throughout range	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
Gulf sturgeon	Throughout range	MA	N/A	MA	MA	MA	MA	NE	MA	N/A	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	N/A	MA	MA	MA
	Critical habitat	NE	NE	MA	NE	NE	NE	NE	MA	N/A	NE	N/A	NE	NE	N/A	MA	MA	MA	NE	NE	N/A	NE	NE	MA
Smalltooth sawfish	U.S. DPS	MA	N/A	MA	MA	MA	MA	NE	MA	N/A	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	N/A	MA	MA	MA
	Critical habitat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Giant manta ray	Throughout range	MA	N/A	MA	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	MA	MA	MA	N/A	MA	MA	MA
Nassau grouper	Throughout range	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	NE	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
	Critical Habitat	NE	N/A	N/A	NE	NE	NE	NE	MA	N/A	NE	N/A	NE	NE	N/A	MA	MA	N/A	NE	NE	N/A	NE	NE	MA
Oceanic whitetip shark	Throughout range	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
Scalloped hammerhead shark	Central and Southwest Atlantic	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA

Table 3.6-13: Fishes ESA Effect Determinations for Military Readiness Activities under Alternative 1 (Preferred Alternative) (continued)

Species	DPS/ Critical Habitat	Effect Determinations by Stressor																						
		Acoustic						Explosives		Energy			Physical Disturbance and Strike						Entanglement			Ingestion		
		Sonar and Other Transducers	Air Guns	Pile Driving	Vessel Noise	Aircraft Noise	Weapons Noise	Explosions in Air	Explosions in Water	In-Air Electromagnetic Devices	In-Water Electromagnetic Devices	High-Energy Lasers	Vessels	In-Water Devices	Aircraft and Aerial Targets	Military Expended Materials[1]	Seafloor Devices	Pile Driving	Wires and Cables	Decelerators/Parachutes	Biodegradable Polymers[1]	Military Expended Materials-Munitions	Military Expended Materials- Other[1]	Secondary Stressors
Testing Activities																								
Atlantic salmon	Gulf of Maine DPS	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
	Critical Habitat	NE	N/A	N/A	NE	NA	N/A	N/A	N/A	N/A	N/A	N/A	NE	NE	N/A	MA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE
Atlantic sturgeon	Gulf of Maine DPS	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
	New York Bight DPS	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
	Chesapeake Bay DPS	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
	Carolina DPS	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
	South Atlantic DPS	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
	Critical habitat	NE	N/A	N/A	NE	N/A	N/A	N/A	MA	N/A	N/A	N/A	NE	NE	N/A	N/A	MA	N/A	N/A	N/A	N/A	N/A	N/A	MA
Shortnose sturgeon	Throughout range	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
Gulf sturgeon	Throughout range	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
	Critical habitat	NE	NE	N/A	NE	NE	NE	NE	MA	N/A	NE	NE	NE	NE	N/A	MA	MA	N/A	NE	NE	NE	NE	NE	MA
Smalltooth sawfish	U.S. DPS	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
	Critical habitat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Giant manta ray	Throughout range	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
Nassau grouper	Throughout range	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	N/A	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
	Critical Habitat	NE	N/A	N/A	NE	NE	NE	NE	MA	N/A	N/A	N/A	NE	NE	N/A	MA	M	N/A	NE	NE	NE	NE	NE	MA
Oceanic whitetip shark	Throughout range	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
Scalloped hammerhead shark	Central and Southwest Atlantic	MA	N/A	N/A	MA	MA	MA	N/A	MA	N/A	N/A	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA

[1] Inclusion of new material (synthetic hagfish slime)
Notes: DPS = distinct population segment; ESA= Endangered Species Act; MA = may affect; N/A = not applicable; NE = no effect; U.S. = United States.
The determinations for likelihood of adverse effects are pending consultation with the National Marine Fisheries Service.

References

Andrzejaczek, S., A. C. Gleiss, C. B. Pattiaratchi, and M. G. Meekan. (2019). Patterns and drivers of vertical movements of the large fishes of the epipelagic. *Reviews in Fish Biology and Fisheries 29* (2): 335-354. DOI:10.1007/s11160-019-09555-1

Copping, A. E., L. G. Hemery, H. Viehman, A. C. Seitz, G. J. Staines, and D. J. Hasselman. (2021). Are fish in danger? A review of environmental effects of marine renewable energy on fishes. *Biological Conservation 262* 109297. DOI:https://doi.org/10.1016/j.biocon.2021.109297

Flávio, H., R. Seitz, D. Eggleston, J. C. Svendsen, and J. Støttrup. (2023). Hard-bottom habitats support commercially important fish species: A systematic review for the North Atlantic Ocean and Baltic Sea. *PeerJ 11* e14681.

Fricke, R., W. Eschmeyer, and J. D. Fong. (2023). *Genera/Species by Family/Subfamily in: Eschmeyer's Catalog of Fishes*. Retrieved January 24, 2023, from https://researcharchive.calacademy.org/research/ichthyology/catalog/SpeciesByFamily.asp.

Fudge, D. S., N. Levy, S. Chiu, and J. M. Gosline. (2005). Composition, morphology and mechanics of hagfish slime. *Journal of Experimental Biology 208* (24): 4613-4625. DOI:10.1242/jeb.01963

Irigoien, X., T. A. Klevjer, A. Røstad, U. Martinez, G. Boyra, J. L. Acuña, A. Bode, F. Echevarria, J. I. Gonzalez-Gordillo, S. Hernandez-Leon, S. Agusti, D. L. Aksnes, C. M. Duarte, and S. Kaartvedt. (2014). Large mesopelagic fishes biomass and trophic efficiency in the open ocean. *Nature Communications 5* (1): 3271. DOI:10.1038/ncomms4271

Milligan, R. J., K. J. Morris, B. J. Bett, J. M. Durden, D. O. B. Jones, K. Robert, H. A. Ruhl, and D. M. Bailey. (2016). High resolution study of the spatial distributions of abyssal fishes by autonomous underwater vehicle. *Scientific Reports 6* (1): 26095. DOI:10.1038/srep26095

Naisbett-Jones, L. C., N. F. Putman, M. M. Scanlan, D. L. G. Noakes, and K. J. Lohmann. (2020). Magnetoreception in fishes: the effect of magnetic pulses on orientation of juvenile Pacific salmon. *Journal of Experimental Biology 2020* (223): 1–6. DOI:doi:10.1242/jeb.222091

Roch, S., C. Friedrich, and A. Brinker. (2020). Uptake routes of microplastics in fishes: Practical and theoretical approaches to test existing theories. *Scientific Reports 10* (1): 3896. DOI:10.1038/s41598-020-60630-1

Ross, S. W., M. Rhode, and A. M. Quattrini. (2015). Demersal fish distribution and habitat use within and near Baltimore and Norfolk Canyons, U.S. middle Atlantic slope. *Deep Sea Research Part I: Oceanographic Research Papers 103* 137-154.

Scanlan, M. M., N. F. Putman, A. M. Pollock, and D. L. Noakes. (2018). Magnetic map in nonanadromous Atlantic salmon. *Proceedings of the National Academy of Sciences 115* (43): 10995-10999.

Sivle, L. D., P. H. Kvadsheim, M. A. Ainslie, A. Solow, N. O. Handegard, N. Nordlund, and F. P. A. Lam. (2012). Impact of naval sonar signals on Atlantic herring (*Clupea harengus*) during summer feeding. *ICES Journal of Marine Science 69* (6): 1078–1085. DOI:10.1093/icesjms/fss080

U.S. Department of the Navy. (2024). *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (Technical Report prepared by Naval Information Warfare Center Pacific). San Diego, CA: Naval Undersea Warfare Center.

Urmy, S. S. and K. J. Benoit-Bird. (2021). Fear dynamically structures the ocean's pelagic zone. *Current Biology 31* (22): 5086-5092.e5083. DOI:10.1016/j.cub.2021.09.003

Willmott, J. R., G. Forcey, M. Vukovich, S. McGovern, J. Clerc, and J. Carter. (2021). *Ecological Baseline Studies of the US Outer Continental Shelf. OCS Study BOEM 2021-079*. Washington, DC: U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs.

Draft

Supplemental Environmental Impact Statement/ Overseas Environmental Impact Statement Atlantic Fleet Training and Testing

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3.7 Marine Mammals

MARINE MAMMALS SYNOPSIS

The Action Proponents considered all stressors that marine mammals could potentially be exposed to from the Proposed Action within the Study Area. The following conclusions have been reached for the Preferred Alternative (Alternative 1).

- Acoustics: Marine mammals may be exposed to multiple acoustic stressors, including sonars and other transducers (hereinafter called sonars), air guns, pile driving, vessel noise, aircraft noise, and weapons noise. The potential for exposure varies for each marine mammal population present in the study area. Exposures to sound-producing activities may cause auditory masking, physiological stress, or minor behavioral responses. Exposure to some sonars, air guns, and pile driving may also affect hearing (temporary threshold shift [TTS] or auditory injury [AINJ]) and cause significant behavioral reactions. The number of auditory and significant behavioral impacts are estimated for each stock. Susceptibility to these impacts differs among marine mammal auditory and behavioral groups. Although individual marine mammals would be impacted, no impacts to marine mammal populations are anticipated.
- Explosives: The potential for exposure to explosives (in the water or near the water surface) varies for each marine mammal population present in the study area. The impulsive, broadband sounds introduced into the marine environment may cause auditory effects (TTS or AINJ), auditory masking, physiological stress, and behavioral responses. Explosions in the water or near the water's surface present a risk to marine mammals located near the explosion, because the resulting shock waves can injure or kill an animal. The number of auditory (TTS and AINJ), non-auditory injury (injury and mortality), and significant behavioral impacts are estimated for each stock. Susceptibility to these impacts differs among marine mammal species and auditory groups. Although individual marine mammals would be impacted, no impacts to marine mammal populations are anticipated.
- Energy: Based on the relatively weak strength of the electromagnetic field created by Navy activities, a marine mammal would have to be in close proximity for there to be any effect and impacts on marine mammal migrating behaviors and navigational patterns are not anticipated. Potential impacts from high-energy lasers would only result for marine mammals directly struck by the laser beam. Statistical probability analyses demonstrate with a high level of certainty that no marine mammals would be struck by a high-energy laser. Energy stressors are temporary and localized in nature and based on patchy distribution of animals, no impacts to individual marine mammals and marine mammal populations are anticipated.
- Physical disturbance and strike: Historical data on Navy ship strike records demonstrate a low occurrence of interactions with marine mammals over the last 15 years. Since the Action Proponents do not anticipate a higher level of vessel use compared to the last decade, the potential for striking a marine mammal remains low. Physical disturbance due to vessel movement and in-water devices of individual marine mammals may also occur, but any stress response of avoidance behavior would not be severe enough to have long-term fitness consequences for individual marine mammals. Results for each of these physical disturbance and strike stressors suggest a very low potential for marine mammals to be struck by any of these items. Impacts to individuals or long-term consequences to marine mammal populations from physical disturbance and strike stressors associated with miliary readiness activities are not anticipated.

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MARINE MAMMALS SYNOPSIS

- Entanglement: Physical characteristics of wires and cables, decelerators/parachutes, and biodegradable polymers combined with the sparse distribution of these items throughout the Study Area indicate a very low potential for marine mammals to encounter and become entangled in them. Long-term impacts to individual marine mammals and marine mammal populations from entanglement stressors associated with training and testing activities are not anticipated.
- Ingestion: Adverse impacts from ingestion of military expended materials would be limited to the unlikely event that a marine mammal would be harmed by ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system. The likelihood that a marine mammal would encounter and subsequently ingest a military expended item associated with military readiness activities is considered low. Long-term consequences to marine mammal populations from ingestion stressors associated with military readiness activities are not anticipated.
- Secondary: In-water explosions would not substantially impact prey availability for marine mammals. Explosion byproducts and unexploded munitions would have no meaningful effect on water or sediment quality; therefore, they are not considered to be secondary stressors for marine mammals. Available research indicates metal contamination is very localized and that bioaccumulation resulting from munitions would not occur. Through rapid dilution, toxic concentrations of chemicals are unlikely to be encountered by marine mammals. Furthermore, bioconcentration or bioaccumulation of chemicals introduced by Navy activities to levels that would significantly alter water quality and degrade marine mammal habitat has not been documented. The Navy's use of marine mammal systems is not likely to increase the risk of transmitting diseases or parasites to wild marine mammals. Secondary stressors from military readiness activities in the Study Area are not expected to have short-term impacts on individual marine mammals or long-term impacts on marine mammal populations.

3.7.1 Introduction

The following sections describe the marine mammals found in the Study Area, the habitats where they can be found, and the analysis of potential effects of their exposure to the Proposed Action.

3.7.2 Affected Environment

The Study Area is generally consistent with that analyzed in the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (hereinafter referred to as the 2018 Final EIS/OEIS). Additions to the Study Area include pierside training and testing events and transit along established navigation channels from pierside locations to offshore range complexes in the Gulf of Mexico. United States (U.S.) Coast Guard activities are similar in nature to Navy activities and fall under the same stressor categories. A review of literature published since 2018 revealed that the affected environment for marine mammals in the Study Area described in the 2018 Final EIS/OEIS is substantially the same. Exceptions are summarized in the subsequent sections, with further details in Appendix F (Biological Resources Supplemental Information).

Extralimital marine mammal species to the Study Area, such as the bowhead whale, narwhal, beluga whale, ringed seal, bearded seal, walrus, and polar bear, are not part of the analysis of potential impacts, because they would not be exposed to stressors from the Proposed Action.

3.7.2.1 General Background

With noted exceptions, the general background for marine mammals in the Study Area is not meaningfully different from what is described in the 2018 Final EIS/OEIS Section 3.7.2.1 (General Background). The details are specified in this section when they directly affect the analysis. There is updated information regarding the number and population status of species in the Study Area that considers the most recent Atlantic and Gulf of Mexico Marine Mammal Stock Assessment Reports (Hayes et al., 2023). Updated information is presented in Appendix F (Biological Resources Supplemental Information).

There are 48 marine mammal species known to exist in the Study Area. Among these species are 93 stocks managed by either the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS) in the U.S. Exclusive Economic Zone. These species and stocks are presented in Table 3.7-1 along with an abundance estimate, an associated coefficient of variation value, a minimum population estimate, as well as the range complexes, inshore waters, and port and pierside areas where each species occurs.

Four main types of marine mammals are recognized: cetaceans (whales, dolphins, and porpoises), pinnipeds (seals, sea lions, and walruses), sirenians (manatees and dugongs), and other marine carnivores (sea otters, marine otters, and polar bears) (Jefferson et al., 2015; Rice, 1998). To maintain consistency with past analyses and retain familiar terminology, “odontocetes” refers to toothed whales, dolphins, and porpoises, “mysticetes” to baleen whales, and “cetaceans” to be inclusive of both. Mysticetes are further divided into four families: right whales, rorquals, gray whales, and pygmy right whales. Odontocetes are divided into 10 families: sperm whales, Kogiids, beaked whales, dolphins, porpoises, beluga/narwhal, and four families of river dolphin. Pinnipeds are of the order Carnivora and can be divided into three families: phocids (true seals), odobenidae (walruses), and otariids (fur seals and sea lions). Other marine carnivores include polar bears and sea otters. The order Sirenia (sirenians) are slow-moving plant eaters, such as manatees, that inhabit shallow coastal and inshore waters. Detailed species descriptions, status and management, habitat and geographic range, population trends, predator and prey interactions, and species-specific threats are provided in Appendix F (Biological Resources Supplemental Information). Hearing and vocalization information is detailed in Appendix D (Acoustic and Explosive Impacts Supporting Information).

3.7.2.2 Endangered Species Act-Listed Species

Table 3.7-1 shows the marine mammal species and applicable stocks listed under the Endangered Species Act (ESA) and occurring within in the Study Area. Critical habitat and proposed critical habitat are provided in Figure 3.7-1 for the North Atlantic right whale, Figure 3.7-2 for the West Indian manatee, and Figure 3.7-3 for the Rice’s whale.

3.7.2.3 Species Not Listed under the Endangered Species Act

Table 3.7-1 also shows the marine mammal species and applicable stocks not listed under the ESA and occurring within in the Study Area.

Table 3.7-1: Marine Mammal Occurrence in the Study Area

Species	Scientific Name[1]	Stock[2]	Population Status[3]	Stock Abundance[4] Best (CV)/Min. Population Estimate	Occurrence in the Study Area: Range Complex	Occurrence in the Study Area: Associated Inshore Waters	Occurrence in the Study Area: Port and Pierside
Order Cetacea							
Suborder Mysticeti (baleen whales)							
Family Balaenidae (right whales and bowhead whales)							
North Atlantic right whale	*Eubalaena glacialis*	Western North Atlantic	Endangered, strategic, depleted	338 (325–350) / 332[5]	Northeast RC*, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC*, SFOMF, SINKEX Box, Other AFTT Areas	Northeast Range Complexes Inshore, VACAPES Inshore, Jacksonville Range Complex (JAX RC) Inshore	Civilian Ports: Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC; Wilmington, NC; Kings Bay, GA; Savannah, GA; Mayport, FL Coast Guard Stations: Boston, MA; Virginia Beach, VA; Charleston, SC; Mayport, FL
Family Balaenopteridae (rorquals)							
Blue whale	*Balaenoptera musculus*	Western North Atlantic (Gulf of St. Lawrence)	Endangered, depleted, strategic stock	Unknown / 402; 39 (.64)[6]	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, Other AFTT Areas	–	–
Bryde's whale	*Balaenoptera edeni*	Atlantic (only expected outside of U.S. EEZ)	–	Unknown	Other AFTT Areas	–	–
Fin whale	*Balaenoptera physalus*	West Greenland	Endangered, depleted	4,468 (1,343–14,871)[7]	Other AFTT Areas	–	–
		Gulf of St. Lawrence	Endangered, depleted	328 (306–350)[8]	Other AFTT Areas	–	–
Fin whale	*Balaenoptera physalus*	Western North Atlantic	Endangered, depleted, strategic stock	6,802 (0.24) / 5,573	Northeast RC, VACAPES RC, Navy Cherry Point RC, JAX RC, Key West RC, GOMEX RC (extralimital), NSWC Panama City Testing Range (extralimital), Other AFTT Areas	Northeast Range Complexes Inshore, VACAPES Inshore	–
Humpback whale	*Megaptera novaeangliae*	Gulf of Maine	–	1,396 (0) / 1,380	Northeast RC, NUWC Division, Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	Northeast Range Complexes Inshore, VACAPES Inshore, Jacksonville Range Complex (JAX RC) Inshore	Civilian Ports: Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC; Wilmington, NC Coast Guard Stations: Boston, MA; Newport, RI; Virginia Beach, VA; Charleston, SC; Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL; Key West, FL; St. Petersburg, FL; Pensacola, FL; New Orleans, LA; Corpus Christi, TX

[1] Taxonomy follows Committee on Taxonomy (2016) and Perrin et al. (2009).
[2] Stock designations for the U.S. EEZ and abundance estimates are from Atlantic and Gulf of Mexico Stock Assessment Reports prepared by NMFS (Hayes et al., 2023).
[3] ESA/MMPA - Populations or stocks are defined by the MMPA as "strategic" for one of the following reasons: (1) the level of direct human-caused mortality exceeds the potential biological removal level; (2) based on the best available scientific information, numbers are declining and species are likely to be listed as threatened species under the ESA within the foreseeable future; (3) species are listed as threatened or endangered under the ESA; or (4) species are designated as depleted under the MMPA.
[4] Stock abundance, CV, and minimum population are numbers provided by the Stock Assessment Reports (Hayes et al., 2023). The stock abundance is an estimate of the number of animals within the stock. The CV is a statistical metric used as an indicator of the uncertainty in the abundance estimate. The minimum population estimate is either a direct count (e.g., pinnipeds on land) or the lower 20th percentile of a statistical abundance estimate. Canadian stocks, USFWS-managed species, and the North Atlantic right whales are handled differently; see subsequent footnotes.
[5] NMFS uses "credible interval" to characterize the uncertainty as opposed to CV for North Atlantic right whales (Hayes et al., 2023).
[6] Photo-ID catalog count of 402 recognizable blue whale individuals from the Gulf of St. Lawrence is considered a minimum population estimate for the western North Atlantic stock (Waring et al., 2010). An additional 39 (0.64) were documented in the summer of 2016 for Central Virginia to Bay of Fundy (Waring et al., 2010).
[7] The West Greenland stock of fin whales is not managed by NMFS and, therefore, does not have an associated Stock Assessment Report. Abundance and a 95% confidence interval were presented in Heide-Jorgensen et al. (2010a).
[8] The Gulf of St. Lawrence stock of fin whales is not managed by NMFS and, therefore, does not have an associated Stock Assessment Report. Abundance and 95% confidence interval were presented in Ramp et al. (2014).
* Intersects with species designated critical habitat

Table 3.7-1: Marine Mammal Occurrence in the Study Area (continued)

Species	Scientific Name[1]	Stock[2]	Population Status[3]	Stock Abundance[4] Best (CV)/Min. Population Estimate	Occurrence in the Study Area		
					Range Complex	Associated Inshore Waters	Port and Pierside
Minke whale	*Balaenoptera acutorostrata*	Canadian East Coast	–	21,968 (0.31) / 17,002	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	Northeast Range Complexes Inshore, VACAPES Inshore, Jacksonville Range Complex (JAX RC) Inshore	Civilian Ports Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC; Wilmington, NC; Kings Bay; GA, Savannah, GA Coast Guard Stations Boston, MA; Newport, RI; Virginia Beach, VA; Charleston, SC; Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL; Key West, FL; St. Petersburg, FL; Pensacola, FL; New Orleans, LA; Corpus Christi, TX
		West Greenland	–	16,609 (7,172–38,461) / NA[9]	Other AFTT Areas	–	Civilian Ports Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC; Wilmington, NC
Rice's whale	*Balaenoptera ricei*	Northern Gulf of Mexico	Endangered, depleted, strategic stock	51 (.05) / 34	GOMEX RC** Key West RC, NSWC Panama City Testing Range*	Gulf of Mexico Range Complex (GOMEX RC) Inshore	Civilian Ports Tampa, FL; Beaumont, TX; Corpus Christi, TX; Gulfport, MS
Sei whale	*Balaenoptera borealis*	Nova Scotia	Endangered, depleted, strategic stock	6,282 (1.02) / 3,098	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, GOMEX RC, Other AFTT Areas	–	–
		Labrador Sea	Endangered, depleted	Unknown[10]	Other AFTT Areas	–	–
Suborder Odontoceti (toothed whales)							
Family Physeteridae (sperm whale)							
Sperm whale	*Physeter macrocephalus*	North Atlantic	Endangered, depleted, strategic stock	4,349 (0.28) / 3,451	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, GOMEX RC, SINKEX Box, Other AFTT Areas	–	–
		Northern Gulf of Mexico	Endangered, depleted, strategic stock	1,180 (.22) / 983	GOMEX RC	–	–
		Puerto Rico and U.S. Virgin Islands	Endangered, depleted, strategic stock	Unknown	Other AFTT Areas	–	–
Family Kogiidae (sperm whales)							
Pygmy and dwarf sperm whales	*Kogia breviceps and Kogia sima*	Western North Atlantic	–	7,750 (0.38) / 5,689	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
	Kogia breviceps and Kogia sima	Gulf of Mexico	–	336 (0.35) / 253	GOMEX RC	–	–

[9] The West Greenland stock of minke whales is not managed by NMFS and, therefore, does not have an associated Stock Assessment Report. Abundance and 95% confidence interval were presented in Heide-Jorgensen et al. (2010b).
[10] The Labrador Sea stock of sei whales is not managed by NMFS and, therefore, does not have an associated Stock Assessment Report. Information was obtained in Prieto et al. (2014).
** Intersects with species proposed critical habitat

Table 3.7-1: Marine Mammal Occurrence in the Study Area (continued)

Species	*Scientific Name*[1]	*Stock*[2]	*Population Status*[3]	*Stock Abundance*[4] *Best (CV)/Min. Population Estimate*	*Occurrence in the Study Area*		
					Range Complex	*Associated Inshore Waters*	*Port and Pierside*
Family Ziphiidae (beaked whales)							
Blainville's beaked whale	*Mesoplodon densirostris*	Western North Atlantic[11]	–	10,107 (0.27) / 8,085	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, GOMEX RC, Other AFTT Areas	–	–
		Northern Gulf of Mexico	–	98 (0.46) / 68	GOMEX RC	–	–
Goose-beaked whale (formerly Cuvier's beaked whale)	*Ziphius cavirostris*	Western North Atlantic	–	5,744 (0.36) / 4,282	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Other AFTT Areas	–	–
		Northern Gulf of Mexico	–	18 (0.75) / 10	GOMEX RC	–	–
		Puerto Rico and U.S. Virgin Islands	Strategic	Unknown	Other AFTT Areas	–	–
Gervais' beaked whale	*Mesoplodon europaeus*	Western North Atlantic	–	10,107 (0.27) / 8,085[12]	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, GOMEX RC, Other AFTT Areas	–	–
		Northern Gulf of Mexico	–	20 (0.98) / 10	GOMEX RC	–	–
Northern bottlenose whale	*Hyperoodon ampullatus*	Western North Atlantic	–	Unknown	Other AFTT Areas	–	–
Sowerby's beaked whale	*Mesoplodon bidens*	Western North Atlantic	–	10,107 (0.27) / 8,085	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, GOMEX RC, Other AFTT Areas	–	–
True's beaked whale	*Mesoplodon mirus*	Western North Atlantic	–	10,107 (0.27) / 8,085	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, GOMEX RC, Other AFTT Areas	–	–
Family Delphinidae (dolphins)							
Atlantic spotted dolphin	*Stenella frontalis*	Western North Atlantic	–	93,233 (0.71) / 54,443	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
Atlantic spotted dolphin (continued)	*Stenella frontalis*	Gulf of Mexico	–	21,506 (0.26) / 17,339	GOMEX RC, Other AFTT Areas	–	–
		Puerto Rico and U.S. Virgin Islands	Strategic	Unknown	Other AFTT Areas	–	–
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Western North Atlantic	–	93,233 (0.71) / 54,443	Northeast RC, VACAPES RC, Other AFTT Areas	–	<u>Civilian Ports</u> Boston, MA <u>Coast Guard Stations</u> Boston, MA
Clymene dolphin	*Stenella clymene*	Western North Atlantic	–	4,237 (1.03) / 2,071	Northeast RC, NUWC Division, Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
		Gulf of Mexico	Strategic	513 (1.3) / 250	GOMEX RC, Other AFTT Areas	–	–

[11] Estimate includes undifferentiated *Mesoplodon* species.
[12] Estimate includes Gervais' and Blainville's beaked whales.

Table 3.7-1: Marine Mammal Occurrence in the Study Area (continued)

Species	Scientific Name[1]	Stock[2]	Population Status[3]	Stock Abundance[4] Best (CV)/Min. Population Estimate	Occurrence in the Study Area		
					Range Complex	Associated Inshore Waters	Port and Pierside
Common bottlenose dolphin	*Tursiops truncatus*	Western North Atlantic, Offshore	–	62,851 (0.23) / 51,914[13]	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Other AFTT Areas	–	–
		Western North Atlantic Northern Migratory Coastal	Depleted, strategic stock	6,639 (0.41) / 4,759	VACAPES RC, Navy Cherry Point RC, JAX RC, Key West RC, Other AFTT Areas	Virginia Capes Range Complex (VACAPES RC) Inshore	Civilian Ports Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC Coast Guard Stations Virginia Beach, VA
		Western North Atlantic Southern Migratory Coastal	Depleted, strategic stock	3,751 (0.06) / 2,353	Navy Cherry Point RC, JAX RC, Key West RC, Other AFTT Areas	Jacksonville Range Complex (JAX RC) Inshore	Civilian Ports Hampton Roads, VA; Morehead City, NC; Wilmington, NC; Kings Bay, GA; Savannah, GA Coast Guard Stations Virginia Beach, VA
		Western North Atlantic South Carolina / Georgia Coastal	Depleted, strategic stock	6,027 (0.34) / 4,569	Other AFTT Areas	Jacksonville Range Complex (JAX RC) Inshore	Civilian Ports Kings Bay, GA; Savannah, GA
		Northern North Carolina Estuarine System	Strategic	823 (0.06) / 782	Other AFTT Areas	–	Civilian Ports Morehead City, NC; Wilmington, NC
		Southern North Carolina Estuarine System	Strategic	Unknown	Other AFTT Areas	–	Civilian Ports Morehead City, NC; Wilmington, NC
		Northern South Carolina Estuarine System	Strategic	453 (0.28) / 359	Other AFTT Areas	Jacksonville Range Complex (JAX RC) Inshore	–
		Charleston Estuarine System	Strategic	Unknown	Other AFTT Areas	Jacksonville Range Complex (JAX RC) Inshore	–
		Northern Georgia /Southern South Carolina Estuarine System	Strategic	Unknown	Other AFTT Areas	Jacksonville Range Complex (JAX RC) Inshore	–
		Central Georgia Estuarine System	Strategic	Unknown	Other AFTT Areas	–	–
		Southern Georgia Estuarine System	Strategic	Unknown	Other AFTT Areas	Jacksonville Range Complex (JAX RC) Inshore	Civilian Ports Kings Bay, GA; Savannah, GA
		Western North Atlantic, Northern Florida Coastal	Depleted, strategic stock	877 (0.49) / 595	Other AFTT Areas	Jacksonville Range Complex (JAX RC) Inshore	Civilian Ports Kings Bay, GA; Savannah, GA
		Jacksonville Estuarine System	Strategic	Unknown	JAX RC	Jacksonville Range Complex (JAX RC) Inshore	Civilian Ports Kings Bay, GA; Savannah, GA
		Western North Atlantic, Central Florida Coastal	Depleted, strategic stock	1.218 (0.35) / 913	JAX RC	Jacksonville Range Complex (JAX RC) Inshore	Civilian Ports Port Canaveral, FL
		Indian River Lagoon Estuarine System	Strategic	1,032 (0.03) / 1,004	Other AFTT Areas	Jacksonville Range Complex (JAX RC) Inshore	Civilian Ports Port Canaveral, FL
		Biscayne Bay	Strategic	Unknown	Other AFTT Areas	–	–
		Florida Bay	–	Unknown	Other AFTT Areas	–	–
		Gulf of Mexico Continental Shelf	–	63,289 (0.11) / 57,917	GOMEX RC	–	–
		Gulf of Mexico Eastern Coastal	–	16,407 (0.17) / 14,199	GOMEX RC	Gulf of Mexico Range Complex (GOMEX RC) Inshore	–
		Gulf of Mexico Northern Coastal	–	11,543 (0.19) / 9,881	GOMEX RC	Gulf of Mexico Range Complex (GOMEX RC) Inshore	Gulfport, MS
		Gulf of Mexico Western Coastal	–	20,759 (0.13) / 18,585	GOMEX RC	Gulf of Mexico Range Complex (GOMEX RC) Inshore	Civilian Ports Beaumont, TX; Corpus Christi, TX; Pascagoula, MS; Gulfport, MS Coast Guard Stations Corpus Christi, TX
		Gulf of Mexico Oceanic	–	7,462 (0.31) / 5,769	GOMEX RC	–	–
		Laguna Madre	Strategic	80 (1.57) / unknown	GOMEX RC	–	–
		Neuces Bay, Corpus Christi Bay	Strategic	58 (0.61) / unknown	GOMEX RC	–	Civilian Ports Corpus Christi, TX

[13] Estimate may include sightings of the coastal form.

Table 3.7-1: Marine Mammal Occurrence in the Study Area (continued)

Species	*Scientific Name*[1]	*Stock*[2]	*Population Status*[3]	*Stock Abundance*[4] *Best (CV)/Min. Population Estimate*	*Occurrence in the Study Area*		
					Range Complex	*Associated Inshore Waters*	*Port and Pierside*
Common bottlenose dolphin (continued)	*Tursiops truncatus*	Copano Bay, Aransas Bay, San Antonio Bay, Redfish Bay, Espiritu Santo Bay	Strategic	55 (0.82) / unknown	GOMEX RC	–	Civilian Ports Corpus Christi, TX
		Matagorda Bay, Tres Palacios Bay, Lavaca Bay	Strategic	61(0.45) / unknown	GOMEX RC	–	–
		Gulf of Mexico Bay, Sound, and Estuaries	Strategic	–	GOMEX RC	Gulf of Mexico Range Complex (GOMEX RC) Inshore	–
		West Bay	–	37 (0.05) / 35	GOMEX RC	–	–
		Galveston Bay/ East Bay/ Trinity Bay	–	842 (0.08) / 787	GOMEX RC	–	–
		Sabine Lake	–	122 (0.19)/104	GOMEX RC	–	Civilian Ports Beaumont, TX
		Calcasieu Lake	Strategic	Unknown	GOMEX RC	–	–
		Vermillion Bay, West Cote Blanche Bay, Atchafalaya Bay	Strategic	Unknown	GOMEX RC	Gulf of Mexico Range Complex (GOMEX RC) Inshore	–
		Terrebonne Timbalier Bay Estuarine System	–	3,870 (0.15) / 3,426	GOMEX RC	–	–
		St. Andrew Bay	–	199 (0.09) / 185	GOMEX RC	Gulf of Mexico Range Complex (GOMEX RC) Inshore	–
		Barataria Bay Estuarine System	Strategic	2,071 (0.06) / 1,971	GOMEX RC	–	–
		Mississippi River Delta	–	1,446 (0.19) / 1,238	GOMEX RC	–	–
		Mississippi Sound, Lake Borgne, Bay Boudreau	Strategic	1,265 (0.35) / 947	GOMEX RC	Gulf of Mexico Range Complex (GOMEX RC) Inshore	–
		Mobile Bay, Bonsecour Bay	Strategic	122 (0.34) / unknown	GOMEX RC	–	–
		Perdido Bay	Strategic	Unknown	GOMEX RC	–	–
		Pensacola Bay, East Bay	Strategic	33 (0.80) / unknown	GOMEX RC	–	–
		St. Joseph Bay	Strategic	142 (0.17) / 123	GOMEX RC	–	–
		Choctawhatchee Bay	Strategic	179 (0.04) / unknown	GOMEX RC	–	–
		St. Vincent Sound, Apalachicola Bay, St. George Sound	Strategic	439 (0.14) / unknown	GOMEX RC	–	–
		Apalachee Bay	Strategic	491 (0.39) / unknown	GOMEX RC	–	–
		Waccasassa Bay, Withlacoochee Bay, Crystal Bay	Strategic	Unknown	GOMEX RC	–	–
		St. Joseph Sound, Clearwater Harbor	Strategic	Unknown	GOMEX RC	–	–
		Tampa Bay	Strategic	Unknown	GOMEX RC	–	Civilian Ports Tampa, FL
		Sarasota Bay, Little Sarasota Bay	–	158 (0.27) / 126	GOMEX RC	–	–
		Pine Island Sound, Charlotte Harbor, Gasparilla Sound, Lemon Bay	Strategic	826 (0.09) / unknown	GOMEX RC	–	–
		Caloosahatchee River	Strategic	Unknown	GOMEX RC	–	–
		Estero Bay	Strategic	Unknown	GOMEX RC	–	–
		Chokoloskee Bay, Ten Thousand Islands, Gullivan Bay	Strategic	Unknown	GOMEX RC	–	–
		Whitewater Bay	Strategic	Unknown	GOMEX RC	–	–
		Florida Keys (Bahia Honda to Key West)	Strategic	Unknown	GOMEX RC	Key West Range Complex Inshore	–
		Puerto Rico and U.S. Virgin Islands	Strategic	Unknown	Other AFTT Areas	–	–
False killer whale	*Pseudorca crassidens*	Western North Atlantic	–	1,791 (0.56) / 1,154	NUWC Division, Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
		Gulf of Mexico	–	494 (0.79) / 276	GOMEX RC, Other AFTT Areas	–	–

Table 3.7-1: Marine Mammal Occurrence in the Study Area (continued)

Species	Scientific Name[1]	Stock[2]	Population Status[3]	Stock Abundance[4] Best (CV)/Min. Population Estimate	Occurrence in the Study Area: Range Complex	Occurrence in the Study Area: Associated Inshore Waters	Occurrence in the Study Area: Port and Pierside
Fraser's dolphin	*Lagenodelphis hosei*	Western North Atlantic	–	Unknown	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
		Northern Gulf of Mexico	–	213 (1.03) / 104	GOMEX RC	–	–
Killer whale	*Orcinus orca*	Western North Atlantic	–	Unknown	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
		Gulf of Mexico	–	267 (0.75) / 152	GOMEX RC	–	–
Long-finned pilot whale	*Globicephala melas*	Western North Atlantic	–	39,215 (0.30) / 30,627	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
Melon-headed whale	*Peponocephala electra*	Western North Atlantic	–	Unknown	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
		Northern Gulf of Mexico	–	1,749 (0.68) / 1,039	GOMEX RC	–	–
Pantropical spotted dolphin	*Stenella attenuata*	Western North Atlantic	–	6,593 (0.52) / 4,367	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
		Northern Gulf of Mexico	–	37,195 (0.24) / 30,377	GOMEX RC	–	–
Pygmy killer whale	*Feresa attenuata*	Western North Atlantic	–	Unknown	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
		Northern Gulf of Mexico	–	613 (1.15) / 283	GOMEX RC	–	–
Risso's dolphin	*Grampus griseus*	Western North Atlantic	–	35,215 (0.19) / 30,051	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
		Northern Gulf of Mexico	–	1,974 (0.46) / 1,368	GOMEX RC	–	–

Table 3.7-1: Marine Mammal Occurrence in the Study Area (continued)

Species	Scientific Name[1]	Stock[2]	Population Status[3]	Stock Abundance[4] Best (CV)/Min. Population Estimate	Occurrence in the Study Area: Range Complex	Associated Inshore Waters	Port and Pierside
Rough-toothed dolphin	*Steno bredanensis*	Western North Atlantic	–	136 (1.0) / 67	Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
		Northern Gulf of Mexico	–	Unknown	GOMEX RC	–	–
Short-beaked common dolphin	*Delphinus delphis*	Western North Atlantic	–	172,974 (0.21) / 145,216	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
Short-finned pilot whale	*Globicephala macrorhynchus*	Western North Atlantic	Strategic	28,924 (0.24) / 23,637	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
		Northern Gulf of Mexico	–	1,321 (0.43) / 934	GOMEX RC	–	–
		Puerto Rico and U.S. Virgin Islands	Strategic	Unknown	Other AFTT Areas	–	–
Spinner dolphin	*Stenella longirostris*	Western North Atlantic	–	4,102 (0.99) / 2,045	Northeast RC, NUWC Division, Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
		Northern Gulf of Mexico	Strategic	2,991 (0.54) / 1,954	GOMEX RC	–	–
		Puerto Rico and U.S. Virgin Islands	Strategic	Unknown	Other AFTT Areas	–	–
Striped dolphin	*Stenella coeruleoalba*	Western North Atlantic	–	67,036 (0.29) / 52,939	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Naval Surface Warfare Center Panama City Testing Range, GOMEX RC, Other AFTT Areas	–	–
		Northern Gulf of Mexico	Strategic	1,817 (0.56) / 1,172	GOMEX RC	–	–
White-beaked dolphin	*Lagenorhynchus albirostris*	Western North Atlantic	–	536,016 (0.31) / 415,344	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC	–	–
Family Phocoenidae (porpoises)							
Harbor porpoise	*Phocoena phocoena*	Gulf of St. Lawrence[14]	–	Unknown[14]	Other AFTT Areas	–	–
		Newfoundland[15]	–	Unknown[15]	Other AFTT Areas	–	–
		Greenland[16]	–	Unknown[16]	Other AFTT Areas	–	–
		Gulf of Maine/ Bay of Fundy	–	95,542 (0.31) / 74,034	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC	Northeast Range Complexes Inshore, Virginia Capes Range Complex (VACAPES RC) Inshore	Civilian Ports Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA Coast Guard Stations Boston, MA; Virginia Beach, VA

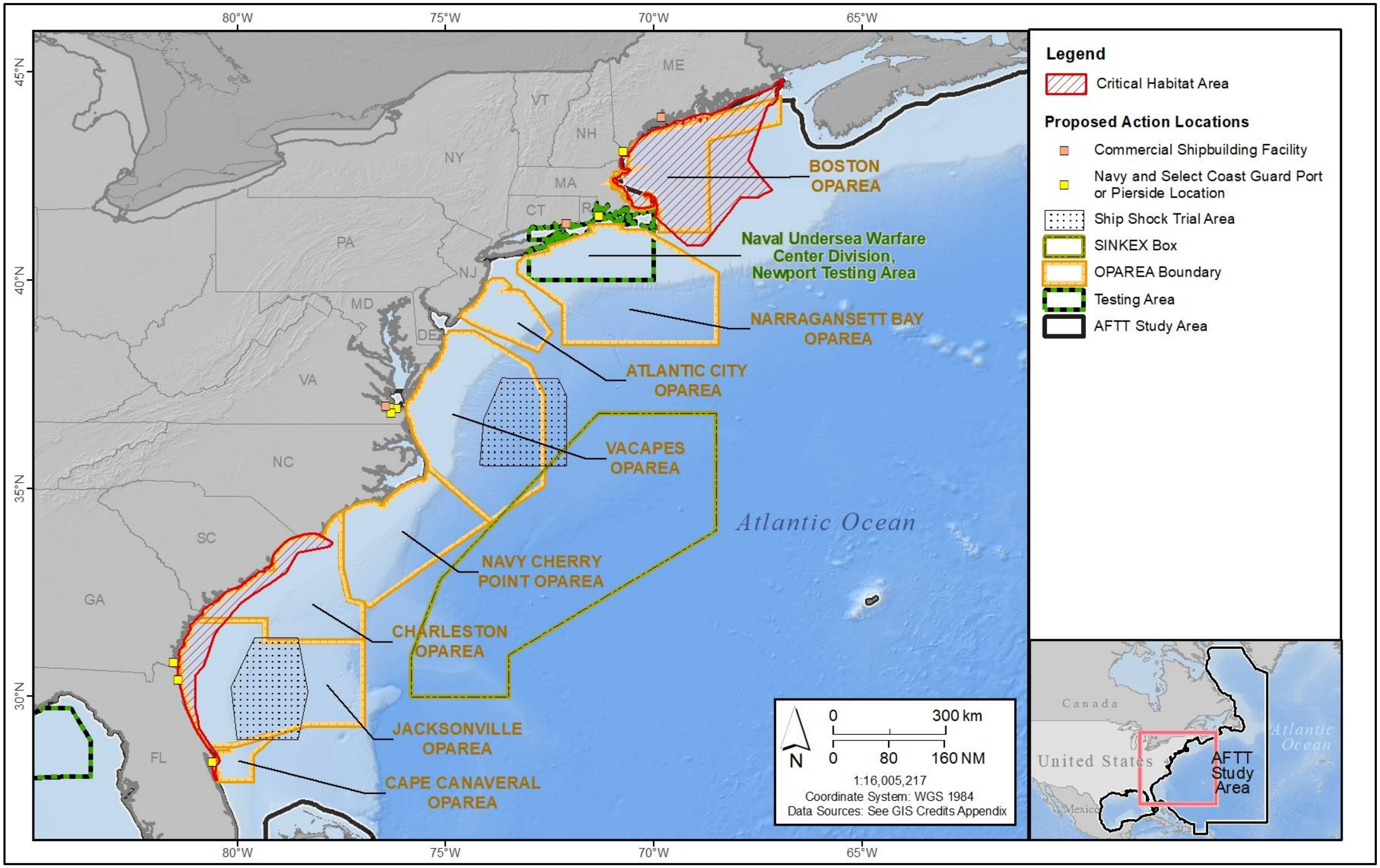
[14] Harbor porpoises in the Gulf of St. Lawrence are not managed by NMFS and have no associated Stock Assessment Report.
[15] Harbor porpoises in Newfoundland are not managed by NMFS and have no associated Stock Assessment Report.
[16] Harbor porpoises in Greenland are not managed by NMFS and have no associated Stock Assessment Report.

Table 3.7-1: Marine Mammal Occurrence in the Study Area (continued)

Species	Scientific Name[1]	Stock[2]	Population Status[3]	Stock Abundance[4] Best (CV)/Min. Population Estimate	Occurrence in the Study Area		
					Range Complex	Associated Inshore Waters	Port and Pierside
Order Carnivora							
Family Phocidae (earless seals)							
Gray seal	*Halichoerus grypus atlantica*	Western North Atlantic	–	27,300 (0.22) / 22,785	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC	Northeast Range Complexes Inshore, Virginia Capes Range Complex (VACAPES RC) Inshore	Civilian Ports Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC Coast Guard Stations Boston, MA; Virginia Beach, VA
Harbor seal	*Phoca vitulina*	Western North Atlantic	–	61,336 (0.08) / 57,637	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC	Northeast Range Complexes Inshore, Virginia Capes Range Complex (VACAPES RC) Inshore	Civilian Ports Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC Coast Guard Stations Boston, MA; Virginia Beach, VA
Harp seal	*Pagophilus groenlandicus*	Western North Atlantic	–	7.6M (0.12) / 7.1M	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC	–	–
Hooded seal	*Cystophora cristata*	Western North Atlantic	–	Unknown	Northeast Range Complex, NUWC Division, Newport Testing Range, Virginia Capes Range Complex, Navy Cherry Point Range Complex	–	Civilian Ports Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC
Family Trichechidae (manatees)							
West Indian manatee[20]	*Trichechus manatus latirostris* (Florida subspecies)	Florida	Threatened, depleted	8,810 (.08) /8,237[17]	Virginia Capes Range Complex Navy Cherry Point Range Complex Jacksonville Range Complex South Florida Ocean Measurement Facility Key West Range Complex NSWC Panama City Division Testing Range Gulf of Mexico Range Complex Other AFTT Areas	Virginia Capes Range Complex (VACAPES RC) Inshore, Jacksonville Range Complex (JAX RC) Inshore, Key West Range Complex Inshore, Gulf of Mexico Range Complex (GOMEX RC) Inshore	Civilian Ports Hampton Roads, VA Morehead City, NC Wilmington, NC Kings Bay, GA Savannah, GA Mayport, FL Port Canaveral, FL Tampa, FL Beaumont, TX Corpus Christi, TX Gulfport, MS Pascagoula, MS Coast Guard Stations Virginia Beach, VA Portsmouth, VA Elizabeth City, NC Charleston, SC Mayport, FL Cape Canaveral, FL Fort Pierce, FL Dania, FL Miami, FL Key West, FL St. Petersburg, FL Pensacola, FL New Orleans, LA Corpus Christi, TX
	Trichechus manatus manatus (Antillean subspecies)	Puerto Rico	Threatened	386 (.23) / 318	Other AFTT Areas	–	–

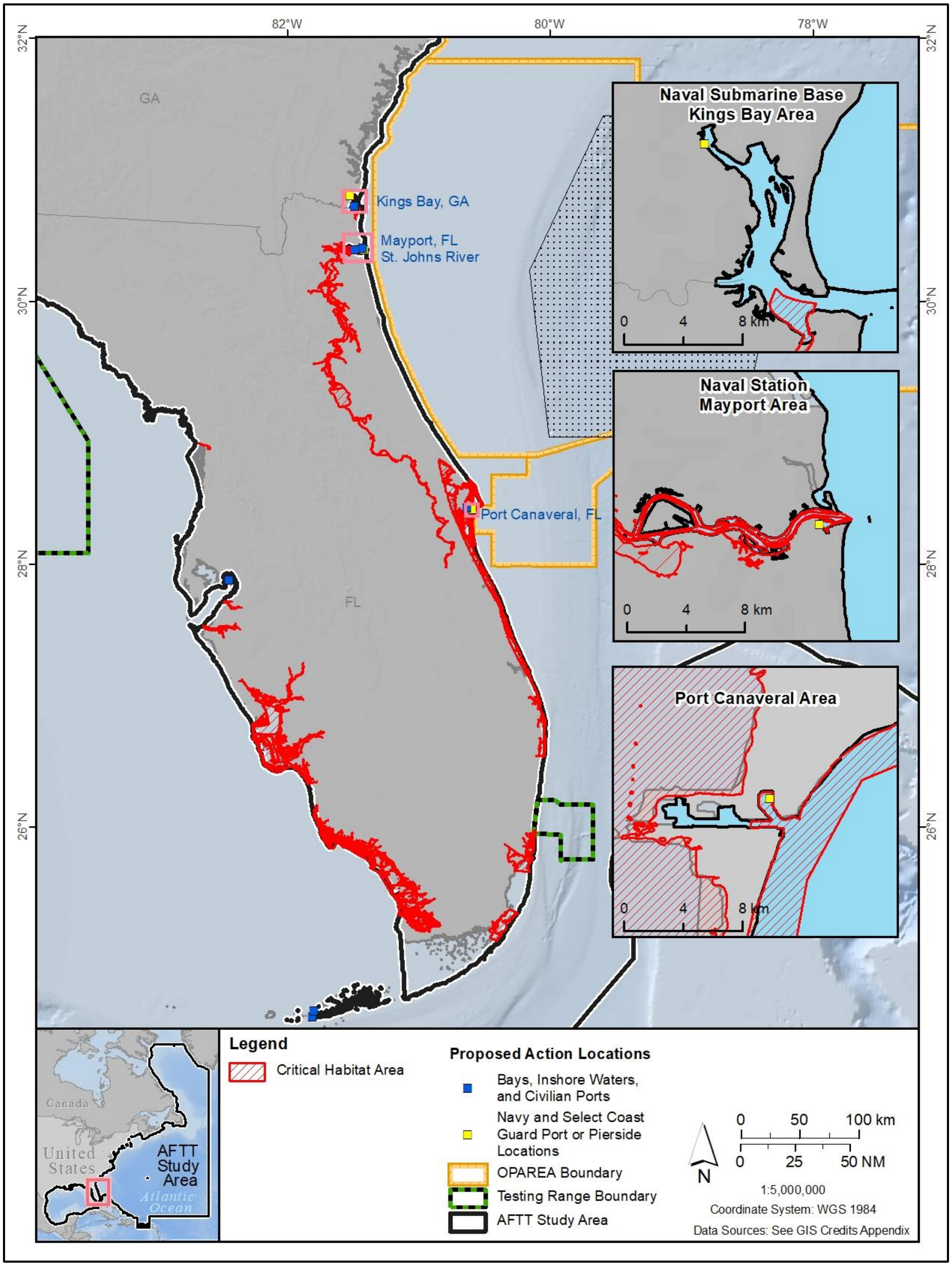
[17]The West Indian manatee is managed by the USFWS.

Notes: % = percent; AFTT = Atlantic Fleet Training and Testing; CV = coefficient of variation; EEZ = Exclusive Economic Zone; EIS = Environmental Impact Statement; ESA = Endangered Species Act; GOMEX = Gulf of Mexico; JAX = Jacksonville; Min. = minimum; MMPA = Marine Mammal Protection Act; NMFS = National Marine Fisheries Service; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; RC = Range Complex; SAR = Stock Assessment Report; SFOMF = South Florida Ocean Measurement Facility Testing Range; U.S. = United States; USFWS = U.S. Fish and Wildlife Service; VACAPES = Virginia Capes



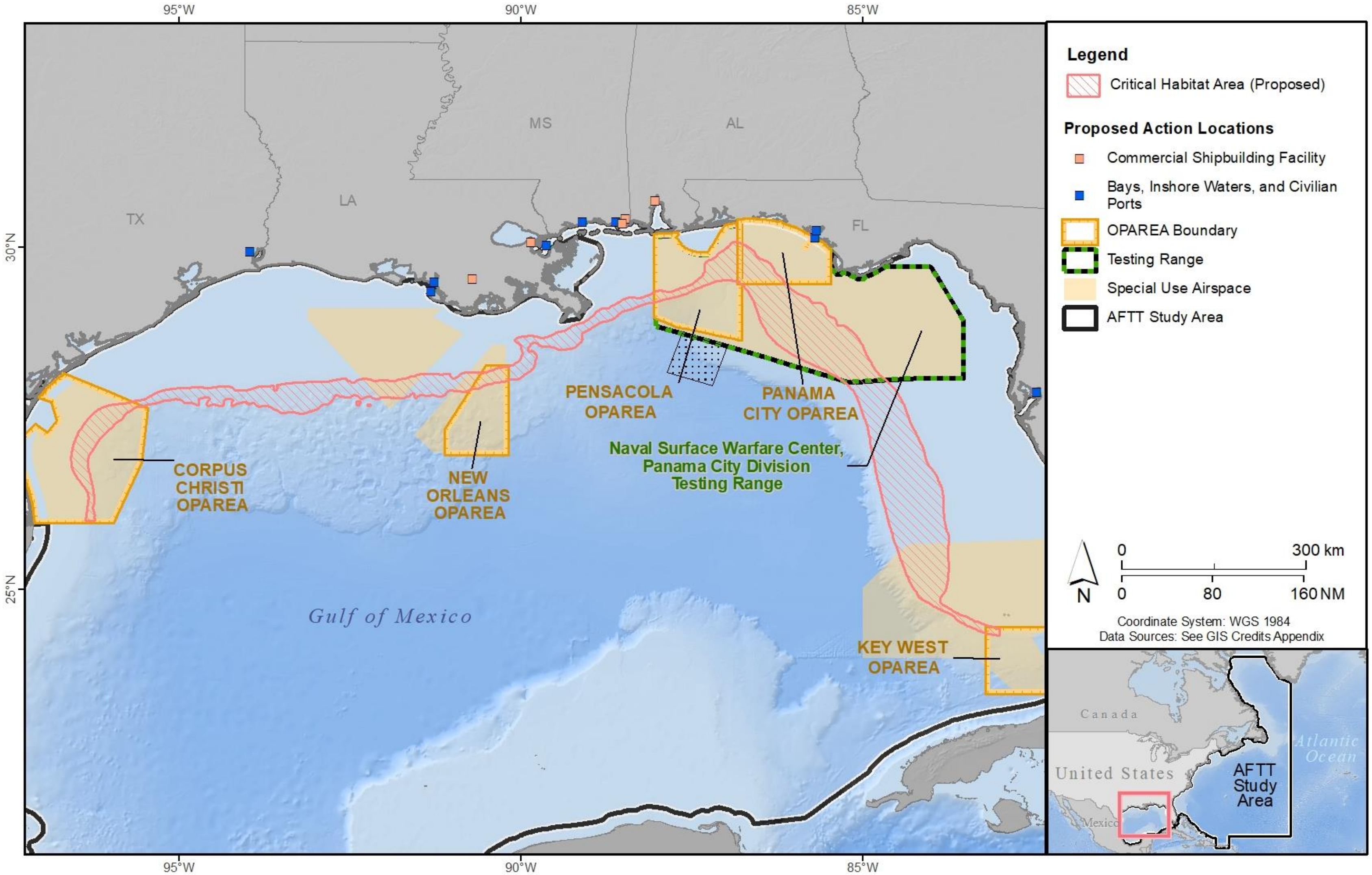
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Figure 3.7-1: Designated Critical Habitat for North Atlantic Right Whales in the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; FL = Florida; GA = Georgia; OPAREA = operating area

Figure 3.7-2: Designated Critical Habitat for West Indian Manatees in the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.7-3: Proposed Critical Habitat for Rice's Whales in the Study Area

3.7.3 Environmental Consequences

Under the No Action Alternative for all stressors and substressors, the Action Proponents would not conduct any of the proposed military readiness activities in the Study Area. Therefore, baseline conditions of the existing environment for marine mammals would either remain unchanged, or would improve after cessation of ongoing military readiness activities. The No Action Alternative is not analyzed further within this section.

This section evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) and the stressors described in Section 3.0.3.3 (Identifying Stressors for Analysis) could potentially impact marine mammals known to occur within the Study Area. With noted exceptions, the environmental consequences are not meaningfully different from what is described in the 2018 Final EIS/OEIS.

The Action Proponents conducted a review of changes in regulatory status and scientific information since 2018 that could alter the stressor analysis presented in the 2018 Final EIS/OEIS. The review identified one newly identified marine mammal species that also has ESA-listing status (Rice's whale; formerly known as the Gulf of Mexico Bryde's whale). The review also concluded that for marine mammals in general, the background information in the 2018 Final EIS/OEIS remains valid for energy stressors. The following stressors have updated background information: (1) acoustics, (2) explosives, (3) physical disturbance and strike. A large body of new literature and/or affected environment data prompted the reanalysis of all or portions of these stressors (refer to Appendix D, Acoustic and Explosive Impacts Supporting Information, and Appendix G, Non-Acoustic Impacts Supporting Information).

The stressors and substressors analyzed for marine mammals in this chapter include the following:

- **acoustic** (sonar and other transducers; air guns; pile driving; vessel noise; aircraft noise; and weapons noise)
- **explosives** (explosions in-air [near the water surface]; explosions in-water)
- **energy** (in-water electromagnetic devices; high-energy lasers)
- **physical disturbance and strike** (vessels and in-water devices; military expended materials; seafloor devices)
- **entanglement** (wires and cables; decelerators/parachutes; biodegradable polymers)
- **ingestion** (military expended materials – munitions; military expended materials other than munitions)

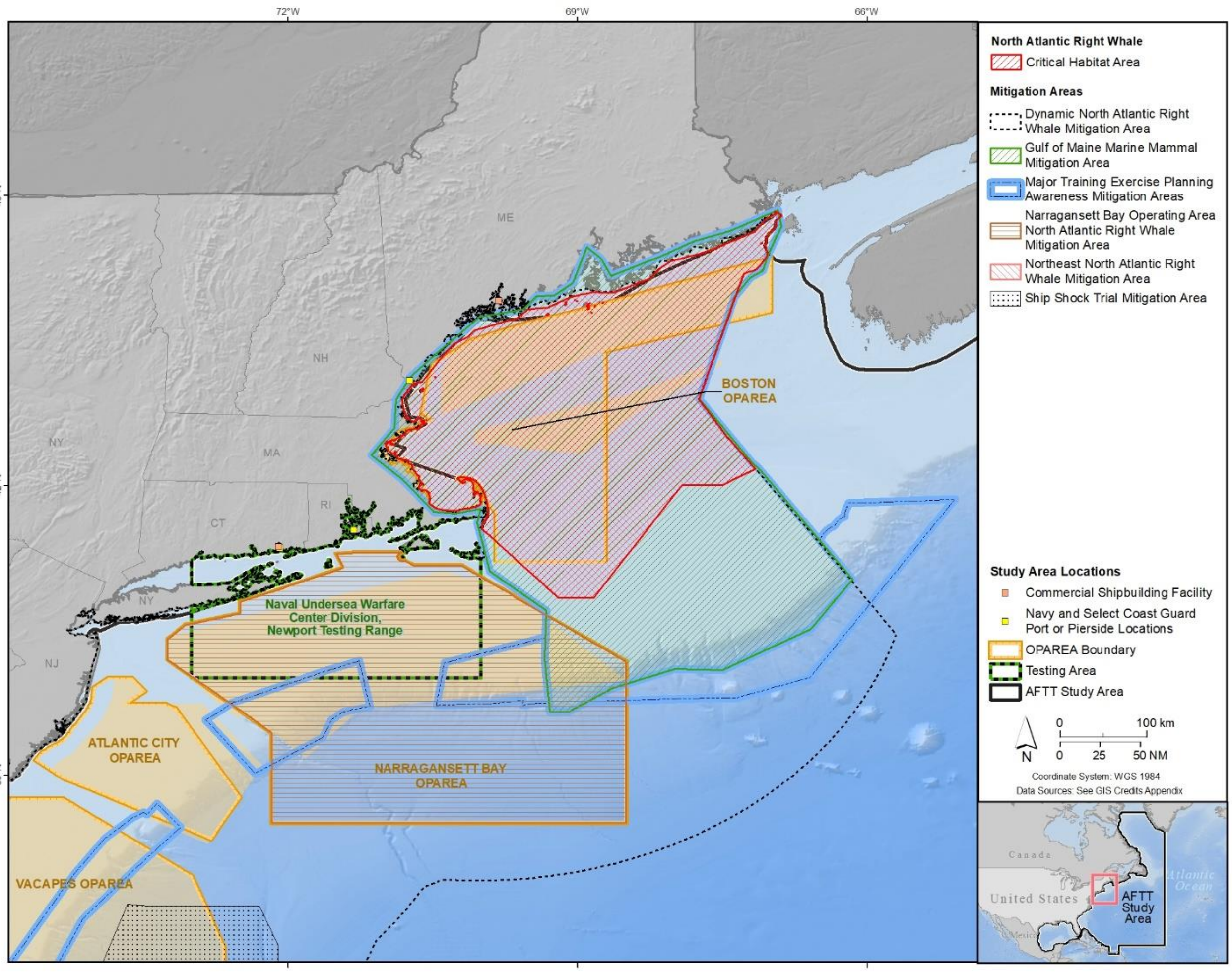
A discussion of secondary stressors, to include the potential impacts to habitat or prey availability, and the potential impacts of all the stressors combined are provided at the end of this section.

The analysis of potential impacts to marine mammals considers the standard operating procedures and mitigation measures that the Action Proponents will implement under Alternative 1 and Alternative 2 of the Proposed Action. Standard operating procedures relevant to marine mammals are detailed in Appendix A (Activity Descriptions, Section A.1.7, Standard Operating Procedures). Details on mitigation measures are provided in Chapter 5 (Mitigation). Standard operating procedures and mitigation relevant to marine mammals are summarized in Table 3.7-2 and relevant mitigation areas are shown in Figure 3.7-4 through Figure 3.7-7. Unlike in the prior analysis, model-predicted impacts due to sonar and explosives are not reduced to account for visual observation mitigation.

Table 3.7-2: Mitigation Requirements Summary by Stressor

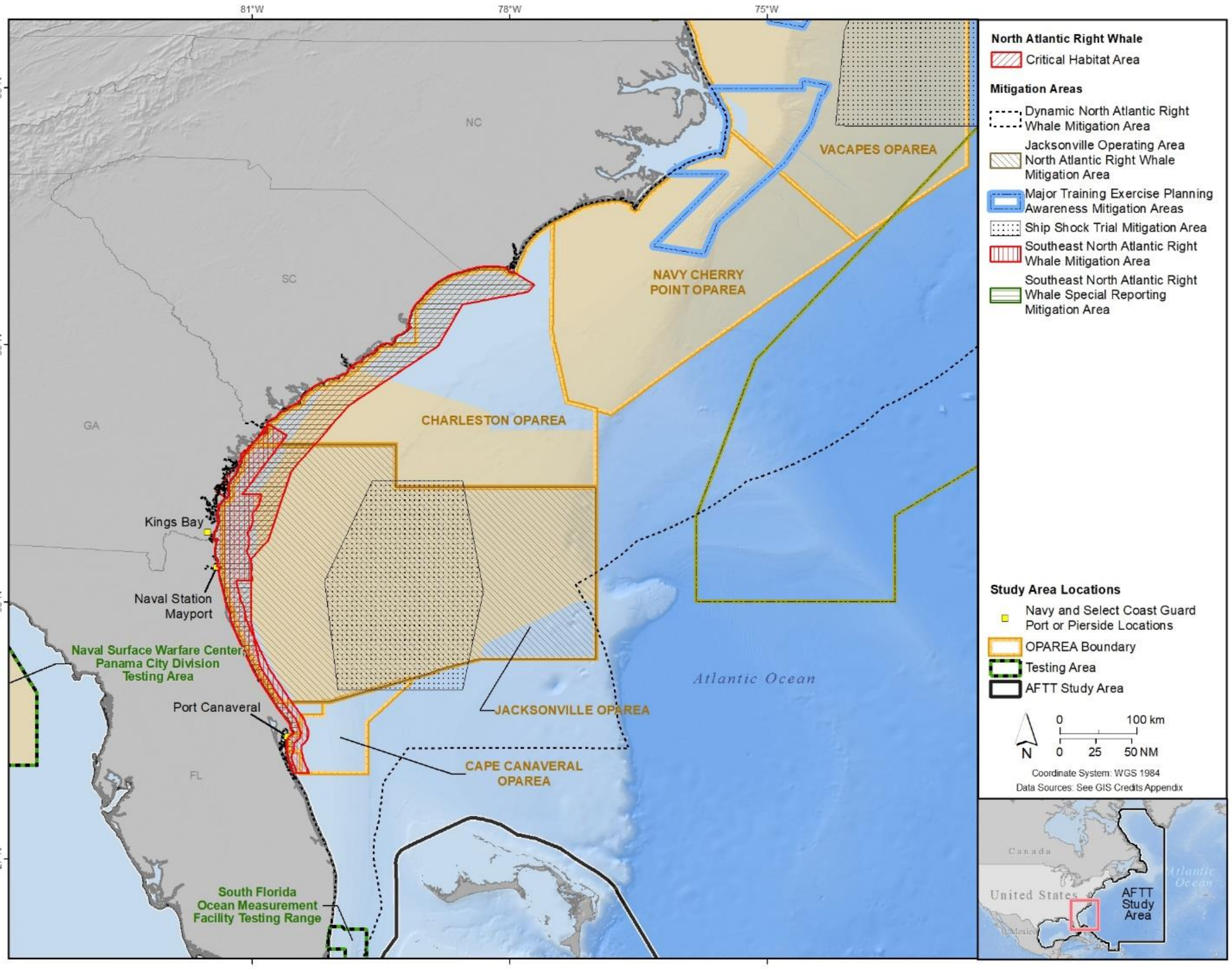
Applicable Stressor	*Requirements Summary and Protection Focus*	*Section Reference*
Acoustics	Conduct visual observations for events involving active acoustic sources, pile driving, and weapons firing noise.	Section 5.6 (Visual Observations)
	Restrictions on use of active acoustic stressors within mitigation areas, marine mammal foraging, reproduction, migration, and critical habitat.	Section 5.7.7 (Inshore Manatee and Sea Turtle Mitigation Areas) Section 5.7.10 (Northeast North Atlantic Right Whale Mitigation Area) Section 5.7.12 (Jacksonville Operating Area North Atlantic Right Whale Mitigation Area) Section 5.7.13 (Southeast North Atlantic Right Whale Mitigation Area) Section 5.7.15 (Dynamic North Atlantic Right Whale Mitigation Areas) Section 5.7.39 (Gulf of Maine Marine Mammal Mitigation Area) Section 5.7.16 (Gulf of Mexico Rice's Whale Mitigation Area)
Explosives	Conduct visual observations for events involving 10 explosive mitigation categories.	Section 5.6 (Visual Observations)
	Restrictions on use of explosive stressors within mitigation areas, marine mammal foraging, reproduction, migration, and critical habitat.	Section 5.7.8 (Ship Shock Trial Mitigation Areas) Section 5.7.10 (Northeast North Atlantic Right Whale Mitigation Area) Section 5.7.12 (Jacksonville Operating Area North Atlantic Right Whale Mitigation Area) Section 5.7.13 (Southeast North Atlantic Right Whale Mitigation Area) Section 5.7.15 (Dynamic North Atlantic Right Whale Mitigation Areas) Section 5.7.16 (Gulf of Mexico Rice's Whale Mitigation Area)
Physical disturbance and strike	Conduct visual observations for events involving six mitigation categories.	Section 5.6 (Visual Observations)
	Restrictions on use of physical disturbance and strike stressors within mitigation areas for marine mammal foraging, reproduction, and migration, and critical habitat.	Section 5.7.7 (Inshore Manatee and Sea Turtle Mitigation Areas) Section 5.7.10 (Northeast North Atlantic Right Whale Mitigation Area) Section 5.7.12 (Jacksonville Operating Area North Atlantic Right Whale Mitigation Area) Section 5.7.13 (Southeast North Atlantic Right Whale Mitigation Area) Section 5.7.15 (Dynamic North Atlantic Right Whale Mitigation Areas)

In the analysis for this Supplemental EIS/OEIS, marine mammal species may be grouped together based on similar biology (e.g., hearing) or behaviors (e.g., feeding or expected reaction to stressors) when most appropriate for the analysis. For some stressors, species are grouped based on their taxonomic relationship and discussed as follows: mysticetes (baleen whales), odontocetes (toothed whales), pinnipeds (seals), and the West Indian manatee. When impacts are expected to be similar for all species or when it is determined there is no impact on any species, the discussion will be general and not species-specific. However, when impacts are not the same to certain species or groups of species, the discussion will be as specific as the best available data allow. In addition, if activities only occur in or will be concentrated in certain areas, the discussion will be geographically specific. Based on acoustic thresholds and criteria developed with NMFS, impacts from sound sources as acoustic stressors will be quantified at the species or stock level as is required by the Marine Mammal Protection Act (MMPA).



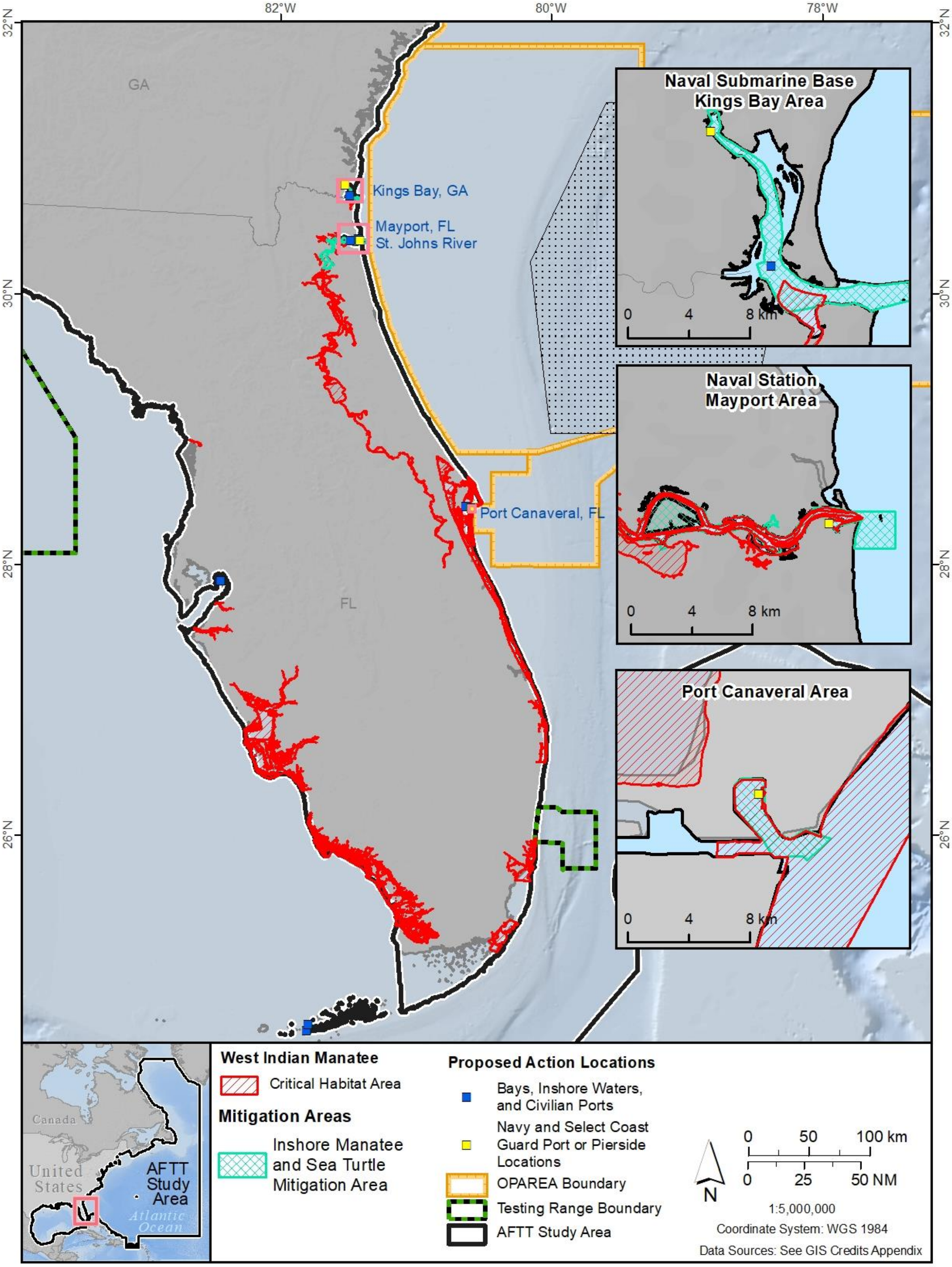
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; VACAPES = Virginia Capes Operating Area

Figure 3.7-4: Northeast and Mid-Atlantic Mitigation Areas for North Atlantic Right Whale in the Study Area



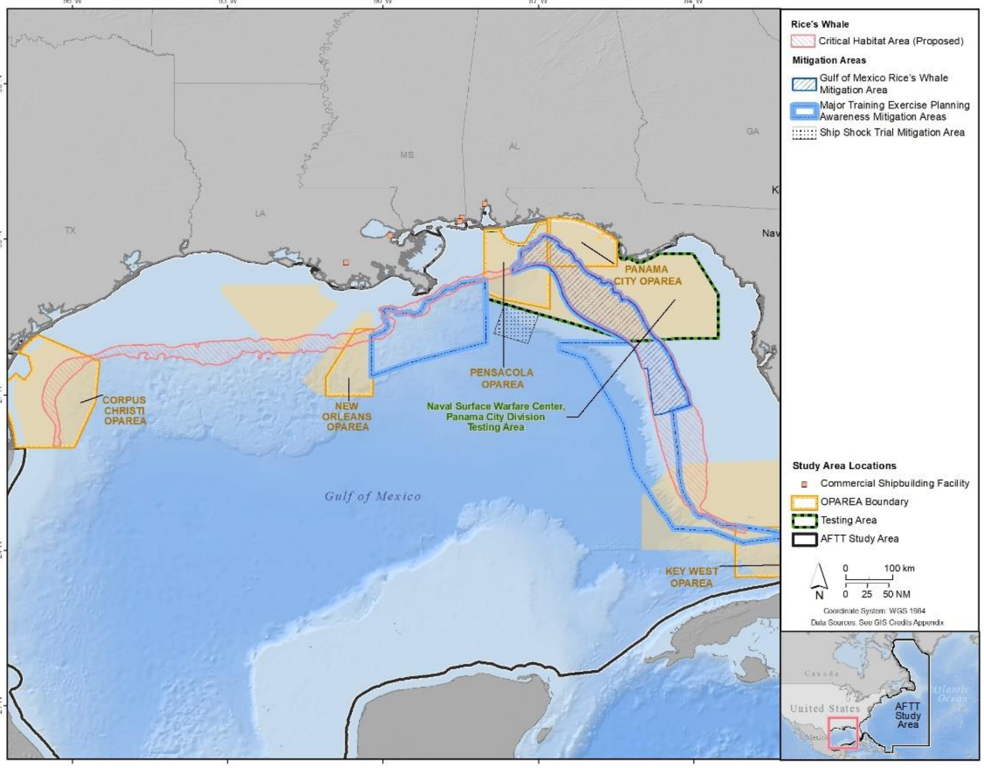
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes Operating Area

Figure 3.7-5: Southeast Mitigation Areas for North Atlantic Right Whale in the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.7-6: Mitigation Areas for West Indian Manatee in the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.7-7: Mitigation Areas for Rice's Whale in the Study Area

Criteria for determining the significance of Proposed Action stressors on marine mammals are described in Table 3.7-3. The analysis under each substressor and alternative provides the technical support for these determinations, with reference to supporting appendices for details.

Table 3.7-3: Criteria for Determining the Significance of Proposed Action Stressors on Marine Mammal Populations

Impact Descriptor	*Context and Intensity*	*Significance Conclusions*
Negligible	Impacts would be temporary (lasting up to several hours) and within the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. Impacts could include disturbances to communication and/or echolocation and behaviors of individuals without interference to feeding, reproduction, or other biologically important functions affecting population levels. There would be no displacement of marine mammals from preferred breeding, feeding, or nursery grounds, migratory routes, or designated critical habitat.	Less than significant
Minor	Impacts would be temporary or short term (lasting several days to several weeks) but within the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. Impacts could include non-life-threatening injury to individual marine mammals and disruptions of behavioral patterns, including occasional disruption of communication and/or echolocation,	

Table 3.7-3: Criteria for Determining the Significance of Proposed Action Stressors on Marine Mammal Populations (continued)

Impact Descriptor	*Context and Intensity*	*Significance Conclusions*
	behavioral disturbance of individuals or groups of marine mammals, and displacement of individuals or groups without interference to feeding, reproduction, or other biologically important functions affecting population levels. Displacement of marine mammals from preferred breeding, feeding, or nursery grounds, migratory routes, or designated critical habitat would be limited to the project area or its immediate surroundings.	
Moderate	Impacts would be short term or long term (lasting several months or longer) and outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. Impacts could include injury (up to and including mortality) and repeated disruptions of communication and/or echolocation and time-sensitive behaviors such as feeding and breeding, but in low enough numbers such that the continued viability of the population is not threatened. Behavioral responses to disturbance by individuals or groups could be expected in the project area, its immediate surroundings, or beyond, including extended displacement of individuals from preferred breeding, feeding, or nursery grounds, migratory routes, or designated critical habitat.	
Major	Impacts would be short term or long term and well outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. Impacts could include extensive (i.e., affecting a large proportion of the local population), life-threatening, or debilitating injury and mortality and substantial disruption of communication and/or echolocation and time-sensitive behaviors such as breeding so that the continued viability of the local population is seriously threatened. Displacement from preferred breeding, feeding, or nursery grounds, migratory routes, or designated critical habitat would be short term or long term within and well beyond the project area. Full recovery of a population would not be expected to occur in a reasonable time.	Significant

3.7.3.1 Acoustic Stressors

The acoustic substressors included for analysis are (1) sonar and other transducers (hereinafter referred to as sonars), (2) air guns, (3) pile driving, (4) vessel noise, (5) aircraft noise, and (6) weapons firing noise. Table 3.7-4 contains brief summaries of background information relevant to the analyses of impacts for each acoustic substressor on marine mammals. Detailed information on acoustic terminology used in this analysis and acoustic impact categories in general, as well as a summary of best available science on effects to marine mammals specific to each substressor, are provided in Appendix D (Acoustic and Explosive Impacts Supporting Information). For a listing of the types of activities that use or produce acoustic stressors, refer to Appendix A (Activity Descriptions) and Appendix B (Activity Stressor Matrices). The types and quantities of sonar sources, air guns, and pile driving, the number of events using vessels and aircrafts and the locations of those events under each alternative are shown in Section 3.0.3.3.1 (Acoustic Stressors).

Table 3.7-4: Acoustic Stressors Background Information Summary

Substressor	*Background Information Summary*
Sonar and other transducers	Sonar and other transducers may result in hearing loss, masking, physiological stress, or behavioral reactions. Behavioral responses can depend on the characteristics of the signal, behavioral state of the animal, sensitivity and previous experience of an individual, and other contextual factors including distance of the source, movement of the source, physical presence of vessels, time of year, and geographic location. Different groups of marine mammals may respond in different ways to sonar and other transducers: • Mysticetes: species are within the Low Frequency (LF) and Very Low Frequency (VLF) hearing groups. Low-frequency and mid-frequency active sonar may cause masking, behavioral responses, and hearing impacts. Mysticetes are less likely to be affected by high-frequency sonars and very-high-frequency sonars that are above their hearing range. While sonar could have a greater impact to whale behavior within seasonal foraging and breeding grounds, mysticetes are more adaptive while migrating. • Odontocetes: species are within the High Frequency (HF) and Very High Frequency (VHF) hearing groups. Active sonars may result in masking, behavioral responses, noise-induced vocal modification, and hearing impacts. Mid-frequency active and high-frequency active sonars are more likely to result in masking and hearing impacts than other sonars. Harbor porpoises and beaked whales are more sensitive to disturbance than other odontocetes. • Pinnipeds: species within the Study Area are all within the phocid carnivores in water and in air (PCW and PCA: true seals) hearing group. Mid-frequency and high-frequency active sonars are more likely to result in hearing loss. In addition, mid-frequency active sonar could mask underwater vocalizations. Very-high-frequency active sonars are outside of the hearing range of phocid seals. Animals are most likely to respond to nearby or approaching sonar. • Sirenians: West Indian manatee, the only Sirenian (SI) within the Study Area, is within the SI hearing group. Mid-frequency and high-frequency active sonar may result in hearing loss and masking. Little information is available on manatee responses to sonars, although responses to pingers and tones have been reported.
Vessel disturbance (including vessel noise)	Vessel disturbance may result in masking, physiological stress, or behavioral reactions. Behavioral responses to vessels can be caused by multiple factors. Vessel sound exposure is rarely decoupled from the physical presence of a surface vessel. In some more industrialized or populated areas, vessel noise is a chronic and frequent stressor. Different groups of marine mammals may respond in different ways to vessels disturbance. • Mysticetes: Vocalizations are likely to be masked or otherwise affected (noise-induced vocal modification) by vessel noise, resulting in decreased communication space. Responses to vessel disturbance are varied and include not responding at all (e.g., North Atlantic right whales) to approaching vessels, as well as both horizontal (swimming away) and vertical (increased diving) avoidance. Stress hormones in North Atlantic right whales may be negatively affected by increased ship traffic and ocean noise. • Odontocetes: Communication calls are more likely to be masked by vessel noise than echolocation, but masking of echolocation is possible. Responses to vessel disturbance includes both attraction (e.g., bowriding) and avoidance behaviors by more sensitive species (e.g., Kogia whales and beaked whales) or individuals. Many noise-induced vocal modifications and short-term responses to boat traffic have been documented. • Pinnipeds: Underwater vocalizations may be masked by vessel noise. Responses to vessel disturbance are varied and include avoidance, alerting, and reduced time feeding, resting, or nursing. Others demonstrate in-water attraction or a lack of significant reaction when hauled out, suggesting habituation to or tolerance of vessels. • Sirenians: Manatees generally seek out areas with a lower density of vessels and are prone to habitat displacement. They will fluke or attempt to avoid approaching vessels by increasing their speed, moving toward deeper water, changing their heading or depth, or rolling. However, they may not be able to determine the direction of approaching vessels

Table 3.7-4: Acoustic Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
	in shallow water and are more likely to avoid if given more time from slower moving vessels.
Aircraft disturbance (including aircraft noise)	Aircraft disturbance may result in masking, physiological stress, or behavioral reactions. Aircraft sound exposure is rarely decoupled from the physical presence of an aircraft. Different groups of marine mammals may respond in different ways to aircraft disturbance. • Mysticetes: Typically whales either ignore or occasionally dive in response to aircraft overflights. Some whales may avoid helicopters or fixed-wing aircraft, but UAVs have not produced responses in any mysticete species. • Odontocetes: Responses to aircraft disturbance is varied, but overall, little change in behavior has been observed. Some odontocetes will fluke, flipper slap or avoid the noise source, particularly sensitive species like beaked whales or Kogia whales. Helicopters may elicit a greater reaction in odontocetes, but do not appear responsive to smaller UAVs except at low altitudes. • Pinnipeds: Responses are dependent on aircraft variables (e.g., altitude, distance, noise abruptness), and pinniped life cycle stage (e.g., breeding and molting). Pinnipeds may be more responsive to UAVs at low altitudes since they could resemble predatory birds but have generally the same possible reactions to all type of aircraft. They may startle, orient towards the sound source, increase vigilance, or briefly re-enter the water, but are generally unresponsive to crewed overflights and typically remain hauled out or immediately return to their haul out location. • Sirenians: Few reactions to aircraft disturbance have been reported. Limited studies suggest that sirenians may not respond to UAVs or fixed-wing aircraft, but like odontocetes, may be more responsive to helicopters.
Impulsive noise (includes air guns, pile driving, and weapons firing)	Impulsive noise may result in hearing loss, masking, physiological stress, or behavioral reaction. The intermittent nature of most impulsive sounds would result in very limited probability of any masking effects. Due to the rapid rise time and higher instantaneous peak pressure of impulsive noise, nearby noise is more likely to cause startle or avoidance responses. Different groups of marine mammals may respond in different ways to impulsive noise: • Mysticetes: LF and VLF species are likely impacted since low-frequency explosive noise propagates long distances and overlaps with the range of best hearing for mysticetes. They have shown a variety of responses to impulsive noise, including avoidance, habitat displacement, reduced surface intervals, altered swimming behavior, and changes in vocalization rates. • Odontocetes: Impulsive noise can result in hearing loss for VHF and HF odontocetes, with the VHF group exhibiting greater sensitivity. Masking effects are possible but release from masking during the silent period between sounds is likely. Most odontocetes are behaviorally less sensitive to impulsive noise than mysticetes, with responses occurring at much closer distances, except for harbor porpoises that avoid both stationary and moving impulsive sources. • Pinnipeds: Pinnipeds may experience hearing effects before exhibiting a behavioral response. No significant behavioral reactions to impulsive noise have been recorded in pinnipeds; they are the least behaviorally sensitive taxonomic group in the action area. Pinnipeds are only likely to respond to loud impulsive noises at close ranges by startling, jumping into the water when hauled out, or ceasing foraging, but only for brief periods before returning to their previous behavior. • Sirenians: No information is available on sirenian responses to impulsive noise.

Notes: HF = high frequency; LF = low frequency; PCA = phocid carnivores in water; PCW = phocid carnivores in water; SI = Sirenian; UAV = unmanned aerial vehicle; VHF = very high frequency; VLF = very low frequency;

The quantitative analyses of impacts due to sonars, air guns, and pile driving in this section supplant the quantitative analyses in the 2018 Final EIS/OEIS. In addition to changes in the Proposed Action, changes in the predicted acoustic impacts due to sonars, air guns, and pile driving compared to the 2018 Final EIS/OEIS are due to the following:

- Updates to criteria used to determine if exposures to acoustic stressors may cause auditory effects and behavioral responses. Changes to the auditory effects criteria include changes to some hearing group divisions and names. The Low Frequency (LF) cetacean group containing mysticete cetaceans was split into two auditory groups: Very Low Frequency (VLF) cetaceans and LF cetaceans. The group previously called the Mid-Frequency (MF) cetaceans (most odontocetes) is now called the High-Frequency (HF) cetaceans. The group previously called the HF cetaceans (harbor porpoises and *kogia* species) is now called the Very High Frequency (VHF) cetaceans. For non-impulsive sounds like sonars, the HF cetacean, Phocid in Water (PCW), and Otariid in Water (OCW) groups are predicted to have increased susceptibility to auditory effects; the VHF cetaceans are predicted to have decreased susceptibility to auditory effects; and the new LF group is predicted to be more susceptible to effects at higher frequencies than the VLF group. For impulsive sounds like air guns and impact pile driving, HF cetaceans are predicted to be more susceptible to auditory effects, especially at low to mid-frequencies, where most explosive energy is concentrated. Peak pressure thresholds increased for VLF and LF cetaceans and decreased for PCW. Susceptibility to auditory effects for the Sirenian (SI) group increased slightly for both impulsive and non-impulsive sounds. For behavioral response criteria, the behavioral response functions for sonars were revised to include experimental behavioral response data available since the prior analysis. Beaked whales and harbor porpoises were placed in a new Sensitive behavioral group with an associated behavioral response function. The cut-off conditions for the behavioral response functions were also revised. A summary of these changes is in Appendix E (Acoustic and Explosives Impact Analysis). For additional details see the technical report *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase IV)* (U.S. Department of the Navy, 2024a).
- Revisions to the modeling of acoustic effects due to sonars and air guns in the Navy Acoustic Effects Model, including incorporation of a new sonar avoidance model. A summary of these changes is in Appendix E (Acoustic and Explosives Impact Analysis). For additional details, see the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (U.S. Department of the Navy, 2024b).
- Updates to data on marine mammal presence, including estimated density of each species or stock (number of animals per unit area), group size, and depth distribution. For additional details, see the technical reports *U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area* (U.S. Department of the Navy, 2024c) and *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii-California Training and Testing Study Areas (Oliveira et al., 2024)*.
- Changes in how mitigation is considered in reducing model-predicted impacts. The number of model-predicted auditory injuries are not reduced due to visual observation mitigation, unlike in prior analyses.

The following sections summarize impacts due to acoustic stressors on marine mammals. A comprehensive analysis of impacts due to acoustic and explosive stressors is in Appendix E (Acoustic and Explosives Impact Analysis), where impacts to marine mammal stocks are assessed considering species life history traits, susceptibility to impacts, and potential for repeated impacts to individuals based on acoustic impacts modeling. Appendix E also assesses impacts to critical habitat for ESA-listed species. While model-predicted impacts are summarized for sonar, air guns, and pile driving in the sections below, Appendix E provides additional detail on modeled impacts to each stock, including seasons and regions in which impacts are most likely to occur; which activities are most likely to cause impacts; and how impacts are summed to estimate maximum annual and seven-year total impacts.

3.7.3.1.1 Impacts from Sonars and Other Transducers

Table 3.7-4 contains a summary of the background information used to analyze the potential impacts of sonars and other transducers (hereinafter inclusively referred to as sonars) on marine mammals. Other transducers include items such as acoustic projectors and countermeasure devices. As discussed, in Section 3.0.1.1.1 (Acoustic Stressors), a detailed comparison of sonar quantities analyzed in the 2018 Final EIS/OEIS with sonar quantities under this Proposed Action is not feasible due to changes in the source binning process.

The below information briefly summarizes information relevant to the assessment of the impacts of sonars on marine mammals under the Proposed Action. A more extensive assessment of the impacts on marine mammals due to exposure to sonars under this Proposed Action is in Appendix E (Acoustic and Explosives Impact Analysis).

Sonars have the potential to affect marine mammals by causing auditory injuries, temporary hearing threshold shifts (TTS), masking, non-injurious physiological responses (such as stress), or behavioral reactions. Low- (less than 1 kilohertz [kHz]), mid- (1 to 10 kHz) frequency sonars, and some high (10 to 100 kHz) frequency sonars are within hearing range of all marine mammals. Additionally, all high- and very high-frequency (100 to 200 kHz) sonars are in the hearing range of all odontocetes (HF and VLF hearing groups).

Sonars with higher source levels, longer durations, higher duty cycles, and frequencies near the best range of hearing are more likely to affect hearing. Due to their high source levels and low transmission loss (compared to higher frequency sources), anti-submarine warfare sonar sources, including hull-mounted sonar (MF1) and high duty cycle hull-mounted sonar (MF1C), have large zones of effects. The ranges to auditory effects for MF1, MF1C, and other selected sonars are in in Appendix E (Acoustic and Explosive Impacts Analysis for Marine Mammals, Reptiles, and Fishes in the Atlantic Fleet Training and Testing Study Area).

In general, the estimated number of predicted auditory impacts has increased since the 2018 Final EIS/OEIS. While some increases may be attributable to changes in the Proposed Action, most increases are due to changes in methodologies used to model impacts that are listed above in Section 3.7.3.1 (Acoustic Stressors). Notably, the updated criteria for the HF cetacean auditory group, which includes delphinids and most other odontocetes, and the PCW auditory group indicate increased susceptibility to auditory effects at low and mid-frequencies compared to the prior auditory criteria. Consequently, predicted auditory effects due to most anti-submarine warfare sonars are substantially higher for these groups than in prior analyses of the same activities. The change in susceptibility to auditory impacts due to sonars is less pronounced for other auditory groups. For most auditory groups, the revision to the avoidance model, which assumes that some marine mammals may avoid sound levels that can cause auditory injury, has also resulted in increased estimates of auditory injuries for certain activities, particularly certain high duty cycle sources. The revised avoidance method bases the initiation of an avoidance response on the behavioral response criteria. The ability to avoid a sonar exposure that may cause auditory impacts in the model depends on a species' susceptibility to auditory effects, a species' sensitivity to behavioral disturbance, and characteristics of the sonar source, including duty cycle, source level, and frequency. Thus, predicted auditory impacts for species that are less sensitive to disturbance compared to susceptibility to auditory effects have increased.

Most anti-submarine warfare sonars are composed of individual sounds which are short, lasting up to a few seconds each. Systems typically operate with low-duty cycles for most tactical sources, but some systems may operate nearly continuously or with higher duty cycles. Some testing activities may also use sonars with high duty cycles. These higher duty cycle sources would pose a greater risk of masking than intermittent sources. Most anti-submarine warfare activities are geographically dispersed, have a limited duration, and intermittently use sonars with a narrow frequency band. These factors reduce the potential for significant or extended masking in marine mammals.

The number of predicted behavioral impacts has changed for all stocks since the prior analysis. These changes are primarily due to revisions to the behavioral response functions. The updated behavioral response functions predict greater sensitivity for the pinniped behavioral group and lower sensitivity for the odontocete and mysticete behavioral groups compared to the previous behavioral response functions. The new function for the sensitive species behavioral group predicts greater sensitivity at lower received levels for beaked whales and harbor porpoises. In addition, the cut-off conditions for predicting behavioral responses have been revised. These factors interact in complex ways that make comparing the predicted behavioral responses in this analysis to the prior analyses challenging.

As discussed in Section 3.7.3 (Environmental Consequences), the Action Proponents will implement visual observation mitigation under Alternative 1 and Alternative 2 to reduce potential impacts from sonar on marine mammals. While model-predicted impacts are not reduced to account for visual observation mitigation, opportunities to mitigate model-predicted impacts were identified by determining if the closest points of approach associated with predicted auditory injuries were also within the mitigation zone. This analysis is presented in Appendix E (Acoustic and Explosives Impact Analysis, Section 2.3.2).

The Action Proponents will also implement geographic mitigation to reduce potential acoustic impacts within important marine mammal habitats as identified in Table 3.7-2. Some of the geographic mitigations limit the use of certain sonars. Table 3.7-5 lists these geographic mitigations and whether their requirements are reflected in the model-predicted impacts to marine mammals presented below. It does not list other geographic mitigation that may still reduce impacts but cannot be modeled, such as pre-event planning, awareness notification messages, or obtaining Early Warning System North Atlantic right whale sighting data.

Table 3.7-5: Geographic Mitigation Reflected in the Sonar Modeling Results

Geographic Mitigation Section Reference	***Reflected in Modeling Results?***	***Summary of Relevant Mitigation***
Section 5.1.3 (Major Training Exercise Planning Mitigation Areas)	Yes	• Limits on the annual number of Major Training Exercises
Section 5.1.4 (Northeast North Atlantic Right Whale Mitigation Area)	No	• Minimization of low-frequency active sonar, mid-frequency active sonar, and high-frequency active sonar
Section 5.1.5 (Gulf of Maine Marine Mammal Mitigation Area)	Yes	• Limit of 200 hours of surface ship hull-mounted mid-frequency active sonar annually
Section 5.1.7 (Southeast North Atlantic Right Whale Mitigation Area)	No	• No use of, or minimization of, certain active sonar sources from November 15 to April 15
Section 5.1.9 (Gulf of Mexico Rice's Whale Mitigation Area)	Yes	• Limit of 200 hours of surface ship hull-mounted mid-frequency active sonar annually

3.7.3.1.1.1 Impacts from Sonar and Other Transducers under Alternative 1

Under Alternative 1, the overall use of sonar and other transducers would decrease from the 2018 Final EIS/OEIS for both training and testing activities for most sources. Compared to the prior analysis, the Action Proponent proposes to use fewer hours of hull-mounted surface ship sonar (greater than 40 percent fewer for regular duty cycle [MF1] and greater than 20 percent fewer for high duty cycle sonar [MF1C]) and 50 percent fewer hours of hull-mounted submarine sonars in the Study Area during training and testing activities.

Under Alternative 1, the number and location of training activities using sonar would be similar to those analyzed in the 2018 Final EIS/OEIS. The following notable changes would occur:

- There would be fewer Integrated and Coordinated Anti-Submarine Warfare training activities in the Virginia Capes, Navy Cherry Point, and Jacksonville Range Complexes.
- Mine Warfare activities would newly occur in the Key West Range Complex.
- Unmanned Underwater Vehicle Training – Certification and Development would newly occur in the Gulf of Mexico, Jacksonville, Navy Cherry Point, Virginia Capes, and Northeast Range Complexes, as well as Virginia Capes Range Complex Inshore.

Under Alternative 1, the following are new activities or location-specific increases compared to the previous analysis in the 2018 Final EIS/OEIS for testing activities using sonars:

- There would be a notable increase in Anti-Submarine Warfare activities in the high seas; Bath, Maine; NS Norfolk; NS Mayport; Pascagoula, Mississippi; and the Gulf of Mexico Range Complex.

- There would be a notable increase in Mine Warfare testing events in the Gulf of Mexico Range Complex and the Naval Surface Warfare Center Panama City Testing Range.

For most other locations, there would be a decrease or a similar number of activities that involve the use of sonar compared to the 2018 Final EIS/OEIS.

The number of impacts to each stock due to exposure to sonar during testing and training under Alternative 1 are shown in Table 3.7-6 for a maximum year of activities and in Table 3.7-7 for seven years of activities. Depending on the stock, impacts to individuals may be permanent (auditory injuries) or temporary (TTS, masking, stress, or behavioral response). Behavioral patterns of some individuals, which may include communication, foraging, or breeding, are likely to be temporarily disrupted. Individuals or groups may avoid areas around sonar activities and be temporarily displaced from a preferred habitat. Displacement may be brief for short duration activities or extended for multi-day events and would depend on the behavioral sensitivity of the species. Sensitive species, particularly beaked whales, may avoid for farther distances and for longer durations. Most activities do not occur for extended multi-day periods and would occur over small areas relative to population ranges. The average rate of predicted impacts to individuals in most populations would range from less than once per year to several times per year. Individuals of some behaviorally sensitive species or in populations concentrated near range complexes in the Atlantic may have higher repeated impacts. These impacts are not expected to interfere with feeding, reproduction, or other biologically important functions such that the continued viability of the population would be threatened. The analysis conclusions for impacts due to sonar during training and testing activities under Alternative 1 are consistent with a minor to moderate impact on marine mammals.

Under the MMPA, the use of sonar and other transducers during military readiness activities as described under Alternative 1 would result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA. As required by section 101(a)(5)(a) of the MMPA, the Action Proponents are requesting authorization from NMFS to take marine mammals incidental to the use of sonar and other transducers during military readiness activities.

Table 3.7-6: Impacts Due to a Maximum Year of Sonar Testing and Training Activity under Alternative 1 and Alternative 2

Species	*Stock*	*Alternative 1*			*Alternative 2*		
		BEH	*TTS*	*AINJ*	*BEH*	*TTS*	*AINJ*
Atlantic spotted dolphin	Northern Gulf of Mexico	7,066	5,705	18	7,367	6,717	20
	Western North Atlantic	51,765	68,898	78	59,410	78,980	87
Atlantic white-sided dolphin	Western North Atlantic	7,160	3,719	6	7,297	3,907	6
Blainville's beaked whale	Northern Gulf of Mexico	126	0	-	178	2	-
	Western North Atlantic	25,549	151	0	29,890	169	0
Blue whale	North Atlantic	10	57	1	12	66	1
Bottlenose dolphin	Central GA Estuarine System	0	-	-	0	-	-
	Gulf of Mexico Eastern Coastal	74	3	-	74	3	-
	Gulf of Mexico Northern Coastal	4,543	503	-	5,018	3,335	4
	Gulf of Mexico Oceanic	4,759	1,508	3	5,508	2,490	3
	Gulf of Mexico Western Coastal	1,771	1,557	-	1,773	1,558	-
	Indian River Lagoon Estuarine System	1,438	138	0	1,438	138	0
	Jacksonville Estuarine System	269	91	0	269	91	0
	MS Sound, Lake Borgne, and Bay Boudreau	151	43	1	153	44	1
	Northern GA/Southern SC Estuarine System	2	-	-	2	-	-
	Northern Gulf of Mexico Continental Shelf	46,413	24,331	21	49,521	40,591	27
	Northern NC Estuarine System	8,578	1,953	6	8,578	1,953	6
	Nueces and Corpus Christi Bays	4	-	-	4	-	-
	Sabine Lake	1	-	-	1	-	-
	Southern GA Estuarine System	85	38	1	85	38	1
	Southern NC Estuarine System	81	80	-	81	80	-
	St. Andrew Bay	44	0	0	44	0	0
	St. Joseph Bay	42	-	-	42	-	-
	Tampa Bay	163	187	-	163	187	-
	Western North Atlantic Central FL Coastal	7,899	2,560	1	7,915	2,560	1
	Western North Atlantic Northern FL Coastal	17,048	4,327	3	17,049	4,327	3
	Western North Atlantic Northern Migratory Coastal	57,194	16,460	53	57,195	16,460	53
	Western North Atlantic Offshore	91,136	95,683	89	105,281	109,625	93
	Western North Atlantic SC GA Coastal	1,412	3,526	4	1,492	3,690	4
	Western North Atlantic Southern Migratory Coastal	2,908	7,212	3	2,972	7,340	3
Bryde's whale	Primary	2	9	-	3	17	-

Table 3.7-6: Impacts Due to a Maximum Year of Sonar Testing and Training Activity under Alternative 1 and Alternative 2 (continued)

Species	Stock	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Clymene dolphin	Northern Gulf of Mexico	389	208	1	517	440	2
	Western North Atlantic	60,202	72,475	95	75,253	91,153	97
Goose-beaked whale	Northern Gulf of Mexico	457	2	-	647	5	-
	Western North Atlantic	111,449	607	0	128,625	653	0
Dwarf sperm whale	Northern Gulf of Mexico	21	132	5	41	320	7
	Western North Atlantic	1,266	4,955	164	1,409	6,243	175
False killer whale	Northern Gulf of Mexico	167	61	0	325	349	0
	Western North Atlantic	317	254	1	410	373	1
Fin whale	Western North Atlantic	547	1,843	18	569	2,029	18
Fraser's dolphin	Northern Gulf of Mexico	167	72	0	310	256	0
	Western North Atlantic	1,360	1,540	2	1,619	1,866	3
Gervais' beaked whale	Northern Gulf of Mexico	123	1	-	179	6	-
	Western North Atlantic	50,216	668	-	59,124	754	-
Gray seal	Western North Atlantic	9,725	5,850	19	9,744	5,902	20
Harbor porpoise	Gulf of ME/Bay of Fundy	80,932	5,655	54	83,039	5,749	54
Harbor seal	Western North Atlantic	13,277	8,597	25	13,304	8,689	26
Harp seal	Western North Atlantic	16,621	9,146	4	16,621	9,146	4
Hooded seal	Western North Atlantic	1,078	644	2	1,079	644	2
Humpback whale	Gulf of ME	184	617	11	184	659	14
Killer whale	Northern Gulf of Mexico	84	26	0	159	170	0
	Western North Atlantic	99	79	1	113	89	1
Long-finned pilot whale	Western North Atlantic	12,760	8,883	8	15,085	10,573	9
Melon-headed whale	Northern Gulf of Mexico	578	191	1	1,136	1,172	2
	Western North Atlantic	1,992	2,605	3	2,695	3,518	3
Minke whale	Canadian Eastern Coastal	642	3,908	54	659	4,621	57
North Atlantic right whale	Western	89	292	2	89	296	2
Northern bottlenose whale	Western North Atlantic	1,641	9	-	1,792	9	-
Pantropical spotted dolphin	Northern Gulf of Mexico	4,586	1,715	3	8,133	8,152	5
	Western North Atlantic	6,434	6,631	4	9,040	10,128	5

Table 3.7-6: Impacts Due to a Maximum Year of Sonar Testing and Training Activity under Alternative 1 and Alternative 2 (continued)

Species	Stock	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Pygmy killer whale	Northern Gulf of Mexico	203	80	0	402	430	0
	Western North Atlantic	216	260	0	285	357	0
Pygmy sperm whale	Northern Gulf of Mexico	22	115	5	41	302	7
	Western North Atlantic	1,301	4,889	157	1,449	6,139	164
Rice's whale	Northern Gulf of Mexico	81	210	2	84	268	2
Risso's dolphin	Northern Gulf of Mexico	154	47	0	243	178	0
	Western North Atlantic	20,203	16,987	19	23,117	19,862	20
Rough-toothed dolphin	Northern Gulf of Mexico	981	649	1	1,222	1,241	2
	Western North Atlantic	1,871	2,876	5	2,239	3,457	5
Sei whale	Western North Atlantic	114	618	7	117	716	8
Short-beaked common dolphin	Western North Atlantic	136,482	132,189	133	152,777	155,566	139
Short-finned pilot whale	Northern Gulf of Mexico	628	390	2	743	514	2
	Western North Atlantic	16,957	16,040	12	20,150	18,939	12
Sowerby's beaked whale	Western North Atlantic	25,255	363	-	29,763	417	-
Sperm whale	North Atlantic	8,871	3,705	4	10,727	4,341	4
	Northern Gulf of Mexico	246	25	-	515	158	0
Spinner dolphin	Northern Gulf of Mexico	478	177	0	1,027	1,140	1
	Western North Atlantic	2,606	2,748	2	3,501	3,986	2
Striped dolphin	Northern Gulf of Mexico	1,727	637	0	3,031	3,298	1
	Western North Atlantic	107,566	101,182	156	129,433	127,852	167
True's beaked whale	Western North Atlantic	25,215	363	-	29,702	417	-
White-beaked dolphin	Western North Atlantic	10	6	-	11	7	-

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; FL = Florida; GA = Georgia; ME = Maine; MS = Mississippi; NC = North Carolina; SC = South Carolina; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

Table 3.7-7: Impacts Due to Seven Years of Sonar Testing and Training Activity under Alternative 1 and Alternative 2

Species	Stock	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Atlantic spotted dolphin	Northern Gulf of Mexico	46,568	37,048	113	50,358	46,637	131
	Western North Atlantic	343,556	452,484	532	403,701	534,476	603
Atlantic white-sided dolphin	Western North Atlantic	46,480	25,069	32	47,779	26,636	35
Blainville’s beaked whale	Northern Gulf of Mexico	812	0	-	1,183	8	-
	Western North Atlantic	171,529	1,043	0	203,382	1,170	0
Blue whale	North Atlantic	69	387	2	80	452	2
Bottlenose dolphin	Central GA Estuarine System	0	-	-	0	-	-
	Gulf of Mexico Eastern Coastal	449	14	-	449	14	-
	Gulf of Mexico Northern Coastal	31,749	3,519	-	35,070	23,337	22
	Gulf of Mexico Oceanic	30,904	9,650	9	36,580	16,901	14
	Gulf of Mexico Western Coastal	10,195	8,704	-	11,329	9,605	-
	Indian River Lagoon Estuarine System	9,804	958	0	9,804	958	0
	Jacksonville Estuarine System	1,861	624	0	1,861	624	0
	MS Sound, Lake Borgne, and Bay Boudreau	832	238	1	842	242	1
	Northern GA/Southern SC Estuarine System	8	-	-	8	-	-
	Northern Gulf of Mexico Continental Shelf	318,775	158,707	132	344,480	283,650	182
	Northern NC Estuarine System	59,194	13,060	37	59,194	13,060	37
	Nueces and Corpus Christi Bays	15	-	-	15	-	-
	Sabine Lake	3	-	-	3	-	-
	Southern GA Estuarine System	521	227	1	521	227	1
	Southern NC Estuarine System	332	350	-	332	350	-
	St. Andrew Bay	301	0	0	301	0	0
	St. Joseph Bay	287	-	-	287	-	-
	Tampa Bay	654	747	-	654	747	-
	Western North Atlantic Central FL Coastal	52,973	14,231	1	53,126	14,529	1
	Western North Atlantic Northern FL Coastal	117,010	26,456	11	118,342	28,113	12
	Western North Atlantic Northern Migratory Coastal	397,269	110,561	343	397,339	110,660	344
	Western North Atlantic Offshore	608,650	636,604	601	715,038	744,470	645
	Western North Atlantic SC GA Coastal	8,993	21,872	16	9,750	23,913	17
	Western North Atlantic Southern Migratory Coastal	19,033	46,009	20	19,750	48,422	21
Bryde’s whale	Primary	7	63	-	10	119	-

Table 3.7-7: Impacts Due to Seven Years of Sonar Testing and Training Activity under Alternative 1 and Alternative 2 (continued)

Species	*Stock*	*Alternative 1*			*Alternative 2*		
		BEH	*TTS*	*AINJ*	*BEH*	*TTS*	*AINJ*
Clymene dolphin	Northern Gulf of Mexico	2,304	1,266	2	3,312	3,006	4
	Western North Atlantic	403,174	498,843	653	513,098	631,792	674
Goose-beaked whale	Northern Gulf of Mexico	2,959	2	-	4,316	25	-
	Western North Atlantic	748,316	4,192	0	875,568	4,539	0
Dwarf sperm whale	Northern Gulf of Mexico	126	875	32	266	2,198	47
	Western North Atlantic	8,406	33,508	1,111	9,496	42,805	1,205
False killer whale	Northern Gulf of Mexico	1,035	386	0	2,162	2,420	0
	Western North Atlantic	2,143	1,728	1	2,821	2,578	1
Fin whale	Western North Atlantic	3,649	12,279	114	3,848	13,852	120
Fraser’s dolphin	Northern Gulf of Mexico	1,030	455	0	2,042	1,764	0
	Western North Atlantic	9,128	10,293	12	11,034	12,740	17
Gervais’ beaked whale	Northern Gulf of Mexico	798	1	-	1,191	36	-
	Western North Atlantic	340,058	4,611	-	405,215	5,238	-
Gray seal	Western North Atlantic	66,112	38,555	121	66,539	40,113	132
Harbor porpoise	Gulf of ME/Bay of Fundy	546,168	37,180	338	564,842	38,344	367
Harbor seal	Western North Atlantic	90,567	56,544	164	91,034	58,849	176
Harp seal	Western North Atlantic	111,493	63,006	23	111,541	63,086	24
Hooded seal	Western North Atlantic	6,736	4,242	5	6,760	4,286	6
Humpback whale	Gulf of ME	1,227	4,054	73	1,247	4,434	90
Killer whale	Northern Gulf of Mexico	521	159	0	1,060	1,173	0
	Western North Atlantic	657	535	1	757	612	1
Long-finned pilot whale	Western North Atlantic	85,407	60,382	49	102,522	72,640	53
Melon-headed whale	Northern Gulf of Mexico	3,599	1,203	1	7,559	8,117	2
	Western North Atlantic	13,542	17,543	12	18,554	24,145	12
Minke whale	Canadian Eastern Coastal	4,308	26,175	366	4,484	31,624	397
North Atlantic right whale	Western	589	1,885	8	597	2,015	8
Northern bottlenose whale	Western North Atlantic	10,821	57	-	12,021	58	-
Pantropical spotted dolphin	Northern Gulf of Mexico	29,007	10,896	13	54,122	56,199	34
	Western North Atlantic	44,263	44,901	24	62,677	69,942	33
Pygmy killer whale	Northern Gulf of Mexico	1,262	509	0	2,677	2,979	0
	Western North Atlantic	1,471	1,754	0	1,959	2,456	0
Pygmy sperm whale	Northern Gulf of Mexico	136	754	24	271	2,072	41
	Western North Atlantic	8,645	33,035	1,063	9,775	42,072	1,131

Table 3.7-7: Impacts Due to Seven Years of Sonar Testing and Training Activity under Alternative 1 and Alternative 2 (continued)

Species	Stock	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Rice's whale	Northern Gulf of Mexico	544	1,428	5	567	1,855	8
Risso's dolphin	Northern Gulf of Mexico	966	284	0	1,603	1,211	0
	Western North Atlantic	132,910	112,684	124	155,506	134,720	136
Rough-toothed dolphin	Northern Gulf of Mexico	6,493	4,257	3	8,283	8,589	5
	Western North Atlantic	12,509	19,034	24	15,257	23,465	29
Sei whale	Western North Atlantic	754	4,139	44	778	4,893	52
Short-beaked common dolphin	Western North Atlantic	921,721	894,423	862	1,045,137	1,066,153	968
Short-finned pilot whale	Northern Gulf of Mexico	3,768	2,407	12	4,793	3,509	13
	Western North Atlantic	113,770	108,022	75	137,252	129,618	76
Sowerby's beaked whale	Western North Atlantic	171,025	2,504	-	203,967	2,894	-
Sperm whale	North Atlantic	59,161	25,438	16	72,719	30,042	17
	Northern Gulf of Mexico	1,505	144	-	3,398	1,076	0
Spinner dolphin	Northern Gulf of Mexico	3,241	1,217	0	7,085	7,957	4
	Western North Atlantic	17,786	18,720	10	24,142	27,584	12
Striped dolphin	Northern Gulf of Mexico	11,261	4,119	0	20,426	22,796	7
	Western North Atlantic	707,993	689,502	1,071	869,671	878,964	1,166
True's beaked whale	Western North Atlantic	170,795	2,502	-	203,585	2,892	-
White-beaked dolphin	Western North Atlantic	65	39	-	67	43	-

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; FL = Florida; GA = Georgia; ME = Maine; MS = Mississippi; NC = North Carolina; SC = South Carolina; TTS = Temporary Threshold Shift

A dash (-) indicates no estimation of take (true zero).

Under the MMPA, the Action Proponents have concluded that the use of sonar and other transducers during military readiness activities as described under Alternative 1 may affect ESA-listed blue whale, Rice's whale, fin whale, North Atlantic right whale, sei whale, sperm whale, and West Indian manatee. The Action Proponents have also concluded that use of sonar during military readiness activities would have no effect on critical habitat for the North Atlantic right whale and West Indian manatee and may affect proposed critical habitat for Rice's whale. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.7.3.1.1.2 Impacts from Sonar and Other Transducers under Alternative 2

Under Alternative 2, sonar use during training activities would increase compared to Alternative 1:

- The maximum number of Composite Training Unit Exercises would occur each year, and an additional Composite Training Unit Exercise would occur in the Gulf of Mexico Range Complex each year.
- There would be an increase in the number of Anti-Submarine Warfare Tracking Exercise – Ship activities in the Virginia Capes, Navy Cherry Point, and Jacksonville Range Complexes as well as in Other AFTT Areas.
- Additional Maritime Security Operations and Waterborne Training would be conducted.

Under Alternative 2, there would be a small increase in sonar use during testing due to a small increase in the number of some activities. The number of impacts to each marine mammal stock due to exposure to sonar during testing and training under Alternative 2 are shown in Table 3.7-6 for a maximum year of activities and in Table 3.7-7 for seven years of activities.

Due to the addition of a Composite Training Unit Exercise in the Gulf of Mexico, impacts due to sonar under Alternative 2 would primarily increase for stocks located in the Gulf of Mexico, particularly delphinid stocks in the northern Gulf of Mexico. The Composite Training Unit Exercise is a multi-day, multi-platform event. The use of multiple active acoustic sources, including anti-submarine warfare sonars, increases impacts compared to Alternative 1 because exposure to anti-submarine warfare sonars in the Gulf of Mexico would be otherwise limited. Despite the increase in impacts, individuals in most stocks would be impacted on average once a year or less. Impacts would also increase to ESA-listed Rice's and sperm whales in the Gulf of Mexico, although no additional injuries are predicted under Alternative 2 compared to Alternative 1. Overall impacts are not meaningfully different from Alternative 1 for most other stocks. The conclusions for significance, ESA-listed species and critical habitat are the same as Alternative 1.

3.7.3.1.2 Impacts from Air Guns

Table 3.7-4 contains a summary of the background information used to analyze the potential impacts of air guns on marine mammals. Air guns create intermittent, broadband, impulsive sounds.

The below information briefly summarizes information relevant to the assessment of the impacts of air guns on marine mammals under the Proposed Action. A more extensive assessment of the impacts on marine mammals due to exposure to air guns under this Proposed Action is in Appendix E (Acoustic and Explosives Impact Analysis).

The broadband impulses from air guns are within the hearing range of all marine mammals. Potential impacts from air guns could include auditory injuries, TTS, behavioral reactions, physiological response, and masking. Single, small air guns lack the peak pressures that could cause auditory injuries for most auditory groups. The ranges to auditory effects and behavioral responses for air guns are in in Appendix E (Acoustic and Explosives Impact Analysis).

While studies have observed marine mammal responses to large, commercial air gun arrays, the small single air guns used in the Proposed Action would be used over a much shorter period and more limited area. Reactions to air gun use in the Proposed Action are less likely to occur or rise to the same level of severity as observed during seismic use.

As discussed in Section 3.7.3 (Environmental Consequences), the Action Proponents will implement visual observation mitigation under Alternative 1 and Alternative 2 to reduce potential impacts from air guns on marine mammals.

3.7.3.1.2.1 Impacts from Air Guns under Alternative 1

Air guns would not be used during training activities. The proposed use of air guns decreased for testing from the 2018 Final EIS/OEIS. Air gun use would only occur in two testing activities: Semi-Stationary Equipment Testing and Acoustic and Oceanographic Research. While air gun use during Semi-Stationary Equipment Testing may occur nearshore at Newport, Rhode Island, air gun use during Acoustic and Oceanographic Research would not occur within 3 nautical miles of shore. Acoustic and Oceanographic Research may occur in the Northeast, Virginia Capes, Jacksonville, and Gulf of Mexico Range Complexes.

The number of impacts to each stock due to exposure to air guns during testing under Alternative 1 is shown in Table 3.7-8 for a maximum year of activities and in Table 3.7-9 for seven years of activities. Appendix E (Acoustic and Explosives Impact Analysis) provides additional detail on modeled impacts to each stock, including seasons and regions in which impacts are most likely to occur; which activities are most likely to cause impacts; overlap with biologically important areas; and analysis of impacts to designated critical habitat for ESA-listed species, where applicable. Appendix E also explains how impacts are summed to estimate maximum annual and seven-year total impacts.

Overall, the number of potential impacts to marine mammals is very low. A small number of auditory effects are predicted for species in the most sensitive hearing group, the VHF cetaceans, which has a substantially lower threshold for auditory effects than other auditory groups for exposure to peak pressures from impulsive sounds. A small number of behavioral responses are also predicted for several stocks.

Although air gun impacts are limited, there is a potential for long-term impacts to any individual with an auditory injury. Most impacts, however, are expected to be TTS or temporary behavioral responses. The average risk of impact to individuals in any population is low. Impacts due to air guns are unlikely to impact survival, growth, recruitment, or reproduction of any marine mammal populations. This is consistent with a negligible to moderate impact on marine mammal populations.

Under the MMPA, the use of air guns during military readiness activities as described under Alternative 1 will result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA. As required by section 101(a)(5)(a) of the MMPA, the Action Proponents are requesting authorization from NMFS to take marine mammals incidental to the use of air guns during military readiness activities.

The Action Proponents have concluded that the use of air guns during military readiness activities as described under Alternative 1 may affect blue whales, Rice's whales, fin whales, North Atlantic right whales, sei whales, sperm whales, as defined by the ESA. The Action Proponents have concluded that testing activities under Alternative 1 may affect the West Indian manatee, but training activities are not applicable to the West Indian manatee, as defined by the ESA. The Action Proponents have also concluded that the use of air guns during military readiness activities would be not applicable to critical habitat for West Indian manatee, and may affect critical habitat for North Atlantic right whales and proposed critical habitat for Rice's whale. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

Table 3.7-8: Impacts Due to a Maximum Year of Air Gun Testing Activity under Alternative 1 and Alternative 2

Species	Stock	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Atlantic spotted dolphin	Northern Gulf of Mexico	0	-	-	0	-	-
	Western North Atlantic	0	-	-	1	-	-
Atlantic white-sided dolphin	Western North Atlantic	0	-	-	0	-	-
Bottlenose dolphin	Gulf of Mexico Oceanic	0	-	-	0	-	-
	Gulf of Mexico Western Coastal	0	-	-	0	-	-
	Northern Gulf of Mexico Continental Shelf	1	0	-	1	0	-
	Western North Atlantic Central FL Coastal	0	-	-	0	-	-
	Western North Atlantic Northern FL Coastal	0	-	-	0	-	-
	Western North Atlantic Northern Migratory Coastal	0	0	-	0	0	-
	Western North Atlantic Offshore	1	-	-	1	-	-
	Western North Atlantic SC GA Coastal	0	-	-	0	-	-
	Western North Atlantic Southern Migratory Coastal	0	-	-	0	-	-
Dwarf sperm whale	Northern Gulf of Mexico	1	-	-	1	-	-
	Western North Atlantic	1	1	0	1	1	0
Fin whale	Western North Atlantic	1	-	-	1	-	-
Gervais' beaked whale	Western North Atlantic	0	-	-	0	-	-
Gray seal	Western North Atlantic	1	0	-	1	0	-
Harbor porpoise	Gulf of ME/Bay of Fundy	2	3	1	2	3	1
Harbor seal	Western North Atlantic	1	0	-	1	0	-
Harp seal	Western North Atlantic	0	-	-	0	-	-
Killer whale	Western North Atlantic	0	-	-	0	-	-
Minke whale	Canadian Eastern Coastal	-	0	-	-	0	-
North Atlantic right whale	Western	0	-	-	0	-	-
Pantropical spotted dolphin	Northern Gulf of Mexico	0	-	-	0	-	-
	Western North Atlantic	0	-	-	0	-	-
Pygmy sperm whale	Western North Atlantic	1	1	-	1	1	-
Risso's dolphin	Western North Atlantic	0	-	-	0	-	-
Rough-toothed dolphin	Northern Gulf of Mexico	0	-	-	0	-	-
Short-beaked common dolphin	Western North Atlantic	1	-	-	1	-	-
Short-finned pilot whale	Northern Gulf of Mexico	0	-	-	0	-	-
	Western North Atlantic	0	-	-	0	-	-
Sperm whale	North Atlantic	0	-	-	0	-	-

Table 3.7 8: Impacts Due to a Maximum Year of Air Gun Testing Activity under Alternative 1 and Alternative 2 (continued)

Species	Stock	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Striped dolphin	Western North Atlantic	1	-	-	1	-	-

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; FL = Florida; GA = Georgia; ME = Maine; SC = South Carolina; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

Table 3.7-9: Impacts Due to Seven Years of Air Gun Testing Activity under Alternative 1 and Alternative 2

Species	Stock	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Atlantic spotted dolphin	Northern Gulf of Mexico	0	-	-	0	-	-
	Western North Atlantic	0	-	-	1	-	-
Atlantic white-sided dolphin	Western North Atlantic	0	-	-	0	-	-
Bottlenose dolphin	Gulf of Mexico Oceanic	0	-	-	0	-	-
	Gulf of Mexico Western Coastal	0	-	-	0	-	-
	Northern Gulf of Mexico Continental Shelf	1	0	-	1	0	-
	Western North Atlantic Central FL Coastal	0	-	-	0	-	-
	Western North Atlantic Northern FL Coastal	0	-	-	0	-	-
	Western North Atlantic Northern Migratory Coastal	0	0	-	0	0	-
	Western North Atlantic Offshore	1	-	-	1	-	-
	Western North Atlantic SC GA Coastal	0	-	-	0	-	-
	Western North Atlantic Southern Migratory Coastal	0	-	-	0	-	-
Dwarf sperm whale	Northern Gulf of Mexico	1	-	-	1	-	-
	Western North Atlantic	3	2	0	3	2	0
Fin whale	Western North Atlantic	1	-	-	1	-	-
Gervais' beaked whale	Western North Atlantic	0	-	-	0	-	-
Gray seal	Western North Atlantic	7	0	-	7	0	-
Harbor porpoise	Gulf of ME/Bay of Fundy	12	15	1	14	17	1
Harbor seal	Western North Atlantic	5	0	-	5	0	-
Harp seal	Western North Atlantic	0	-	-	0	-	-
Killer whale	Western North Atlantic	0	-	-	0	-	-
Minke whale	Canadian Eastern Coastal	-	0	-	-	0	-
North Atlantic right whale	Western	0	-	-	0	-	-

Table 3.7 9: Impacts Due to Seven Years of Air Gun Testing Activity under Alternative 1 and Alternative 2 (continued)

Species	Stock	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Pantropical spotted dolphin	Northern Gulf of Mexico	0	-	-	0	-	-
	Western North Atlantic	0	-	-	0	-	-
Pygmy sperm whale	Western North Atlantic	2	4	-	3	4	-
Risso's dolphin	Western North Atlantic	0	-	-	0	-	-
Rough-toothed dolphin	Northern Gulf of Mexico	0	-	-	0	-	-
Short-beaked common dolphin	Western North Atlantic	4	-	-	4	-	-
Short-finned pilot whale	Northern Gulf of Mexico	0	-	-	0	-	-
	Western North Atlantic	0	-	-	0	-	-
Sperm whale	North Atlantic	0	-	-	0	-	-
Striped dolphin	Western North Atlantic	2	-	-	2	-	-

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; FL = Florida; GA = Georgia; ME = Maine; SC = South Carolina; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

3.7.3.1.2.2 Impacts from Air Guns under Alternative 2

Air guns would not be used during training activities. The number of impacts to each stock due to exposure to air guns during testing under Alternative 2 is shown in Table 3.7-8 for a maximum year of activities and in Table 3.7-9 for seven years of activities. Impacts from air guns under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for testing activities.

3.7.3.1.3 Impacts from Pile Driving Noise

Table 3.7-4 contains a summary of the background information used to analyze the potential impacts of pile driving noise on marine mammals. Only the Port Damage Repair training activity includes pile driving. Additional information on the assessment of these acoustic stressors under this Proposed Action is in Appendix E (Acoustic and Explosives Impact Analysis). The below information briefly summarizes information relevant to the assessment of the impacts of pile driving on marine mammals under the Proposed Action. A more extensive assessment of the impacts on marine mammals due to exposure to pile driving under this Proposed Action is in Appendix E (Acoustic and Explosives Impact Analysis).

The impact and vibratory pile driving hammers would expose marine mammals to impulsive and continuous non-impulsive broadband sounds, respectively. Potential impacts could include auditory injuries, TTS, behavioral reactions, physiological responses (stress), and masking. This analysis applies NMFS' recommended thresholds for behavioral responses to impact and vibratory pile driving. The ranges to auditory effects and behavioral responses for pile driving are in in Appendix E (Acoustic and Explosives Impact Analysis).

As discussed in Section 3.7.3 (Environmental Consequences), the Action Proponents will implement visual observation mitigation under Alternative 1 and Alternative 2 to reduce potential impacts from pile driving on marine mammals.

3.7.3.1.3.1 Impacts from Pile Driving Noise under Alternative 1

Pile driving would not occur during testing activities. The activity type and location for pile driving activities for training have changed from the 2018 Final EIS/OEIS.

Under Alternative 1 for training:

- Pile driving would occur up to 20 days each year as part of Port Damage Repair activities in Gulfport, Mississippi.
- Pile driving would no longer occur as part of the Elevated Causeway System at Joint Expeditionary Base Little Creek in the Virginia Capes Range Complex or Marine Corps Base Camp Lejeune in the Navy Cherry Point Range Complex.

Only two species are anticipated to be present in the nearshore waters by Gulfport: West Indian manatees and two stocks of bottlenose dolphins. Pile driving activities would not overlap with the presence of ESA-listed blue whales, Rice's whales, fin whales, North Atlantic right whales, sei whales, and sperm whales nor critical habitat for North Atlantic right whales or proposed critical habitat for Rice's whales.

The pile driving mitigation zone encompasses the relatively short ranges to auditory injuries and TTS for the HF and SI hearing groups and soft start procedures are employed. Auditory impacts are unlikely, but masking, physiological responses, or behavioral reactions may occur over limited periods at farther distances. Pile driving would occur in an industrialized location with existing higher ambient noise levels. Depending on where the activity occurs in the port, transmission of pile driving noise may be reduced by earthen pier structures. The number of impacts to each stock due to exposure to pile driving during training under Alternative 1 are shown in Table 3.7-10 for a maximum year of activities and in Table 3.7-11 for seven years of activities. Due to the low number of days the activity would occur and the intermittent use of pile driving hammers, impacts are expected to be minor and temporary (lasting minutes to hours) or short-term (day). This is consistent with a negligible to minor impact on marine mammal populations.

Under the MMPA, the use of pile driving during military readiness activities as described under Alternative so 1 will result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA. As required by section 101(a)(5)(a) of the MMPA, the Action Proponents are requesting authorization from NMFS to take marine mammals incidental to the use of pile driving during military readiness activities.

The Action Proponents have concluded that the use of pile driving during training activities as described under Alternative 1 may affect the West Indian manatee, as defined by the ESA, but testing activities are not applicable. The noise footprint from the pile driving activities in Gulfport, Mississippi would not overlap West Indian manatee critical habitat. The Action Proponents are consulting with USFWS as required by section 7(a)(2) of the ESA.

3.7.3.1.3.2 Impacts from Pile Driving Noise under Alternative 2

Pile driving would not occur during testing activities. The number of impacts to each stock due to exposure to pile driving during training under Alternative 2 is shown in Table 3.7-10 for a maximum year of activities and in Table 3.7-11 for seven years of activities. Impacts from pile driving during training under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance, ESA-listed species and critical habitat are the same.

3.7.3.1.4 Impacts from Vessel Noise

Table 3.7-4 contains a summary of the background information used to analyze the potential impacts of vessel noise on marine mammals. Vessels produce broadband, non-impulsive, continuous noise during operation and transit. Additional information on the assessment of this acoustic stressor under the Proposed Action is in Appendix E (Acoustic and Explosives Impact Analysis).

3.7.3.1.4.1 Impacts from Vessel Noise under Alternative 1

For both training and testing activities, vessel activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of vessel noise, so impacts would be expected to be similar or lesser than previously concluded. Based on the updated background and previous analysis for training and testing under Alternative 1, vessel noise impacts on marine mammals could include brief behavioral reactions and short periods of masking while in the proximity of a vessel. Vessels do not purposefully approach marine mammals and are not expected to elicit significant behavioral responses (entanglement response is not a military readiness activity). The analysis conclusions for impacts due to vessel noise during training and testing activities under Alternative 1 are consistent with a negligible impact on marine mammals.

Under the MMPA, the Action Proponents have concluded that vessel noise during military readiness activities as described under Alternative 1 will not result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA.

The Action Proponents have concluded that vessel noise during military readiness activities as described under Alternative 1 may affect blue whales, Rice's whales, fin whales, North Atlantic right whales, sei whales, sperm whales, as defined by the ESA. The Action Proponents have concluded that training activities may affect the West Indian manatee, but that testing activities are not applicable. The Action Proponents have also concluded that vessel noise during military readiness activities would have no effect on critical habitat for the North Atlantic right whale and West Indian manatee and may affect proposed critical habitat for Rice's whales. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

Table 3.7-10: Impacts Due to a Maximum Year of Pile Driving Training Activity under Alternative 1 and Alternative 2

Species	*Stock*	*Alternative 1*			*Alternative 2*		
		BEH	*TTS*	*AINJ*	*BEH*	*TTS*	*AINJ*
Bottlenose dolphin	Gulf of Mexico Northern Coastal	1,894	0	-	1,894	0	-
	MS Sound, Lake Borgne, and Bay Boudreau	1,564	0	-	1,564	0	-

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; MS = Mississippi; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

Table 3.7-11: Impacts Due to Seven Years of Pile Driving Training Activity under Alternative 1 and Alternative 2

Species	*Stock*	*Alternative 1*			*Alternative 2*		
		BEH	*TTS*	*AINJ*	*BEH*	*TTS*	*AINJ*
Bottlenose dolphin	Gulf of Mexico Northern Coastal	13,255	0	-	13,255	0	-
	MS Sound, Lake Borgne, and Bay Boudreau	10,944	0	-	10,944	0	-

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; MS = Mississippi; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

3.7.3.1.4.2 Impacts from Vessel Noise under Alternative 2

Although the number of activities with associated vessel noise would increase in all range complexes under Alternative 2 compared to Alternative 1, impacts from vessel noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species and critical habitat are the same for both training and testing.

3.7.3.1.5 Impacts from Aircraft Noise

Table 3.7-4 contains a summary of the background information used to analyze the potential impacts of aircraft noise on marine mammals. Aircrafts produce broadband, non-impulsive, continuous noise during operation and transit. Additional information on the assessment of this acoustic stressor under the Proposed Action is in Appendix E (Acoustic and Explosives Impact Analysis).

3.7.3.1.5.1 Impacts from Aircraft Noise under Alternative 1

For both training and testing activities, aircraft activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of aircraft noise, so impacts would be expected to be similar or lesser than previously concluded.

Based on the updated background and previous analysis for training and testing under Alternative 1, aircraft noise may cause brief temporary changes in the behavior of marine mammals. Marine mammals at or near the surface when an aircraft flies overhead at low altitude may startle, divert their attention to the aircraft, or avoid the immediate area by swimming away or diving. No long-term consequences for individuals would be expected. The analysis conclusions for impacts due to aircraft noise during training and testing activities under Alternative 1 are consistent with a negligible impact on marine mammals.

Under the MMPA, the Action Proponents have concluded that aircraft noise during military readiness activities as described under Alternative 1 will not result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA.

Under the ESA, the Action Proponents have concluded that aircraft noise during military readiness activities as described under Alternative 1 may affect blue whales, Rice's whales, fin whales, North Atlantic right whales, sei whales, sperm whales, and West Indian manatees as defined by the ESA. The Action Proponents have also concluded that aircraft noise during military readiness activities would have no effect on critical habitat for the North Atlantic right whale, and may affect proposed critical habitat for Rice's whales. The Action Proponents have concluded that aircraft noise during training would have no effect on the West Indian manatee critical habitat but that testing activities are not applicable. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2).

3.7.3.1.5.2 Impacts from Aircraft Noise under Alternative 2

Impacts from aircraft noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species and critical habitat are the same for both training and testing.

3.7.3.1.6 Impacts from Weapons Noise

Table 3.7-4 contains a summary of the background information used to analyze the potential impacts of weapons noise on marine mammals. Firing of guns, vibrations from the hull of ships, items that impact the water's surface, and items launched from underwater may produce weapons noise.

As discussed in Section 3.7.3 (Environmental Consequences), the Action Proponents will implement visual observation mitigation under Alternative 1 and Alternative 2 to reduce potential impacts from weapons noise on marine mammals. The Action Proponents will also implement geographic mitigation to reduce potential acoustic impacts within important marine mammal habitats as identified in Table 3.7-2.

3.7.3.1.6.1 Impacts from Weapons Noise under Alternative 1

For both training and testing activities, weapons activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of weapons noise, as impacts are expected to be similar to or less than previously analyzed.

Based on the updated background and previous analysis for training and testing under Alternative 1, the impact of weapon noise on marine mammals would be limited to temporary behavioral responses. Marine mammals may startle or avoid the immediate area. Because firing of medium and large caliber gunnery would occur greater than 12 nautical miles (NM) from shore, impacts to coastal species are unlikely. The analysis conclusions for impacts due to weapons noise during training and testing activities under Alternative 1 are consistent with a negligible impact on marine mammals.

The Action Proponents have concluded that weapons noise during military readiness activities as described under Alternative 1 will not result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA.

The Action Proponents have concluded that weapons noise during military readiness activities as described under Alternative 1 may affect blue whales, Rice's whales, fin whales, North Atlantic right whales, sei whales, sperm whales, and are not applicable to the West Indian manatee, as defined by the ESA. The Action Proponents have also concluded that weapons noise during military readiness activities would have no effect on critical habitat for the North Atlantic right whale and West Indian manatee and may affect proposed critical habitat for Rice's whale. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.7.3.1.6.2 Impacts from Weapons Noise under Alternative 2

Impacts from weapons noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species and critical habitat are the same for both training and testing.

3.7.3.2 Explosive Stressors

This section summarizes the potential impacts of explosives used during military readiness activities within the Study Area. Explosives analyzed for impacts to marine mammals include those in water and those that detonate within 19 meters (m) (30 ft.) above the water surface, which are analyzed as in-water explosives. Table 3.7-12 summarizes background information that is relevant to the analyses of impacts for explosives. New applicable and emergent science regarding explosive impacts is presented in Appendix D (Acoustic and Explosive Impacts Supporting Information).

Table 3.7-12: Explosive Stressors Background Information Summary

Substressor	*Background Information Summary*
Explosives	Explosives may cause auditory effects (auditory injuries and TTS), non-auditory injury (including mortality), and behavioral responses. Susceptibility to auditory effects differs by auditory group. Non-auditory injury depends on the charge size, the geometry of the exposure (e.g., distance and depth), and the size of the animal. The intermittent nature of most impulsive sounds would result in very limited probability of any masking effects. Few studies on reactions to explosives exist, but responses to other impulsive noises have been recorded, as summarized in Table 3.7-4. Marine mammals may respond to explosions by alerting, startling, breaking off feeding dives and surfacing, diving, or swimming away, changing vocalization, pausing or changing migration path, or showing no response at all.

The quantitative analyses of impacts due to explosives in this section supplant the quantitative analyses in the 2018 Final EIS/OEIS. In addition to changes in the Proposed Action, changes in the predicted explosive impacts since the 2018 Final EIS/OEIS are due to the following:

- Updates to criteria used to determine if an exposure to explosive energy may cause auditory effects, non-auditory injury (including mortality), and behavioral responses. Changes to auditory criteria for explosives are the same as for other impulsive sounds. Behavioral response thresholds are related to TTS thresholds and were revised accordingly. Non-auditory injury criteria are unchanged, but the onset thresholds were applied. A summary of these changes is in Appendix E (Acoustic and Explosives Impact Analysis). For additional details see the technical report *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase IV)* (U.S. Department of the Navy, 2024a).
- Revisions to the modeling of explosive effects in the Navy Acoustic Effects Model, including an updated explosive propagation model. See the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing (U.S. Department of the Navy, 2024b)*.
- Updates to data on marine mammal presence, including estimated density of each species or stock (number of animals per unit area), group size, and depth distribution. For additional details see the technical reports U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area (U.S. Department of the Navy, 2024c) and Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii-Southern California Training and Testing Study Areas (Oliveira et al., 2024).
- Changes in how mitigation is considered in reducing predicted impacts in the modeling. The number of model-predicted mortalities are not reduced due to visual observation mitigation, unlike in prior analyses.

The following section summarizes impacts due to explosive stressors on marine mammals. A comprehensive analysis of impacts due to acoustic and explosive stressors is in Appendix E (Acoustic and Explosives Impact Analysis), where impacts to marine mammal stocks are assessed considering species life history traits, susceptibility to impacts, and potential for repeated impacts to individuals based on acoustic impacts modeling. Appendix E also assesses impacts to critical habitat for ESA-listed species. While model-predicted impacts are summarized for explosives in the section below, Appendix E provides additional detail on modeled impacts to each stock, including seasons and regions in which impacts are most likely to occur; which activities are most likely to cause impacts; and how impacts are summed to estimate maximum annual and seven-year total impacts.

3.7.3.2.1 Impacts from Explosives

For information on the size and quantity of explosives under each alternative, see Table 3.0-5 (Explosive Sources Quantitatively Analyzed that Could Be Used Underwater or at the Water Surface).

The below information briefly summarizes information relevant to the assessment of the impacts of explosives on marine mammals under the Proposed Action. A more extensive assessment of the impacts on marine mammals due to exposure to explosives under this Proposed Action is in Appendix E (Acoustic and Explosives Impact Analysis).

Explosions produce loud, impulsive, broadband sounds with sharp pressure peaks that can be injurious. Potential impacts from explosive energy and sound include non-auditory injury (including mortality), auditory effects (auditory injuries and TTS), behavioral reactions, physiological response, and masking.

Ranges to effects for mortality, non-auditory injury, and behavioral responses are shown in Appendix E (Acoustic and Explosives Impact Analysis).

Explosive noise is very brief and intermittent. Detonations usually occur in a limited area over a brief period rather than being widespread. The potential for masking is limited. Marine mammals may behaviorally respond, but responses to single detonations or clusters may be limited to startle responses.

As discussed in Section 3.7.3 (Environmental Consequences), the Action Proponents will implement visual observation mitigation under Alternative 1 and Alternative 2 to reduce potential impacts from explosives on marine mammals. An assessment of the potential opportunities to mitigate mortalities due to explosives under this Proposed Action is in Appendix E (Acoustic and Explosives Impact Analysis, Section 2.3.2).

The Action Proponents will also implement geographic mitigation to reduce potential impacts within important marine mammal habitats as identified in Table 3.7-2. Some of the geographic mitigations limit the use of explosives. Table 3.7-13 lists these geographic mitigations and whether their requirements are reflected in the model-predicted impacts to marine mammals presented below. It does not list other geographic mitigation that may still reduce impacts but cannot be modeled, such as pre-event planning, awareness notification messages, or obtaining Early Warning System North Atlantic right whale sighting data.

Table 3.7-13: Applicable Geographic Mitigation Reflected in the Explosive Modeling Results

Geographic Mitigation Section Reference	*Reflected in Modeling Results?*	*Summary of Relevant Mitigation*
Section 5.1.2 (Ship Shock Trial Mitigation Areas)	Yes	Repositioning of the northern Gulf of Mexico ship shock trial box outside of Rice's whale core distribution as identified by NMFS in 2019 (84 *Federal Register* 15446) and updated in 2021 (86 *Federal Register* 47022). • No ship shock trials overlapping the Jacksonville OPAREA from November 15 through April 15
Section 5.1.3 (Major Training Exercise Planning Mitigation Areas)	Not Applicable[1]	• Limits on the annual number of Major Training Exercises
Section 5.1.4 (Northeast North Atlantic Right Whale Mitigation Area)	Yes	• No in-water explosives
Section 5.1.7 (Southeast North Atlantic Right Whale Mitigation Area)	No	• No in-water explosives from November 15 to April 15.
Section 5.1.9 (Gulf of Mexico Rice's Whale Mitigation Area)	Yes	• No in-water explosives (except mines)

[1] For Major Training Exercises, only sonar during anti-submarine warfare activities were analyzed. Other warfare area training conducted during Major Training Exercises, including any use of explosives, was analyzed as unit-level training, including in the modeling.

Notes: NMFS = National Marine Fisheries Service; OPAREA = operating area

3.7.3.2.1.1 Impacts from Explosives under Alternative 1

The use of explosives would generally decrease from the 2018 Final EIS/OEIS for both training and testing activities. Notably, for testing there would be no use of bin E17 (> 14,500 – 58,000 pounds [lb.] net explosive weight [NEW]) and reduced use of bin E16 (> 7,250 to 14,500 lb. NEW) for Ship Shock Trials. There is also a reduction in use of most of the largest explosive bins for both training and testing, and a large decrease in explosives associated with medium-caliber gunnery (bin E1 [0.1 to 0.25 lb. NEW]).

Most explosive activities would occur in the Virginia Capes, Navy Cherry Point, Jacksonville, and Gulf of Mexico Range Complexes, although activities with explosives would also occur in other areas as described in Appendix A (Activity Descriptions). Activities involving in-water explosives from medium- and large-caliber naval gunfire, missiles, bombs, or other munitions are conducted more than 12 NM from shore. Explosive munitions used during surface warfare activities would typically detonate at or within 9 m (30 ft.) above the water surface. Certain activities with explosives may be conducted closer to shore at locations identified in Appendix A, including the training activity Mine Neutralization Explosive Ordnance Disposal and testing activities Semi-Stationary Equipment Testing and Line Charge Testing.

The number of impacts to each stock due to exposure to explosives during testing and training under Alternative 1 is shown in Table 3.7-14 for a maximum year of activities and in Table 3.7-15 for seven years of activities. Appendix E (Acoustic and Explosives Impact Analysis) provides additional detail on modeled impacts to each stock, including seasons and regions in which impacts are most likely to occur; which activities are most likely to cause impacts; and analysis of impacts to designated critical habitat for ESA-listed species, where applicable. Appendix E also shows total impacts to each stock due to training or testing activities under this alternative and explains how impacts are summed to estimate maximum annual and seven-year total impacts. The number of impacts to marine mammals are over-estimated in this analysis by modeling explosions at or near the water surface as underwater explosions.

All model-predicted mortalities and a large portion of model-predicted non-auditory injuries are due to small ship shock trials, which could occur in the Virginia Capes, Jacksonville, or Gulf of Mexico Range Complexes. The Action Proponents conduct extensive visual observations for ship shock trials in accordance with NMFS-reviewed event-specific mitigation and monitoring plans (see Chapter 5, Mitigation). Adherence to these plans increases the likelihood that Lookouts would sight surface active marine mammals within the ship shock trial mitigation zone. For other explosive activities, the Action Proponents will also implement mitigation to relocate, delay, or cease detonations when a marine mammal is sighted within or entering a mitigation zone to avoid or reduce potential explosive impacts.

Depending on the stock, impacts to individuals may be permanent (auditory injuries or mortality) or temporary (non-auditory injury, TTS, masking, stress, or behavioral response). The behavioral patterns of a limited number of individuals may be interrupted. Individuals or groups may temporarily avoid areas around explosive activities if multiple detonations occur. Activities would be relatively brief and occur over small areas relative to population ranges. Permanent impacts would be present in low enough numbers such that the continued viability of populations is not threatened. The total impacts are not expected to interfere with feeding, reproduction, or other biologically important functions such that the continued viability of the population would be threatened. The analysis conclusions for impacts due to use of explosives during training and testing activities under Alternative 1 are consistent with a minor to moderate impact on marine mammals.

Under the MMPA, the use of explosives during military readiness activities as described under Alternative 1 will result in the unintentional taking of marine mammals incidental to those activities. As required by section 101(a)(5)(a) of the MMPA, the Action Proponents are requesting authorization from NMFS to take marine mammals incidental to the use of explosives during military readiness activities.

The Action Proponents have concluded that the use of explosives during military readiness activities as described under Alternative 1 may affect blue whales, Rice's whales, fin whales, North Atlantic right whales, sei whales, sperm whales, and West Indian manatees, as defined by the ESA. The Action Proponents have also concluded that explosives used during military readiness activities would have no effect on critical habitat for the North Atlantic right whale and West Indian manatee and may affect proposed critical habitat for the Rice's whale. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

Table 3.7-14: Impacts Due to a Maximum Year of Explosive Testing and Training Activity under Alternative 1 and Alternative 2

Species	Stock	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
Atlantic spotted dolphin	Northern Gulf of Mexico	19	14	2	0	0	20	14	2	0	0
	Western North Atlantic	75	65	8	4	1	76	66	8	4	1
Atlantic white-sided dolphin	Western North Atlantic	12	10	2	1	0	13	10	2	1	0
Blainville's beaked whale	Northern Gulf of Mexico	0	0	-	-	-	0	0	-	-	-
	Western North Atlantic	2	3	2	1	0	2	3	2	1	0
Blue whale	North Atlantic	2	3	-	-	-	2	3	-	-	-
Bottlenose dolphin	Central GA Estuarine System	0	-	-	-	-	0	-	-	-	-
	Gulf of Mexico Eastern Coastal	1	2	0	-	-	1	2	0	-	-
	Gulf of Mexico Northern Coastal	87	119	17	-	-	87	119	17	-	-
	Gulf of Mexico Oceanic	5	2	1	0	0	5	2	1	0	0
	Gulf of Mexico Western Coastal	2	1	1	0	-	2	1	1	0	-
	Northern Gulf of Mexico Continental Shelf	387	199	6	2	0	390	200	6	2	0
	Northern NC Estuarine System	1	0	0	-	-	1	0	0	-	-
	Northern SC Estuarine System	0	-	-	-	-	0	-	-	-	-
	Southern NC Estuarine System	1	-	-	-	-	1	-	-	-	-
	St. Andrew Bay	1	1	-	-	-	1	1	-	-	-
	Western North Atlantic Central FL Coastal	22	13	2	1	0	22	13	2	1	0
	Western North Atlantic Northern FL Coastal	6	4	2	0	-	6	5	2	0	-
	Western North Atlantic Northern Migratory Coastal	23	43	6	1	0	23	43	6	1	0
	Western North Atlantic Offshore	118	130	20	3	2	120	131	20	3	2
	Western North Atlantic SC GA Coastal	14	8	2	0	1	15	8	2	0	1
	Western North Atlantic Southern Migratory Coastal	28	32	5	1	0	29	32	5	1	0
Bryde's whale	Primary	0	0	-	-	-	0	0	-	-	-
Clymene dolphin	Northern Gulf of Mexico	1	1	1	1	0	1	1	1	1	0
	Western North Atlantic	21	27	7	2	2	22	28	7	2	2
Goose-beaked whale	Northern Gulf of Mexico	0	1	0	-	-	0	1	0	-	-
	Western North Atlantic	8	13	3	0	0	9	13	3	0	0
Dwarf sperm whale	Northern Gulf of Mexico	5	30	17	0	-	5	30	17	0	-
	Western North Atlantic	41	65	28	0	0	43	67	28	0	0
False killer whale	Northern Gulf of Mexico	1	1	0	-	-	1	1	0	-	-
	Western North Atlantic	0	1	-	-	-	0	1	-	-	-

Table 3.7-14: Impacts Due to a Maximum Year of Explosive Testing and Training Activity under Alternative 1 and Alternative 2 (continued)

Species	Stock	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
Fin whale	Western North Atlantic	141	168	12	-	-	143	169	12	-	-
Fraser's dolphin	Northern Gulf of Mexico	1	1	0	0	-	1	1	0	0	-
	Western North Atlantic	2	3	1	0	-	2	3	1	0	-
Gervais' beaked whale	Northern Gulf of Mexico	0	1	-	-	-	0	1	-	-	-
	Western North Atlantic	4	4	2	0	-	4	4	2	0	-
Gray seal	Western North Atlantic	85	64	5	0	-	93	67	5	0	-
Harbor porpoise	Gulf of ME/Bay of Fundy	171	379	100	0	0	185	394	103	0	0
Harbor seal	Western North Atlantic	128	94	7	0	0	139	98	7	0	0
Harp seal	Western North Atlantic	15	10	2	0	-	18	11	2	0	-
Hooded seal	Western North Atlantic	2	2	0	-	-	2	2	0	-	-
Humpback whale	Gulf of ME	28	23	1	-	-	29	24	1	-	-
Killer whale	Northern Gulf of Mexico	0	0	0	-	-	0	0	0	-	-
	Western North Atlantic	1	1	0	-	0	1	1	0	-	0
Long-finned pilot whale	Western North Atlantic	23	29	9	3	1	23	29	9	3	1
Melon-headed whale	Northern Gulf of Mexico	1	1	0	0	0	1	1	0	0	0
	Western North Atlantic	1	0	0	0	0	1	0	0	0	0
Minke whale	Canadian Eastern Coastal	51	49	2	0	-	53	50	2	0	-
North Atlantic right whale	Western	20	14	1	-	-	20	14	1	-	-
Northern bottlenose whale	Western North Atlantic	1	0	1	-	-	1	0	1	-	-
Pantropical spotted dolphin	Northern Gulf of Mexico	3	12	3	3	2	3	12	3	3	2
	Western North Atlantic	2	1	1	0	0	2	1	1	0	0
Pygmy killer whale	Northern Gulf of Mexico	1	1	0	0	0	1	1	0	0	0
	Western North Atlantic	0	1	1	0	-	0	1	1	0	-
Pygmy sperm whale	Northern Gulf of Mexico	6	32	17	-	-	6	33	17	-	-
	Western North Atlantic	39	64	28	0	-	41	66	28	0	-
Rice's whale	Northern Gulf of Mexico	7	5	1	-	-	8	5	1	-	-
Risso's dolphin	Northern Gulf of Mexico	1	1	0	0	0	1	1	0	0	0
	Western North Atlantic	23	37	4	2	1	25	38	4	2	1
Rough-toothed dolphin	Northern Gulf of Mexico	7	5	1	1	0	7	5	1	1	0
	Western North Atlantic	3	3	1	0	-	3	3	1	0	-
Sei whale	Western North Atlantic	11	6	0	-	-	12	6	0	-	-
Short-beaked common dolphin	Western North Atlantic	437	370	38	19	5	445	373	38	19	5

Table 3.7-14: Impacts Due to a Maximum Year of Explosive Testing and Training Activity under Alternative 1 and Alternative 2 (continued)

Species	Stock	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
Short-finned pilot whale	Northern Gulf of Mexico	1	2	1	0	0	1	2	1	0	0
	Western North Atlantic	21	27	7	1	1	22	27	7	1	1
Sowerby's beaked whale	Western North Atlantic	2	2	1	0	0	2	2	1	0	0
Sperm whale	North Atlantic	7	11	3	1	0	7	11	3	1	0
	Northern Gulf of Mexico	2	2	0	0	0	2	2	0	0	0
Spinner dolphin	Northern Gulf of Mexico	0	1	0	0	-	0	1	0	0	-
	Western North Atlantic	1	2	0	0	-	1	2	0	0	-
Striped dolphin	Northern Gulf of Mexico	1	11	5	2	1	1	11	5	2	1
	Western North Atlantic	29	92	19	16	6	32	93	20	16	6
True's beaked whale	Western North Atlantic	2	2	1	-	0	2	2	1	-	0
White-beaked dolphin	Western North Atlantic	0	-	-	-	-	0	-	-	-	-

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; FL = Florida; GA = Georgia; INJ = Non-Auditory Injury; ME = Maine; MORT = Mortality; MS = Mississippi; NC = North Carolina; SC = South Carolina; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

Table 3.7-15: Impacts due to Seven Years of Explosive Testing and Training Activity under Alternative 1 and Alternative 2

Species	Stock	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
Atlantic spotted dolphin	Northern Gulf of Mexico	125	93	10	0	0	130	94	10	0	0
	Western North Atlantic	468	390	42	11	2	478	396	43	12	2
Atlantic white-sided dolphin	Western North Atlantic	71	60	8	3	0	78	63	9	3	0
Blainville's beaked whale	Northern Gulf of Mexico	0	0	-	-	-	0	0	-	-	-
	Western North Atlantic	6	10	3	1	0	6	11	3	1	0
Blue whale	North Atlantic	4	8	-	-	-	4	9	-	-	-

Table 3.7-15: Impacts due to Seven Years of Explosive Testing and Training Activity under Alternative 1 and Alternative 2 (continued)

Species	Stock	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
Bottlenose dolphin	Central GA Estuarine System	0	-	-	-	-	0	-	-	-	-
	Gulf of Mexico Eastern Coastal	4	8	0	-	-	4	8	0	-	-
	Gulf of Mexico Northern Coastal	604	823	114	-	-	604	823	114	-	-
	Gulf of Mexico Oceanic	19	11	2	0	0	20	11	3	0	0
	Gulf of Mexico Western Coastal	10	4	1	0	-	13	6	1	0	-
	Northern Gulf of Mexico Continental Shelf	2,697	1,384	31	2	0	2,718	1,394	33	2	0
	Northern NC Estuarine System	1	0	0	-	-	1	0	0	-	-
	Northern SC Estuarine System	0	-	-	-	-	0	-	-	-	-
	Southern NC Estuarine System	1	-	-	-	-	1	-	-	-	-
	St. Andrew Bay	1	1	-	-	-	1	1	-	-	-
	Western North Atlantic Central FL Coastal	132	82	8	2	0	132	82	8	2	0
	Western North Atlantic Northern FL Coastal	29	24	2	0	-	31	25	2	0	-
	Western North Atlantic Northern Migratory Coastal	157	294	31	1	0	157	294	31	1	0
	Western North Atlantic Offshore	747	721	89	9	3	762	729	90	9	3
	Western North Atlantic SC GA Coastal	87	52	6	0	1	88	52	6	0	1
	Western North Atlantic Southern Migratory Coastal	188	220	28	4	0	189	221	28	4	0
Bryde's whale	Primary	0	0	-	-	-	0	0	-	-	-
Clymene dolphin	Northern Gulf of Mexico	4	3	1	1	0	4	3	1	1	0
	Western North Atlantic	142	170	42	5	5	149	176	43	5	5
Goose-beaked whale	Northern Gulf of Mexico	0	1	0	-	-	0	1	0	-	-
	Western North Atlantic	44	51	8	0	0	45	51	8	0	0
Dwarf sperm whale	Northern Gulf of Mexico	21	89	41	0	-	23	91	41	0	-
	Western North Atlantic	277	360	104	0	0	291	373	105	0	0
False killer whale	Northern Gulf of Mexico	1	1	0	-	-	1	1	0	-	-
	Western North Atlantic	0	2	-	-	-	0	2	-	-	-
Fin whale	Western North Atlantic	876	704	40	-	-	887	710	40	-	-
Fraser's dolphin	Northern Gulf of Mexico	1	1	0	0	-	1	1	0	0	-
	Western North Atlantic	7	7	2	0	-	7	8	2	0	-
Gervais' beaked whale	Northern Gulf of Mexico	0	1	-	-	-	0	1	-	-	-
	Western North Atlantic	4	8	1	0	-	4	9	2	0	-

Table 3.7-15: Impacts due to Seven Years of Explosive Testing and Training Activity under Alternative 1 and Alternative 2 (continued)

Species	Stock	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
Gray seal	Western North Atlantic	591	432	31	0	-	642	453	32	0	-
Harbor porpoise	Gulf of ME/Bay of Fundy	1,158	2,472	635	0	0	1,254	2,575	657	0	0
Harbor seal	Western North Atlantic	879	630	41	0	0	952	659	42	0	0
Harp seal	Western North Atlantic	102	63	5	0	-	124	73	6	0	-
Hooded seal	Western North Atlantic	6	5	0	-	-	7	6	0	-	-
Humpback whale	Gulf of ME	177	105	1	-	-	182	108	1	-	-
Killer whale	Northern Gulf of Mexico	0	0	0	-	-	0	0	0	-	-
	Western North Atlantic	2	2	0	-	0	2	2	0	-	0
Long-finned pilot whale	Western North Atlantic	138	120	28	6	1	141	120	29	6	1
Melon-headed whale	Northern Gulf of Mexico	1	3	0	0	0	1	3	0	0	0
	Western North Atlantic	1	0	0	0	0	1	0	0	0	0
Minke whale	Canadian Eastern Coastal	330	214	9	0	-	344	222	9	0	-
North Atlantic right whale	Western	127	87	1	-	-	130	90	1	-	-
Northern bottlenose whale	Western North Atlantic	1	0	1	-	-	1	0	1	-	-
Pantropical spotted dolphin	Northern Gulf of Mexico	18	38	7	8	5	19	38	7	8	5
	Western North Atlantic	8	6	1	0	0	8	6	1	0	0
Pygmy killer whale	Northern Gulf of Mexico	1	1	0	0	0	1	1	0	0	0
	Western North Atlantic	0	1	1	0	-	0	1	1	0	-
Pygmy sperm whale	Northern Gulf of Mexico	27	100	41	-	-	29	102	42	-	-
	Western North Atlantic	260	359	116	0	-	272	373	118	0	-
Rice’s whale	Northern Gulf of Mexico	49	26	1	-	-	50	27	1	-	-
Risso’s dolphin	Northern Gulf of Mexico	1	1	0	0	0	1	1	0	0	0
	Western North Atlantic	145	165	18	4	1	157	171	19	4	1
Rough-toothed dolphin	Northern Gulf of Mexico	40	24	1	1	0	41	24	1	1	0
	Western North Atlantic	10	11	1	0	-	10	11	1	0	-
Sei whale	Western North Atlantic	68	25	0	-	-	72	26	0	-	-
Short-beaked common dolphin	Western North Atlantic	2,686	1,986	177	50	12	2,745	2,012	180	51	12
Short-finned pilot whale	Northern Gulf of Mexico	3	5	1	0	0	3	5	1	0	0
	Western North Atlantic	124	116	26	3	1	127	116	26	3	1
Sowerby’s beaked whale	Western North Atlantic	8	10	1	0	0	8	10	1	0	0
Sperm whale	North Atlantic	35	51	9	1	0	36	52	9	1	0
	Northern Gulf of Mexico	2	2	0	0	0	2	2	0	0	0
Spinner dolphin	Northern Gulf of Mexico	0	1	0	0	-	0	1	0	0	-

Table 3.7-15: Impacts due to Seven Years of Explosive Testing and Training Activity under Alternative 1 and Alternative 2 (continued)

Species	Stock	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
	Western North Atlantic	2	6	0	0	-	3	6	0	0	-
Striped dolphin	Northern Gulf of Mexico	5	29	10	5	2	5	29	10	5	2
	Western North Atlantic	189	320	68	44	16	211	331	70	44	16
True's beaked whale	Western North Atlantic	2	3	1	-	0	2	3	1	-	0
White-beaked dolphin	Western North Atlantic	0	-	-	-	-	0	-	-	-	-

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; FL = Florida; GA = Georgia; INJ = Non-Auditory Injury; ME = Maine; MORT = Mortality; MS = Mississippi; NC = North Carolina; SC = South Carolina; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

3.7.3.2.1.2 Impacts from Explosives under Alternative 2

Under Alternative 2, the use of explosives during training activities would be identical to Alternative 1. Under Alternative 2, there would be an increase in use of some explosive bins during testing compared to Alternative 1. This would slightly increase impacts to some stocks as shown in Table 3.7-14 and Table 3.7-15. Still, impacts from explosives in water under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

3.7.3.3 Energy Stressors

Table 3.7-16 contains brief summaries of the background information that is relevant to the analyses of impacts of in-water electromagnetic devices on marine mammals. Details on the updated information in general, as well as effects specific to each substressor, are provided in Appendix G (Non-Acoustic Impacts Supporting Information). Energy stressors from human activities have not been identified among the causes of decline in marine mammal populations to date (Appendix F, Biological Resources Supplemental Information).

Table 3.7-16: Energy Stressors Background Information Summary

Substressor	*Background Information Summary*
In-air electromagnetic devices	In-air electromagnetic devices are not applicable to marine mammals because of the lack of transmission of electromagnetic radiation across the air/water interface and distant proximity to in-air sources. For pinnipeds that occur on land, in-air electromagnetic sources used during training or testing will never be in close enough proximity to land-based haul-outs or areas to have an effect on those animals. As a result, in-air electromagnetic devices will not be analyzed further.
In-water electromagnetic devices	Impacts to marine mammals from the use of in-water electromagnetic devices are not expected. • The in-water devices producing an electromagnetic field are towed or unmanned mine countermeasure systems. • The electromagnetic field is produced to simulate a vessel's magnetic field. In an actual mine-clearing operation, the intent is that the electromagnetic field would trigger an enemy mine designed to sense a vessel's magnetic field. • Impacts from the use of in-water electromagnetic devices are not anticipated because the electromagnetic field is the simulation of a ship's magnetic field, having no greater impact than that of a passing ship.
High-energy lasers	Impacts to marine mammals from the use of high energy lasers are not expected. Based on the statistical probability analysis described in Appendix I (Military Expended Materials and Direct Strike Impact Analysis), results indicate that no marine mammal would be struck by a high-energy laser over the course of a year. • Marine mammals could be exposed to a laser only if the beam missed the target. • The probability analysis does not take into account that high-energy laser systems used in military readiness activities automatically shut down when target-lock is lost; meaning that if a high-energy laser beam aimed at a small boat on the surface, either from an aircraft or surface vessel, moves off the target, the system ceases projecting laser light, preventing any energy from striking the water or a nearby marine mammal. Therefore, even though marine mammals may be present at the time high-energy lasers are used, there is no plausible route of effects to the listed species.

3.7.3.3.1 Impacts from In-Water Electromagnetic Devices

The types of activities that create an electromagnetic field under water are listed in Appendix B (Activity Stressor Matrices). The in-water devices producing an electromagnetic field are towed or unmanned mine countermeasure systems. The electromagnetic field is produced to simulate a vessel's magnetic field. In an actual mine-clearing operation, the intent is that the electromagnetic field would trigger an enemy mine designed to sense a vessel's magnetic field.

With the increased use of undersea power cables associated with offshore energy generation, there has been renewed scientific interest in the possibility of electromagnetic fields affecting migrating marine mammals (Driessen et al., 2020; Gill et al., 2014; Kremers et al., 2016; Kremers et al., 2014; Zellar et al., 2017). Reported analysis of empirical observations of humpback whale migrations suggested that the migratory decisions for the species are relatively insensitive to changing oceanographic and geomagnetic conditions (Horton et al., 2017; Horton et al., 2020). These additional scientific findings do not change the rationale for the dismissal of in-water electromagnetic devices as presented in the 2018 Final EIS/OEIS analyses. As presented and at the most basic level, impacts from the use of in-water electromagnetic devices are not anticipated because the electromagnetic field is the simulation of a ship's magnetic field, having no greater impact than that of a passing ship.

3.7.3.3.1.1 Impacts from In-Water Electromagnetic Devices under Alternative 1

For both training and testing activities, in-water electromagnetic device activity would decrease overall from the 2018 Final EIS/OEIS (see Supplemental EIS/OEIS Table 3.0-6, Number and Location of Activities Using In-Water Electromagnetic Devices).

Under Alternative 1 for training:

- In-water electromagnetic devices would occur in two areas not previously analyzed (Key West Range Complex and Virginia Capes Range Complex Inshore) for the 2018 Final EIS/OEIS. There would also be notable increases in in-water electromagnetic devices in the Virginia Capes and Gulf of Mexico Range Complexes. For all other locations, there would either be a decrease or similar amount of in-water electromagnetic devices.

Under Alternative 1 for testing:

- In-water electromagnetic devices would occur in two areas not previously analyzed (Northeast Range Complexes and Hampton Roads, Virginia) in the 2018 Final EIS/OEIS. There would also be a notable increase in in-water electromagnetic devices in the Naval Surface Warfare Center Panama City Testing Range. For all other locations, there would either be a decrease or cessation of in-water electromagnetic devices.

For locations without notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.7.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of marine mammals among training and testing locations has not changed.

For locations with notable increase in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of in-water electromagnetic device activity remains an accurate characterization of the Proposed Action in those locations.

For the locations not previously analyzed, standard operating procedures (e.g., in-water device safety) will help reduce potential impacts to marine mammals. Potential impacts would be limited to temporary behavioral and stress-startle responses to individual sensitive marine mammals within localized areas.

Military readiness activities that use in-water electromagnetic devices would occur within the northeast and southeast portions of North Atlantic right whale designated critical habitat. Since North Atlantic right whales occur within the southeast critical habitat area primarily in winter months, any potential overlap with military readiness activities in these areas would be seasonal. Physical and biological features identified for North Atlantic right whale conservation and considered in the critical habitat designation include water temperatures, depths, and sea surface conditions that are suitable for the southern calving habitats (National Marine Fisheries Service, 2015). These habitat features would not be impacted by in-water electromagnetic devices.

Physical and biological features identified for Rice's whale conservation and considered in the proposed critical habitat designation include continental shelf and slope associated waters between the 100 to 400m isobaths that support individual growth, reproduction, and development, social behavior, and overall population growth through sufficient prey density, waters with elevated productivity, water temperatures of 10-19° C, low pollution, and quiet conditions (88 *Federal Register* 47453). These habitat features would not be impacted by in-water electromagnetic devices.

Under the MMPA, the use of in-water electromagnetic devices during the proposed military readiness activities as described under Alternative 1 will not result in the unintentional taking of marine mammals incidental to those activities.

The Action Proponents have concluded that the use of in-water electromagnetic devices during military readiness activities as described under Alternative 1 will have no effect on the blue whale, fin whale, North Atlantic right whale, sei whale, sperm whale, Rice's whale, and West Indian manatee, as defined by the ESA. The Action Proponents have also concluded that the use of in-water electromagnetic devices during the proposed military readiness activities would have no effect on designated critical habitat for the North Atlantic right whale and West Indian manatee, nor on proposed Rice's whale critical habitat.

The analysis conclusions for in-water electromagnetic device use under Alternative 1 are consistent with negligible impact on marine mammal populations.

3.7.3.3.1.2 Impacts from In-Water Electromagnetic Devices under Alternative 2

Impacts from in-water electromagnetic devices under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species and critical habitat are the same for both training and testing.

3.7.3.3.2 Impacts from High-Energy Lasers

Table 3.7-16 contains a summary of the background information used to analyze the potential impacts of high-energy lasers on marine mammals. For a listing of the types of activities that use high-energy lasers, refer to Appendix B (Activity Stressor Matrices). High-energy laser weapons are designed to disable surface targets and automatically shut down when target-lock is lost.

3.7.3.3.2.1 Impacts from High-Energy Lasers under Alternative 1

For training activities, the use of high-energy lasers increased from the 2018 Final EIS/OEIS, and for testing activities, the use of high-energy lasers would decrease (Table 3.0-7, Number and Location of Activities Using High-Energy Lasers).

Under Alternative 1 for training:

- High-energy lasers would occur in one area not previously analyzed (Navy Cherry Point Range Complex) for the 2018 Final EIS/OEIS. There would also be notable increases in high-energy lasers at the Virginia Capes and Jacksonville Range Complexes.

Under Alternative 1 for testing:

- High-energy lasers would no longer occur in two locations (South Florida Ocean Measurement Facility and Key West Range Complex) that they occurred in for the 2018 Final EIS/OEIS. For all other locations, there would be a decrease in high-energy lasers.

Due to changes in the understanding of how high-energy lasers operate during military readiness activities, the below analysis has been updated from that included in the 2018 Final EIS/OEIS

High-energy lasers are used from surface or aircraft platforms to disrupt or disable targets, such as small boats or aircraft, over short ranges. During a high-energy laser testing activity, the system specifications, integration, and performance are evaluated as the laser is deployed against an unmanned aerial or surface target. After system evaluation, similar scenarios are used to train operators on the use of high-energy laser systems.

The only potential effect on marine mammals from the use of high-energy lasers is direct exposure to laser light incident on the water's surface at the same time a marine mammal is at or near the water's surface, and for the exposure to cause injury. A marine mammal could only be exposed if a laser beam missed the intended target and inadvertently struck a nearby marine mammal. The statistical probability analysis (see Appendix I [Military Expended Materials and Direct Strike Impact Analysis] in the Draft Supplemental AFTT EIS/OEIS) indicates that even for short-beaked common dolphins, the species with the highest density in the Study Area, the probability of a marine mammal being hit by a high-energy laser beam is so low that it is considered discountable.

The probability analysis does not take into account that high-energy laser systems used in military readiness activities automatically shut down when target-lock is lost; meaning that if a high-energy laser beam aimed at a small boat on the surface, either from an aircraft or surface vessel, moves off the target, the system ceases projecting laser light, preventing any energy from striking the water or a nearby marine mammal. Therefore, even though marine mammals may be present at the time high-energy lasers are used, there is no plausible route of effects to the listed species.

For the same reasons the use of higher energy lasers would not affect marine mammal species, the use of high-lasers would not result in permanent or temporary impacts on the essential features defining critical habitat in the Study Area. Military readiness activities that use high-energy lasers would not occur within the northeast portion of North Atlantic right whale designated critical habitat but would occur in the southeast critical habitat area. Since North Atlantic right whales occur within the southeast critical habitat area primarily in winter months, any potential overlap with military readiness activities in these areas would be seasonal. Given the high level of certainty that no marine mammals would be struck by a high-energy laser, the Action Proponents do not anticipate a strike of a North Atlantic right whale with a high-energy laser during training activities. Physical and biological features identified for North Atlantic right whale conservation and considered in the critical habitat designation include water temperatures, depths, and sea surface conditions that are suitable for the southern calving habitats (National Marine Fisheries Service, 2015). High-energy lasers would not impact these habitat features.

Physical and biological features identified for Rice's whale conservation and considered in the proposed critical habitat designation include continental shelf and slope associated waters between the 100 to 400m isobaths that support individual growth, reproduction, and development, social behavior, and overall population growth through sufficient prey density, waters with elevated productivity, water temperatures of 10-19° C, low pollution, and quiet conditions (88 *Federal Register* 47453). High-energy lasers would not impact these habitat features.

Military readiness activities that use high-energy lasers would not occur within West Indian manatee critical habitat.

Under the MMPA, the Action Proponents have concluded that the use of high-energy lasers during military readiness activities as described under Alternative 1 would have no effect on North Atlantic right whale critical habitats, or the proposed Rice's whale critical habitat, and is not applicable to West Indian manatee critical habitat as defined by the ESA. The use of high-energy lasers will have no effect on the blue whale, fin whale, North Atlantic right whale, Rice's whale, sei whale, sperm whale, and West Indian manatee as defined by the ESA.

The analysis conclusions for high-energy laser use with military readiness activities under Alternative 1 are consistent with negligible impact on marine mammal populations.

3.7.3.3.2.2 Impacts from High-Energy Lasers under Alternative 2

Impacts from high-energy lasers under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

3.7.3.4 Physical Disturbance and Strike Stressors

This section analyzes the potential impacts of the various types of physical disturbance, including the potential for strike during military readiness activities within the Study Area from (1) vessels; (2) in-water devices; (3) military expended materials, including non-explosive practice munitions and fragments from high-explosive munitions; and (4) seafloor devices.

The way a physical disturbance may affect a marine mammal would depend in part on the relative size of the object, the speed of the object, the location of the mammal in the water column, and reactions of marine mammals to anthropogenic activity, which may include avoidance or attraction. It is not known at what point or through what combination of stimuli (visual, acoustic, or through detection in pressure changes) an animal becomes aware of a vessel or other potential physical disturbances before reacting or being struck. Refer to Section 3.7.3.1.1.3 (Physiological Stress) and Section 3.7.3.1.1.5 (Behavioral Reactions) of the 2018 Final EIS/OEIS for the discussion of the potential for disturbance from acoustic stimuli. Given that the presentation of a physical disturbance should be very rare and brief, the cost from the response is likely to be within the normal variation experienced by an animal in its daily routine unless the animal is struck (see Table 3.7-17). If a strike does occur, the cost to the individual could range from slight injury to death. While the analysis of potential impacts from the physical presence of the vessel is presented here, the analysis of potential impacts in response to sounds produced by vessel operations is addressed in Section 3.7.3.1.4 (Impacts from Vessel Noise). For a summary of background studies on physical disturbance and strike stressors, refer to Appendix G (Non-Acoustic Impacts Supporting Information).

Table 3.7-17: Physical Disturbance and Strike Stressors Background Information Summary

Substressor	*Background Information Summary*
Vessels and in-water devices	Vessel strikes may impact marine mammal species, but mitigation measures are in place that reduce the potential for a strike to occur. • Vessel strikes from commercial, recreational, and military vessels are known to have resulted in serious injury and occasional fatalities to cetaceans. The majority of the military readiness activities under all alternatives involve some level of vessel activity.

Table 3.7-17: Physical Disturbance and Strike Stressors Summary Background Information (continued)

Substressor	*Background Information Summary*
	• An examination of vessel traffic within the Study Area determined that military vessel occurrence is two orders of magnitude lower than that of commercial traffic. Standard operating procedures for vessel safety and additional mitigation measures will benefit marine mammals through a reduction in the potential for vessel strike. It is possible that marine mammal species that occur in areas that overlap with in-water device use associated with the Proposed Action may experience some level of physical disturbance, but it is not expected to result in more than a momentary behavioral response. • In-water devices are generally smaller (several inches to 111 feet) than most vessels. • Devices that could pose a collision risk to marine mammals are those that are operated at high speeds and that are unmanned. Since some in-water devices are identical to support craft (typically less than 15 meters in length), marine mammals could respond to the physical presence of the device similar to how they respond to the physical presence of a vessel.
Military expended materials	While no strike from military expended materials has ever been reported or recorded, military expended materials may impact marine mammal species. • The primary concern is the potential for a marine mammal to be hit with military expended material at or near the water's surface, which could result in injury or death. • While disturbance or strike from an item falling through the water column is possible, it is not very likely given that objects generally sink slowly through the water and can be avoided by most marine mammals. Therefore, the discussion of military expended materials strikes focuses on the potential of a strike at the surface of the water. • The potential for marine mammals to be struck by military expended materials was evaluated using statistical probability modeling to estimate potential direct strike exposures to a marine mammal under a worst-case scenario.
Seafloor devices	Seafloor devices are not likely to impact marine mammals. • The likelihood of any marine mammal species encountering seafloor devices is considered low because these items are either stationary or move very slowly along the bottom. • In the unlikely event that a marine mammal is in the vicinity of a seafloor device, the stationary or very slowly moving devices would not be expected to physically disturb or alter natural behaviors of marine mammals. • The only seafloor device used during military readiness activities that has the potential to strike a marine mammal at or near the surface is an aircraft-deployed mine shape, which is used during aerial mine laying activities.
Pile driving	Pile driving will not affect marine mammals. • Given the nearshore locations for this training activity and the temporary nature of the structures, it is not likely that marine mammals would experience physical disturbance from the presence of the temporary pier structure. • Furthermore, it is not likely that any marine mammal would be struck by a piling during installation. Mitigation measures discussed in Chapter 5 (Mitigation) would be implemented to further reduce any potential for impacts. • Therefore, the Action Proponents have determined that the pile driving training activity would not strike a marine mammal or result in physical disturbance impacts above those associated with acoustic impacts described in Section 3.7.3.1.3

Table 3.7-17: Physical Disturbance and Strike Stressors Summary Background Information (continued)

Substressor	Background Information Summary
	(Acoustic Stressors, Impacts from Pile Driving Noise). Accordingly, this activity is not considered further in this section.

3.7.3.4.1 Impacts from Vessels and In-Water Devices

Vessel strikes from commercial, recreational, and military vessels have resulted in serious injury and fatalities to cetaceans (Abramson et al., 2011; Berman-Kowalewski et al., 2010; Calambokidis, 2012; Douglas et al., 2008; Laggner, 2009; Lammers et al., 2003; Van der Hoop et al., 2013; Van der Hoop et al., 2012). Reviews of the literature on ship strikes mainly involve collisions between commercial vessels and whales (Jensen & Silber, 2004; Laist et al., 2001).

In the Study Area, commercial traffic is heaviest in the nearshore waters, near major ports and in the shipping lanes along the entire U.S. East Coast and along the northern coast of the Gulf of Mexico, while military vessel traffic is primarily concentrated between the mouth of the Chesapeake Bay and Jacksonville, Florida (Mintz, 2016). An examination of vessel traffic within the Study Area determined that military vessel occurrence is two orders of magnitude lower than that of commercial traffic. The study also revealed that while commercial traffic is relatively steady throughout the year, military vessel usage within the range complexes is episodic, based on specific exercises being conducted at different times of the year (Mintz, 2012); however, military vessel use within inshore waters occurs regularly and routinely consists of high-speed small craft movements.

Large military vessels (greater than 18 m in length) within the offshore areas of the Study Area operate differently from commercial vessels in ways important to the prevention of whale collisions. For example, the average speed of large military ships ranges between 10 and 15 knots. Submarines generally operate at lower speeds. By comparison, this is slower than most commercial vessels where full speed for a container ship is typically 24 knots (Bonney & Leach, 2010). Even given the advent of "slow steaming" by commercial vessels in recent years due to fuel prices (Barnard, 2016; Maloni et al., 2013), this is generally a reduction of only a few knots, given that 21 knots would be considered "slow," 18 knots is considered "extra slow," and 15 knots is considered "super slow" (Bonney & Leach, 2010). Small military craft (less than 50 feet [ft.] in length), have much more variable speeds (0 to 50 knots or more, depending on the mission).

Military vessel movements include both surface and sub-surface operations. Navy vessels include ships, submarines and boats ranging in size from small, 22 ft. (7 m) rigid hull inflatable boats to aircraft carriers with lengths up to 1,092 ft. (333 m). The Marine Corps would operate small boats from 10 to 50 ft. (3 to 15.2 m) in length and include small unit riverine craft, rigid hull inflatable boats and amphibious combat vehicles. Coast Guard vessels range from small boats between 13 and 65 ft. (3.9 to 19.8 m) to large cutters with lengths up to 418 ft. (127.4 m).

The ability to detect a marine mammal and avoid a collision depends on a variety of factors including environmental conditions, ship design, size, speed, and manning, as well as the behavior of the animal. Differences between most large military ships and commercial ships also include the following:

- The operation of military vessels incorporates standard operating procedures for vessel safety that will benefit marine mammals through a reduction in the potential for vessel strike, as discussed in 2018 Final EIS/OEIS Section 2.3.3.2 (Vessel Safety). For example, military ships have personnel assigned to stand watch at all times, day and night, when moving through the water (i.e., when the vessel is underway). Watch personnel undertake extensive training to certify that they have demonstrated all necessary skills. While on watch, personnel employ visual search and reporting procedures in accordance with the U.S. Navy Lookout Training Handbook, Coast Guard, or civilian equivalent. Watch personnel are responsible for using correct scanning procedures while monitoring an assigned sector and reporting any indication of danger to the ship and personnel on board, such as a floating or partially submerged object or piece of debris, periscope, surfaced submarine, wisp of smoke, flash of light, or surface disturbance. As a standard collision avoidance procedure, watch personnel also monitor for marine mammals that have the potential to be in the direct path of the ship. Vessels are required to operate in accordance with applicable navigation rules, including Inland Navigation Rules (33 Code of Federal Regulations part 83) and the International Regulations for Preventing Collisions at Sea, which were formalized in the Convention on the International Regulations for Preventing Collisions at Sea, 1972. Applicable navigation requirements include, but are not limited to, Rule 5 (Lookouts) and Rule 6 (Safe Speed). These rules require that vessels at all times proceed at a safe speed so that proper and effective action can be taken to avoid collision and so they can be stopped within a distance appropriate to the prevailing circumstances and conditions.

- Many military ships have their bridges positioned closer to the bow, offering good visibility ahead of the ship.
- There are often aircraft associated with military readiness activities, which may support the detection of marine mammals in the vicinity or ahead of a vessel's present course.
- Military ships are generally much more maneuverable than commercial merchant vessels if marine mammals are spotted and the need to change direction is necessary.
- Military ships operate at the slowest speed possible consistent with either transit needs or training or testing needs. While minimum speed is intended as a fuel conservation measure particular to a certain ship class, secondary benefits include a better ability to detect and avoid objects in the water, including marine mammals.
- In many cases, military ships will likely operate within a sub-area of the Study Area for a period of time from 1 day to 2 weeks as compared to straight line point-to-point commercial shipping.
- Military vessel overall crew size, including bridge crew, is much larger than merchant ships allowing for more watch personnel on the bridge.
- When submerged, submarines are generally slow moving (to avoid detection) and therefore marine mammals at depth within the vicinity of a submarine are likely able to avoid collision with the submarine. When a submarine is transiting on the surface, there are Lookouts serving the same function as they do on surface ships.
- Vessels will implement mitigation to avoid or reduce potential impacts from vessel strikes on marine mammals (see Chapter 5, Mitigation).

The history of Navy and Coast Guard large whale strikes reported in the Study Area from 2009 to 2024 is provided in Figure 3.7-8. It is both Navy and Coast Guard policy to report all marine mammal strikes to NMFS as soon as feasible. The frequency of military vessel strikes reported in the scientific literature and NMFS databases are the result of the Navy's and Coast Guard's commitment to reporting vessel strikes (even if it cannot be confirmed to be a marine mammal), rather than a greater frequency of collisions relative to other ship types. Most documented vessel strikes of marine mammals involve commercial vessels and occur over or near the continental shelf (Laist et al., 2001), and reporting of whale strikes by commercial vessels is not required, therefore, reporting rates are unknown but likely to be much lower than actual occurrences.

In the Study Area, no large whales have been struck by the Navy since 2012. The most recent large whale strike in the Study Area occurred in early 2024 by the Coast Guard. Prior to this, the Coast Guard had not struck a whale in the Study Area since 2009. All reported strikes in the Study Area have been in the Virginia Capes Operating Area. In the most recent strikes reported by the Coast Guard, the whales were observed swimming away with no apparent injuries. While not all injuries are evident when a whale is struck, not all whale strikes result in mortality. In 2021, a small Navy vessel struck a dolphin in waters offshore Panama City, Florida. This was considered an anomaly (the only known Navy vessel dolphin strike), since dolphins are highly maneuverable and can avoid boat collisions in open water. Lastly, two manatees were struck by the Coast Guard in 2013.

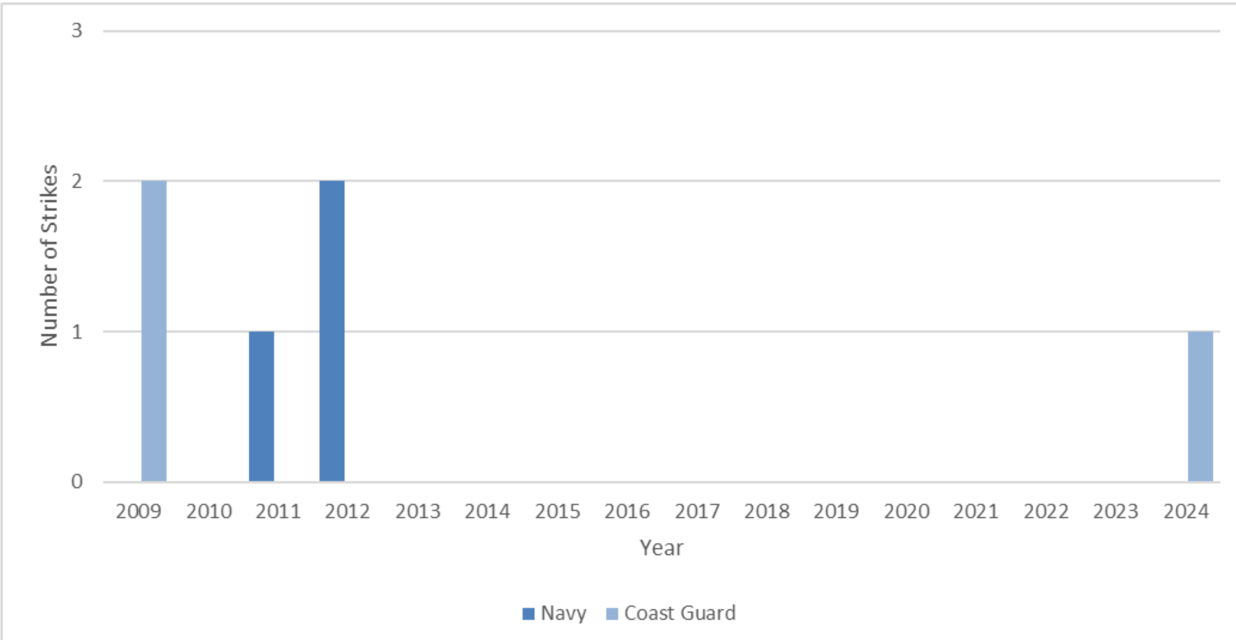


Figure 3.7-8: Large Whale Strikes in the Study Area by Year (2009 to 2024)

In-water devices could pose a collision risk to marine mammals when operated at high speeds or when unmanned. In-water devices, such as unmanned underwater vehicles, and in-water devices towed from unmanned platforms that move slowly through the water are highly unlikely to strike marine mammals because the mammal could easily avoid the object. In-water devices towed by manned platforms are unlikely to strike a marine mammal because of the observers on the towing platform and other standard safety measures employed when towing in-water devices. Torpedoes (a type of in-water device) are generally smaller (several inches [in.] to 111 ft.) than most vessels. The Navy reviewed torpedo design features and a large number of previous anti-submarine warfare torpedo exercises to assess the potential of torpedo strikes on marine mammals. The tactical software that guides U.S. Navy torpedoes is sophisticated and would not identify a marine mammal as a target. All torpedoes are recovered after being fired and are reconfigured for reuse. In thousands of exercises in which torpedoes were fired or in-water devices used, there have been no recorded or reported instances of a marine mammal strike.

Since some in-water devices are identical to support craft, it is possible that marine mammals could respond to the physical presence of the device similar to how they respond to the physical presence of a vessel. It is possible that marine mammal species occur in areas that overlap with in-water device use and may experience some level of physical disturbance, but it is not expected to result in more than a momentary behavioral response.

3.7.3.4.1.1 Impacts from Vessels and In-Water Devices under Alternative 1

For all military readiness activities, vessel and in-water device activity would decrease from the 2018 Final EIS/OEIS (Table 3.0-9, Number and Location of Activities Including Vessels and Table 3.0-10, Number and Location of Activities Including In-Water Devices).

Under Alternative 1 for training:

- Vessel activity would occur in one new location (Gulfport, Mississippi) that it did not occur in the 2018 Final EIS/OEIS, and one area not previously analyzed (Pascagoula, Mississippi) in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease or similar amount of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in one location not previously analyzed (Northeast Range Complexes Inshore) in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease, similar amount, or cessation of in-water device activity.

Under Alternative 1 for testing:

- Vessel activity would occur in five locations not previously analyzed (Other AFTT Areas; Northeast, Virginia Capes, and Gulf of Mexico Range Complexes Inshore; Hampton Roads, Virginia) that it did not occur in for the 2018 Final EIS/OEIS. There would also be notable increases in vessel activity at the Naval Surface Warfare Center Panama City Division Testing Range; Naval Station Norfolk; and Pascagoula, Mississippi. For all other locations, there would either be a decrease, similar amount, or cessation of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in four locations not previously analyzed (Gulf of Mexico Range Complex Inshore; Bath, Maine; Newport, Rhode Island; and Pascagoula, Mississippi). For all other locations, there would either be a decrease, similar amount, or cessation of in-water device activity.

For locations without a notable increase in vessel and in-water device activity, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.7.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of marine mammal taxa among military readiness locations has not changed.

For the new inshore location and locations not previously analyzed, standard operating procedures and mitigation will be implemented as in the currently existing areas. Consequently, the level at which physical disturbance and strikes are expected to occur is likely to remain consistent with or lower than the previous decade. For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of vessel and in-water device use remains an accurate characterization of the Proposed Action in those locations.

Most military readiness activities involve vessel movement. Vessel strikes to marine mammals are not associated with any specific training or testing activity but rather a limited, sporadic, and accidental result of vessel movement within the Study Area. Vessel movement can be widely dispersed throughout the Study Area, occurring in both offshore and inshore water areas. Physical disturbance from large vessels and in-water devices would be more likely in the continental shelf portions than in the open ocean portions of the Study Area because of the concentration of large vessel movements and in-water device activities in those areas. Marine mammal species that occur over the continental shelf would therefore have a greater potential for impacts, and include mysticete, odontocete, and pinniped species.

Large vessels may occasionally be required to operate at speeds that are higher than normal operating speeds, which may pose a greater strike risk to marine mammals because there would be less time for the vessel crew to detect a marine mammal and maneuver to avoid a strike, and there would be less time over a given distance for the animal to react and avoid the vessel. However, the potential for greater risk may be offset by marine mammal avoidance behavior occurring at a greater distance due to the higher noise levels that are typically generated by any vessel transiting at high speed. Historically, the few vessel strikes of whales that have occurred in the Study Area (see Figure 3.7-8) have not been associated with vessels operating at higher speeds.

The use of small crafts associated with training activities within inshore waters would occur on a more regular basis than offshore vessel use and typically involve high speed (greater than 10 knots) vessel movements. The inshore waters are generally more confined waterways where mysticetes and offshore odontocete species do not typically occur. As stated in Section 3.7.3.4.1 (Impacts from Vessels and In-Water Devices under Alternative 1), odontocetes known to occur within inshore waters, such as bottlenose dolphins and harbor porpoises, are not as susceptible to vessel strikes as compared to mysticetes. The Action Proponents do not anticipate an odontocete strike as a result of training activities in inshore waters.

Physical disturbance from small crafts would be more likely in the inshore water locations listed in Table 3.0-9 (Number and Location of Activities Including Vessels), especially in areas where high-speed training activities occur. Marine mammal species with the greatest potential for impact are those that occur in the inshore waters (e.g., bottlenose dolphins, harbor porpoise, manatees, and pinniped species).

Testing activities primarily involve large vessel movement. However, the number of activities that include large vessel movement and use for testing is comparatively lower than the number of training activities. In addition, testing often occurs jointly with a training event, so it is likely that the testing activity would be conducted from a training vessel.

Propulsion testing, which sometimes includes ships operating at speeds in excess of 30 knots, and use of large high-speed unmanned surface vessels occurs infrequently but may pose a higher strike risk because of the high speeds at which some vessels need to transit to complete the testing activity. These activities would occur in the Northeast, Virginia Capes, Jacksonville, and Gulf of Mexico Range Complexes. However, there are just a few of these events proposed per year, so the increased risk is nominal compared to all vessel use proposed for testing activities under Alternative 1. Testing activities involving the use of in-water devices would occur in the Study Area at any time of year.

Military readiness activities involving vessels and in-water devices may occur year-round; therefore, impacts from physical disturbance would depend on each species' seasonal patterns of occurrence or degree of residency in the continental shelf portions of the Study Area. As previously indicated, any physical disturbance from vessel movements and use of in-water devices is not expected to result in more than a momentary behavioral response.

Historical vessel use (steaming days) and ship strike data were used to calculate the probability of a direct strike during proposed training activities in the offshore portion of the Study Area by a large Navy or Coast Guard vessel. Between 2009 and early 2024, there were a total of 42,748 Navy steaming days (days where ships were at sea in the Study Area) and 26,756 steaming days where Coast Guard ships were at sea in the Study Area. During that same time, there were three Navy vessel strikes and three Coast Guard vessel strikes. This corresponds to an average of 14,249 Navy steaming days per strike and 8,919 Coast Guard steaming days per strike.

These values were used to determine the rate parameters to calculate a series of Poisson probabilities (a Poisson distribution is often used to describe random occurrences when the probability of an occurrence is small, e.g., count data such as cetacean sighting data, or in this case strike data, are often described as a Poisson or over-dispersed Poisson distribution).

In modeling strikes as a Poisson process, we assume this strike rate for the future, and we use the Poisson distribution to estimate the number of strikes over a defined time period:

$$P\left\langle n \middle| \mu \right\rangle = \frac{e^{-\mu} \bullet \mu^{n}}{n!}$$

P(*n*|*μ*) is the probability of observing *n* events in some time interval, when the expected number of events in that time interval is *u*.

Based on the annual steaming days average from 2009 to early 2024, the Action Proponents estimate that 18,702 Navy and 11,706 Coast Guard steaming days will occur over the seven-year period associated with the anticipated MMPA authorization. Given a strike rate of 0.000070 Navy strikes per steaming day, and 0.000112 Coast Guard strikes per steaming day, the calculated number of whale strikes over a seven-year period would be 1.31 strikes by the Navy and 1.31 strikes by the Coast Guard. Results of the strike probability analysis based on a Poisson distribution are shown in Table 3.7-18.

Most Navy-reported whale strikes are not identified to the species level; however, the Action Proponents predict that large whales have the greatest potential to be struck by a large vessel as a result of military readiness activities over the continental shelf portion of the Study Area.

Feeding areas for fin whales, humpback whales, minke whales, and sei whales as well as a small and resident area for harbor porpoises have been identified as key habitats that seasonally overlap with portions of the Northeast Range Complexes within the Study Area (LaBrecque et al., 2015a). Military readiness activities that involve vessel movements and the use of in-water devices within the Northeast Range Complexes could occur year-round, however, any potential overlap with feeding activities in these biologically important areas would be seasonal. Harbor porpoises resident to the northern Gulf of Maine and southern Bay of Fundy within the Northeast Range Complexes may be impacted year-round. Physical disturbance from vessels and in-water device use may result in a momentary behavioral response but would not result in abandonment of feeding behaviors in these areas or cause resident marine mammals to avoid these areas.

Table 3.7-18: Probability of Whale Strike in a Seven-Year Period

Number of Whales	*Percent Probability of Strike in a Seven-Year Period – 2018 Final EIS/OEIS (Navy)*	*Percent Probability of Strike in a Seven-Year Period – Supplemental EIS/OEIS (Navy)*	*Percent Probability of Strike in a Seven-Year Period – Supplemental EIS/OEIS (Coast Guard)*
0	12	27	27
1	26	35	35
2	27	23	23
3	19	10	10
4	10	3	3
5	4	1	1

Notes: EIS = Environmental Impact Statement; OEIS = Overseas Environmental Impact Statement

LaBrecque et al. (2015a) also identified a migratory corridor, two reproductive areas, and three feeding areas for North Atlantic right whales that seasonally overlap with portions of the Study Area, including the Northeast, Virginia Capes, Navy Cherry Point, and Jacksonville Range Complexes. Any potential overlap of activities that involve vessel movement and the use of in-water devices with seasonal presence of North Atlantic right whales while engaged in migratory, reproductive, and feeding activities in these biologically important areas would be limited to those times of year. Vessel movement and in-water device use may occur within the North Atlantic right whale's designated critical habitat year-round. Physical and biological features identified for North Atlantic right whale conservation and considered in the critical habitat designation include oceanic conditions that distribute and aggregate dense concentrations of copepods within the northern foraging habitats and water temperatures, depths, and sea surface conditions that are suitable for the southern calving habitats (National Marine Fisheries Service, 2015). These habitat features would not be impacted by vessels and in-water devices.

It is possible that North Atlantic right whales encountered could be disturbed by the physical presence of large vessels and in-water devices. Disturbance within the southeast critical habitat is most likely to occur in winter months and during summer months within the northeast critical habitat; however, the direct route that the Navy predominantly uses for large vessels between Norfolk and Jacksonville largely avoids the coastal North Atlantic right whale migratory corridor and reproductive areas, as well as critical habitat, especially off the coasts of South Carolina and Georgia. Disturbance due to the physical presence of vessels and in-water devices is not expected to result in more than a momentary behavioral response and would not result in a permanent abandonment or alteration of migratory, reproductive, and feeding behaviors in these areas. Refer to Section 3.7.3.1.4 (Impacts from Vessel Noise) for a discussion on disturbance and impacts caused by vessel noise. The Action Proponents do not anticipate that it will strike a North Atlantic right whale because of the extensive mitigation in place to reduce the risk of a strike to that species.

LaBrecque et al. (2015b) also identified one year-round small and resident area for Rice's whale (Bryde's whale in LaBrecque et al., 2015b)) and three small and resident areas for bottlenose dolphins that overlap with the Gulf of Mexico Range Complex. Five additional small and resident areas for bottlenose dolphins were identified along the U.S. East Coast (LaBrecque et al., 2015a), three of which overlap with the Jacksonville Range Complex, including Naval Submarine Base Kings Bay and Naval Station Mayport, and two of which overlap with the Navy Cherry Point Range Complex. Training activities that involve large vessels and in-water device use within the Navy Cherry Point, Jacksonville, and Gulf of Mexico Range Complexes could occur year-round. Physical disturbance from the presence of large vessels and in-water devices may result in a momentary behavioral response but would not cause resident marine mammals to avoid these areas.

The use of small crafts associated with training activities within inshore waters would occur on a more regular basis than offshore vessel use and typically involve high speed (greater than 10 knots) vessel movements. The inshore waters are generally more confined waterways where mysticetes and offshore odontocete species do not typically occur. Odontocetes known to occur within inshore waters, such as bottlenose dolphins and harbor porpoises, are not as susceptible to vessel strikes as mysticetes. In addition, no vessel strikes of marine mammals have been reported due to inshore training activities (the previously mentioned dolphin strike occurred when a vessel involved in a testing activity was returning to port). Therefore, the Action Proponents do not anticipate that it will strike an odontocete as a result of training activities in inshore waters.

Pinniped occurrence within the northeast and mid-Atlantic portions of the Study Area is seasonal, and very close to shore where the majority of large vessel movements are conducted. Pinnipeds also seasonally occur within inshore waters and near the mouth of the Chesapeake Bay where high-speed small craft movements associated with inshore training would be conducted year-round. While it is possible that during military readiness activities, large vessels could transit outside the range complex and train anywhere within the Study Area. Large vessel movements are expected to be very infrequent and would have limited overlap with pinniped occurrence over continental shelf waters. High-speed small craft movements within the lower Chesapeake Bay would occur frequently; however, pinnipeds spend large amounts of time on land and display high maneuverability in the water, suggesting they could avoid interactions with small crafts. Compared to cetaceans and sirenians, pinnipeds are not as susceptible to vessel strikes; therefore, the Action Proponents do not anticipate that it will disturb or strike pinnipeds.

The Action Proponents do not anticipate encountering a manatee during the use of in-water devices from military readiness activities. Manatees occur in a very limited portion of the Study Area, primarily close to shore in the inshore and coastal waters of the Mid-Atlantic States and the Gulf coast of Florida, and there are few activities that may involve the use of in-water devices there. Potential impacts on manatees would only result from military readiness activities that include small craft use in the inshore waters of the Mid-Atlantic States and the Gulf coast of Florida. High-speed small craft movements would primarily occur within the Northeast Range Complexes Inshore, VACAPES Range Complex Inshore, and Jacksonville Range Complex Inshore. Military readiness activities that occur in this northern portion of the Study Area would not have an impact on manatees since they typically do not occur there. Training activities that use small crafts within inshore waters of the Jacksonville Range Complex Inshore, Key West Range Complex Inshore, and GOMEX Range Complex Inshore are limited, yet have the potential to impact manatees in these areas.

In the St. Johns River, areas of known manatee occurrence have been designated by the Florida Fish and Wildlife Conservation Commission as Manatee Protection Zones. These areas are marked with signs and enforce vessel speed restrictions to protect manatees from boat strikes. Training units follow all manatee protection rules and are briefed on requirements before each exercise. Similar precautions would be followed for high-speed small craft movements in Port Canaveral and St. Andrew Bay.

Vessel movements within inshore waters of Savannah, Georgia; Kings Bay, Georgia; Mayport, Florida; St. Johns River; Port Canaveral, Florida; Tampa, Florida; and St. Andrew Bay would co-occur with manatees. Implementation of mitigation measures in these areas would reduce the likelihood of a strike.

There have been no reported manatee boat strikes as a result of Navy training in inshore waters of the Study Area, but there have been two manatee strikes by the Coast Guard in the St. Mary's River. With the implementation of mitigation as described in Section 5.6.2 (Mitigation Specific to Vessels, Vehicles, and Towed In-Water Devices) and Section 5.7.7 (Inshore Manatee and Sea Turtle Mitigation Areas), a manatee strike is not anticipated. Disturbance due to the physical presence of vessels and in-water devices is not expected to result in more than a momentary behavioral response. Manatees also occur in the coastal waters of Puerto Rico, which is within the Study Area, but no training or testing is anticipated in these areas. Based on these factors and the implementation of mitigation, the Action Proponents do not anticipate that it will disturb or strike a West Indian manatee.

Vessel movements and in-water device use would occur within West Indian manatee designated critical habitat, specifically within inshore waters associated with Mayport and Port Canaveral, Florida, and the St. Johns River, year-round. Disturbance within manatee habitat is most likely to occur during spring, summer, or fall, because manatees generally move farther inshore during winter. The current critical habitat designation for the West Indian manatee does not identify specific physical and biological features essential for species conservation, but essential habitat features have been reported to include warm water refuges, various food sources (seagrasses and freshwater vegetation), travel corridors, and shelter for calving (75 *Federal Register* 1574). These habitat features would not be impacted by vessel and in-water device use during military readiness activities within the designated critical habitat.

Vessel movement and in-water device use related to military readiness activities occur near marine mammals only on an incidental basis. Mitigation measures described in Chapter 5 (Mitigation) will minimize interactions with marine mammals, which would further reduce any potential physical disturbance and direct strike impacts from vessels. Long-term consequences to populations of marine mammals are not expected to result from vessel movement and in-water device use associated with the proposed military readiness exercises.

The use of vessels during military readiness activities as described under Alternative 1 could result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA. The Action Proponents have requested authorization from NMFS as required by section 101(a)(5)(A) of the MMPA in that regard. The use of in-water devices during training activities as described under Alternative 1 would not result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA.

The Action Proponents have concluded that the use of vessels and in-water devices during military readiness activities as described under Alternative 1 would have no effect on North Atlantic right whale critical habitats, and proposed Rice's whale critical habitat, as defined by the ESA. The use of vessels will have no effect on West Indian manatee critical habitat, and the use of in-water devices during training events will have no effect on West Indian manatee critical habitat, testing activities are not applicable. The use of vessels and in-water devices may affect the blue whale, Rice's whale, fin whale, North Atlantic right whale, sei whale, sperm whale, and West Indian manatee, as defined by the ESA. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA regarding potential impacts to those ESA-listed species that may be affected by the use of vessels and in-water devices during military readiness activities.

The analysis conclusions for vessel and in-water device use with training activities under Alternative 1 are consistent with a moderate (due to limited potential for injury/mortality) impact on marine mammal populations.

3.7.3.4.1.2 Impacts from Vessels and In-Water Devices under Alternative 2

Impacts from vessels and in-water device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

3.7.3.4.2 Impacts from Military Expended Materials

This section analyzes the strike potential to marine mammals from the following categories of military expended materials: (1) all sizes of non-explosive practice munitions, (2) fragments from high-explosive munitions, (3) expendable targets and target fragments, and (4) expended materials other than munitions, such as sonobuoys, expended bathythermographs, and torpedo accessories. For a discussion of the types of activities that use military expended materials, refer to Appendix B (Activity Stressor Matrices) and for a discussion on where items would be used or expended under each alternative, see Table 3.0-11 (Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities) through Table 3.0-14 (Number and Location of Other Military Materials Expended during Military Readiness Activities). For physical disturbance and strike stressors as they relate to marine mammals, impacts from fragments from high-explosive munitions are included in the analysis presented in Section 3.7.3.2 (Explosive Stressors), and are not considered further in this section. Potential impacts from military expended materials as ingestion stressors to marine mammals are discussed in Section 3.7.3.6.1 (Impacts from Military Expended Materials – Munitions) and Section 3.7.3.6.3 (Impacts from Military Expended Materials Other Than Munitions).

The primary concern is the potential for a marine mammal to be hit with military expended material at or near the water's surface. While disturbance or strike from an item falling through the water column is possible, it is not very likely given the objects generally sink slowly through the water and can be avoided by most marine mammals. Therefore, the discussion of military expended materials strikes focuses on the potential of a strike at the surface of the water.

While no strike from military expended materials has ever been reported or recorded, the possibility of a strike still exists. Therefore, the potential for marine mammals to be struck by military expended materials was evaluated using statistical probability modeling to estimate potential direct strike exposures. To estimate potential direct strike exposures, a scenario was calculated using the marine mammal species with the highest average monthly density in areas with the highest amounts of military expended material expenditures, specifically the Virginia Capes Range Complex. This is considered a worst-case scenario because, as described below, exposure calculations of a single military item hitting an animal assumes all activities would be conducted during the season associated with the marine mammal species with the highest average seasonal density and that all marine mammals have equal densities. These highest estimates would provide reasonable comparisons for all other areas and species. Direct strike exposures of marine mammal species protected under the ESA are estimated separately from non-ESA species. Because the ESA has specific standards for understanding the likelihood of impacts on each endangered species, estimates were made for all endangered marine mammal species found in the areas where the highest levels of military expended materials would be expended. In this way, the appropriate ESA conclusions could be based on the highest estimated probabilities of a strike for those species. Specific details of the modeling approach, including model selection and calculation methods, are presented in Appendix I (Military Expended Materials and Direct Strike Impact Analysis). This analysis provides a reasonably high level of certainty that marine mammals would not be struck by military expended materials.

3.7.3.4.2.1 Impacts from Military Expended Materials under Alternative 1

For both training and testing activities, the number of military expended materials would decrease from the 2018 Final EIS/OEIS (see Supplemental EIS/OEIS Table 3.0-11, Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities; Table 3.0-12, Number and Location of Explosives that May Result in Fragments Used during Military Readiness Activities; Table 3.0-13, Number and Location of Targets Expended during Military Readiness Activities; Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities; and Table 3.0-17, Number and Location of Wires and Cables Expended during Military Readiness Activities).

Under Alternative 1 for training:

- Military expended materials would occur in one location not previously analyzed (Key West Range Complex Inshore) in the 2018 Final EIS/OEIS. For all other locations, there would be either a decrease, cessation of use, or similar amount of military expended materials.

Under Alternative 1 for testing:

- Military expended materials would occur in three locations not previously analyzed (other AFTT Areas; Naval Submarine Base Kings Bay, and Port Canaveral, Florida) in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease of military expended materials.

For locations without a notable increase in military expended materials, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.7.2 (Affected

Environment) do not alter the analysis because the general distribution and sensitivity of marine mammal taxa among military readiness locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the localized nature of military expended materials remains an accurate characterization of the Proposed Action in those locations.

For locations not previously analyzed, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of marine mammals encountering military expended materials remains low for marine mammals.

Military readiness activities involving military expended materials as described under Alternative 1 would not result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA, and potential impacts would be considered negligible.

Physical and biological features identified for North Atlantic right whale conservation, and considered in the critical habitat designation, include water temperatures, depths, and sea surface conditions that are suitable for the southern calving habitats (National Marine Fisheries Service, 2015). These habitat features would not be impacted by training or testing activities involving military expended materials.

Physical and biological features identified for Rice's whale conservation and considered in the proposed critical habitat designation include continental shelf and slope associated waters between the 100 to 400m isobaths that support individual growth, reproduction, and development, social behavior, and overall population growth through sufficient prey density, waters with elevated productivity, water temperatures of 10 to 19° C, low pollution, and quiet conditions (88 *Federal Register* 47453). These habitat features would not be impacted by training or testing activities involving military expended materials.

The current critical habitat designation for the West Indian manatee does not identify specific physical and biological features essential for species conservation, but essential habitat features have been reported to include warm water refuges, various food sources (seagrasses and freshwater vegetation), travel corridors, and shelter for calving (75 *Federal Register* 1574). These habitat features would not be impacted by training or testing activities involving military expended materials.

The Action Proponents have concluded that activities involving military expended materials may affect the blue whale, Rice's whale, fin whale, North Atlantic right whale, sei whale, sperm whale, and West Indian manatee, as defined by the ESA. The Action Proponents have concluded that activities involving military expended materials will have no effect on the North Atlantic right whale and West Indian manatee critical habitats, or the proposed Rice's whale critical habitat. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA regarding potential impacts to those ESA-listed species that may be affected by training or testing activities involving military expended materials.

The analysis conclusions for military expended materials for military readiness activities under Alternative 1 are consistent with a negligible impact on marine mammal populations.

3.7.3.4.2.2 Impacts from Military Expended Materials under Alternative 2

Impacts from military expended materials under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species and critical habitat are the same for both training and testing.

3.7.3.4.3 Impacts from Seafloor Devices

Table 3.7-16 contains a summary of the background information used to analyze the potential impacts of seafloor devices on marine mammals. For a listing of the types of activities that include seafloor devices, refer to Appendix B (Activity Stressor Matrices). These include items placed on, dropped on, or moved along the seafloor such as mine shapes, anchor blocks, anchors, bottom-placed devices, and bottom-crawling unmanned underwater vehicles. The likelihood of any marine mammal species encountering seafloor devices is considered low because these items are either stationary or move very slowly along the bottom. In the unlikely event that a marine mammal is in the vicinity of a seafloor device, the stationary or very slowly moving devices would not be expected to physically disturb or alter natural behaviors of marine mammals. The only seafloor device used during military readiness activities that has the potential to strike a marine mammal at or near the surface is an aircraft-deployed mine shape, which is used during aerial mine laying activities. These devices are identical to non-explosive practice bombs, and, therefore, the analysis of the potential impacts from those devices is covered in Section 3.7.3.4.2 (Impacts from Military Expended Materials) and is not further analyzed in this section.

3.7.3.4.3.1 Impacts from Seafloor Devices under Alternative 1

For both training and testing activities, the proposed use of seafloor devices would increase from the 2018 Final EIS/OEIS devices (Table 3.0-15, Number and Location of Activities that Use Seafloor Devices).

Under Alternative 1 for training:

- Seafloor device use would occur in four locations not previously analyzed (Northeast Range Complexes; Other AFTT Areas; Jacksonville Range Complex Inshore, Naval Station Mayport), and one new area (Gulfport, Mississippi) that was not in the 2018 Final EIS/OEIS. There would also be notable increases in seafloor devices at the Virginia Capes Range Complex, Virginia Capes Range Complex Inshore, and Key West Range Complex Inshore. For all other locations, there would either be a decrease, similar amount, or cessation of seafloor device use.

Under Alternative 1 for testing:

- Seafloor device use would occur in five locations not previously analyzed (Virginia Cape Range Complex Inshore, Key West Range Complex Inshore, Naval Submarine Base New London, Naval Station Mayport, and Port Canaveral, Florida) in the 2018 Final EIS/OEIS. There would also be notable increases in seafloor devices in the Northeast and Jacksonville Range Complexes, and in the Naval Surface Warfare Center Naval Surface Warfare Center Panama City Testing Range. For all other locations, there would either be a decrease or similar amount of seafloor devices.

For locations without a notable increase in seafloor devices, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.7.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of marine mammal taxa among military readiness locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of seafloor device activity remains an accurate characterization of the Proposed Action in those locations. There is a reasonable level of certainty that no marine mammals would be struck by seafloor devices.

For new locations and ones not previously analyzed, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of marine mammals encountering a seafloor device remains low for marine mammals.

Military readiness activities that involve seafloor devices would occur within the North Atlantic right whale southeast critical habitat area year-round but would not occur in the Northeast Critical Habitat Area. Since North Atlantic right whales occur within the southeast critical habitat area primarily in winter months, any potential overlap with training in these areas would be seasonal. The Action Proponents do not anticipate that the use of seafloor devices would result in physical disturbance or direct strike of North Atlantic right whales. Physical and biological features identified for North Atlantic right whale conservation, and considered in the critical habitat designation, include water temperatures, depths, and sea surface conditions that are suitable for the southern calving habitats (National Marine Fisheries Service, 2015). These habitat features would not be impacted by seafloor devices.

Physical and biological features identified for Rice's whale conservation and considered in the proposed critical habitat designation include continental shelf and slope associated waters between the 100 to 400m isobaths that support individual growth, reproduction, and development, social behavior, and overall population growth through sufficient prey density, waters with elevated productivity, water temperatures of 10 to 19° C, low pollution, and quiet conditions (88 *Federal Register* 47453). These habitat features would not be impacted by seafloor devices.

There is a low likelihood that the West Indian manatee would be exposed to seafloor devices during military readiness activities in the offshore areas where the Action Proponents generally conduct the types of activities that use these devices, due to their primarily inshore/coastal distribution. Military readiness activities that use seafloor devices could occur within West Indian manatee critical habitat, specifically in inshore waters near Port Canaveral, Florida, and to a limited extent, Mayport, Florida. The Action Proponents do not anticipate that the use of seafloor devices would result in physical disturbance or direct strike of manatees. The current critical habitat designation for the West Indian manatee does not identify specific physical and biological features essential for species conservation, but essential habitat features have been reported to include warm water refuges, various food sources (seagrasses and freshwater vegetation), travel corridors, and shelter for calving (75 *Federal Register* 1574). These habitat features would not be impacted by seafloor devices.

The use of seafloor devices during military readiness activities as described under Alternative 1 would not result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA, and potential impacts would be considered negligible.

The Action Proponents have concluded that the use of seafloor devices during military readiness activities as described under Alternative 1 would have no effect on North Atlantic right whale and West Indian manatee critical habitats, or proposed Rice's whale critical habitat, as defined by the ESA. The use of seafloor devices may affect the blue whale, Rice's whale, fin whale, North Atlantic right whale, sei whale, sperm whale, and West Indian manatee, as defined by the ESA. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA regarding potential impacts to those ESA-listed species that may be affected by training activities involving seafloor devices.

The analysis conclusions for seafloor devices for military readiness activities under Alternative 1 are consistent with a negligible impact on marine mammal populations.

3.7.3.4.3.2 Impacts from Seafloor Devices under Alternative 2

Impacts from seafloor device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

3.7.3.5 Entanglement Stressors

Table 3.7-19 contains brief summaries of background information that is relevant to analyses of impacts for each entanglement substressor (wires and cables, decelerators/parachutes, and biodegradable polymer). Details on the updated information in general, as well as effects specific to each substressor, is provided in Appendix G (Non-Acoustic Impacts Supporting Information). Links to substressor details that are unchanged from the 2018 Final EIS/OEIS (Section 3.7.3.5, Entanglement Stressors) are provided in Table 3.7-19.

Table 3.7-19: Entanglement Stressors Background Information Summary

Substressor	*Background Information Summary*
Wires and cables	Wires and cables are unlikely to impact marine mammals. • The chance that an individual animal would encounter expended cables or wires is most likely low based on: (1) the sparse distribution of both the cables and wires expended throughout the Study Area, (2) the fact that the wires and cables will sink upon release, and (3) the relatively few marine mammals that are likely to feed on the bottom in the deeper waters where wires and cables would be expended. • It is very unlikely that an animal would get entangled even if it encountered a cable or wire while it was sinking or upon settling to the seafloor. • A marine mammal would have to swim through loops, become twisted within the cable or wire, or in the case of mysticetes, get the cable or wire stuck in their baleen to become entangled, and given the properties of the expended wires (low breaking strength, sinking rates, and reluctance to coiling or looping) this is unlikely.
Decelerators/ parachutes	Entanglement of a marine mammal in a decelerator/parachute assembly at the surface or within the water column would be unlikely. • This is due to decelerator/parachute size and distribution of decelerators/parachutes expended in the Study Area. The decelerator/parachute would have to land directly on an animal, or an animal would have to swim into it and become entangled within the cords or fabric panel before it sinks or while it is sinking through the water column. • The majority of small and medium decelerators/parachutes expended will occur in deep ocean areas and sink to the bottom relatively quickly. • The main potential for entanglement is with the large and extra-large decelerators/parachutes. While the large parachutes would eventually sink and flatten, there is the potential that these decelerators/parachutes could remain suspended in the water column or billow at the seafloor for a longer period of time before flattening. The length of the parachute lines poses an entanglement risk as well.
Biodegradable polymer	It is unlikely a marine mammal would become entangled in a biodegradable polymer. • Based on the constituents of the biodegradable polymer the Navy proposes to use, it is anticipated that the material would breakdown into small pieces within a few days to weeks. This would breakdown further and dissolve into the water column within weeks to a few months. • The final products which are all environmentally benign would be dispersed quickly to undetectable concentrations. Unlike other entanglement stressors, biodegradable polymers only retain their strength for a relatively short period of time, therefore the potential for entanglement by a marine mammal would be limited. • Furthermore, the longer the biodegradable polymer remains in the water, the weaker it becomes making it more brittle and likely to break. A marine mammal would have to encounter the biodegradable polymer immediately after it was expended for it to be a potential entanglement risk. If an animal were to encounter the polymer even a few hours after it was expended, it is very likely that it would break easily and would no longer be an entanglement stressor.

3.7.3.5.1 Impacts from Wires and Cables

For a listing of the types of activities that include wires and cables, refer to Appendix B (Activity Stressor Matrices).

Marine mammal species that occur within the Study Area were evaluated based on the likelihood of encountering these items. Marine mammal species that occur where these military readiness activities take place and forage on the bottom could encounter these items once they settle to the seafloor.

An evaluation of potential environmental impacts related to guidance wire left at sea where torpedo tests are conducted by the Navy suggests there is an low entanglement potential for marine animals found within these range areas (Swope & McDonald, 2013). As indicated in the report by Neilson et al. (2009), a large percentage of whales have been non-lethally entangled in their lifetime, suggesting some degree of ability to become disentangled. So, while an animal may initially become entangled in a cable or wire while either swimming in the water column or feeding on the bottom, they may become free in situations where the item breaks or if it is only loosely attached and the animal is able to maneuver to free itself from permanent entanglement. As a result, no long-term impacts would occur. Based on the estimated concentration of expended cables and wires, impacts from cables or wires are unlikely to occur. In fact, data suggests that torpedo guidance wires do not present a physical hazard in the marine environment (Swope & McDonald, 2013).

3.7.3.5.1.1 Impacts from Wires and Cables under Alternative 1

For training activities, the use of wires and cables would increase overall from the 2018 Final EIS/OEIS, and for testing activities, the use of wires and cables would decrease overall (Table 3.0-17, Number and Location of Wires and Cables Expended during Military Readiness Activities).

Under Alternative 1 for training:

- The use of wires and cables would occur in one location not previously analyzed (Key West Range Complex) in the 2018 Final EIS/OEIS. There would also be a notable increase in the use of wires and cables in the Virginia Capes and Jacksonville Range Complexes. For all other locations, there would either be the same amount or a similar amount of wires and cables.

Under Alternative 1 for testing:

- The use of wires and cables would occur in one area not previously analyzed (Other AFTT Areas) in the 2018 Final EIS/OEIS. There would also be a notable increase in wires and cables in the Virginia Capes and Key West Range Complexes. For all other locations, there would either be a decrease or similar amount of wires and cables.

For locations without a notable increase in wires and cables, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.7.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of marine mammal taxa among military readiness locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of wire and cable releases remains an accurate characterization of the Proposed Action in those locations.

For locations not previously analyzed, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of marine mammals encountering a wire or cable and becoming entangled remains low for marine mammals.

Marine mammals resident to, or engaging in migratory, reproductive, and feeding behaviors within the range complexes of the Study Area may encounter wires expended during military readiness activities. Based on the analysis in Appendix G (Non-Acoustic Impacts Supporting Information), and the low concentration of expended wires combined with their physical characteristics, the Action Proponents anticipate that no marine mammals would become entangled.

Military readiness activities that expend wires would occur within the Northeast and Southeast North Atlantic right whale critical habitat year-round. Since North Atlantic right whales occur within the southeast critical habitat area primarily in winter months and occur within the northeast critical habitat area during summer months, any potential overlap with training activities in these areas would be seasonal. Physical and biological features identified for North Atlantic right whale conservation and considered in the critical habitat designation include oceanic conditions that distribute and aggregate dense concentrations of copepods within the northern foraging habitats and water temperatures, depths, and sea surface conditions that are suitable for the southern calving habitats (National Marine Fisheries Service, 2015). These habitat features would not be impacted by wires and cables.

Physical and biological features identified for Rice's whale conservation and considered in the proposed critical habitat designation include continental shelf and slope associated waters between the 100 to 400m isobaths that support individual growth, reproduction, and development, social behavior, and overall population growth through sufficient prey density, waters with elevated productivity, water temperatures of 10-19° C, low pollution, and quiet conditions (88 *Federal Register* 47453). These habitat features would not be impacted by wires and cables.

Although manatees may occur in coastal areas of the Gulf of Mexico, military readiness activities that expend wires would not take place in shallow waters where manatees would be feeding and potentially encounter these items on the seafloor. Training activities that expend wires will not occur within West Indian manatee critical habitat.

Although manatees may occur in coastal, estuarine, and riverine areas along the southeast and Gulf of Mexico coasts of the U.S., testing activities that use cables, guidance wires, and sonobuoy cables would not take place in shallow waters where manatees would be feeding and therefore potentially encounter these items on the seafloor. Testing activities that expend wires and cables would be conducted within a small portion of West Indian manatee critical habitat that occurs within the South Florida Ocean Measurement Facility. The potential for wires and cables to be expended in this area would be very low based on the limited overlap between West Indian manatee critical habitat and the South Florida Ocean Measurement Facility area. It is not anticipated that a West Indian manatee would become entangled in expended wires and cables. The current critical habitat designation for the West Indian manatee does not identify specific physical and biological features essential for species conservation, but essential habitat features have been reported to include warm water refuges, various food sources (seagrasses and freshwater vegetation), travel corridors, and shelter for calving (75 *Federal Register* 1574). These habitat features would not be impacted by cables and wires expended during testing activities.

The use of wires during military readiness activities as described under Alternative 1 will not result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA, and potential impacts are considered negligible.

The Action Proponents have concluded that the use of wires during military readiness activities as described under Alternative 1 will have no effect on North Atlantic right whale critical habitat, and proposed Rice's whale critical habitat, and are not applicable to West Indian manatee critical habitat, as defined by the ESA. The use of wires may affect the blue whale, Rice's whale, fin whale, North Atlantic right whale, sei whale, and sperm whale, and West Indian manatee, as defined by the ESA. The Action

Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA regarding potential impacts to those ESA-listed species that may be affected by the use of wires during military readiness activities.

The analysis conclusions for wires and cables for military readiness activities under Alternative 1 are consistent with a negligible impact on marine mammal populations.

3.7.3.5.1.2 Impacts from Wires and Cables under Alternative 2

Impacts from wires and cables under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

3.7.3.5.2 Impacts from Decelerators/Parachutes

Parachutes used during the proposed activities range in size from 18 in. up to 80 ft. in diameter. A small decelerator/parachute has short attachment cords (1 to 3 ft.) and upon water impact may remain at the surface for 5 to 15 seconds before it sinks to the seafloor, where it becomes flattened. Sonobuoy decelerators/parachutes are designed to sink within 15 minutes, but the rate of sinking depends on sea conditions and the shape of the decelerator/parachute; the duration of the descent depends on the water depth. Prior to reaching the seafloor, a decelerator/parachute could be carried along in a current or become snagged on a hard structure near the bottom. Conversely, the decelerator/parachute and associated lines could settle to the bottom, where they would be buried by sediment in most soft bottom areas or colonized by attaching and encrusting organisms, which would further stabilize the material and reduce the potential for reintroduction as an entanglement risk.

Illumination flares and targets use medium-sized parachutes, which are up to 19 ft. in diameter with attachment cords that are up to 18 ft. long. Some aerial targets use large and extra-large decelerators/parachutes. Large parachutes are up to 50 ft. in diameter, and extra-large parachutes are up to 80 ft. in diameter. More information on large and extra-large parachutes can be found in Section 3.0.3.3.5.2 (Decelerators/Parachutes) of the 2018 Final EIS/OEIS. The majority of these larger sized decelerators/parachutes that would be expended are the medium parachutes, with a small amount of large and extra-large decelerators/parachutes being expended. The large and extra-large decelerators/parachutes have long attachment cords, up to 70 ft. and 82 ft. in length, respectively, and upon water impact may remain at the surface for up to five minutes before sinking to the seafloor. As previously stated, the rate of sinking depends on sea conditions and the shape of the decelerator/parachute, and the duration of the descent depends on water depth.

The majority of large decelerators/parachutes would be expended within the Jacksonville and Virginia Capes Range Complexes. Large decelerators/parachutes may also be expended in the Northeast, Navy Cherry Point, Gulf of Mexico, and Key West Range Complexes, as well as Naval Undersea Warfare Center Division, Newport Testing Range and the Naval Surface Warfare Center Panama City Testing Range. For aerial targets that are launched from shore, as they would be in the Virginia Capes Range Complex, efforts are made to recover the large decelerators/parachutes if it is safe to do so; however, this analysis assumes they are not recovered. The extra-large decelerators/parachutes are primarily expended in the Virginia Capes Range Complex with the potential to be expended in Northeast, NUWC Newport, Navy Cherry Point, Jacksonville, NSWC Panama City, and the Gulf of Mexico Range Complexes on an infrequent basis and during testing only.

The chance that an individual animal would encounter expended decelerators/parachutes that have sunk to the bottom is low based on the sparse distribution of the decelerators/parachutes expended throughout the Study Area and the relatively few marine mammals that feed on the bottom. Mysticetes found within the Study Area are not expected to encounter decelerators/parachutes on the seafloor because, with the exception of humpback whales and right whales, they do not feed there or make frequent contact with the bottom. The majority of decelerators/parachutes will be expended in deep ocean areas, as opposed to the shallow water locations where humpback whales feed on the bottom. The possibility of odontocetes, pinnipeds, and manatees becoming entangled exists for species that feed on the bottom in areas where decelerators/parachutes have been expended. This is unlikely because decelerators/parachutes are primarily used in exercises that occur in waters far out to sea. Species that are known to feed on the bottom in deep water as well as the mid-water column include beaked whales, sperm whales, and dwarf/pygmy sperm whales.

The possibility of these species becoming entangled exists if an animal is feeding in areas where decelerators/parachutes have been expended, but it is considered unlikely because of the infrequency of use of larger-sized decelerators/parachutes. Sunken decelerators/parachutes would eventually flatten and become encrusted with benthic organisms, lowering the risk of entanglement. There has never been any recorded or reported instance of a marine mammal becoming entangled in a decelerator/parachute; thus, decelerators/parachutes are not likely to be an entanglement hazard.

For a discussion of the types of activities that use decelerators/parachutes, see Appendix B (Activity Stressor Matrices), and for a discussion on where they are used and how many decelerators/parachutes would be used or expended under each alternative, see Table 3.0-14 (Number and Location of Other Military Materials Expended during Military Readiness Activities). Military readiness activities that introduce decelerators/parachutes into the water column can occur anywhere in the Study Area and may pose an entanglement risk to marine mammals. Potential impacts from decelerators/parachutes as ingestion stressors to marine mammals are discussed in Section 3.7.3.6.3 (Impacts from Military Expended Materials Other Than Munitions).

3.7.3.5.2.1 Impacts from Decelerators/Parachutes under Alternative 1

For both training and testing activities, decelerator/parachute use would increase from the 2018 Final EIS/OEIS (see Supplemental EIS/OEIS Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities).

Under Alternative 1 for training:

- Decelerators/parachutes would be used in the same locations they did for the 2018 Final EIS/OEIS. However, there would be notable increases in the Virginia Capes and Jacksonville Range Complexes. For all other locations, there would be a similar amount of decelerators/parachutes.

Under Alternative 1 for testing:

- Decelerators/parachutes would be used in one location not previously analyzed (Other AFTT Areas) in the 2018 Final EIS/OEIS, and there would be a notable increase in the Northeast, Virginia Capes and Key West Range Complexes. For all other locations, there would either be a decrease, the same, or similar amount of decelerators/parachutes.

For locations without a notable increase in decelerators/parachutes, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.7.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of marine mammal taxa among military readiness locations has not changed.

Although there are notable increases in decelerators/parachutes for training activities, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of marine mammals encountering a decelerator/parachute and becoming entangled remains low.

For locations not previously analyzed for testing activities, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of marine mammals encountering a decelerator/parachute and becoming entangled remains low.

Marine mammals resident to, or engaging in migratory, reproductive, and feeding behaviors within the range complexes of the Study Area may encounter decelerators/parachutes expended during military readiness activities. Based on the low concentration of expended decelerator/parachutes, the Action Proponents do not anticipate that any marine mammal would become entangled in decelerators/parachutes.

Military readiness activities would expend decelerators/parachutes within the North Atlantic right whale's designated critical habitat year-round. Since North Atlantic right whales occur within the southeast critical habitat area primarily in winter months and occur within the northeast critical habitat area during summer months, any potential overlap with training activities in these areas would be seasonal. Physical and biological features identified for North Atlantic right whale conservation and considered in the critical habitat designation include oceanic conditions that distribute and aggregate dense concentrations of copepods within the northern foraging habitats and water temperatures, depths, and sea surface conditions that are suitable for the southern calving habitats (National Marine Fisheries Service, 2015). These habitat features would not be impacted by decelerators/parachutes.

Fourteen large and six extra-large decelerator/parachutes are expected to be expended in the Gulf of Mexico Range Complex per year during training activities, and the likelihood of a Rice's whale encountering it is minimal; therefore, the risk of entanglement is low. Extra-large decelerators/parachutes are not expended during training activities. Twelve large and six extra-large decelerator/parachutes are expected to be expended in the NSWC Panama City Testing Range during testing activities, however it remains true that the risk of entanglement is low. Physical and biological features identified for Rice's whale conservation and considered in the proposed critical habitat designation include continental shelf and slope associated waters between the 100 to 400 m isobaths that support individual growth, reproduction, and development, social behavior, and overall population growth through sufficient prey density, waters with elevated productivity, water temperatures of 10° to 19° C, low pollution, and quiet conditions (88 *Federal Register* 47453). Decelerators/parachutes would not impact these habitat features.

Military readiness activities that expend decelerators/parachutes will not occur within West Indian manatee critical habitat.

The use of decelerators/parachutes during military readiness activities as described under Alternative 1 would not result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA, and potential impacts are considered negligible.

The Action Proponents have concluded that the use of decelerators/parachutes during military readiness activities as described under Alternative 1 would have no effect on North Atlantic right whale or the proposed Rice's whale critical habitat, as defined by the ESA. The use of decelerators/parachutes may affect the blue whale, Rice's whale, fin whale, North Atlantic right whale, sei whale, and sperm whale, as defined by the ESA. The use of decelerators/parachutes during testing activities may affect the West Indian manatee and would have no effect on their critical habitat, training activities are not applicable. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA regarding potential impacts to those ESA-listed species that may be affected by the use of decelerators/parachutes during training activities.

The analysis conclusions for decelerators/parachutes for military readiness activities under Alternative 1 are consistent with a negligible impact on marine mammal populations.

3.7.3.5.2.2 Impacts from Decelerators/Parachutes under Alternative 2

Impacts from decelerators/parachutes under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

3.7.3.5.3 Impacts from Biodegradable Polymers

Table 3.7-19 contains a summary of the background information used to analyze the potential impacts of biodegradable polymer on marine mammals. For a listing of the types of activities that include biodegradable polymer, refer to Appendix B (Activity Stressor Matrices).

3.7.3.5.3.1 Impacts from Biodegradable Polymers under Alternative 1

Biodegradable polymer would not be used during training activities associated with the Proposed Action.

The proposed use of biodegradable polymer would decrease for testing from the 2018 Final EIS/OEIS.

Under Alternative 1 for testing:

- Activities using biodegradable polymer would occur in three locations not previously analyzed (Northeast Range Complexes, Navy Cherry Point Range Complex, and Joint Expeditionary Base Little Creek Fort Story) in the 2018 Final EIS/OEIS. For all other locations, there would be a decrease in the activities using biodegradable polymer (Table 3.0-18, Number and Location of Activities Including Biodegradable Polymers during Testing).

For locations with a proposed decrease in biodegradable polymer use, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.7.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of marine mammal taxa among these locations has not changed.

For locations not previously analyzed, these additions would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of marine mammals encountering a biodegradable polymer and becoming entangled remains low. Based on the small levels of activity, the concentration of these items being expended throughout these areas is likewise considered low and the Action Proponents do not anticipate that any marine mammals would become entangled with biodegradable polymers.

Testing activities would expend biodegradable polymers within the North Atlantic right whale's designated Northeast and Southeast critical habitat year-round. Physical and biological features identified for North Atlantic right whale conservation and considered in the critical habitat designation include oceanic conditions that distribute and aggregate dense concentrations of copepods within the northern foraging habitats and water temperatures, depths, and sea surface conditions that are suitable for the southern calving habitats (National Marine Fisheries Service, 2015). These habitat features would not be impacted by biodegradable polymers expended during testing activities.

Rice's whales may encounter testing activities using biodegradable polymers in the shelf break waters of the Gulf of Mexico Range Complex. Rice's whales are restricted to tropical and subtropical waters and do not generally occur beyond latitude 40° in either the northern or southern hemisphere (Jefferson et al., 2015; Kato & Perrin, 2009). Rice's whales generally occur over the shelf break. LaBrecque et al. (2015a) identified one year-round small and resident area for Rice's whales that overlaps with the Gulf of Mexico Range Complex. Testing activities that involve biodegradable polymer use in the Gulf of Mexico Range Complex could occur year-round; however, entanglement from use of biodegradable polymers is unlikely due to the very low density of Rice's whales. Physical and biological features identified for Rice's whale conservation and considered in the proposed critical habitat designation include continental shelf and slope associated waters between the 100 to 400m isobaths that support individual growth, reproduction, and development, social behavior, and overall population growth through sufficient prey density, waters with elevated productivity, water temperatures of 10° to 19° C, low pollution, and quiet conditions (88 *Federal Register* 47453). Biodegradable polymers would not impact these habitat features.

Testing activities that expend biodegradable polymers would not be conducted within West Indian manatee critical habitat.

The use of biodegradable polymers during testing activities as described under Alternative 1 would not result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA, and potential impacts are considered negligible.

The Action Proponents have concluded that the use of biodegradable polymers during testing activities as described under Alternative 1 would have no effect on North Atlantic right whale, and proposed Rice's whale critical habitat, as defined by the ESA. The use of biodegradable polymers would have no effect on the blue whale, Rice's whale, fin whale, North Atlantic right whale, sei whale, sperm whale, and West Indian manatee, as defined by the ESA.

The analysis conclusions for biodegradable polymer for military readiness activities under Alternative 1 are consistent with a negligible impact on marine mammal populations.

3.7.3.5.3.2 Impacts from Biodegradable Polymers under Alternative 2

There would be no use of biodegradable polymers associated with training activities.

Impacts from biodegradable polymer use during testing under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same.

3.7.3.6 Ingestion Stressors

This section analyzes the potential impacts of the various types of ingestion stressors used during military readiness activities within the Study Area. This analysis includes the potential impacts from the following types of military expended materials: non-explosive practice munitions (small- and medium-caliber), fragments from high-explosives, fragments from targets, chaff, flare casings, and biodegradable polymer.

Table 3.7-20 contains a summary of the background information used to analyze the potential impacts of military expended materials that are munitions on marine mammals. For a listing of the types of activities that include military expended materials – munitions, refer to Appendix B (Activity Stressor Matrices).

Table 3.7-20: Ingestion Stressors Background Information Summary

Substressor	*Background Information Summary*
Military expended materials – munitions	Ingestion of military expended materials - munitions is not expected in most species of marine mammal, unless they are species that feed on the bottom. • Types of non-explosive practice munitions generally include projectiles, missiles, and bombs. Of these, only small- or medium-caliber projectiles would be small enough for a marine mammal to ingest. • Small- and medium-caliber projectiles include all sizes up to and including 2.25 inches in diameter. These solid metal materials would quickly move through

Table 3.7-20: Ingestion Stressors Summary Background Information (continued)

Substressor	*Background Information Summary*
	the water column and settle to the seafloor. Ingestion of non-explosive practice munitions is not expected to occur in the water column because the munitions sink quickly. Instead, they are most likely to be encountered by species that forage on the bottom. • Types of high-explosive munitions that can result in fragments include demolition charges, projectiles, missiles, and bombs. Fragments would result from fractures in the munitions casing and would vary in size depending on the net explosive weight and munitions type; however, typical sizes of fragments are unknown. • These solid metal materials would quickly move through the water column and settle to the seafloor; therefore, ingestion is not expected by most species.
Military expended materials other than munitions	Non-munition military expended materials that would remain floating on the surface are too small to pose a risk of intestinal blockage to any marine mammal that happened to encounter them. • The impacts of ingesting military expended materials other than munitions would be limited to cases where an individual marine mammal might eat an indigestible item too large to be passed through the gut. • The marine mammals would not be preferentially attracted to these military expended materials, with the possible exception of decelerators/parachutes that may appear similar to the prey of some species such as sperm whales and beaked whales. • For the most part, these military expended materials would most likely only be incidentally ingested by individuals feeding on the bottom in the precise location where these items were deposited. It is unlikely a marine mammal would ingest biodegradable polymer or bio-inspired slime. • Based on the constituents of the biodegradable polymer the Navy proposes to use, it is anticipated that the material would break down into small pieces within a few days to weeks. This would break down further and dissolve into the water column within weeks to a few months. • The final products, which are all environmentally benign, would be dispersed quickly to undetectable concentrations. Unlike other ingestion stressors, biodegradable polymers only remain in the water column for a relatively short period of time, and therefore the potential for ingestion by a marine mammal would be limited. • A marine mammal would have to encounter the biodegradable polymer immediately after it was expended for it to be a potential ingestion risk. If an animal were to encounter the polymer even a few hours after it was expended, it is very likely that it would break easily and would no longer be an ingestion stressor.

The distribution and density of expended items plays a central role in the likelihood of impact on marine mammals. The Action Proponents conduct military readiness activities throughout the Study Area and those that result in expended materials that could be ingested are widely distributed and low in density. There may be areas within the study area where expended materials may be more concentrated, however they are still dispersed widely within those locations. The majority of material expended during military readiness activities would likely penetrate into the seafloor and not be accessible to most marine mammals. Since potential impacts depend on where these items are expended and how a marine mammal feeds, the following subsections discuss important information for specific groups or species.

3.7.3.6.1 Impacts from Military Expended Materials – Munitions under Alternative 1

Table 3.7-20 contains a summary of the background information used to analyze the potential impacts of military expended materials that are munitions on marine mammals. For a listing of the types of activities that include military expended materials – munitions, refer to Appendix B (Activity Stressor Matrices).

Military expended materials – munitions for both training and testing activities (Table 3.0-11, Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities, and Table 3.0-12, Number and Location of Explosives that May Result in Fragments Used during Military Readiness Activities) would decrease from the 2018 Final EIS/OEIS.

Under Alternative 1 for training:

- Ingestible munitions (including fragments from explosive munitions) would occur in mostly the same locations they did in the 2018 Final EIS/OEIS. There would not be any ingestible munitions released in the Northeast, Virginia Capes, or Jacksonville Range Complexes Inshore, and there would be a notable increase in the Key West Range Complex Inshore.

Under Alternative 1 for testing:

- Ingestible munitions would occur in one location not previously analyzed (Naval Undersea Warfare Center Division, Newport Testing Range) in the 2018 Final EIS/OEIS. For all other locations, there would be a decrease in the amount of ingestible munitions.

For both training and testing, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.7.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of marine mammal taxa among military readiness locations has not changed.

For locations not previously analyzed, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of marine mammals that forage on the bottom in this areas encountering a munition or munition fragment and consuming it remains low. Therefore, the Action Proponents do not anticipate that any marine mammals would experience adverse ingestion impacts from non-explosive practice munitions and high-explosive munition fragments associated with military readiness activities under Alternative 1.

Military readiness activities that expend non-explosive practice munitions and high-explosive munitions fragments would occur within the North Atlantic right whale's designated critical habitat year-round. Physical and biological features identified for North Atlantic right whale conservation and considered in the critical habitat designation include oceanic conditions that distribute and aggregate dense concentrations of copepods within the northern foraging habitats and water temperatures, depths, and sea surface conditions that are suitable for the southern calving habitats (National Marine Fisheries Service, 2015). These habitat features would not be impacted by expended non-explosive practice munitions and high-explosive munitions fragments.

Physical and biological features identified for Rice's whale conservation and considered in the proposed critical habitat designation include continental shelf and slope associated waters between the 100 to 400m isobaths that support individual growth, reproduction, and development, social behavior, and overall population growth through sufficient prey density, waters with elevated productivity, water temperatures of 10-19° C, low pollution, and quiet conditions (88 *Federal Register* 47453). These habitat features would not be impacted by military expended materials – munitions.

Military readiness activities that expend non-explosive practice munitions and high-explosive munitions would not occur within West Indian manatee designated critical habitat.

Military readiness activities involving military expended materials as described under Alternative 1 would not result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA, and potential impacts are considered negligible.

The Action Proponents have concluded that military readiness activities involving military expended materials – munitions as described under Alternative 1 would have no effect on North Atlantic right whale, or the proposed Rice's whale critical habitat, as defined by the ESA. Training and testing activities involving military expended materials – munitions may affect the blue whale, Rice's whale, fin whale, North Atlantic right whale, sei whale, sperm whale, and West Indian manatee, as defined by the ESA. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA regarding potential impacts to those ESA-listed species that may be affected by the use of military expended materials – munitions during Military readiness activities.

The analysis conclusions for military expended materials – munitions for military readiness activities under Alternative 1 are consistent with a negligible impact on marine mammal populations.

3.7.3.6.2 Impacts from Military Expended Materials – Munitions under Alternative 2

Impacts from military expended materials – munitions under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

3.7.3.6.3 Impacts from Military Expended Materials Other Than Munitions under Alternative 1

Table 3.7-20 contains a summary of the background information used to analyze the potential impacts of military expended materials other than munitions on marine mammals. For a listing of the types of activities that include military expended materials other than munitions, refer to Appendix B (Activity Stressor Matrices).

Military expended materials – other than munitions for both training and testing activities (Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities) would decrease from the 2018 Final EIS/OEIS.

Under Alternative 1 for training:

- Ingestible military expended materials other than munitions would no longer occur at one location (Virginia Capes Range Complex Inshore) that they did in the 2018 Final EIS/OEIS. However, there would be a notable increase in military expended materials other than munitions at the Virginia Capes Range Complex and the Key West Range Complex. For all other locations, there would either be a decrease or similar amount of military expended materials other than munitions.

Under Alternative 1 for testing:

- Ingestible military expended materials other than munitions would occur in one location not previously analyzed (Other AFTT Areas) in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease or similar amount of military expended materials other than munitions.
- Activities using biodegradable polymer would occur in three locations not previously analyzed (Northeast Range Complexes, Navy Cherry Point Range Complex, and Joint Expeditionary Base Little Creek Fort Story) in the 2018 Final EIS/OEIS. For all other locations, there would be a

decrease or cessation in the activities using biodegradable polymer (Table 3.0-18, Number and Location of Activities Including Biodegradable Polymers during Testing).

For locations without a notable increase in ingestible non-munitions and target fragments, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.7.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of marine mammal taxa among military readiness locations has not changed.

For locations with notable increases in military expended materials other than munitions and targets, overall, there would be a decrease in expended materials in the Study Area. The impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid because the likelihood of marine mammals encountering ingestible military expended material or target fragment and consuming it remains low.

Target-related material, chaff, flares, decelerators/parachutes, and their subcomponents have the potential to be ingested by a marine mammal, although that is considered unlikely since most of these materials would quickly drop through the water column and settle on the seafloor. Some Styrofoam, plastic endcaps, chaff, and other small items may float for some time before sinking. The Action Proponents do not anticipate that any marine mammals would experience adverse ingestion impacts from target-related material, chaff, flares, and decelerators/parachutes associated with military readiness activities under Alternative 1. There would be no use of biodegradable polymers associated with training activities, only testing activities.

Military readiness activities that expend non-munition military expended materials would occur within the North Atlantic right whale's designated critical habitat year-round. Physical and biological features identified for North Atlantic right whale conservation and considered in the critical habitat designation include oceanic conditions that distribute and aggregate dense concentrations of copepods within the northern foraging habitats and water temperatures, depths, and sea surface conditions that are suitable for the southern calving habitats (National Marine Fisheries Service, 2015). These habitat features would not be impacted by military expended materials other than munitions.

Physical and biological features identified for Rice's whale conservation and considered in the proposed critical habitat designation include continental shelf and slope associated waters between the 100 to 400m isobaths that support individual growth, reproduction, and development, social behavior, and overall population growth through sufficient prey density, waters with elevated productivity, water temperatures of 10-19° C, low pollution, and quiet conditions (88 Federal Register 47453). These habitat features would not be impacted by military expended materials other than munitions.

Military readiness activities that expend non-munition military expended materials would not occur within West Indian manatee designated critical habitat.

Training and testing activities involving military expended materials other than munitions as described under Alternative 1 will not result in the unintentional taking of marine mammals incidental to those activities, as defined by the MMPA, and potential impacts are considered negligible.

The Action Proponents have concluded that military readiness activities involving military expended materials other than munitions as described under Alternative 1 would have no effect on North Atlantic right whale, or the proposed Rice's whale critical habitat, as defined by the ESA. Training and testing activities involving military expended materials other than munitions may affect the blue whale, Rice's whale, fin whale, North Atlantic right whale, sei whale, sperm whale, and West Indian manatee, as defined by the ESA. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA regarding potential impacts to those ESA-listed species that may be affected by training activities involving military expended materials other than munitions.

The analysis conclusions for military expended materials other than munitions for military readiness activities under Alternative 1 are consistent with a negligible impact on marine mammal populations.

3.7.3.6.4 Impacts from Military Expended Materials Other Than Munitions under Alternative 2

Impacts from military expended materials other than munitions under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance impacts, ESA-listed species and critical habitat are the same for both military readiness.

3.7.3.7 Secondary Stressors

This section analyzes potential impacts on marine mammals exposed to stressors indirectly through impacts on their habitat (sediment or water quality) or prey. For the purposes of this analysis, indirect impacts on marine mammals via sediment or water quality that do not require trophic transfer (e.g., bioaccumulation) to be observed are considered here. Bioaccumulation considered previously in this document in the analysis of habitats (Section 3.3), invertebrates (Section 3.5) and fish (Section 3.6) indicated minimal to no impacts on potential prey species of marine mammals. It is important to note that the terms "indirect" and "secondary" do not imply reduced severity of environmental consequences but instead describe how the impact may occur in an organism. Bioaccumulation is considered in the Ecosystem Technical Report for the Atlantic Fleet Training and Testing (AFTT) Final Environmental Impact Statement (U.S. Department of the Navy, 2012). Additionally, the transportation of marine mammals (the Navy's marine mammal system) in association with force protection and mine warfare exercises is presented to detail the lack of potential for the introduction of disease or parasites from those marine mammals to the Study Area. The potential for impacts from all of these secondary stressors are discussed below.

Stressors from military readiness activities that could pose indirect impacts on marine mammals via habitat or prey include (1) explosives, (2) explosive byproducts and unexploded munitions, (3) metals, (4) chemicals, and (5) transmission of disease and parasites (see Table 3.7-21). Analyses of the potential impacts on sediment and water quality are discussed in Section 3.2 (Sediment and Water Quality).

Table 3.7-21: Secondary Stressors Background Information Summary

Substressor	*Background Information Summary*
Explosives	Underwater explosions could impact other species in the food web, including prey species that marine mammals feed upon. • The impacts of explosions would differ depending on the type of prey species in the area of the blast. • In addition to physical effects of an underwater blast, prey might have behavioral reactions to underwater sound. For instance, prey species might exhibit a strong startle reaction to explosions that might include swimming to the surface or scattering away from the source. • Any of these scenarios would be temporary, only occurring during activities involving explosives, and no lasting effect on prey availability or the pelagic food web would be expected.
Explosion byproducts and unexploded munitions	Explosion byproducts associated with high order detonations present no indirect stressors to marine mammals through sediment or water. • Low-order detonations and unexploded munitions present elevated likelihood of impacts on marine mammals. • Most explosions occur in depths exceeding that which normally support seagrass beds, an area that is commonly occupied by manatees. • Low-order detonations and unexploded munitions present elevated likelihood of secondary impacts on marine mammals.
Metals	See Appendix G (Non-Acoustic Impacts Supporting Information).

Table 3.7-21: Secondary Stressors Background Information Summary (continued)

Substressor	Background Information Summary
Chemicals	Several military readiness activities introduce chemicals into the marine environment that are potentially harmful in higher concentrations; however, rapid dilution would occur, and toxic concentrations are unlikely to be encountered. • Chemicals introduced are principally from flares and propellants for missiles and torpedoes. Properly functioning flares, missiles, and torpedoes combust most of their propellants, leaving benign or readily diluted soluble combustion byproducts (e.g., hydrogen cyanide). • Operational failures may allow propellants and their degradation products to be released into the marine environment. Flares and missiles that operationally fail may release perchlorate, which is highly soluble in water, persistent, and impacts metabolic processes in many plants and animals if in sufficient concentration. • Such concentrations are not likely to persist in the ocean.
Transmission of disease and parasites	The Navy Marine Mammal Program has operated globally for 40 years with no known impacts to wild populations due to the excellent veterinary care provided to the marine mammal systems, as well as the handling procedures in place for the systems. • When not engaged in the training event, Navy marine mammals are either housed in temporary enclosures or aboard ships involved in training exercises. • All marine mammal waste is disposed of in a manner approved for the specific holding facilities. • When working, sea lions are transported in boats, and dolphins are transferred in boats or by swimming alongside the boat under the handler's control. Their open-ocean time is under stimulus control and is monitored by their trainer.

3.7.3.7.1 Impacts from Secondary Stressors Under Alternative 1

For all secondary stressors, the analysis from the 2018 Final EIS/OEIS remains valid. See Appendix G (Non-Acoustic Impacts Supporting Information) for all information regarding secondary stressors.

The impact of the Proposed Action on secondary stressors were considered negligible to moderate (depending on the primary stressor) on marine mammal populations.

The Action Proponents have concluded that secondary stressors as described under Alternative 1 would have no effect on North Atlantic right whale, or the proposed Rice's whale critical habitat; may affect the blue whale, Rice's whale, fin whale, North Atlantic right whale, sei whale, sperm whale, and West Indian manatee, as defined by the ESA. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.7.3.7.2 Impacts from Secondary Stressors Under Alternative 2

Impacts from secondary stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

3.7.3.8 Combined stressors

3.7.3.8.1 Combined Impacts of All Stressors under Alternative 1

As described in Section 3.0.3.5 (Resource-Specific Impacts Analysis for Multiple Stressors), this section evaluates the potential for combined impacts of all the stressors from the Proposed Action. The analysis and conclusions for the potential impacts from each of the individual stressors are discussed in Sections 3.7.3.1 (Acoustic Stressors) through 3.7.3.6 (Ingestion Stressors) and, for ESA-listed species, summarized in Section 3.7.4 (Endangered Species Act Determinations). Stressors associated with military readiness activities do not typically occur in isolation but rather occur in some combination. For example, mine neutralization activities include elements of acoustic, physical disturbance and strike, entanglement, ingestion, and secondary stressors that are all coincident in space and time. An analysis of the combined impacts of all stressors considers the potential consequences of additive stressors as described below. This analysis makes the reasonable assumption that the majority of exposures to stressors are non-lethal, and instead focuses on consequences potentially impacting marine mammal fitness (e.g., physiology, behavior, reproductive potential).

There are generally two ways that a marine mammal could be exposed to multiple additive stressors. The first would be if a marine mammal were exposed to multiple sources of stress from a single event or activity within a single testing or training event (e.g., a mine warfare event may include the use of a sound source and a vessel). The potential for a combination of these impacts from a single activity would depend on the range to effects of each of the stressors and the response or lack of response to that stressor. Most of the activities proposed under Alternative 1 generally involve the use of moving platforms (e.g., ships, torpedoes, aircraft) that may produce one or more stressors; therefore, it is likely that if a marine mammal were within the potential impact range of those activities, it may be impacted by multiple stressors simultaneously. Individual stressors that would otherwise have minimal to no impact may combine to have a measurable response. However, due to the wide dispersion of stressors, speed of the platforms, general dynamic movement of many military readiness activities, and behavioral avoidance exhibited by many marine mammal species, it is very unlikely that a marine mammal would remain in the potential impact range of multiple sources or sequential exercises. Exposure to multiple stressors is more likely to occur at an instrumented range where military readiness activities using multiple platforms may be concentrated during a particular event. In such cases involving a relatively small area on an instrumented range, a behavioral reaction resulting in avoidance of the immediate vicinity of the activity would reduce the likelihood of exposure to additional stressors. Nevertheless, the majority of the proposed activities are unit-level training and small testing activities which are conducted in the open ocean. Unit-level exercises occur over a small spatial scale (one to a few square miles) and with few participants (usually one or two) or short duration (the order of a few hours or less).

Secondly, a marine mammal could be exposed to multiple military readiness activities over the course of its life, however, military readiness activities are generally separated in space and time in such a way that it would be unlikely that any individual marine mammal would be exposed to stressors from multiple activities within a short timeframe. However, animals with a home range intersecting an area of concentrated activity have elevated exposure risks relative to animals that simply transit the area through a migratory corridor.

Multiple stressors may also have synergistic effects. For example, marine mammals that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors via a decreased ability to detect and avoid threats. Marine mammals that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to entanglement and physical strike stressors via malnourishment and disorientation. These interactions are speculative, and without data on the combination of multiple stressors, the synergistic impacts from the combination of stressors are difficult to predict in any meaningful way. Research and monitoring efforts have included: before, during, and after-event observations and surveys; data collection through conducting long-term studies in areas of military readiness activity; occurrence surveys over large geographic areas; biopsy of animals occurring in areas of military readiness activity; and tagging studies where animals are exposed to military readiness stressors. These efforts are intended to contribute to the overall understanding of what impacts may be occurring overall to animals in these areas. To date, the findings from the research and monitoring and the regulatory conclusions from previous analyses by

NMFS (National Oceanic and Atmospheric Administration, 2013, 2015) are that majority of impacts from military readiness activities are not expected to have deleterious impacts on the fitness of any individuals or long-term consequences to populations of marine mammals.

Although potential impacts on certain marine mammal species from military readiness activities under Alternative 1 may include behavioral responses, or injury to individuals, those injuries are not expected to lead to long-term consequences for populations. The potential impacts anticipated from Alternative 1 are summarized in Sections 3.7.4 (Endangered Species Act Determinations) and Section 3.7.5 (Marine Mammal Protection Act Determinations) for each regulation applicable to marine mammals. For a discussion of mitigation, see Chapter 5 (Mitigation).

The combined impact of all stressors from Alternative 1 is considered moderate (due to limited potential for injury/mortality) for both action alternatives.

3.7.3.8.2 Combined Impacts of All Stressors under Alternative 2

The combined maximum quantities of direct and indirect stressors from military readiness under Alternative 2 (at the same locations as Alternative 1) would still be characterized as a moderate impact on marine mammal populations, including ESA-listed species.

3.7.4 Endangered Species Act Determinations

The Action Proponents have concluded that military readiness activities may affect the North Atlantic right whale, blue whale, fin whale, Rice's whale, sei whale, sperm whale, and West Indian manatee, the North Atlantic right whale critical habitat, and the proposed Rice's whale critical habitat. The Action Proponents have also concluded that military readiness activities would have no effect on designated critical habitat for the West Indian manatee. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA regarding potential impacts to those ESA-listed species that may be affected by the proposed military readiness activities.

The summary of effects determinations for each ESA-listed species is provided in Table 3.7-22.

3.7.5 Marine Mammal Protection Act Determinations

The Action Proponents are seeking Letters of Authorization in accordance with the MMPA from NMFS for certain military readiness activities (the use of sonar and other transducers, air guns, pile driving, vessels, and explosives), as described under the Preferred Alternative (Alternative 1). The use of sonar and other transducers may result in Level A and Level B harassment of certain marine mammals. The use of air guns and pile driving may result in Level B harassment of certain marine mammal species. The use of explosives may result in Level A harassment, Level B harassment, and mortality of certain marine mammals. The use of vessels may result in Level A harassment or potential mortality due to physical strike.

Weapons noise, vessel noise, aircraft noise, the use of in-water electromagnetic devices, high-energy lasers, in-water devices, seafloor devices, wires and cables, decelerators/parachutes, biodegradable polymers and bio-inspired slime, and military expended materials are not expected to result in Level A or Level B harassment of any marine mammals.

Table 3.7-22: Marine Mammal ESA Effect Determinations for Military Readiness Activities under Alternative 1 (Preferred Alternative)

Species	Designation Unit/Critical Habitat	Effect Determinations by Stressor																						
		Acoustic						Explosives		Energy			Physical Disturbance and Strike						Entanglement			Ingestion		
		Sonar and Other Transducers	Air Guns	Pile Driving	Vessel Noise	Aircraft Noise	Weapons Noise	Explosives in Air	Explosives in Water	In-Water Electromagnetic Devices	In-Air Electromagnetic Devices	High-Energy Lasers	Aircraft and Aerial Targets	Vessels	In-Water Devices	Military Expended Materials	Seafloor Devices	Pile Driving	Wires and Cables	Decelerators/Parachutes	Biodegradable Polymer	Military Expended Materials – Munitions	Military Expended Materials – Other Than Munitions	Indirect/Secondary
Training Activities																								
North Atlantic right whale	Throughout range	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
	Critical habitat	NE	N/A	N/A	NE	NE	NE	NE	NE	N/A	NE	NE	NE	NE	N/A	NE	NE	N/A	NE	NE	N/A	NE	NE	NE
Blue whale	Throughout range	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
Rice's whale	Throughout range	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
	Proposed Critical Habitat	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	NE	NE	NE	NE	N/A	NE	NE	N/A	NE	NE	N/A	NE	NE	NE
Fin whale	Throughout range	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
Sei whale	Throughout range	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
Sperm whale	Atlantic Stock	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA
	Gulf of Mexico Stock	MA	N/A	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	N/A	MA	MA	MA

Table 3.7-22: Marine Mammal ESA Effect Determinations for Military Readiness Activities under Alternative 1 (Preferred Alternative) (continued)

Species	**Designation Unit/Critical Habitat**	***Effect Determinations by Stressor***																						
		Acoustic						***Explosives***		***Energy***			***Physical Disturbance and Strike***						***Entanglement***			***Ingestion***		
		Sonar and Other Transducers	***Air Guns***	***Pile Driving***	***Vessel Noise***	***Aircraft Noise***	***Weapons Noise***	***Explosives in Air***	***Explosives in Water***	***In-Water Electromagnetic Devices***	***In-Air Electromagnetic Devices***	***High-Energy Lasers***	***Aircraft and Aerial Targets***	***Vessels***	***In-Water Devices***	***Military Expended Materials***	***Seafloor Devices***	***Pile Driving***	***Wires and Cables***	***Decelerators/Parachutes***	***Biodegradable Polymer***	***Military Expended Materials – Munitions***	***Military Expended Materials – Other Than Munitions***	***Indirect/Secondary***
West Indian manatee	Throughout range	MA	N/A	MA	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	NE	MA	MA	N/A	MA	MA	MA
	Critical habitat	NE	N/A	N/A	NE	NE	NE	NE	NE	N/A	NE	N/A	NE	NE	N/A	N/A	NE	N/A	N/A	N/A	N/A	N/A	N/A	NE
Testing Activities																								
North Atlantic right whale	Throughout range	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
	Critical habitat	NE	NE	N/A	NE	NE	NE	NE	NE	N/A	NE	NE	NE	NE	N/A	NE	NE	N/A	NE	NE	NE	NE	NE	NE
Blue whale	Throughout range	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	NA	MA	N/A	MA	MA	MA	MA	MA	MA
Rice's whale	Throughout range	MA	MA	N/A	NE	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	NA	MA	N/A	MA	MA	MA	MA	MA	MA
	Proposed Critical Habitat	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	NE	NE	NE	NE	N/A	NE	NE	NE	NE	NE	NE	NE	NE	NE
Fin whale	Throughout range	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
Sei whale	Throughout range	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA

Table 3.7-22: Marine Mammal ESA Effect Determinations for Military Readiness Activities under Alternative 1 (Preferred Alternative) (continued)

Species	Designation Unit/Critical Habitat	Effect Determinations by Stressor: Acoustic						Explosives		Energy			Physical Disturbance and Strike						Entanglement			Ingestion		
		Sonar and Other Transducers	Air Guns	Pile Driving	Vessel Noise	Aircraft Noise	Weapons Noise	Explosives in Air	Explosives in Water	In-Water Electromagnetic Devices	In-Air Electromagnetic Devices	High-Energy Lasers	Aircraft and Aerial Targets	Vessels	In-Water Devices	Military Expended Materials	Seafloor Devices	Pile Driving	Wires and Cables	Decelerators/Parachutes	Biodegradable Polymer	Military Expended Materials – Munitions	Military Expended Materials – Other Than Munitions	Indirect/Secondary
Sperm whale	Atlantic Stock	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
	Gulf of Mexico Stock	MA	MA	N/A	MA	MA	MA	NE	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	MA	MA	MA
West Indian manatee	Throughout range	NE	N/A	N/A	N/A	N/A	N/A	N/A	NE	N/A	N/A	N/A	NE	N/A	N/A	NE	NE	N/A	NE	N/A	N/A	N/A	N/A	NE
	Critical habitat	NE	N/A	N/A	NE	NE	NE	NE	NE	NE	N/A	N/A	N/A	NE	N/A	NE	NE	NE	N/A	NE	N/A	N/A	N/A	NE

*The use of air guns during military readiness activities may affect designated foraging critical habitat in the Northeast and would have no effect on calving critical habitat in the Southeast for North Atlantic right whales.

Notes: MA = may affect; N/A = not applicable; NE = no effect

References

Abramson, L., S. Polefka, S. Hastings, and K. Bor. (2011). *Reducing the Threat of Ship Strikes on Large Cetaceans in the Santa Barbara Channel Region and Channel Islands National Marine Sanctuary: Recommendations and Case Studies* (Marine Sanctuaries Conservation Series). Silver Spring, MD: National Oceanic and Atmospheric Administration, National Ocean Service, National Marine Sanctuary Program.

Barnard, B. (2016, April 1). *Carriers stick with slow-steaming despite fuel-price plunge*. *The Journal of Commerce.* Retrieved from http://www.joc.com/maritime-news/container-lines/carriers-stick-slow-steaming-despite-fuel-price-plunge_20160401.html.

Berman-Kowalewski, M., F. M. D. Gulland, S. Wilkin, J. Calambokidis, B. Mate, J. Cordaro, D. Rotstein, J. S. Leger, P. Collins, K. Fahy, and S. Dover. (2010). Association Between Blue Whale (*Balaenoptera musculus*) Mortality and Ship Strikes Along the California Coast. *Aquatic Mammals 36* (1): 59–66. DOI:10.1578/am.36.1.2010.59

Bonney, J. and P. T. Leach. (2010, February 1). *Slow Boat From China*. *Maritime News.* Retrieved April 7, 2017, from http://www.joc.com/maritimenews/slowboatchina_20100201.html.

Calambokidis, J. (2012). *Summary of Ship-Strike Related Research on Blue Whales in 2011*. Olympia, WA: Cascadia Research.

Committee on Taxonomy. (2016). *List of Marine Mammal Species and Subspecies*. Retrieved April 27, 2017, from https://www.marinemammalscience.org/species-information/list-marine-mammal-species-subspecies/previous-versions/.

Douglas, A. B., J. Calambokidis, S. Raverty, S. J. Jeffries, D. M. Lambourn, and S. A. Norman. (2008). Incidence of ship strikes of large whales in Washington State. *Journal of the Marine Biological Association of the United Kingdom 88* (6): 1121–1132. DOI:10.1017/S0025315408000295

Driessen, S., L. Bodewein, D. Dechent, D. Graefrath, K. Schmiedchen, D. Stunder, T. Kraus, and A. Petri. (2020). Biological and health-related effects of weak static magnetic fields (<1 mT) in humans and vertebrates: A systematic review. *PLoS ONE 15* (6).

Gill, A. B., I. Gloyne-Philips, J. Kimber, and P. Sigray. (2014). Marine Renewable Energy, Electromagnetic (EM) Fields and EM-Sensitive Animals. In M. Shields & A. Payne (Eds.), *Marine Renewable Energy Technology and Environmental Interactions. Humanity and the Sea* (pp. 61–79). Dordrecht, Netherlands: Springer.

Hayes, S. A., E. Josephson, K. Maze-Foley, P. E. Rosel, J. McCordic, and J. Wallace (Eds.). (2023). *U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments 2022*. Woods Hole, MA: National Marine Fisheries Service Northeast Fisheries Science Center. NOAA Technical Memorandum NMFS-NE-304.

Heide-Jorgensen, M. P., K. L. Laidre, M. Simon, M. L. Burt, D. L. Borchers, and M. Rasmussen. (2010a). Abundance of fin whales in West Greenland in 2007. *Journal of Cetacean Research and Management 11* (2): 83–88.

Heide-Jorgensen, M. P., L. Witting, K. L. Laidre, R. G. Hansen, and M. Rasmussen. (2010b). Fully corrected estimates of common minke whale abundance in West Greenland in 2007. *Journal of Cetacean Research and Management 11* (2): 75–82.

Horton, T. W., N. Hauser, A. N. Zerbini, M. P. Francis, M. L. Domeier, A. Andriolo, D. P. Costa, P. W. Robinson, C. A. J. Duffy, N. Nasby-Lucas, R. N. Holdaway, and P. J. Clapham. (2017). Route fidelity during marine megafauna migration. *Frontiers in Marine Science 4* 1–21. DOI:10.3389/fmars.2017.00422

Horton, T. W., A. N. Zerbini, A. Andriolo, D. Danilewicz, and F. Sucunza. (2020). Multi-decadal humpback whale migratory route fidelity despite oceanographic and geomagnetic change. *Frontiers in Marine Science 7*.

Jefferson, T. A., M. A. Webber, and R. L. Pitman. (2015). *Marine Mammals of the World: A Comprehensive Guide to Their Identification* (2nd ed.). Cambridge, MA: Academic Press.

Jensen, A. S. and G. K. Silber. (2004). *Large Whale Ship Strike Database* (NOAA Technical Memorandum NMFS-OPR-25). Silver Spring, MD: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

Kato, H. and W. F. Perrin. (2009). Bryde's whales, *Balaenoptera edeni/brydei*. In W. F. Perrin, B. Wursig, & J. G. M. Thewissen (Eds.), *Encyclopedia of Marine Mammals* (2nd ed., pp. 158–163). Cambridge, MA: Academic Press.

Kremers, D., A. Celerier, B. Schaal, S. Campagna, M. Trabalon, M. Boye, M. Hausberger, and A. Lemasson. (2016). Sensory Perception in Cetaceans: Part I—Current Knowledge about Dolphin Senses as a Representative Species. *Frontiers in Ecology and Evolution 4* (49): 1–17. DOI:10.3389/fevo.2016.00049

Kremers, D., J. Lopez Marulanda, M. Hausberger, and A. Lemasson. (2014). Behavioural evidence of magnetoreception in dolphins: Detection of experimental magnetic fields. *Die Naturwissenschaften 101* (11): 907–911. DOI:10.1007/s00114-014-1231-x

LaBrecque, E., C. Curtice, J. Harrison, S. M. Van Parijs, and P. N. Halpin. (2015a). Biologically Important Areas for Cetaceans Within U.S. Waters—East Coast Region. *Aquatic Mammals 41* (1): 17–29. DOI:10.1578/am.41.1.2015.54

LaBrecque, E., C. Curtice, J. Harrison, S. M. Van Parijs, and P. N. Halpin. (2015b). Biologically Important Areas for Cetaceans Within U.S. Waters—Gulf of Mexico Region. *Aquatic Mammals 41* (1): 30–38. DOI:10.1578/am.41.1.2015.54

Laggner, D. (2009). *Blue whale (Baleanoptera musculus) ship strike threat assessment in the Santa Barbara Channel, California.* (Unpublished master's thesis). The Evergreen State College, Olympia, WA. Retrieved from http://archives.evergreen.edu.

Laist, D. W., A. R. Knowlton, J. G. Mead, A. S. Collet, and M. Podesta. (2001). Collisions between ships and whales. *Marine Mammal Science 17* (1): 35–75.

Lammers, M. O., A. A. Pack, and L. Davis. (2003). *Historical evidence of whale/vessel collisions in Hawaiian waters (1975–Present)*. Honolulu, HI: National Oceanic and Atmospheric Administration Ocean Science Institute.

Maloni, M., J. A. Paul, and D. M. Gligor. (2013). Slow steaming impacts on ocean carriers and shippers. *Maritime Economics & Logistics 15* (2): 151–171. DOI:10.1057/mel.2013.2

Mintz, J. D. (2012). *Vessel Traffic in the Hawaii-Southern California and Atlantic Fleet Testing and Training Study Areas*. Alexandria, VA: Center for Naval Analyses.

Mintz, J. D. (2016). *Characterization of Vessel Traffic in the Vicinities of HRC, SOCAL, and the Navy Operating Areas off the U.S. East Coast*. Alexandria, VA: Center for Naval Analyses.

National Marine Fisheries Service. (2015). *North Atlantic Right Whale (Eubalaena glacialis) Source Document for the Critical Habitat Designation: A review of information pertaining to the definition of "critical habitat"*. Silver Spring, MD: National Marine Fisheries Service.

National Oceanic and Atmospheric Administration. (2013). Takes of Marine Mammals Incidental to Specified Activities; U.S. Navy Training and Testing Activities in the Hawaii-Southern California Training and Testing Study Area; Final Rule. *Federal Register 78* (247): 78106–78158.

National Oceanic and Atmospheric Administration. (2015). Takes of Marine Mammals Incidental to Specified Activities; U.S. Navy Training and Testing Activities in the Northwest Training and Testing Study Area; Final Rule. *Federal Register 80* (226): 73556–73627.

Neilson, J. L., J. M. Straley, C. M. Gabriele, and S. Hills. (2009). Non-lethal entanglement of humpback whales (*Megaptera novaeangliae*) in fishing gear in northern Southeast Alaska. *Journal of Biogeography 36* 452–464. DOI:10.1111/j.1365-2699.2007.01820

Oliveira, E., M. DeAngelis, M. Chalek, J. Krumholz, and K. Anatone-Ruiz. (2024). *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii-California Training and Testing Study Areas* (Undersea Warfare Center Division Newport Technical Report). Newport, RI: Undersea Warfare Center Division Newport.

Perrin, W. F., C. S. Baker, A. Berta, D. J. Boness, R. L. Brownell, Jr., M. L. Dalebout, D. P. Domning, R. M. Hamner, T. A. Jefferson, J. G. Mead, D. W. Rice, P. E. Rosel, J. Y. Wang, and T. Yamada. (2009). *Marine Mammal Species and Subspecies*. Retrieved 2010, from http://www.marinemammalscience.org/index.php?option=com_content&view=article&id=420&Itemid=280.

Prieto, R., M. A. Silva, G. T. Waring, and J. M. A. Goncalves. (2014). Sei whale movements and behaviour in the North Atlantic inferred from satellite telemetry. *Endangered Species Research 26* 103–113. DOI:10.3354/esr00630

Ramp, C., J. Delarue, M. Berube, P. S. Hammond, and R. Sears. (2014). Fin whale survival and abundance in the Gulf of St. Lawrence, Canada. *Endangered Species Research 23* 125–132. DOI:10.3354/esr00571

Rice, D. W. (1998). *Marine Mammals of the World: Systematics and Distribution* (Society for Marine Mammalogy Special Publication). Lawrence, KS: Society for Marine Mammalogy.

Swope, B. and J. McDonald. (2013). *Copper-Based Torpedo Guidance Wire: Applications and Environmental Considerations*. San Diego, CA: Space and Naval Warfare Systems Command Center Pacific.

U.S. Department of the Navy. (2012). *Ecosystem Technical Report for the Atlantic Fleet Training and Testing (AFTT) Environmental Impact Statement*. Arlington, VA: Naval Facilities Engineering Command, Atlantic Division.

U.S. Department of the Navy. (2024a). *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase IV)*. San Diego, CA: Naval Information Warfare Center, Pacific.

U.S. Department of the Navy. (2024b). *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (Technical Report prepared by Naval Information Warfare Center Pacific). San Diego, CA: Naval Undersea Warfare Center.

U.S. Department of the Navy. (2024c). *U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area* (Naval Facilities Engineering Command Atlantic Technical Report). Norfolk, VA: Naval Facilities Engineering Command Atlantic.

Van der Hoop, J. M., M. J. Moore, S. G. Barco, T. V. Cole, P. Y. Daoust, A. G. Henry, D. F. McAlpine, W. A. McLellan, T. Wimmer, and A. R. Solow. (2013). Assessment of management to mitigate anthropogenic effects on large whales. *Conservation Biology: The Journal of the Society for Conservation Biology 27* (1): 121–133. DOI:10.1111/j.1523-1739.2012.01934

Van der Hoop, J. M., A. S. M. Vanderlaan, and C. T. Taggart. (2012). Absolute probability estimates of lethal vessel strikes to North Atlantic right whales in Roseway Basin, Scotian Shelf. *Ecological Applications 22* (7): 2021–2033.

Waring, G. T., E. Josephson, K. Maze-Foley, and P. E. Rosel. (2010). *U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments–2010* (NOAA Technical Memorandum NMFS-NE-219). Woods Hole, MA: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Fisheries Science Center.

Zellar, R., A. Pulkkinen, K. Moore, D. Reeb, E. Karakoylu, and O. Uritskaya. (2017). *Statistical Assessment of Cetacean Stranding Events in Cape Cod (Massachusetts, USA) Area OS21A-1345*. Greenbelt, MD: National Aeronautics and Space Administration.

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3.8 Reptiles

REPTILES SYNOPSIS

The Action Proponents considered the stressors to reptiles that could result from the Proposed Action in the Study Area. The following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Acoustic: Reptiles may be exposed to multiple acoustic stressors, including sonars and other transducers (hereafter called sonars), air guns, pile driving, vessel, aircraft, and weapons noise. Reptiles may be affected by a limited portion of acoustic stressors due to limited hearing abilities. Exposures to sound-producing activities may cause auditory masking, physiological stress, or minor behavioral responses, while non-auditory injury and mortality are unlikely to occur under realistic conditions. Exposures to some sonars, air guns, and pile driving may also affect hearing (temporary threshold shift [TTS] or auditory injury [AINJ]) and cause significant behavioral reactions. The number of auditory and significant behavioral reactions are estimated for each sea turtle species. Sea turtles would be exposed to acoustic stressors in the inshore and offshore portions of the Study Area, while crocodilians and terrapins would be exposed at inshore locations. Most activities involving acoustic stressors would be temporary and localized. Effects such as hearing loss or behavioral responses are expected to have a minor to moderate impact on individuals. Overall, long-term consequences for reptile populations are not expected.
- Explosive: Explosions in the water or near the water surface may cause auditory effects (TTS or AINJ), auditory masking, physiological stress, and behavioral reactions. Reptiles located in close proximity to explosions in the water or near the water surface can be injured or killed due to the shock waves produced by explosives. The number of auditory (TTS and AINJ), non-auditory injury (injury and mortality), and significant behavioral impacts are estimated for each sea turtle species. Sea turtles would be exposed to explosive stressors in the inshore and offshore portions of the Study Area, while crocodilians and terrapins would be exposed to explosive stressors at inshore locations. The time scale of individual explosions is very limited, and military readiness activities involving explosions are dispersed in space and time. Effects such as hearing loss or behavioral responses are expected to have a minor to moderate impact on individuals. More severe impacts (e.g., injury and mortality) could lead to permanent effects and have a moderate impact on individuals. Overall, long-term consequences for reptile populations are not expected.
- Energy: The impact of energy stressors on reptiles is expected to be negligible based on (1) Magnetic fields generated by electromagnetic devices used in military readiness activities are of relatively minute strength and generate relatively week electromagnetic energy. Reptile reactions to fields and electrical pulses may include no reaction, avoidance, habituation, changes in activity level, or attraction, but effects would only occur near the source where an individual reptile may be but population-level impacts are unlikely;

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REPTILES SYNOPSIS

Energy (continued): (2) high-energy lasers would only be used in open-ocean areas, so is not anticipated to impact crocodilians and terrapins as they would not occur where high-energy lasers are used; and (3) high-energy lasers are directed at surface targets and are designed to disable surface targets and turn off when they lose track of the target. The impacts of energy stressors would be limited to individual cases where a sea turtle might become temporarily disoriented or be injured. In addition, high-energy laser systems used automatically shut down when the target-lock is lost. Although a small number of individuals may be impacted by energy stressors, no population-level impacts would occur.

- Physical disturbance and strike: Vessels, in-water devices, military expended materials, and seafloor devices present a risk for physical disturbance and collision with reptiles. Because of the low numbers of reptiles potentially impacted by activities that may potentially cause a physical disturbance and strike, population-level effects are unlikely. Further, mitigation implemented in nearshore waters that protects critical habitat and limits vessel activities within aquatic vegetation habitat (i.e., *Sargassum*), would minimize the potential of physical disturbance or strike to reptiles.

- Entanglement: Sea turtles could be exposed to multiple entanglement stressors within the inshore and offshore training and testing locations. Entanglement stressors are not anticipated to impact crocodilians or terrapins because activities that expend materials that present a potential entanglement risk would not occur within crocodilian or terrapin habitats. The potential for impacts to sea turtles is dependent on the physical properties of the expended materials and the likelihood that a sea turtle would encounter a potential stressor and then become entangled in it. Physical characteristics of wires and cables, decelerators/parachutes, and biodegradable polymers combined with the sparse distribution of these items throughout the Study Area indicates a very low potential for sea turtles to encounter and become entangled in them. Long-term impacts on individual reptiles and reptile populations from entanglement stressors associated with military readiness activities are not anticipated.

  Ingestion: Military readiness activities have the potential to expose reptiles to multiple ingestion stressors and associated impacts within the inshore and offshore training and testing locations. The likelihood and magnitude of impacts depends on the physical properties of the military expended items and the feeding behaviors of the particular species of reptiles that occur in specific areas where potentially ingestible items are used. Adverse impacts from ingestion of military expended materials would be limited to the unlikely event that a reptile would be harmed by ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system. The likelihood that a reptile would encounter and subsequently ingest a military expended item associated with military readiness activities is considered low and long-term consequences to reptile populations are not anticipated.

3.8.1 Introduction

The following sections provide an overview of reptiles found in the Study Area and the potential of the proposed training and testing activities on reptiles. Impacts to reptiles from the Proposed Action were analyzed in the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (hereinafter referred to as the 2018 Final EIS/OEIS).

3.8.2 Affected Environment

The affected environment provides context for evaluating the effects of the Action Proponents' military readiness activities to impact reptiles. With noted exceptions, the general background for reptiles in the Study Area is not meaningfully different from what is described in the 2018 Final EIS/OEIS. See Appendix F (Biological Resources Supplemental Information) for detailed information on the affected environment of reptiles. The details are specified in this section when they directly affect the analysis.

The Study Area is generally consistent with that analyzed in the 2018 Final EIS/OEIS. Additions to the Study Area include pierside training and testing events and transit along established navigation channels from pierside locations to offshore range complexes in the Gulf of Mexico. United States (U.S.) Coast Guard activities are similar in nature to Navy activities and fall under the same stressor categories.

3.8.2.1 General Background

Reptiles evaluated in this Supplemental Environmental Impact Statement (EIS)/Overseas EIS (OEIS) include sea turtles—green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), loggerhead sea turtle (*Caretta caretta*), and leatherback sea turtle (*Dermochelys coriacea*); crocodilians—American crocodile (*Crocodylus acutus*) and American alligator (*Alligator mississippiensis*); and the diamondback terrapin (*Malaclemys terrapin*). There is updated information regarding density distribution and abundance, population status, group size, habitat use, movement and behavior, and general threats to species in the Study Area.

3.8.2.1.1 Group Size

Group size for sea turtles can vary from solitary to large groups during foraging, mating, and nesting. Crocodilians will gather in groups to defend against predators as juveniles and during courtship and feeding as adults. Diamondback terrapins may hibernate individually or in large groups.

Updated information includes grouping behavior for sea turtles during nesting, foraging, and mating seasons as well as observations of multi-species communities of sea turtles foraging together in the northern Gulf of Mexico.

3.8.2.1.2 Habitat Use

Habitat use by sea turtles includes sandy beaches for nesting and water column and sea floor for diving, foraging, mating, and migration. Crocodilians utilize wetland edges on dry land for nesting and hunt and stock prey within brackish and fresh water estuarine habitats. Diamondback terrapins lay eggs on land, but remaining time is spent in coastal swamp, estuarine, lagoon, tidal creek, mangrove, and salt marsh habitats. Updated information includes the following:

- In 2022, the Naval Undersea Warfare Center Division Newport, Rhode Island provided updated density models for green, Kemp's ridley, leatherback, and loggerhead sea turtles in the Atlantic Ocean spanning from the northern Florida Keys to the Gulf of Maine and out to the United States Exclusive Economic Zone.

- In 2022, density models were produced for green, Kemp's ridley, leatherback, and loggerhead sea turtle populations in the Gulf of Mexico.
- Observed habitat use as highly dependent on sea turtles' species and life stages.
- Updated research on overall habitat use and nesting ground preferences of sea turtles.

3.8.2.1.3 Dive Behavior

Movement and behavior as described for reptiles includes migration patterns and seasons as well as dive behavior during foraging, resting, and migrating. Updated information includes the following:

- Sea turtle dive depth and duration by species, age, location of animal, and activity (e.g., foraging, mating, and resting) in the Gulf of Mexico.
- Diving behavior and its implications for mitigation, monitoring, and development of sound conservation strategies.

3.8.2.1.4 Hearing and Vocalization

Information on hearing and vocalization in reptiles has changed since the publication of the 2018 Final EIS/OEIS. See Appendix D (Acoustic and Explosive Impacts Supporting Information) of this Supplemental EIS/OEIS for detailed information.

3.8.2.1.5 General Threats

General threats to reptiles include water quality impacts, commercial and recreational fishing industries, disease and parasites, invasive species, climate change, and marine debris. Updated information includes the following:

- Plastic pollution as a threat to sea turtle species.
- Impacts of recreational fisheries on sea turtle species as a result of bycatch and entanglement.
- Updated reports of boat strikes, particularly to sea turtles in the Gulf of Mexico.

3.8.2.2 Endangered Species Act-Listed Species

Table 3.8-1 shows the ESA-listed reptiles that occur in the Study Area. Figure 3.8-1 through Figure 3.8-11 show the designated and proposed critical habitat for reptile species in or near the Study Area. Changes in the ESA listings and critical habitat designations since the 2018 Final EIS/OEIS include:

- Proposed rule to designate marine critical habitat for six distinct population segments of green sea turtles on July 19, 2023 (88 *Federal Register* 46572).

Table 3.8-1: Status and Occurrence of Endangered Species Act-Listed Reptiles in the Study Area

Species Name and Regulatory Status			*Species Occurrence in the Study Area*		
Common Name	***Scientific Name***	***ESA Status/Critical Habitat***	***Range Complex/Testing Range***	***Range Complex Inshore Areas***	***Piers/Ports/Coast Guard Stations***
Family Cheloniidae (hard-shelled sea turtles)					
Green sea turtle (North Atlantic DPS)	*Chelonia mydas*	Threatened[1]/ Designated and Proposed	All locations[4]	All locations[4]	Pierside NSB New London; NS Newport; NS Norfolk; JEB Little Creek; Norfolk Naval Shipyard; NSB Kings Bay[4]; NS Mayport[4]; Port Canaveral Civilian Ports Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC[4]; Wilmington, NC[4]; Kings Bay, GA[4]; Savannah, GA; Mayport, FL[4]; Port Canaveral, FL[4]; Tampa, FL[4]; Beaumont, TX; Corpus Christi, TX; Pascagoula, MS; Gulfport, MS Coast Guard Stations Boston, MA; New London, CT; Newport, RI; Montauk, NY; Atlantic City, NJ; Virginia Beach, VA; Portsmouth, VA; Elizabeth City, NC; Charleston, SC; Mayport, FL[4]; Cape Canaveral, FL[4]; Fort Pierce, FL[4]; Dania, FL[4];Miami, FL[4]; Key West, FL[4]; St. Petersburg, FL[4]; Pensacola, FL[4]; New Orleans, LA[4]; Corpus Christi, TX[4]
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered/ Designated	JAX RC; JAX Inshore RC; SFOMF; Key West RC; GOMEX RC; Naval Surface Warfare Center, Panama City Division Testing Range; Other AFTT Areas	JAX RC Inshore; Key West RC Inshore; GOMEX RC Inshore	Pierside NS Mayport; Port Canaveral Civilian Ports Mayport, FL; Port Canaveral, FL; Tampa, FL; Pascagoula, MS; Gulfport, MS; Beaumont, TX; Corpus Christi, TX Coast Guard Stations Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL; Key West, FL; St.

Table 3.8-1: Status and Occurrence of Endangered Species Act-Listed Reptiles in the Study Area (continued)

Species Name and Regulatory Status			*Species Occurrence in the Study Area*		
Common Name	***Scientific Name***	***ESA Status/Critical Habitat***	***Range Complex/Testing Range***	***Range Complex Inshore Areas***	***Piers/Ports/Coast Guard Stations***
					Petersburg, FL; Pensacola, FL; Corpus Christi, TX
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered/ None	All locations	All locations	Pierside NSB New London; NS Newport; JEB Little Creek; NS Norfolk; Norfolk Naval Shipyard; NSB Kings Bay; NS Mayport; Port Canaveral Civilian Ports Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC; Wilmington, NC; Kings Bay, GA; Savannah, GA; Mayport, FL; Port Canaveral, FL; Tampa, FL; Pascagoula, MS; Gulfport, MS; Beaumont, TX; Corpus Christi, TX Coast Guard Stations Boston, MA; Montauk, NY; Atlantic City, NJ; New London, CT; Newport, RI; Virginia Beach, VA; Portsmouth, VA; Mayport, FL; Port Canaveral, FL; Fort Pierce, FL; Dania, FL Miami, FL; Key West, FL; St. Petersburg, FL; Pensacola, FL; New Orleans, LA; Corpus Christi, TX
Loggerhead sea turtle (Northwest Atlantic Ocean DPS)	*Caretta caretta*	Threatened[2]/ Designated	All locations	All locations	Pierside JEB Little Creek; NS Norfolk; Norfolk Naval Shipyard; NSB Kings Bay[5]; NS Mayport[5]; Port Canaveral[5] Civilian Ports Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC[5]; Wilmington, NC[5]; Kings Bay, GA[5]; Savannah, GA[5]; Mayport, FL[5]; Port Canaveral,

Table 3.8-1: Status and Occurrence of Endangered Species Act-Listed Reptiles in the Study Area (continued)

Species Name and Regulatory Status			*Species Occurrence in the Study Area*		
Common Name	***Scientific Name***	***ESA Status/Critical Habitat***	***Range Complex/Testing Range***	***Range Complex Inshore Areas***	***Piers/Ports/Coast Guard Stations***
					FL[5]; Tampa, FL[5]; Pascagoula, MS; Gulfport, MS; Beaumont, TX[5]; Corpus Christi, TX[5] <u>Coast Guard Stations</u> Boston, MA; Newport, RI; Montauk, NY; Atlantic City, NJ; Virginia Beach, VA; Portsmouth, VA; Charleston, SC; Mayport, FL[5]; Cape Canaveral, FL[5]; Fort Pierce, FL[5]; Dania, FL[5]; Miami, FL[5]; Key West, FL[5]; St. Petersburg, FL[5]; Pensacola, FL[5]; New Orleans, LA[5]; Corpus Christi, TX[5]
Family Dermochelyidae (leatherback sea turtle)					
Leatherback sea turtle	*Dermochelys coriacea*	Endangered/ Designated	All locations	All locations	<u>Pierside</u> NS Mayport; Port Canaveral <u>Civilian Ports</u> Delaware Bay, DE; Hampton Roads, VA; Hampton Roads, VA; Morehead City, NC; Wilmington, NC; Mayport, FL; Port Canaveral, FL <u>Coast Guard Stations</u> Virginia Beach, VA; Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL; Key West, FL; St. Petersburg, FL; Pensacola, FL
Family Crocodylidae (true crocodiles)					
American crocodile	*Crocodylus acutus*	Threatened/ Designated	SFOMF (nearshore ocean only)	Key West RC Inshore	<u>Pierside</u> - <u>Civilian Ports</u> Tampa, FL <u>Coast Guard Stations</u> Fort Pierce, FL; Dania, FL; Miami, FL; St. Petersburg, FL
American alligator	*Alligator mississippiensis*	Threatened due to	N/A	VACAPES RC Inshore; Navy	<u>Pierside</u> NSB Kings Bay; NS Mayport;

Table 3.8-1: Status and Occurrence of Endangered Species Act-Listed Reptiles in the Study Area (continued)

Species Name and Regulatory Status			*Species Occurrence in the Study Area*		
Common Name	***Scientific Name***	***ESA Status/Critical Habitat***	***Range Complex/Testing Range***	***Range Complex Inshore Areas***	***Piers/Ports/Coast Guard Stations***
		similarity of appearance[3]/ None		Cherry Point RC Inshore; JAX RC Inshore; Key West RC Inshore; GOMEX RC Inshore	Port Canaveral Civilian Ports Wilmington, NC; Kings Bay, GA; Savannah, GA; Mayport, FL; Port Canaveral, FL; Tampa, FL; Beaumont, TX; Corpus Christi, TX Coast Guard Stations Charleston, SC; Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL; St. Petersburg, FL; Pensacola, FL; New Orleans, LA; Corpus Christi, TX

[1] On April 6, 2016, NMFS and the USFWS listed the Central West Pacific, Central South Pacific, and Mediterranean distinct population segments as endangered, while listing the other eight distinct population segments (Central North Pacific, East Indian-West Pacific, East Pacific, North Atlantic, North Indian, South Atlantic, Southwest Indian, and Southwest Pacific) as threatened. The Study Area shares portions of the geographic extents identified for the North Atlantic distinct population segment, including breeding populations along the U.S. Atlantic and Gulf of Mexico coasts. The green sea turtle has proposed and designated critical habitat in the Study Area (88 *Federal Register* 46572).

[2] On September 22, 2011, NMFS and the USFWS listed the North Pacific Ocean, South Pacific Ocean, North Indian Ocean, Northeast Atlantic Ocean, and Mediterranean Sea distinct population segments of the loggerhead sea turtle as endangered under the ESA, while the other four distinct population segments (the Southeast Indo-Pacific Ocean, Southwest Indian Ocean, Northwest Atlantic Ocean, and South Atlantic Ocean) are listed as threatened. The Study Area shares portions of the geographic extents identified for the Northwest Atlantic Ocean distinct population segment.

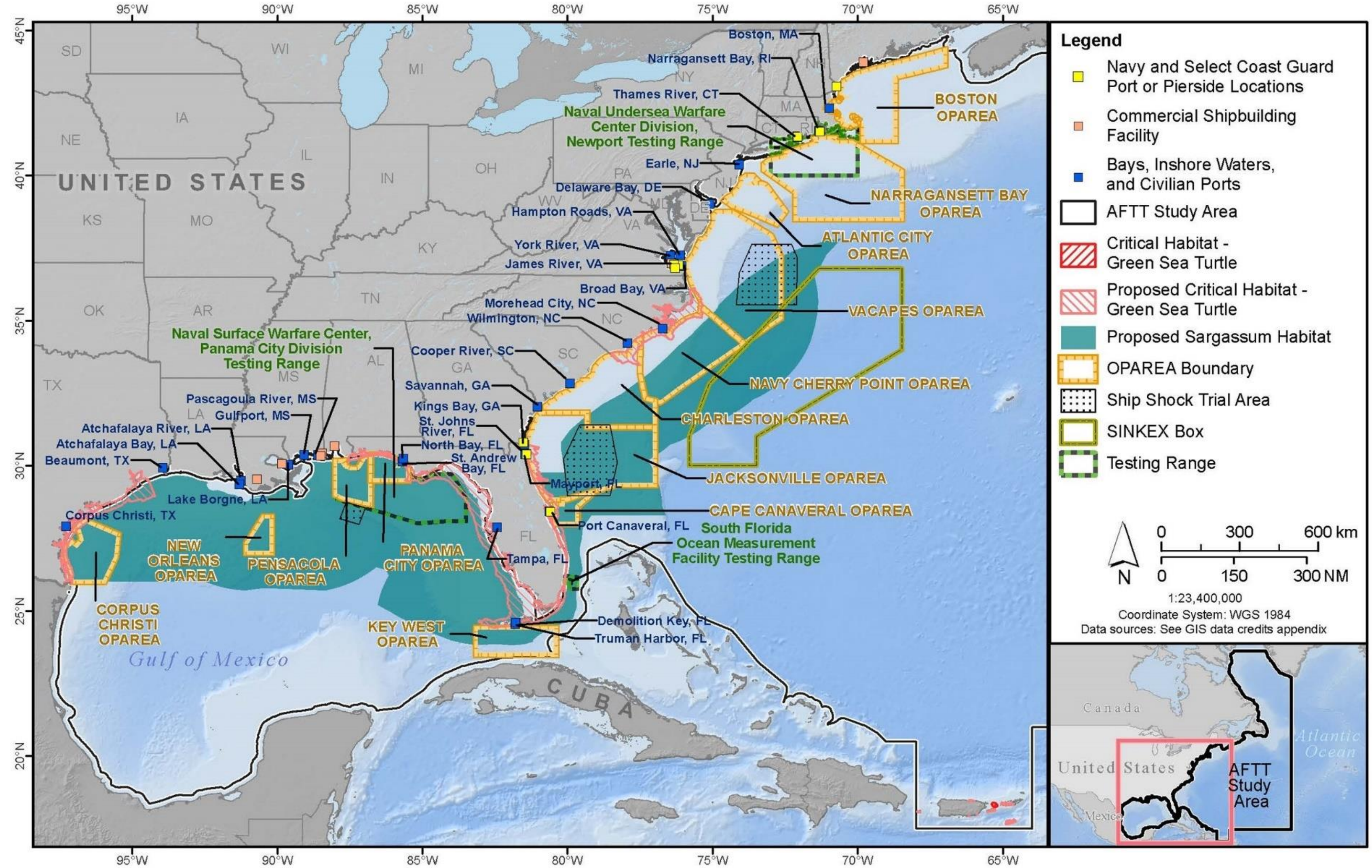
[3] The American alligator is listed under the ESA classification of "threatened due to similarity of appearance" to the American crocodile.

[4] Intersects with proposed green sea turtle critical habitat as shown in Figure 3.8-1 through Figure 3.8-4.

[5] Intersects with species' designated critical habitat.

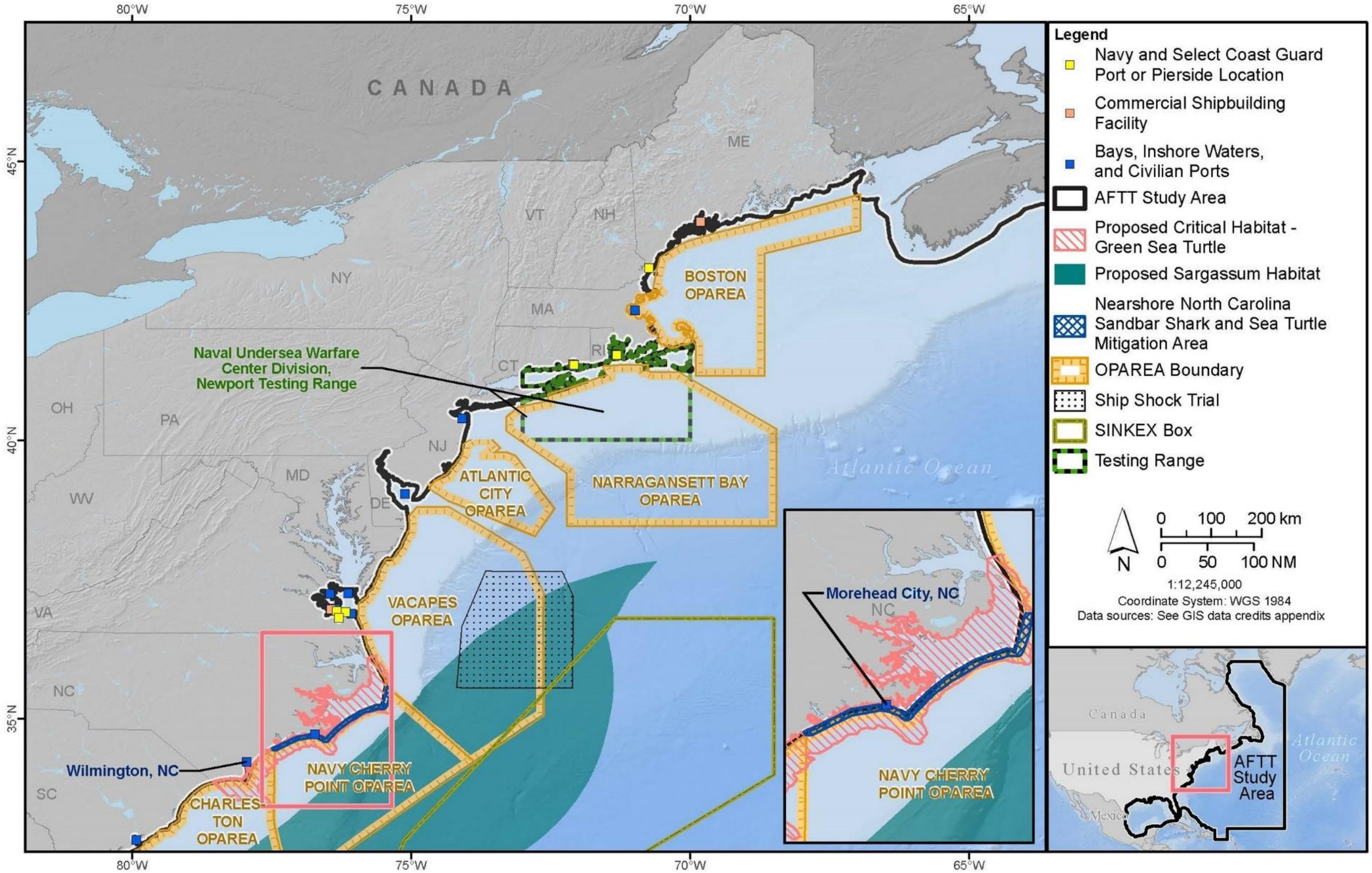
Sources: 35 *Federal Register* 8491, 35 *Federal Register* 18319, 41 *Federal Register* 41914, 43 *Federal Register* 32800, 43 *Federal Register* 43688; 44 *Federal Register* 17710, 44 *Federal Register* 75074, 52 *Federal Register* 21059, 63 *Federal Register* 46693, 76 *Federal Register* 58868. 79 *Federal Register* 39856, 79 *Federal Register* 51264, 81 *Federal Register* 20057, 85 *Federal Register* 48332.

Notes: DPS = Distinct Population Segment; ESA = Endangered Species Act; GOMEX = Gulf of Mexico; JAX = Jacksonville; N/A = not applicable; NMFS = National Marine Fisheries Service; NS = Naval Station; NSB = Naval Submarine Base; RC = Range Complex; U.S. = United States; USFWS = U.S. Fish and Wildlife Service



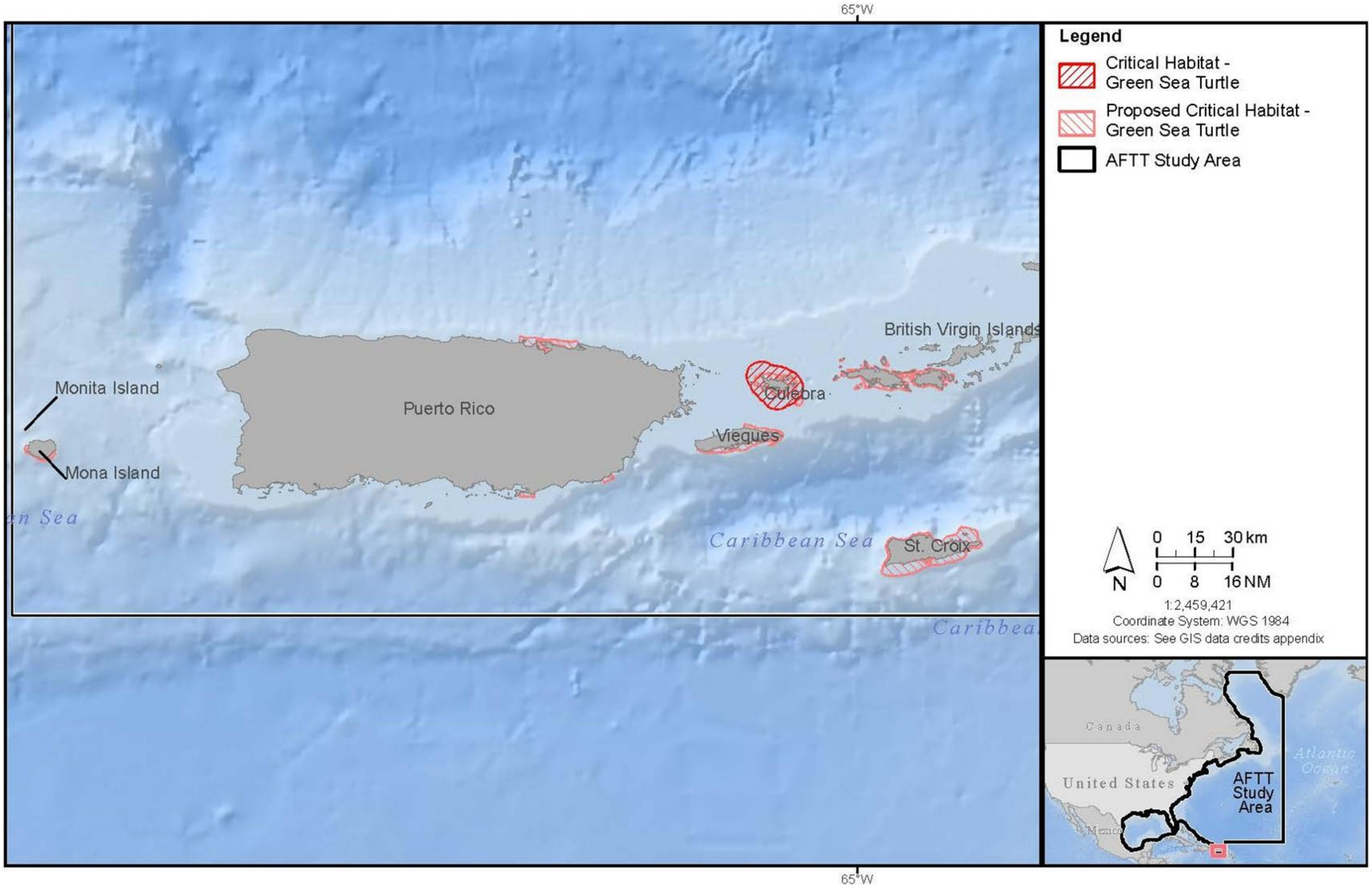
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Figure 3.8-1: Designated and Proposed Critical Habitat for the Green Sea Turtle in the Study Area



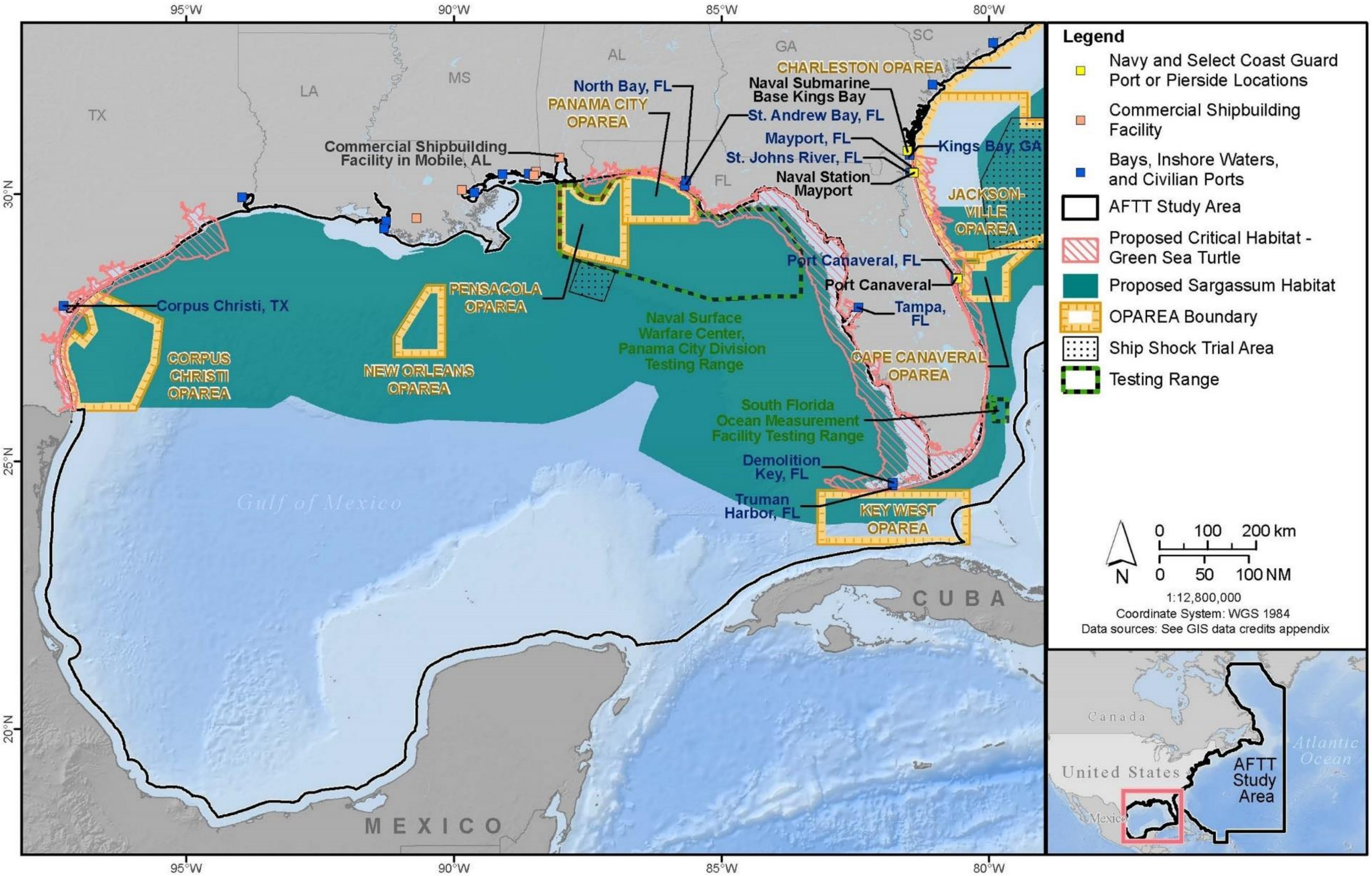
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Figure 3.8-2: Proposed Critical Habitat for the Green Sea Turtle in the Northeast Portion of the Study Area



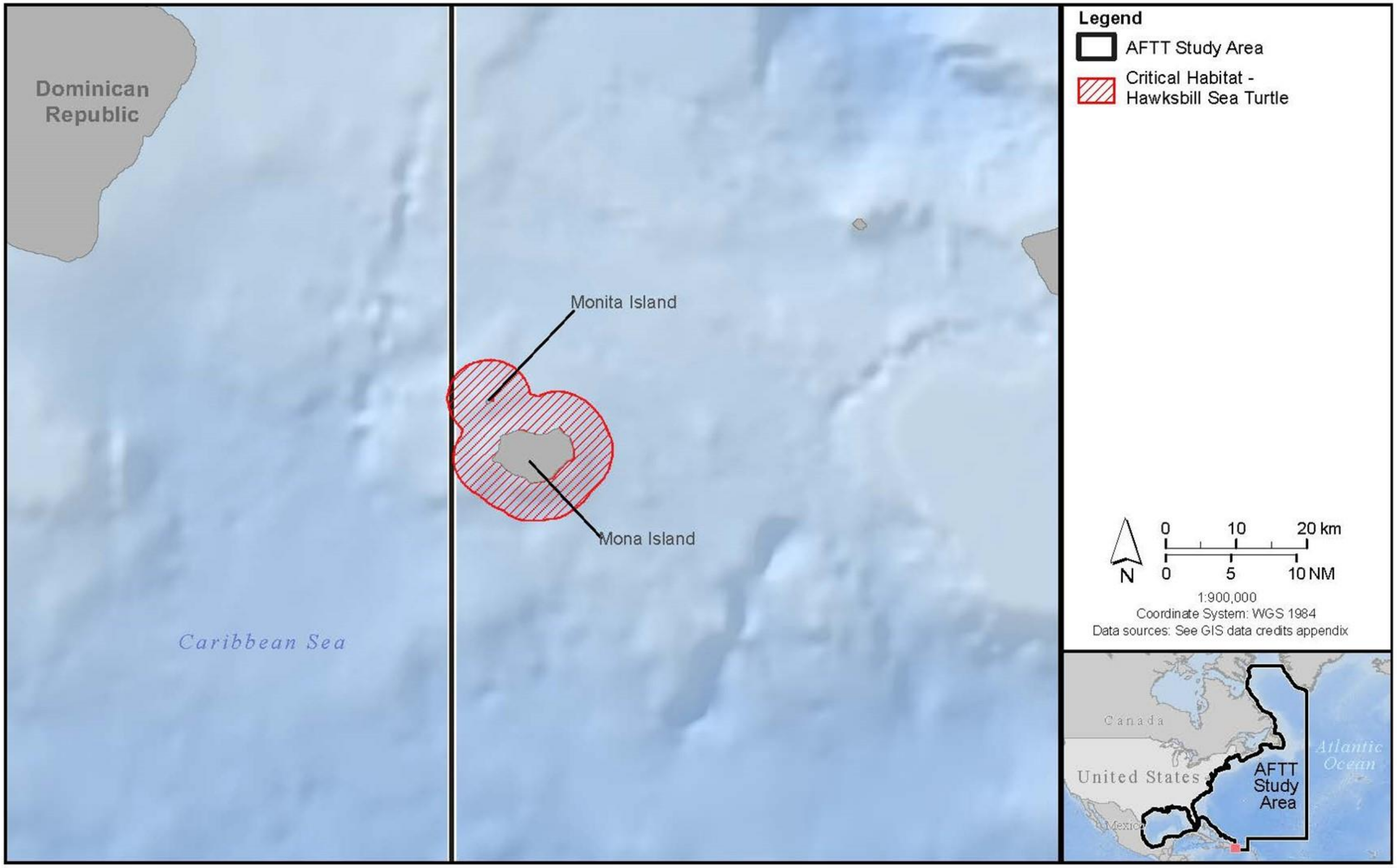
Notes: AFTT = Atlantic Fleet Training and Testing

Figure 3.8-3: Designated and Proposed Critical Habitat for the Green Sea Turtle in the Caribbean Portion of the Study Area



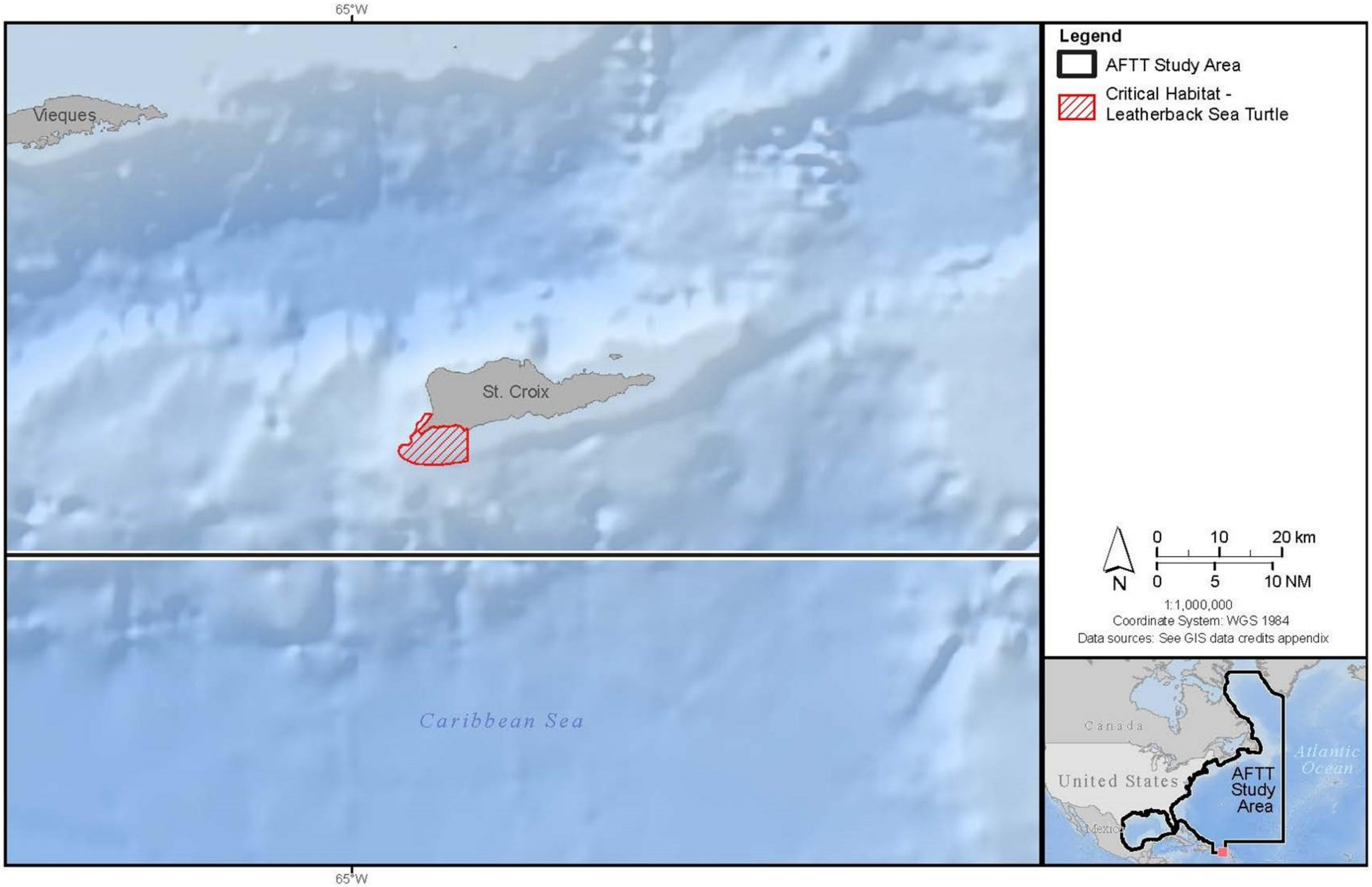
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.8-4: Proposed Critical Habitat for the Green Sea Turtle in the Gulf of Mexico Portion of the Study Area



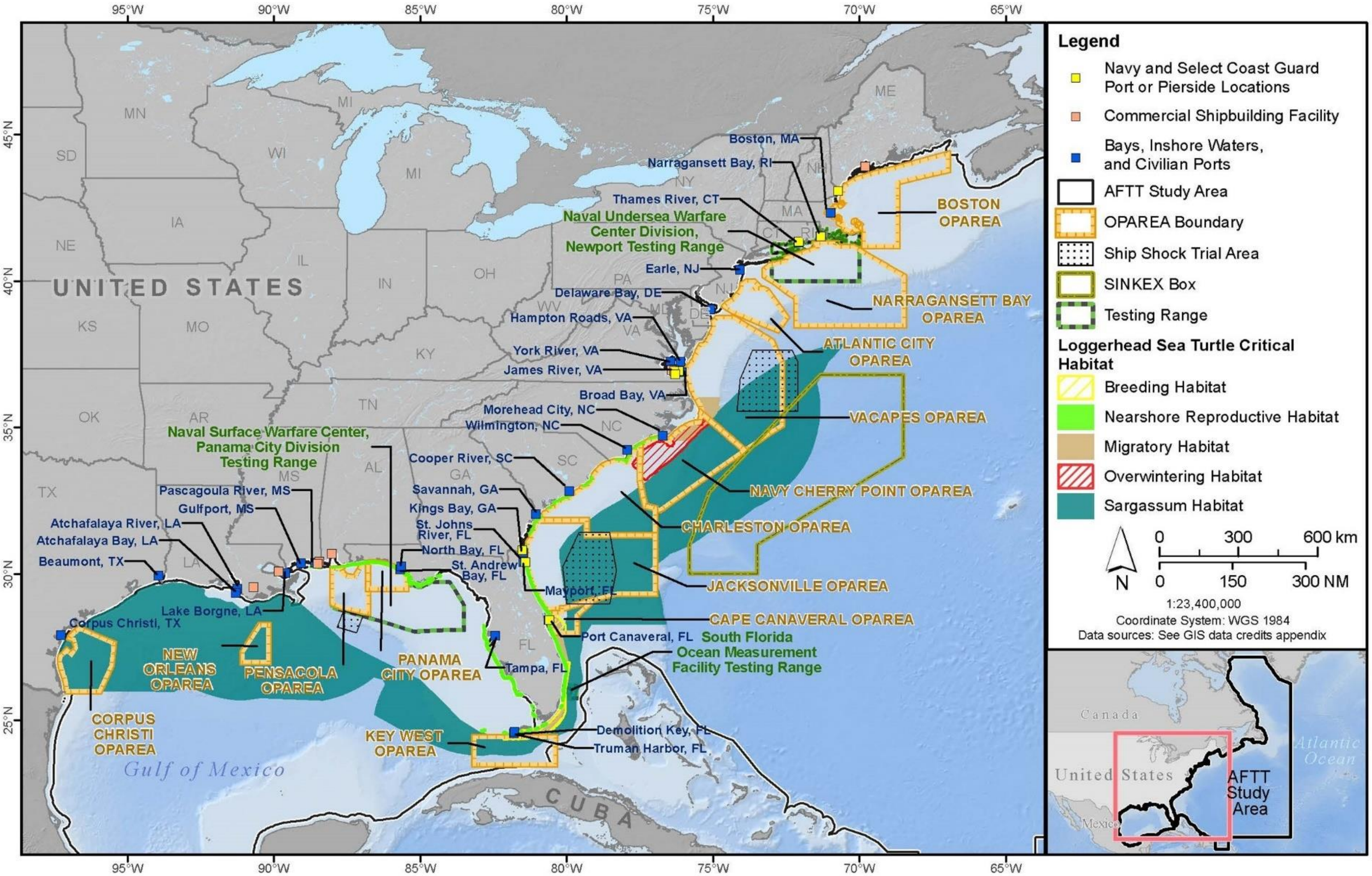
Note: AFTT = Atlantic Fleet Training and Testing

Figure 3.8-5: Designated Critical Habitat for the Hawksbill Sea Turtle in the Caribbean Portion of the Study Area



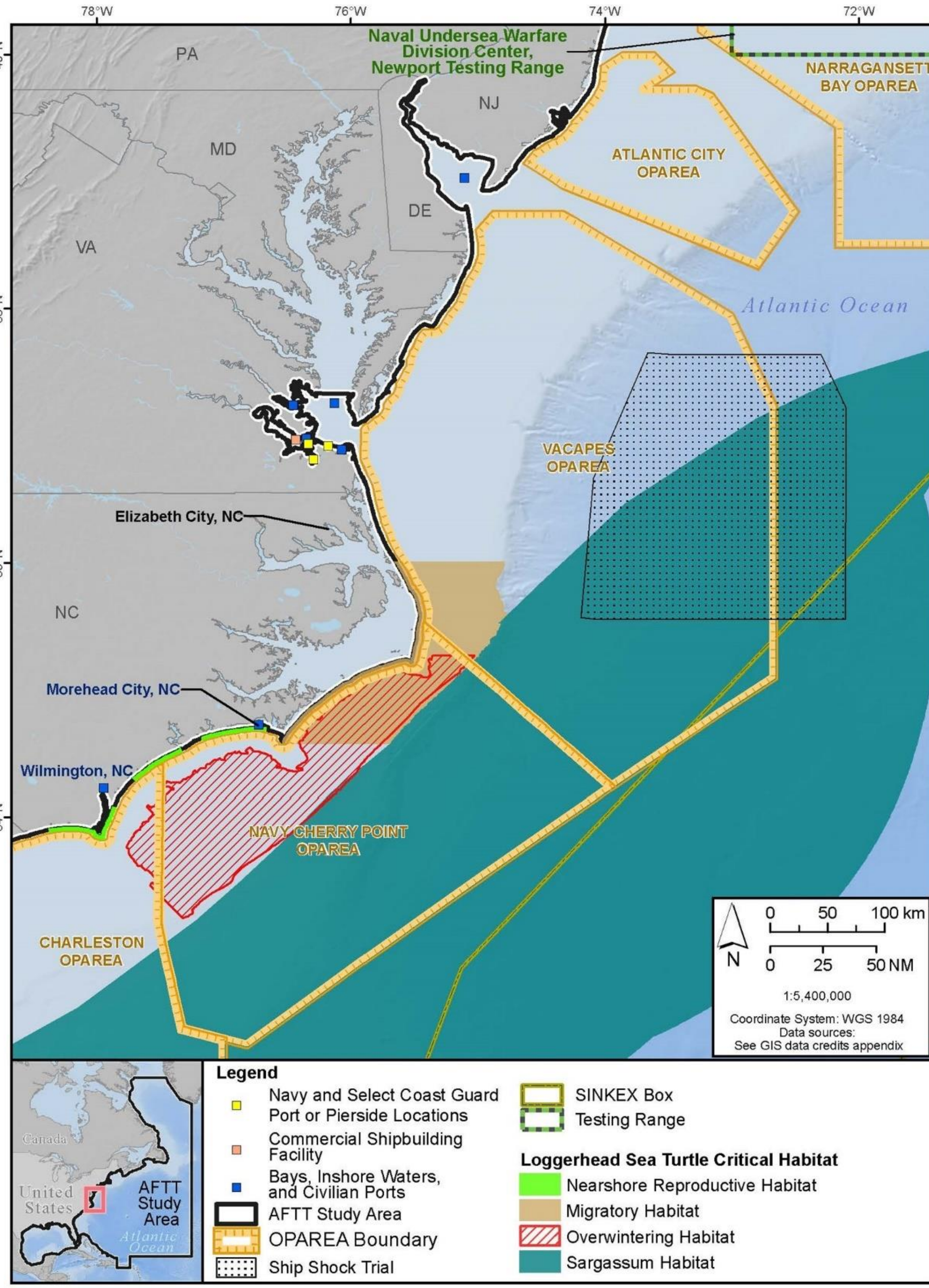
Note: AFTT = Atlantic Fleet Training and Testing

Figure 3.8-6: Designated Critical Habitat for the Leatherback Sea Turtle near the Study Area



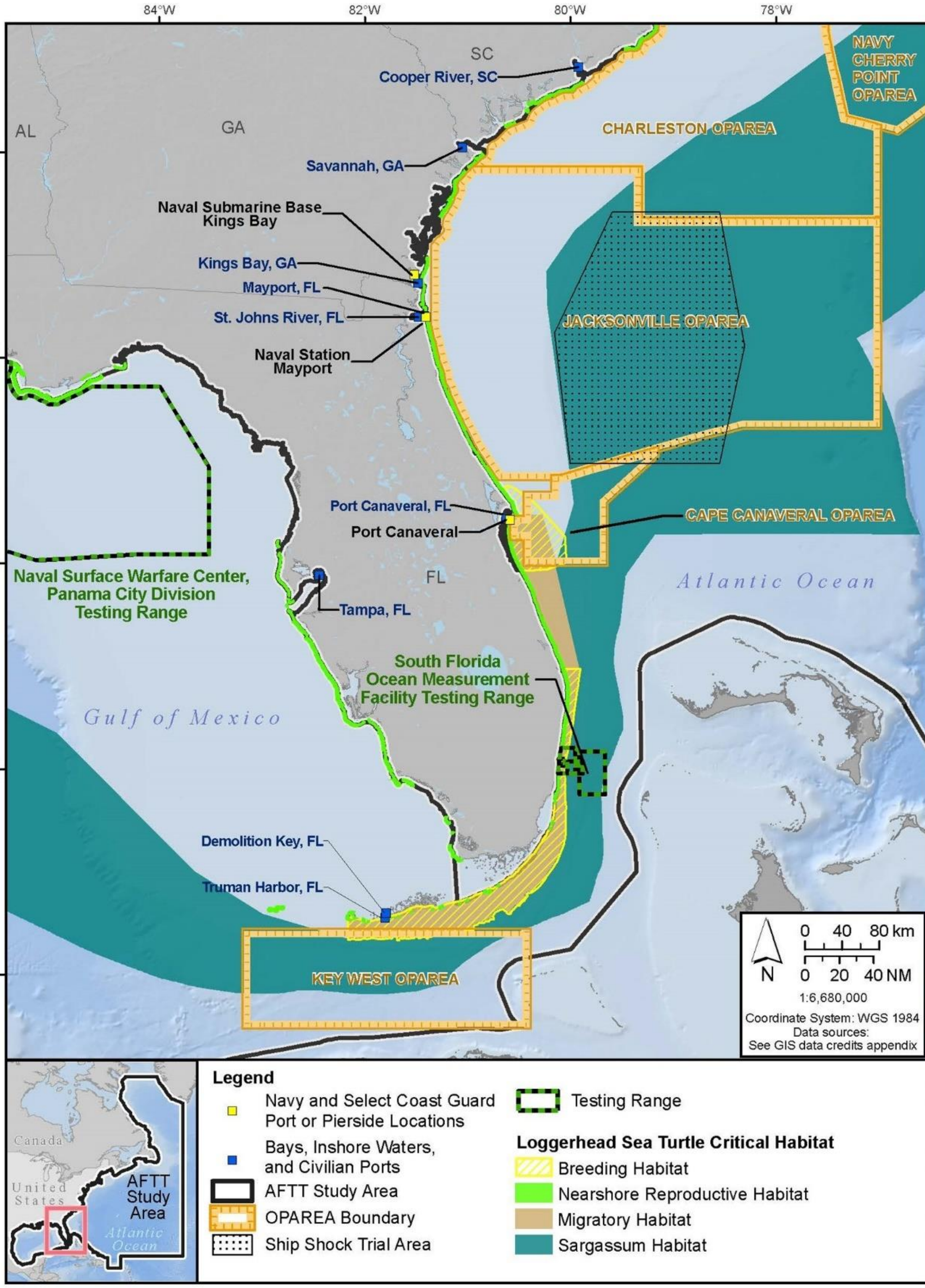
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Figure 3.8-7: Designated Critical Habitat for the Loggerhead Sea Turtle in the Study Area



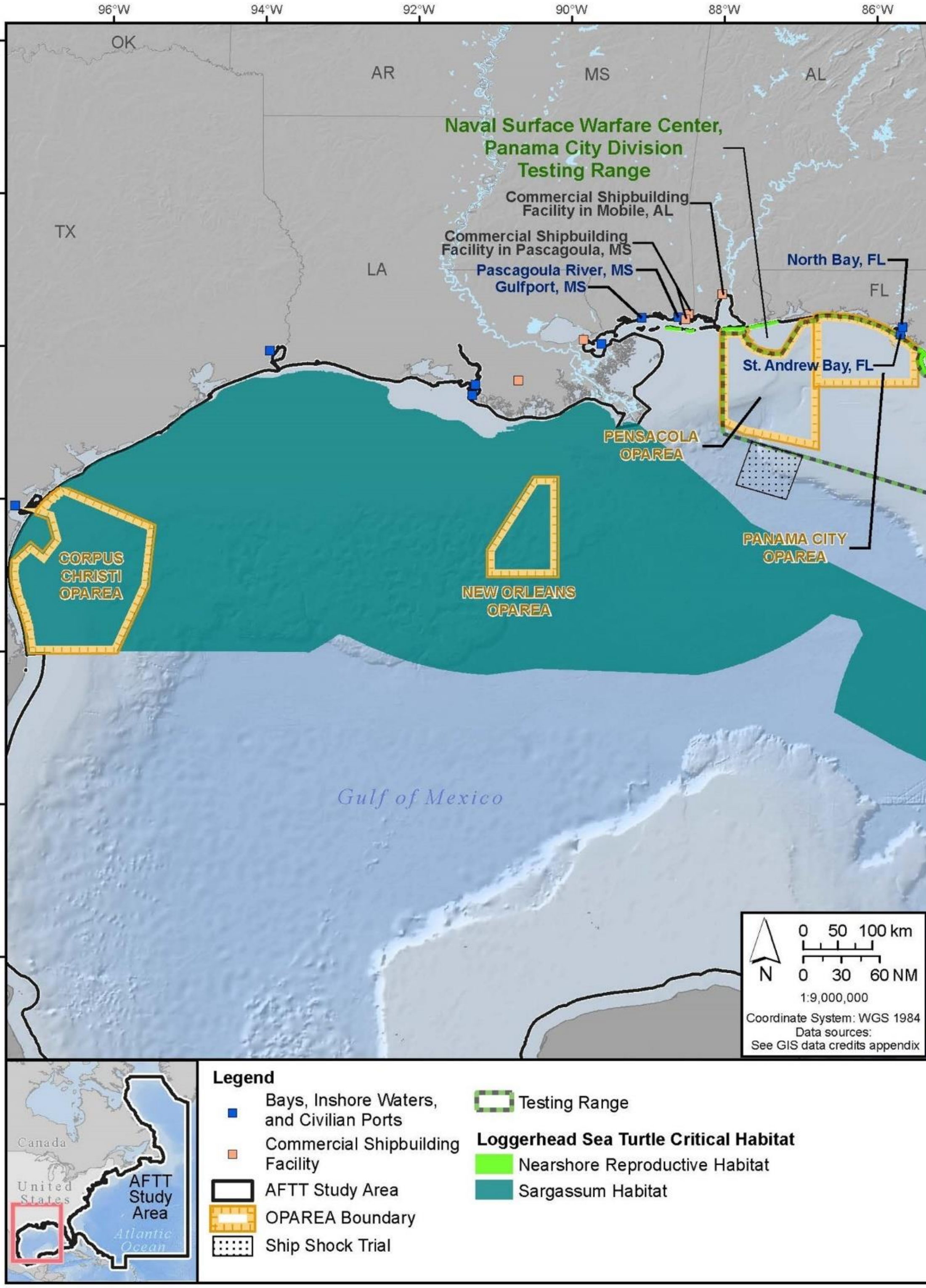
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Figure 3.8-8: Designated Critical Habitat for the Loggerhead Sea Turtle in the Mid-Atlantic Portion of the Study Area



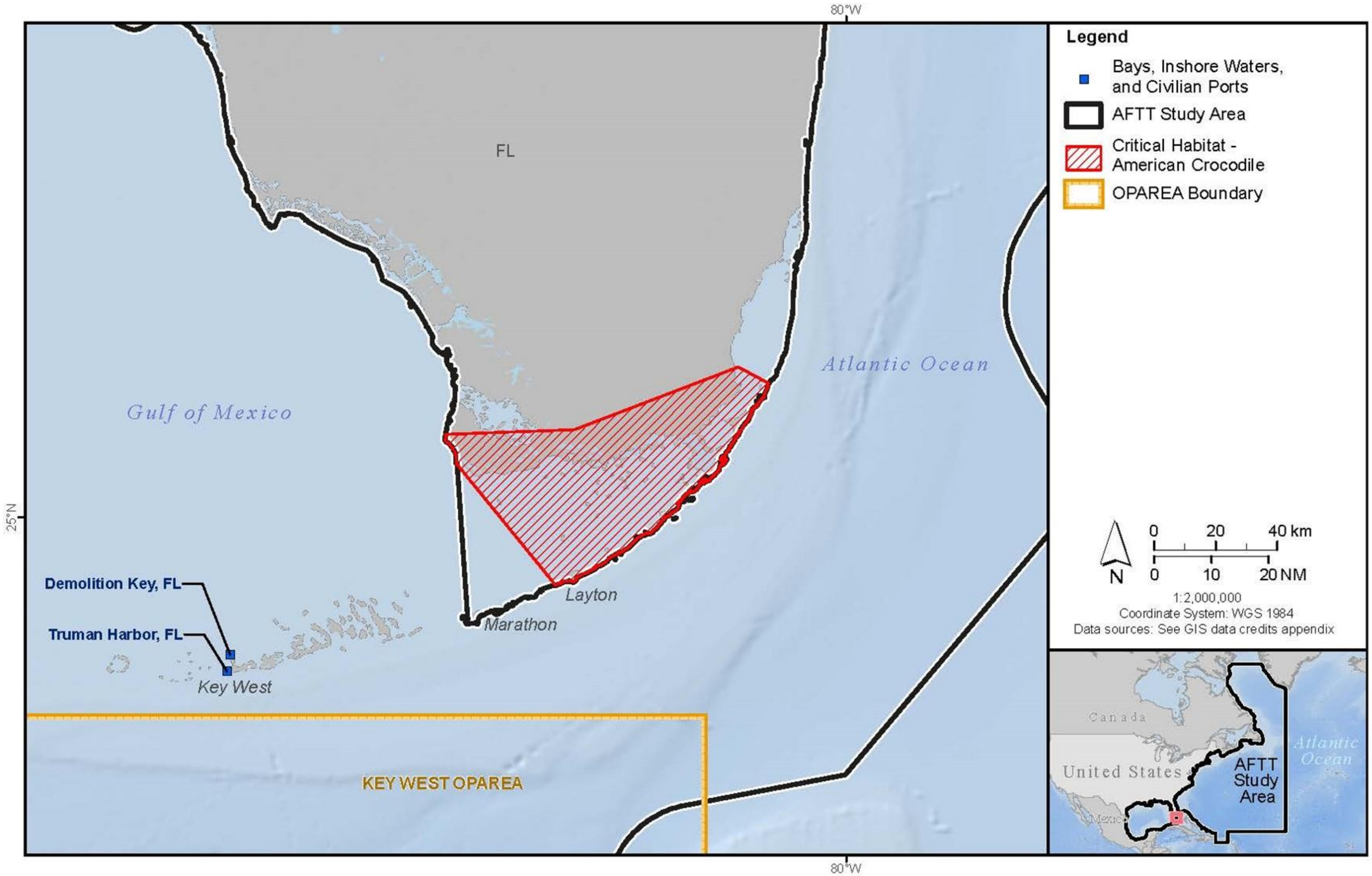
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.8-9: Designated Critical Habitat for the Loggerhead Sea Turtle in the Southeast Portion of the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.8-10: Designated Critical Habitat for the Loggerhead Sea Turtle in the Gulf of Mexico Portion of the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.8-11: Designated Critical Habitat for the American Crocodile in the Study Area

3.8.2.3 Species Not Listed under the Endangered Species Act

Although not listed under the ESA, the diamondback terrapin (*Malaclemys terrapin*) is present in the Study Area and is considered in this analysis. Diamondback terrapins occur along the east coast of the United States, from Cape Cod to Florida, as well as the Gulf coast from Florida to Texas and are most commonly found within salt marshes and shallow bays. They are typically found in brackish water and will travel out into the open ocean periodically to forage, but for a limited time due to their intolerance of high salinities (University of Georgia, 2023). Additional information is provided in Appendix F (Biological Resources Supplemental Information) of this Supplemental EIS/OEIS.

3.8.3 Environmental Consequences

Under the No Action Alternative for all stressors and substressors, the Action Proponents would not conduct any of the proposed military readiness activities in the Study Area. Therefore, baseline conditions of the existing environment for reptiles would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further within this section.

This section describes and evaluates how, and to what degree, the activities described in Chapter 2 (Description of Proposed Action and Alternatives) and stressors described in Section 3.0.3.3 (Identifying Stressors for Analysis) could potentially impact reptiles known to occur in the Study Area.

The stressors vary in intensity, frequency, duration, and location within the Study Area. The activities that involve each of the following stressors are identified in Appendix A (Activity Descriptions) and Appendix B (Activity Stressor Matrices).

The stressors and substressors analyzed for reptiles include:

- **acoustic** (sonar and other transducers; air guns; pile driving; vessel noise; aircraft noise; and weapons noise)
- **explosive** (explosions in water)
- **energy** (in-water electromagnetic devices; high-energy lasers)
- **physical disturbance and strikes** (vessels and in-water devices; military expended materials; and seafloor devices)
- **entanglement** (wires and cables; decelerators/parachutes; biodegradable polymers)
- **ingestion** (military expended materials – munitions; military expended materials other than munitions)

A discussion of secondary stressors, to include potential impacts to habitat or prey availability, and potential impacts of all stressors combined are provided at the end of the section.

The analysis of potential impacts to reptiles considers standard operating procedures and mitigation measures that would potentially provide protection to reptiles. Standard operating procedures are detailed in Appendix A (Section A.2.7, Standard Operating Procedures). Mitigation measures relevant to reptiles are referenced in Table 3.8-2.

The stressors vary in intensity, frequency, duration, and location in the Study Area. The activities that involve each of the following stressors are identified in Appendix A (Activity Descriptions) and Appendix B (Activity Stressor Matrices).

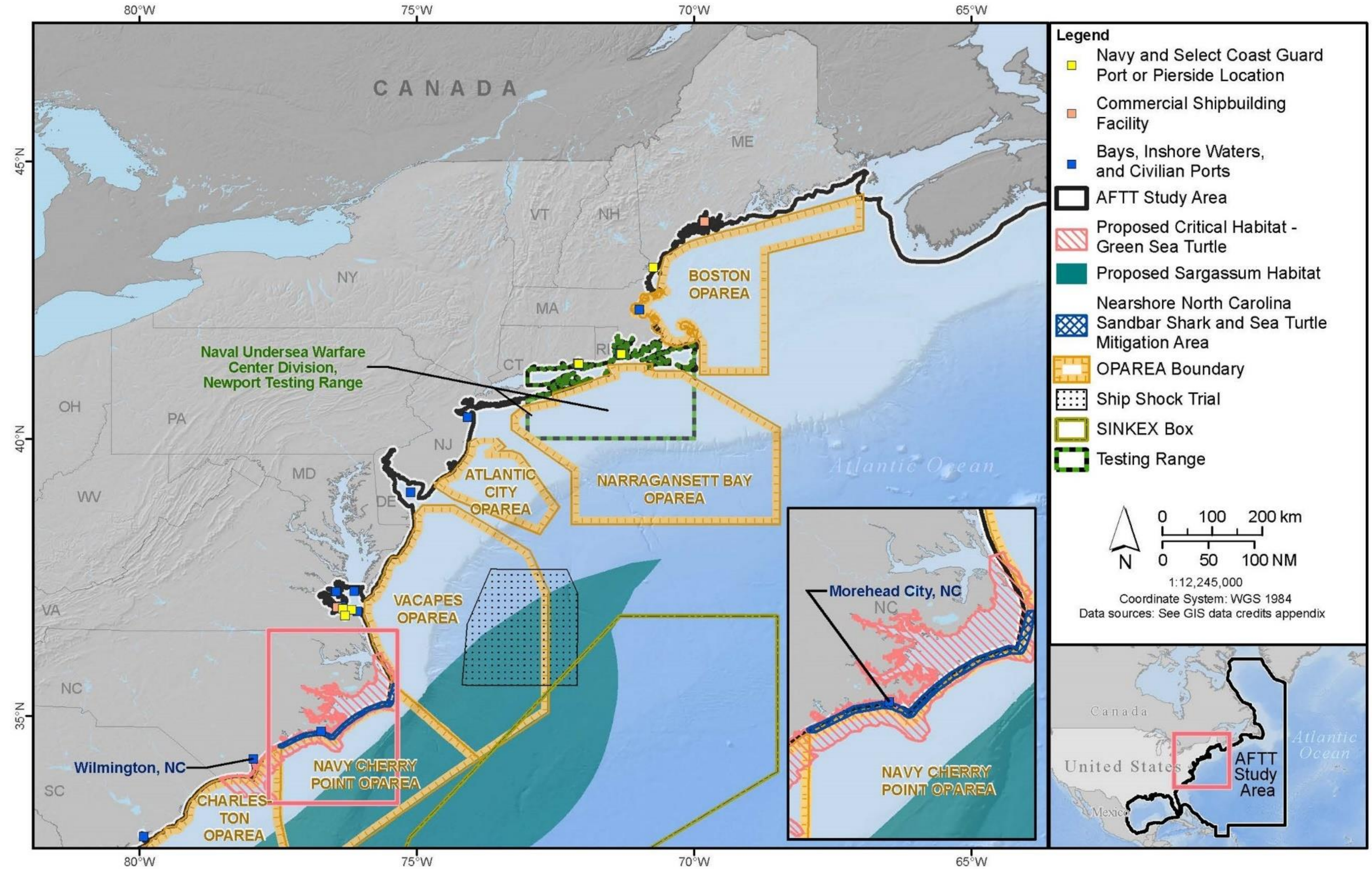
Details on all mitigation measures are provided in Chapter 5 (Mitigation). Figure 3.8-12 through Figure 3.8-16 depict the mitigation areas for reptiles.

Table 3.8-2: Mitigation Requirements Summary by Stressor for Reptiles

Applicable Stressor	*Requirements Summary and Protection Focus*	*Section Reference*
Acoustics	Conduct visual observations for sea turtles during activities involving active acoustic sources, pile driving, and weapon firing noise.	Section 5.6.1.2 (Additional Details for Acoustic Stressors)
	Active sonar restrictions and lookouts posted at specified mitigation areas.	Section 5.7.7 (Inshore Manatee and Sea Turtle Mitigation Area)
Explosives	Restrictions on detonating explosives on or near the seafloor (e.g., explosive bottom-laid or moored mines) within a horizontal distance from artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks.	Section 5.7.2 (Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck mitigation areas)
	Restrictions on detonating any in-water explosives within a horizontal distance from shallow-water coral reefs and other sensitive invertebrate habitats.	Section 5.7.1 (Shallow-Water Coral Reef Mitigation Areas)
	Conduct visual observations for sea turtles during events involving explosives.	Section 5.6.1.2 (Additional Details for Explosives)
	Restrictions on use of explosive stressors within specified mitigation areas.	Section 5.7.5 (Nearshore North Carolina Sandbar Shark and Sea Turtle Mitigation Area); Section 5.7.6 (Panama City Gulf Sturgeon and Sea Turtle Mitigation Area); Section 5.7.7 (Inshore Manatee and Sea Turtle Mitigation Area)
Physical disturbance and strike	Restrictions on: (1) setting vessel anchors within the anchor swing circle radius from artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks (except in designated anchorages) (2) placing non-explosive seafloor devices (that are not precisely placed) within a horizontal distance of 350 yards from artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks (except as described above for vessel anchors) (3) place other seafloor devices too close to shallow-water coral reefs except in South Florida Ocean Measurement Facility Seafloor Mitigation Area (4) Deploying non-explosive seafloor devices directly on artificial reefs, live hard bottom, submerged aquatic vegetation, or shipwrecks (5) deploying non-explosive ordnance against surface targets too close to shallow-water coral reefs.	Section 5.7.2 (Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck Mitigation Areas)

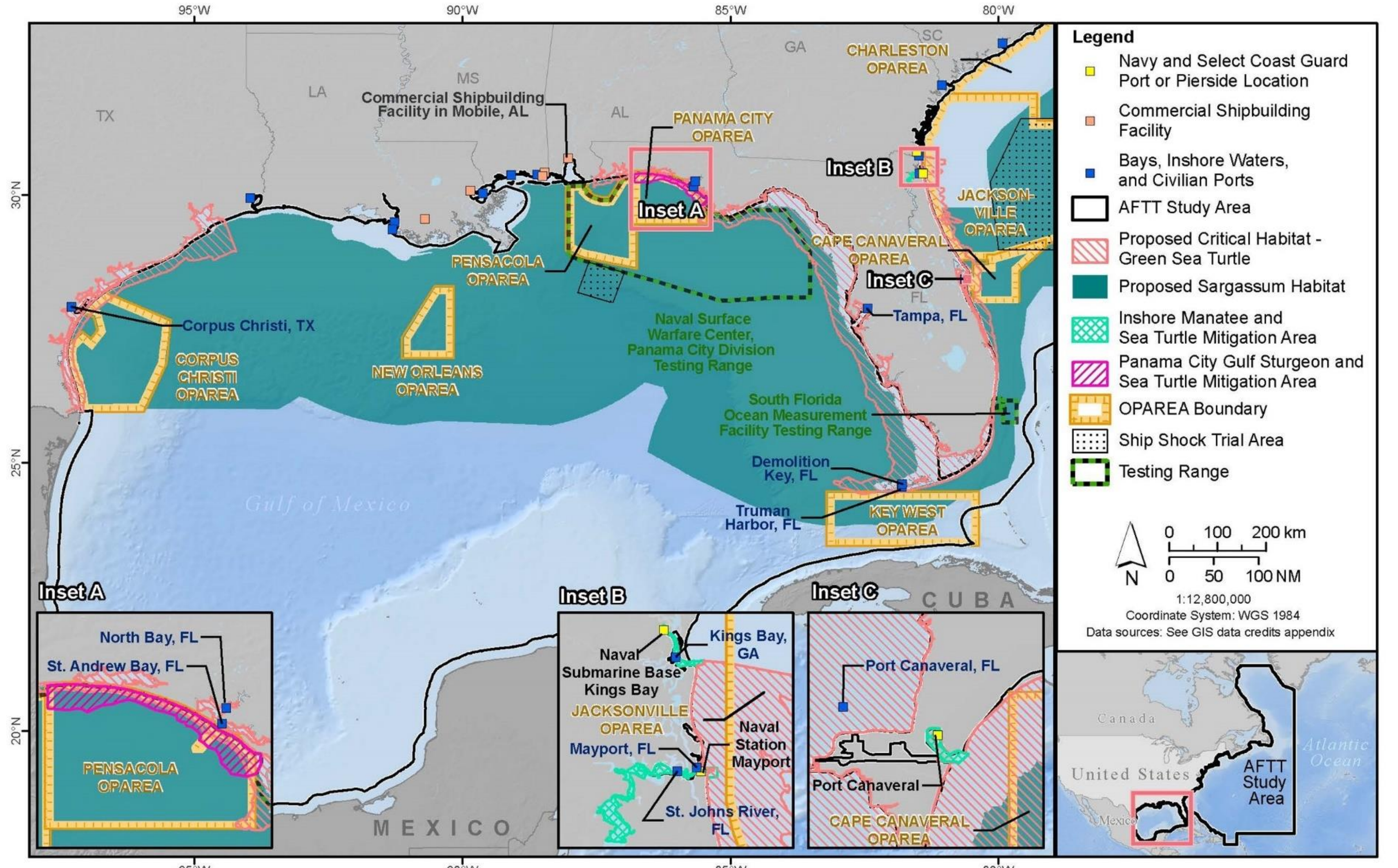
Table 3.8-2: Mitigation Requirements by Stressor for Reptiles (continued)

Applicable Stressor	*Requirements Summary and Protection Focus*	*Section Reference*
	Requirements to: operate surface vessels in waters deep enough to avoid bottom scouring or prop dredging, with at least a 1-foot clearance between the deepest draft of the vessel (with the motor down) and the seafloor at mean low water. The mitigation will ensure that surface vessels and their propellers do not come into contact with shallow-water coral reefs, artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks.	Section 5.7.3 (Key West Range Complex Seafloor Mitigation Area)
	Requirements to: (1) operate surface vessels in waters deep enough to avoid bottom scouring or prop dredging, with at least a 1-foot clearance between the deepest draft of the vessel (with the motor down) and the seafloor at mean low water (2) use a real-time geographic information system and global positioning system (along with remote-sensing verification) during deployment, installation, and recovery of anchors and mine-like objects and during deployment of bottom-crawling unmanned underwater vehicles in waters deeper than 10 feet to avoid shallow-water coral reefs and live hard bottom (3) minimize surface vessel movement and drift in accordance with mooring installation and deployment plans and will conduct activities during sea and wind conditions that allow vessels to maintain position and speed control during deployment, installation, and recovery of seafloor devices (4) not anchor surface vessels or moor over shallow-water coral reefs or live hard bottom (5) use semi-permanent anchoring systems that are assisted with riser buoys over soft bottom habitats to avoid contact of mooring cables with shallow-water coral reefs and live hard bottom	Section 5.7.4 (South Florida Ocean Measurement Facility Seafloor Mitigation Area)
	Requirements to: When underway in the turning basins, channels, and waterways adjacent to Naval Station Mayport, vessels will comply with federal, state, and local Manatee Protection Zones and reduce speed in accordance with established operational safety and security procedures. This mitigation will also protect sea turtles and designated critical habitat for loggerhead sea turtles.	Section 5.7.7 (Inshore Manatee and Sea Turtle Mitigation Area)



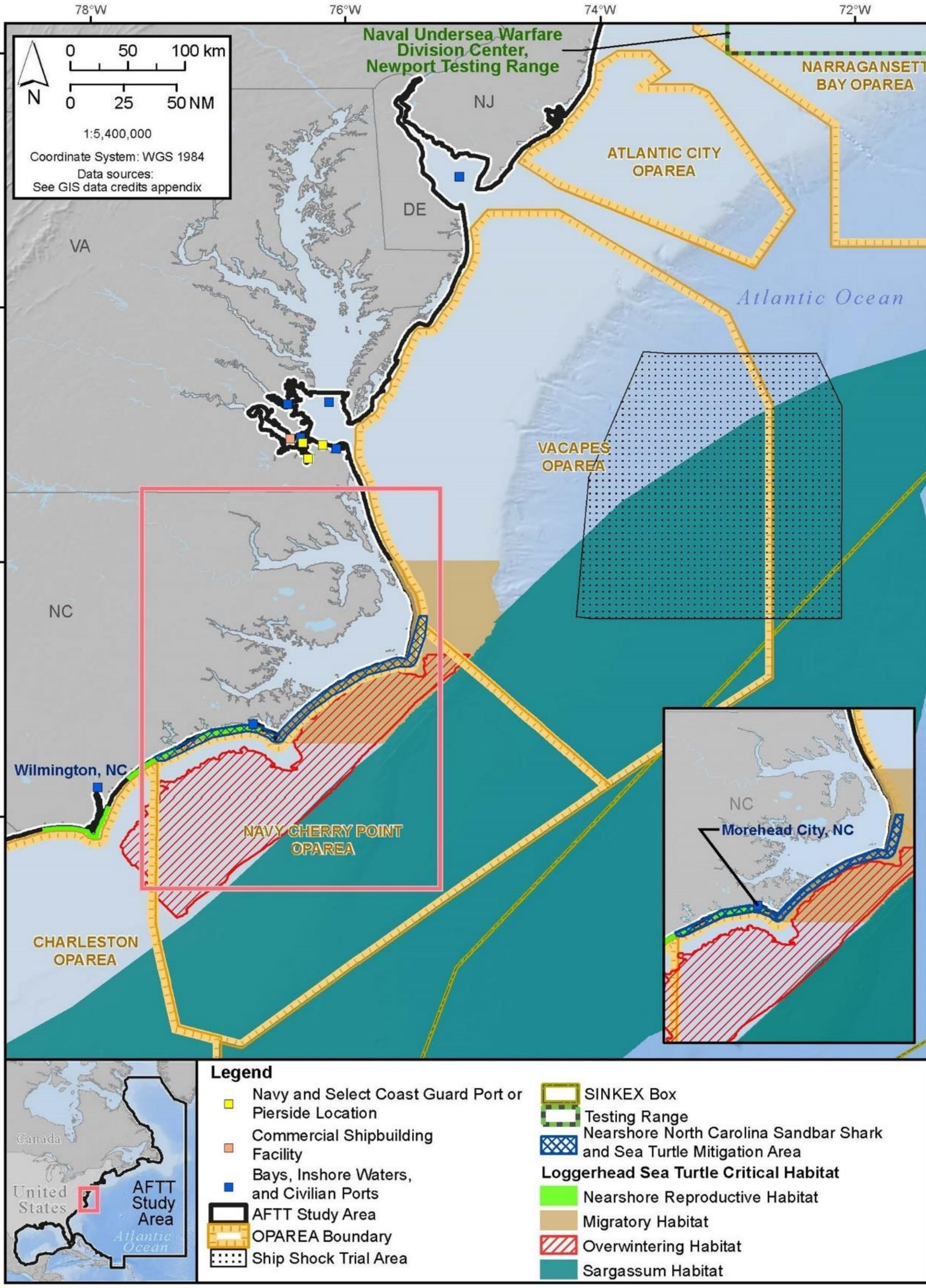
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Figure 3.8-12: Mitigation Areas and Proposed Critical Habitat for the Green Sea Turtle in the Northeast Portion of the Study Area



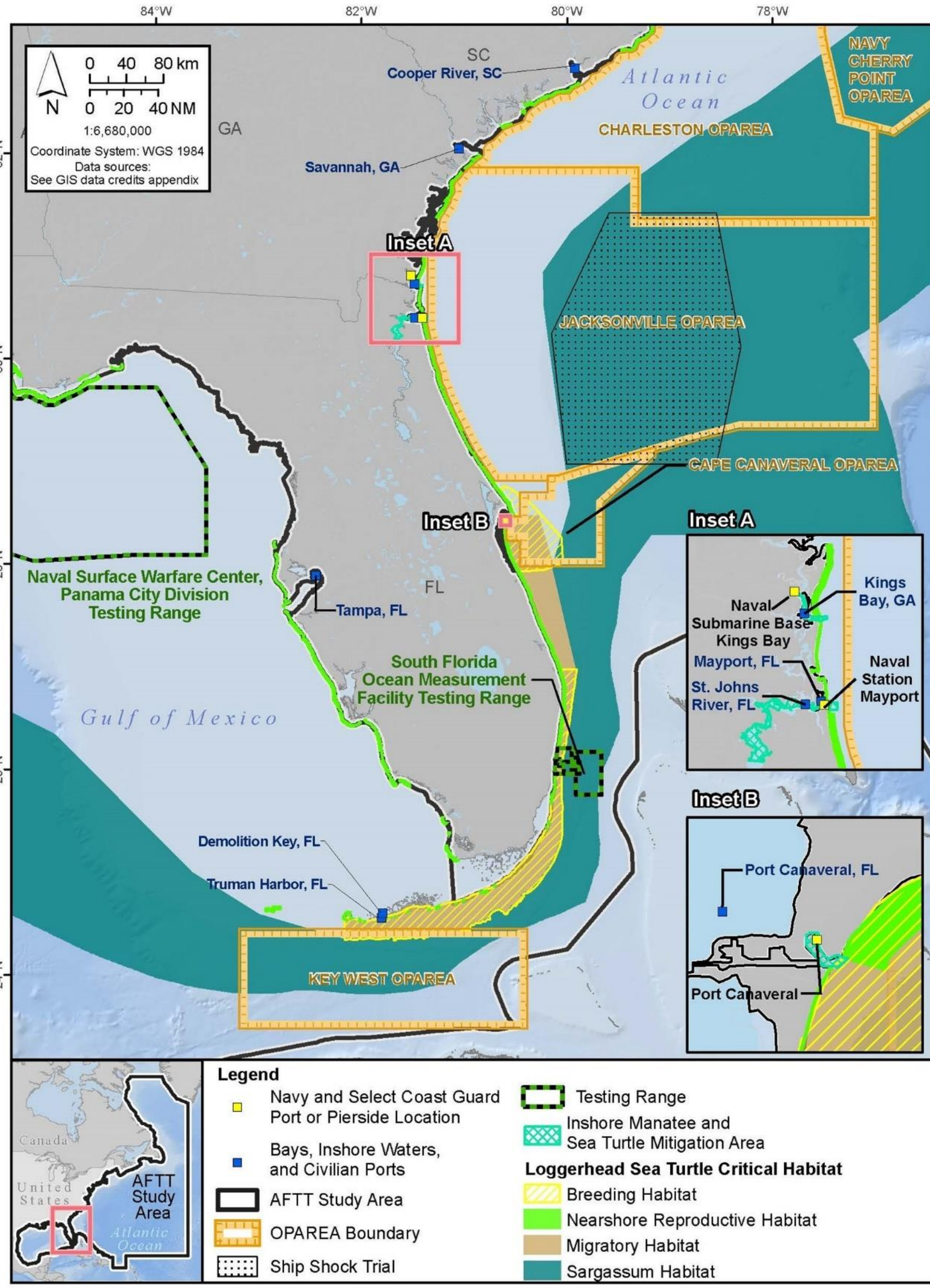
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.8-13: Mitigation Areas and Proposed Critical Habitat for the Green Sea Turtle within the Gulf of Mexico Portion of the Study Area



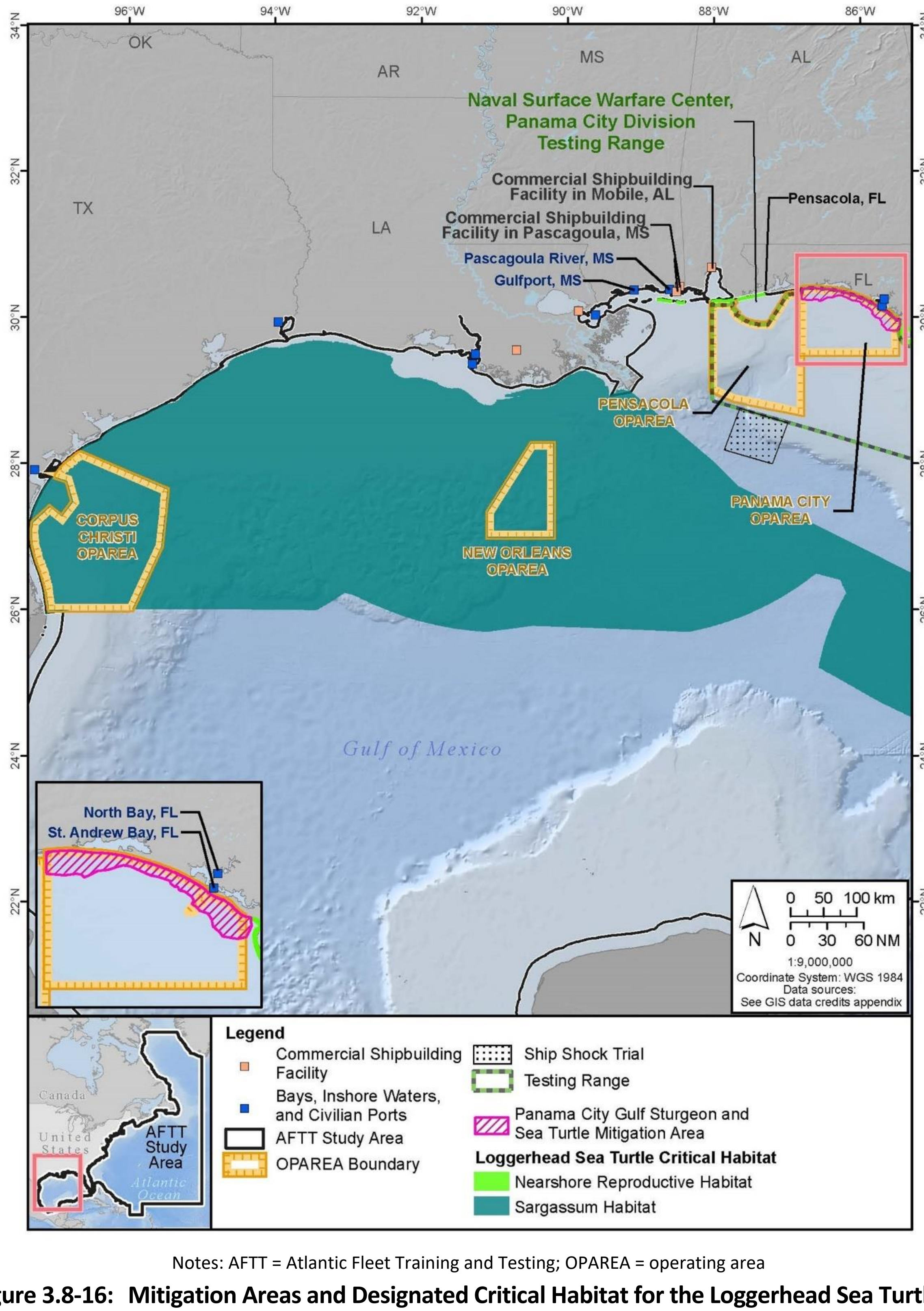
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Figure 3.8-14: Mitigation Areas and Designated Critical Habitat for the Loggerhead Sea Turtle in the Mid-Atlantic Portion of the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.8-15: Mitigation Areas and Designated Critical Habitat for the Loggerhead Sea Turtle in the Southeast Portion of the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.8-16: Mitigation Areas and Designated Critical Habitat for the Loggerhead Sea Turtle in the Gulf of Mexico Portion of the Study Area

The criteria for determining the significance of Proposed Action stressors on reptiles are described in Table 3.8-3. The abbreviated analysis under each substressor and alternative provides the technical support for these determinations, with reference to the 2018 Final EIS/OEIS or supporting appendices for details.

Table 3.8-3: Criteria for Determining the Significance of Proposed Action Stressors on Reptiles

Impact Descriptor	*Context and Intensity*	*Significance Conclusions*
Negligible	Impacts to reptiles would be limited to temporary (lasting up to several hours) behavioral changes to a reptile or group of reptiles within localized areas of disturbance. Impacts on habitat would be temporary (e.g., temporary placement of an object on the sea floor in the vicinity of a foraging or resting sea turtle) and localized with no lasting damage or alteration.	Less than significant
Minor	Impacts to reptiles would be temporary or short-term (lasting several days to several weeks, respectively) but would not be outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. Impacts could include short-term auditory impairment without permanent physiological damage (e.g., temporary threshold shift due to underwater noise impacts). Behavioral responses to disturbance by some individuals or a group of reptiles could be expected, but only temporary disturbance of breeding, feeding, or other activities would occur, without any impacts on population levels. Displacement would be short-term and limited to the Study Area or its immediate surroundings. Impacts on habitat (e.g., placement of an object on the seafloor or loss of a small area of vegetation) would be easily recoverable with no long-term or permanent damage or alteration.	Less than significant
Moderate	Impacts to reptiles would be short term or long term (lasting several months or longer) and outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. Impacts could include physiological injury to individuals (e.g., auditory injury from underwater noise), repeated stress responses causing behavioral disturbance to numerous individuals that could be expected in the Study Area, its immediate surroundings, or beyond; or adverse impacts to breeding, feeding, growth, or other factors affecting population levels. However, they would not threaten the continued existence of a population or species.	Less than significant
Major	Impacts to reptiles would be short-term or long-term changes well outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. Behavioral and stress responses would be repeated or permanent (e.g., auditory injury from underwater noise, vessel strike resulting in mortality, a removal from or inability to access breeding, foraging, and/or rearing habitat). Impacts would affect any stage of a species' life cycles (i.e., breeding, feeding, growth, and maturity), alter population structure, genetic diversity, or other demographic factors, and/or cause mortality beyond a small number of individuals, resulting in a decrease in population levels. Displacement and stress responses would be short term or long term within and well beyond the Study Area. Reptile habitats would be degraded over the long term or permanently, such that the habitats would no longer possess the requirements to sustain the population.	Significant

3.8.3.1 Acoustic Stressors

This section summarizes the potential impacts of acoustic stressors used during military readiness activities within the Study Area. The acoustic substressors included for analysis are: (1) sonar and other transducers, (2) air guns, (3) pile driving, (4) vessel noise, (5) aircraft noise, and (6) weapons firing. Table 3.8-4 contains brief summaries of background information that is relevant to the analyses of impacts for each acoustic substressor on reptiles (specifically sea turtles as data on other reptiles are not available). Detailed information on acoustic impact categories in general, as well as effects specific to each substressor, are provided in Appendix D (Acoustic and Explosive Impacts Supporting Information). For a listing of the types of activities that use or produce acoustic stressors, refer to Appendix A (Activity Descriptions) and Appendix B (Activity Stressor Matrices). The types and quantities of sonar sources, air guns, and pile driving, the number of events using vessels and aircrafts and the locations of those events under each alternative are shown in Section 3.0.3.3.1 (Acoustic Stressors).

The detailed assessment of these acoustic stressors under this Proposed Action is in Appendix E (Acoustic and Explosives Impacts Analysis). Changes in the predicted acoustic impacts are due to the following:

- Updates to criteria used to determine if acoustic stressors may cause auditory effects (TTS or AINJ) and behavioral responses. Changes to the auditory effects criteria include a 22 decibel (dB) (re 1 $\mu Pa^2 s$) decrease to the weighted non-impulsive sound exposure level thresholds.
- Revisions to the modeling of explosive effects in the Navy Acoustic Effects Model. See the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (U.S. Department of the Navy, 2024a).
- Updates to data on sea turtle presence, including estimated density of each species (number of animals per unit area), and depth distribution. For additional details, see the technical reports *U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area (U.S. Department of the Navy, 2024b)* and *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii-Southern California Training and Testing Study Areas* (Oliveira et al., 2024).
- Changes in the locations, numbers, and types of modeled military readiness activities as described in Chapter 2 (Description of Proposed Action and Alternatives), and associated quantities (hours and counts) of acoustic stressors shown in Section 3.0.3.3.1 (Acoustic Stressors).
- As discussed in Section 3.8.3 (Environmental Consequences), the Action Proponents will implement visual observation mitigation under Alternative 1 and Alternative 2 to reduce potential impacts from acoustic stressors on reptiles. There is no reduction of model-predicted impacts due to visual observation mitigation. The Action Proponents will also implement geographic mitigation to reduce potential acoustic impacts within important sea turtle habitats as identified in Table 3.8-2.
- No reduction of model-predicted impacts due to animal avoidance of a sound source, unlike in prior analyses.

Table 3.8-4: Acoustic Stressors Background Information Summary

Substressor	Background Information Summary
Sonar and other transducers	Sonar and other transducers may result in hearing loss, masking, physiological stress, or behavioral responses. Behavioral responses can depend on the characteristics of the signal, behavioral state of the animal, sensitivity and previous experience of an individual, and other contextual factors including distance of the source, movement of the source, physical presence of vessels, time of year, and geographic location. • Reptiles are likely only susceptible to hearing loss when exposed to high levels of sound within their limited hearing range (most sensitive from 100 to 400 Hertz [Hz] and have limited hearing ability over 1 kilohertz [kHz]). This includes low-frequency sonar and other transducers that produce noise below 2 kHz. • Due to the lack of any data on non-auditory injuries from sonar and other transducers, the estimated risk from low-frequency sonar is low, and the estimated risk from mid-frequency sonar is non-existent. • Sonar and other transducers would have limited potential for masking. • Information on acoustically induced stress responses in reptiles is limited and any physiological response or behavioral response is likely associated with a stress response. • Information on behavioral responses to sonar and other transducers is limited and behavioral responses could consist of temporary avoidance, increased swim speed, or no observable response.
Vessel disturbance (including vessel noise)	Vessel disturbance (including the production of noise) may result in masking, physiological stress, or behavioral reactions. Behavioral responses to vessels can be caused by multiple factors, such as noise and the physical presence of vessels. Vessel sound exposure is rarely decoupled from the physical presence of a surface vessel. In some more industrialized or populated areas, non-military vessel noise can be a chronic and frequent stressor. • Continuous vessel noise with low-frequency components of an appreciable received level (e.g., proximate vessel noise) within the limited hearing range for reptiles (most sensitive from 100 to 400 Hz and limited over 1 kHz) is most likely to result in masking. • Information on acoustically induced stress responses in reptiles is limited and any physiological response or behavioral response is likely associated with a stress response. • Information on behavioral responses to vessel noise is limited and can include amplification of existing behaviors, increased vigilance, or no observable response.
Aircraft disturbance (including aircraft noise)	Aircraft disturbance (including the production of noise) may result in physiological stress or behavioral reactions. Aircraft sound exposure is rarely decoupled from the physical presence of an aircraft. The brief and intermittent nature of aircraft would result in a very limited probability of any masking effects. • Information on acoustically induced stress responses in reptiles is limited and any physiological response or behavioral response is likely associated with a stress response. • Reptile behavioral reactions have not been studied like marine mammals. Given less sensitive hearing than marine mammals, reptiles could exhibit behavioral reactions to aircraft noise that are likely to be brief and minor.
Impulsive noise (includes air guns, pile driving, and weapons firing)	Impulsive noise may result in hearing loss, masking, physiological stress, or behavioral reaction. The intermittent nature of most impulsive sounds would result in very limited probability of any masking effects. Due to the rapid rise time and higher instantaneous peak pressure of impulsive noise, nearby noise is more likely to cause startle or avoidance responses.

Table 3.8-4: Acoustic Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
	• Reptiles are likely susceptible to hearing loss when exposed to high levels of sound within their limited hearing range (most sensitive around 100 to 400 Hz and limited over 1 kHz). This includes low-frequency components from air guns, pile driving, and weapons noise. • Information on acoustically induced stress responses in reptiles is limited and any physiological response or behavioral response is likely associated with a stress response. • Information on behavioral responses to repetitive impulsive noise over long durations (i.e., air guns) is limited and can include temporary avoidance, increased swim speed, changes in depth, and no observable response. Similar responses are expected for other sources that produce repetitive and long duration impulsive noise (e.g., pile driving).

3.8.3.1.1 Impacts from Sonar and Other Transducers

Table 3.8-4 contains a summary of the background information used to analyze the potential impacts of sonars and other transducers (hereafter inclusively referred to as sonars) on reptiles. Other transducers include items such as acoustic projectors and countermeasure devices.

Sonars have the potential to affect reptiles by causing auditory injuries, temporary threshold shifts (TTSs), masking, non-injurious physiological responses (such as stress), or behavioral reactions. As discussed in Appendix E (Acoustic and Explosives Impacts Analysis), reptile hearing is most sensitive from 100 to 400 Hertz (Hz) and limited over 1 kilohertz (kHz). Therefore, only sonars below 2 kHz, including low-frequency sonar, are analyzed for their impacts to reptiles. As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information), sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

3.8.3.1.1.1 Impacts from Sonar and Other Transducers under Alternative 1

As discussed in Section 3.0.3.3.1 (Acoustic Stressors), a detailed comparison of sonar quantities analyzed in the 2018 Final EIS/OEIS with sonar quantities under this Proposed Action is not feasible due to changes in the source binning process. However, the overall use of sonars would decrease from the 2018 Final EIS/OEIS for both training and testing activities.

Under Alternative 1, the following changes exist from the 2018 Final EIS/OEIS for training activities using low-frequency sonar:

- There would be a small increase in unit level anti-submarine warfare activities in the Gulf of Mexico Range Complex and pierside location Naval Station Mayport.

For all other locations, there would be a decrease or a similar number of activities that involve the use of low-frequency sonar to the 2018 Final EIS/OEIS.

Under Alternative 1, the following changes exist from the 2018 Final EIS/OEIS for testing activities using low-frequency sonars:

- Under Anti-Submarine Warfare Testing activities, there would be new events in the high seas, Gulf of Mexico Range Complex Inshore, Joint Expeditionary Base Little Creek, Naval Station Mayport, Naval Station Norfolk, Naval Submarine Base King Bay, and Naval Submarine Base New London.

- Under Pierside Sonar Testing activities, there would be new events in the Gulf of Mexico Range Complex Inshore.
- Under At-Sea Sonar Testing activities, there would be new events in the Gulf of Mexico, Northeast, and Virginia Capes Range Complexes.
- There would also be a notable increase in Anti-Submarine Warfare activities in Bath, Maine, and Pascagoula, Mississippi.

Low-frequency sonars are operated less often than mid- or high-frequency sources throughout the Study Area. Activities using sonar would generally occur within Navy range complexes, on Navy testing ranges, around inshore locations, and specified ports and piers identified in Chapter 2 (Description of Proposed Action and Alternatives). Activities using sonar range from single source, limited duration events to multi-day events with multiple sound sources on different platforms. The types of sonars and the way they are used differ between primary mission areas. This in turn influences the potential for impacts to exposed reptiles.

The number of impacts to each turtle species due to exposure to sonar during training and testing under Alternative 1 are shown in Table 3.8-5 for a maximum year of activities and in Table 3.8-6 for seven years of activities. Appendix E (Acoustic and Explosives Impacts Analysis) provides additional details on modeled impacts to each species, including seasons and regions in which impacts are most likely to occur; which activities are most likely to cause impacts; and analysis of impacts to designated critical habitat for ESA-listed species, where applicable. Appendix E also shows total impacts to each species due to training or testing activities under this alternative and explains how impacts are summed to estimate maximum annual and seven-year total impacts.

Sonar-induced acoustic resonance and bubble formation phenomena are very unlikely to occur under realistic conditions, as discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information). Non-auditory injury and mortality from sonar are unlikely under realistic exposure conditions. Any impact to hearing could reduce the distance over which a reptile detects environmental cues, such as the sound of waves, or the presence of a vessel or predator. A reptile could respond to sounds detected within its limited hearing range if it is close enough to the source. Use of sonar would typically be transient and temporary, and there is no evidence to suggest that any behavioral response would persist after a sound exposure. In addition, a stress response could accompany any behavioral response. Although masking of biologically relevant sounds by the limited number of sonars operated in reptile hearing range is possible, this may only occur in certain circumstances. Reptiles most likely use sound to detect nearby broadband, continuous environmental signals, such as the sounds of waves crashing on the beach. Reptiles may rely on senses other than hearing such as vision or magnetic orientation and could potentially reduce any effects of masking caused by sonar use. The use characteristics of most low-frequency sonars, including limited band width, beam directionality, limited beam width, relatively low source levels, low duty cycle, and limited duration of use, would both greatly limit the potential for a reptile to detect these sources and limit the potential for masking of broadband, continuous environmental sounds.

Based on the updated background and analysis for training and testing under Alternative 1, impacts from sonars on reptiles would likely be limited to temporary or short-term impacts including stress, startle, and behavioral responses, and TTS, while long-term impacts would include auditory injuries. This is consistent with a moderate impact on reptile populations as defined in Table 3.8-3.

Under the Endangered Species Act (ESA), the use of sonars during military readiness activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle The use of sonars during training and testing activities would have no effect on the American crocodile.

The use of sonars is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and the American crocodile. Proposed critical habitat for the green sea turtle may be affected by the substressor (refer to Appendix E, Acoustic and Explosive Impacts Analysis, for details). Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The use of sonars would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing "noise pollution" from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the use of sonar and other transducers during training activities. The Action Proponents are consulting with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) as required by section 7(a)(2) of the ESA.

3.8.3.1.1.2 Impacts from Sonar and Other Active Sources under Alternative 2

Under Alternative 2, sonar use during training activities would increase compared to Alternative 1:

- The maximum number of Composite Unit Training Exercises would occur each year, and an additional Composite Unit Training Exercise would occur in the Gulf of Mexico Range Complex.

Impacts from sonars under Alternative 2 (Table 3.8-5 and Table 3.8-6) would increase for reptiles but the expected impacts are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing activities. The quantities of sonar and other transducer activity (i.e., hours and counts) under Alternative 2 would increase only slightly over Alternative 1.

Table 3.8-5: Impacts Due to a Maximum Year of Sonar Training and Testing Activity under Alternative 1 and Alternative 2

Species	*Alternative 1*			*Alternative 2*		
	BEH	*TTS*	*AINJ*	*BEH*	*TTS*	*AINJ*
Green sea turtle	33	6,423	33	33	7,246	40
Kemp's ridley sea turtle	13	4,996	10	13	5,393	12
Leatherback sea turtle	11	1,944	9	11	2,164	10
Loggerhead sea turtle	83	34,570	178	84	40,107	217

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

Table 3.8-6: Impacts Due to Seven Years of Sonar Training and Testing Activity under Alternative 1 and Alternative 2

Species	Alternative 1			Alternative 2		
	BEH	TTS	AINJ	BEH	TTS	AINJ
Green sea turtle	204	42,488	228	231	50,722	280
Kemp's ridley sea turtle	81	32,247	66	91	37,750	82
Leatherback sea turtle	66	12,815	57	75	15,141	69
Loggerhead sea turtle	516	232,111	1,226	583	280,743	1,515

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

3.8.3.1.2 Impacts from Air Guns

Table 3.8-4 contains a summary of the background information used to analyze the potential impacts of air guns on reptiles. The broadband impulses from air guns are within the hearing range of all reptiles. Potential impacts from air guns could include auditory injuries, TTS, behavioral reactions, physiological response, and masking. The ranges to auditory effects and behavioral responses for air guns are in in Appendix E (Acoustic and Explosives Impacts Analysis). As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information) sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

3.8.3.1.2.1 Impacts from Air Guns under Alternative 1

Air guns would not be used during training activities. The proposed use of air guns decreased overall for testing from the 2018 Final EIS/OEIS. During testing activities, small air guns would be fired over a limited period within a single day. Air gun use would only occur in two testing activities: semi-stationary equipment testing and acoustic and oceanographic research. While air gun use during semi-stationary equipment testing may occur nearshore at Newport, Rhode Island, air gun use during acoustic and oceanographic research may occur offshore in the Northeast, Virginia Capes, Jacksonville, and Gulf of Mexico Range Complexes.

The number of impacts to each species due to exposure to air guns during testing under Alternative 1 are shown in Table 3.8-7 for a maximum year of activities and in Table 3.8-8 for seven years of activities. Appendix E (Acoustic and Explosives Impacts Analysis) provides additional detail on modeled impacts to each species, including seasons and regions in which impacts are most likely to occur; which activities are most likely to cause impacts; and analysis of impacts to designated critical habitat for ESA-listed species, where applicable. Appendix E also shows total impacts to each species due to testing activities under this alternative and explains how impacts are summed to estimate maximum annual and seven-year total impacts.

Potential impacts from exposures to air guns include hearing loss and AINJ within a short distance, behavioral reactions, and physiological response. Due to the low duration of an individual air gun shot (approximately 0.1 second) and the low duty cycle of sequential shots, the potential for masking from air guns would be low. Additionally, pierside air gun use would only occur several times a year and would use a limited number of air gun shots, limiting the occurrence of masking. The use of air guns in offshore waters would not interfere with the detection of environmental cues in nearshore environments, such as the sound of waves crashing on the beach. Table 3.8-7 provides sea turtle impacts from the quantitative analysis using the number of air gun shots for a maximum year of testing activities under Alternative 1 and Alternative 2.

Based on the updated background and analysis for testing under Alternative 1, impacts from air guns on reptiles would be limited to temporary or short-term impacts including TTS. This is consistent with a minor impact on reptile populations as defined in Table 3.8-3.

Under the ESA, the use of air guns during testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of air guns is not applicable to the American crocodile.

The use of air guns is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. Proposed critical habitat for the green sea turtle may be affected by the substressor (refer to Appendix E, Acoustic and Explosive Impacts Analysis, for details). Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The use of air guns would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing "noise pollution" from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the use of air guns during training activities. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.8.3.1.2.2 Impacts from Air Guns under Alternative 2

Air guns would not be used during training activities. Impacts from air guns under Alternative 2 (Table 3.8-7 and Table 3.8-8) are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for testing activities. The quantities of air gun activity (i.e., counts) under Alternative 2 are the same Alternative 1.

Table 3.8-7: Impacts Due to a Maximum Year of Air Gun Testing Activity under Alternative 1 and Alternative 2

Species	*Alternative 1*			*Alternative 2*		
	BEH	*TTS*	*AINJ*	*BEH*	*TTS*	*AINJ*
Green sea turtle	-	1	0	-	1	0
Kemp's ridley sea turtle	-	1	-	-	1	-
Leatherback sea turtle	-	0	-	-	0	-
Loggerhead sea turtle	-	2	0	-	2	0

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

Table 3.8-8: Impacts Due to Seven Years of Air Gun Testing Activity under Alternative 1 and Alternative 2

Species	*Alternative 1*			*Alternative 2*		
	BEH	*TTS*	*AINJ*	*BEH*	*TTS*	*AINJ*
Green sea turtle	-	4	0	-	4	0
Kemp's ridley sea turtle	-	1	-	-	1	-
Leatherback sea turtle	-	0	-	-	0	-
Loggerhead sea turtle	-	10	0	-	11	0

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

3.8.3.1.3 Impacts from Pile Driving

Table 3.8-4 contains a summary of the background information used to analyze the potential impacts of pile driving noise on reptiles. This activity does not overlap with the American crocodile or their designated critical habitat. The impact and vibratory pile driving hammers would expose reptiles to impulsive and continuous non-impulsive broadband sounds, respectively. Potential impacts could include auditory injuries, TTS, behavioral reactions, physiological responses (stress), and masking. This analysis applies NMFS' recommended thresholds for behavioral responses to impact and vibratory pile driving. The ranges to auditory effects and behavioral responses for pile driving are in in Appendix E (Acoustic and Explosives Impacts Analysis). As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information), sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

3.8.3.1.3.1 Impacts from Pile Driving under Alternative 1

Impact and vibratory pile driving would not occur during testing activities. The activity type and location for pile driving activities for training have changed from the 2018 Final EIS/OEIS:

- Pile driving would occur as part of Port Damage Repair activities in Gulfport, Mississippi.
- Pile driving would no longer occur as part of the Elevated Causeway System at Joint Expeditionary Base Little Creek in the Virginia Capes Range Complex or Marine Corps Base Camp Lejeune in the Navy Cherry Point Range Complex.

Impact and vibratory pile driving during port damage repair training activities can occur throughout the year over a period of five days, and up to four times per year (20 days total) in Gulfport, Mississippi. Pile driving activities would occur intermittently in very limited areas and would be of temporary duration. This area is a commercial port lined with artificial shorelines and experiencing ambient noise levels that are already high due to vessel traffic.

Based on the updated background (refer to Appendix E, Acoustic and Explosive Impacts Analysis, for details) and previous analysis for training and testing under Alternative 1, pile driving noise impacts on reptiles would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual reptiles found within localized areas. This is consistent with a negligible impact on reptile populations as defined in Table 3.8-3.

Under the ESA, pile driving during training activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. Pile driving is not applicable to the American crocodile.

Pile driving is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle, and American crocodile. Pile driving is not applicable to proposed critical habitat for the green sea turtle. Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The use of pile driving would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing "noise pollution" from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the use of pile driving during training activities. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.8.3.1.3.2 Impacts from Pile Driving under Alternative 2

Pile driving or removal would not occur during testing activities. Impacts from pile driving during training activities under Alternative 2 are not different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for training activities.

3.8.3.1.4 Impacts from Vessel Noise

Table 3.8-4 contains a summary of the background information used to analyze the potential impacts of vessel noise on reptiles. The broadband, non-impulsive, and continuous noise from vessels is within the hearing range of all reptiles. As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information), sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

3.8.3.1.4.1 Impacts from Vessel Noise under Alternative 1

For both training and testing activities, vessel activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of vessel noise, so impacts would be expected to be similar or lesser than previously concluded.

Based on the updated background and previous analysis for training and testing under Alternative 1, vessel noise impacts on reptiles could include brief behavioral reactions and short periods of masking while in the proximity of a vessel (refer to Appendix E, Acoustic and Explosive Impacts Analysis, for supporting details). This is consistent with a negligible impact on reptile populations as defined in Table 3.8-3.

Under the ESA, vessel noise generated during military readiness activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, loggerhead sea turtle, and leatherback sea turtle. Only vessel noise associated with training may affect American crocodile. Vessel noise from testing is not applicable to the American crocodile.

Vessel noise is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. Proposed critical habitat for the green sea turtle may be affected by the substressor. Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The production of vessel noise would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing "noise pollution" from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the production of vessel noise during training activities. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.8.3.1.4.2 Impacts from Vessel Noise under Alternative 2

Under Alternative 2, an additional Composite Unit Level Training Exercise would occur in the Gulf of Mexico Range Complex that would not occur under Alternative 1. However, impacts from vessel noise under Alternative 2 are not meaningfully different from Alternative 1 and the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing activities. The number of activities including vessels or in-water devices increases only slightly over that of Alternative 1.

3.8.3.1.5 Impacts from Aircraft Noise

Table 3.8-4 contains a summary of the background information used to analyze the potential impacts of aircraft noise on reptiles. Aircrafts produce broadband, non-impulsive, continuous noise during operation and transit that is within the hearing range of all reptiles. As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information), sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

3.8.3.1.5.1 Impacts from Aircraft Noise under Alternative 1

For both training and testing activities, aircraft activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of aircraft noise, so impacts would be expected to be similar or lesser than previously concluded.

Based on the updated background and previous analysis for training and testing under Alternative 1, aircraft noise impacts on reptiles would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual reptiles found within localized areas. Reptiles at or near the surface when an aircraft flies overhead at low altitude may startle, divert their attention to the aircraft, or avoid the immediate area by swimming away or diving. This is consistent with a negligible impact on reptile populations as defined in Table 3.8-3.

Under the ESA, aircraft noise generated during military readiness activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp’s ridley sea turtle, loggerhead sea turtle, and leatherback sea turtle. Only aircraft noise associated with training may affect American crocodile. Aircraft noise from testing is not applicable to the American crocodile.

Aircraft noise is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. Proposed critical habitat for the green sea turtle may be affected by the substressor. Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The production of aircraft noise would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing “noise pollution” from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the production of aircraft noise during training activities. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.8.3.1.5.2 Impacts from Aircraft Noise under Alternative 2

Impacts from aircraft noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing activities. The number of activities including aircraft under Alternative 2 would increase only slightly over Alternative 1.

3.8.3.1.6 Impacts from Weapons Noise

Table 3.8-4 contains a summary of the background information used to analyze the potential impacts of weapons noise on reptiles. Firing of guns, vibrations from the hull of ships, items that impact the water's surface, and items launched from underwater may produce weapons noise that are within the hearing range of all reptiles. As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information), sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

3.8.3.1.6.1 Impacts from Weapons Noise under Alternative 1

For both training and testing activities, weapons noise would decrease from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of weapons noise, as impacts are expected to be similar to or less than previously analyzed.

Based on the updated background and previous analysis for training and testing under Alternative 1, the impact of weapons noise on reptiles would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual reptiles found within localized areas (refer to Appendix E, Acoustic and Explosive Impacts Analysis for supporting details). This is consistent with a negligible impact on reptile populations as defined in Table 3.8-3.

Under the ESA, weapons noise generated during military readiness activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. Weapons noise is not applicable to the American crocodile.

Weapons noise is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and the American crocodile. Proposed critical habitat for the green sea turtle may be affected by the substressor. Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The production of weapons noise would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing "noise pollution" from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the production of weapons noise during training activities. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.8.3.1.6.2 Impacts from Weapons Noise under Alternative 2

Impacts from weapons noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing activities. The number of items generating weapons firing noise (e.g., non-explosive and explosive practice munitions) under Alternative 2 is the same as Alternative 1.

3.8.3.2 Explosive Stressors

This section summarizes the potential impacts of explosives used during military readiness activities within the Study Area. Explosives analyzed for impacts to reptiles include those in water and those that detonate within 10 meters (m) of the water surface, which are analyzed as in-water explosives.

Table 3.8-9 summarizes background information that is relevant to the analyses of impacts for explosives. New applicable and emergent science regarding explosive impacts is presented in Appendix D (Acoustic and Explosive Impacts Supporting Information).

Table 3.8-9: Explosive Stressors Background Information Summary

Substressor	*Background Information Summary*
Explosives in air	In-air detonations at or near the water surface could transmit sound and energy into the water and impact reptiles. However, detonations within a few tens of meters of the surface are analyzed as if detonating completely underwater and the background information described above would also apply. Detonations that occur at higher altitudes would not propagate enough sound and energy into the water to result in impacts to reptiles and therefore are not analyzed in this section.
Explosives in water	Explosives may result in mortality and non-auditory injury. Direct injury due to explosives depends on the charge size, the geometry of the exposure (e.g., distance and depth), and the size of the animal. The intermittent nature of most impulsive sounds would result in very limited probability of any masking effects. Due to the rapid rise time and higher instantaneous peak pressure of impulsive noise, nearby noise is likely to cause startle or avoidance responses. There are limited studies of reptile responses to sounds from impulsive sound sources, and all data come from sea turtles exposed to seismic air guns, as summarized in Table 3.8-4.

The quantitative analyses of impacts due to explosives supplants the analyses in the 2018 Final EIS/OEIS due to updates to the following: modifications in the criteria and thresholds used to assess impacts, revisions to animal density (number per unit area) calculations, alternations to the acoustic effects modeling, and changes to the proposed use of explosives. The detailed assessment of explosive stressors under this Proposed Action is in Appendix E (Acoustic and Explosives Impacts Analysis). Changes in the predicted explosive impacts are due to the following:

- Updates to criteria used to determine if an exposure to explosive energy may cause auditory effects, non-auditory injury, mortality, and behavioral responses. Changes to the auditory effects criteria include: a 20 dB (re 1 $\mu Pa^2 s$) decrease in the weighted impulsive sound exposure level thresholds, and a 2 dB (re 1 μPa) decrease in the impulsive sound pressure level thresholds.
- Revisions to the modeling of explosive effects in the Navy Acoustic Effects Model. See the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (U.S. Department of the Navy, 2024a).
- Updates to data on sea turtle presence, including estimated density of each species (number of animals per unit area), and depth distribution. For additional details, see the technical reports *U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area* (U.S. Department of the Navy, 2024b) and *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii-Southern California Training and Testing Study Areas* (Oliveira et al., 2024).
- Changes in the locations, numbers, and types of modeled military readiness activities as described in Chapter 2 (Description of Proposed Action and Alternatives), and associated quantities of explosives (counts) shown in Section 3.0.3.3.2 (Explosive Stressors).
- No reduction of model-predicted mortalities due to visual observation mitigation, unlike in prior analyses. As discussed in Section 3.8.3 (Environmental Consequences), the Action Proponents will implement visual observation mitigation under Alternative 1 and Alternative 2 to reduce potential impacts from explosives on sea turtles. The Action Proponents will also implement

geographic mitigation to reduce potential explosive impacts within important sea turtle habitats as identified in Table 3.8-2. Mitigation areas for seafloor resources, as described in Section 3.3 (Habitats), may also provide some level of protection from explosive impacts for sea turtles that feed among, shelter, or otherwise inhabit these habitats.

- No reduction of model-predicted impacts due to animal avoidance of a sound source, unlike in prior analyses.

3.8.3.2.1 Impacts from Explosives

Explosions produce loud, impulsive, broadband sounds with sharp pressure peaks that can be injurious. Potential impacts from explosive energy and sound include non-auditory injury (including mortality), auditory effects (auditory injuries and TTS), behavioral reactions, physiological response, and masking. Ranges to effects for mortality, non-auditory injury, and behavioral responses are shown in Appendix E (Acoustic and Explosives Impacts Analysis). Explosive noise is very brief and intermittent, and detonations usually occur over a limited area for a brief period rather than being widespread. The potential for masking is limited. Reptiles may behaviorally respond, but responses to single detonations or small numbers of clusters may be limited to startle responses. As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information), sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

3.8.3.2.1.1 Impacts from Explosives under Alternative 1

The use of explosives would generally decrease from the 2018 Final EIS/OEIS for both training and testing activities. Notably, for testing there would be no use of bin E17 (> 14,500 – 58,000 pounds [lb.] net explosive weight [NEW]) and reduced use of bin E16 (> 7,250 to 14,500 lb. NEW) for ship shock trials. There is also a reduction in the use of most of the largest explosive bins for both training and testing, and an extremely large decrease in explosives associated with medium-caliber gunnery (bin E1 [0.1 to 0.25 lb. NEW]).

Most explosive activities would occur in the Virginia Capes, Navy Cherry Point, Jacksonville, and Gulf of Mexico Range Complexes, although activities with explosives would also occur in other areas as described in Appendix A (Activity Descriptions). Activities involving in-water explosives from medium- and large-caliber naval gunfire, missiles, bombs, or other munitions are conducted more than 12 nautical miles from shore. Certain activities with explosives may be conducted closer to shore at locations identified in Appendix A, including the training activity Mine Neutralization Explosive Ordnance Disposal and testing activities Semi-Stationary Equipment Testing and Line Charge Testing.

The number of impacts to each species due to exposure to explosives during training and testing under Alternative 1 is shown in

Table 3.8-10 for a maximum year of activities and in Table 3.8-11 for seven years of activities. Appendix E (Acoustic and Explosives Impacts Analysis) provides additional detail on modeled impacts to each species, including seasons and regions in which impacts are most likely to occur; which activities are most likely to cause impacts; and analysis of impacts to designated critical habitat for ESA-listed species, where applicable. Appendix E also shows total impacts to each species due to training or testing activities under this alternative and explains how impacts are summed to estimate maximum annual and seven-year total impacts.

Table 3.8-10: Impacts Due to a Maximum Year of Explosive Training and Testing Activity under Alternative 1 and Alternative 2

Species	Alternative 1					Alternative 2				
	BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
Green sea turtle	3,353	1,647	33	3	1	3,364	1,651	33	3	1
Kemp's ridley sea turtle	6,584	2,858	52	2	0	6,590	2,860	53	2	0
Leatherback sea turtle	734	3,554	70	4	1	738	3,557	71	4	1
Loggerhead sea turtle	25,672	10,653	227	9	3	25,741	10,686	228	9	3

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; INJ = Non-Auditory Injury; MORT = Mortality; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero)

Table 3.8-11: Impacts Due to Seven Years of Explosive Training and Testing Activity under Alternative 1 and Alternative 2

Species	Alternative 1					Alternative 2				
	BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
Green sea turtle	22,565	9,059	210	16	4	22,639	9,093	213	16	4
Kemp's ridley sea turtle	45,834	19,607	353	2	0	45,880	19,620	360	2	0
Leatherback sea turtle	4,942	10,343	217	10	3	4,974	10,362	218	10	3
Loggerhead sea turtle	174,632	65,720	1,434	60	10	175,124	65,948	1,444	61	10

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; INJ = Non-Auditory Injury; MORT = Mortality; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

A reptile's behavioral response to a single detonation or explosive cluster is expected to be limited to a short-term startle response or other behavioral responses, as the duration of noise from these events is very brief. Limited research and observations from air gun studies in Appendix D (Acoustic and Explosive Impacts Supporting Information) suggest that if sea turtles are exposed to repetitive impulsive sounds (analogous to impulsive sounds from explosives) in close proximity, they may react by increasing swim speed, avoiding the source, or changing their position in the water column. There is no evidence to suggest that any behavioral response would persist beyond the sound exposure. In addition, a stress response could accompany any behavioral response. Because the duration of most explosive events is brief, the potential for masking is low. Impacts including TTS, auditory injury, and non-auditory injury could reduce the fitness of an individual animal, causing a reduction in foraging success, reproduction, or increased susceptibility to predators. This reduction in fitness would be temporary for recoverable impacts, such as TTS. Full recovery from a TTS is expected to take a few minutes to a few days, depending on the severity of the initial shift.

Based on the updated background and analysis for training and testing under Alternative 1, impacts from explosives on reptiles would be limited to temporary or short-term impacts including behavioral and stress-startle responses and TTS, and long-term impacts including auditory injury, non-auditory injury, and mortality. This is consistent with a moderate impact on reptile populations as defined in Table 3.8-3.

Under the ESA, the use of explosives during military readiness activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of explosives for both training and testing may affect the American crocodile.

The use of explosives is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. Proposed critical habitat for the green sea turtle may be affected by the substressor. *Sargassum* habitat for green sea turtle proposed critical habitat would not be impacted by the sound from the use of explosives due to procedural mitigation of floating vegetation. Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The use of explosives would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing “noise pollution” from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the use of explosives during training activities. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.8.3.2.1.2 Impacts from Explosives under Alternative 2

Impacts from explosives under Alternative 2 (Table 3.8-10 and Table 3.8-11) would increase for reptiles but are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing activities. The quantities of explosive activity (i.e., counts) under Alternative 2 would increase only slightly over Alternative 1.

3.8.3.3 Energy Stressors

This section analyzes the potential impacts of energy stressors used during military readiness activities in the Study Area. Detailed background information is provided in Appendix G (Non-Acoustic Impacts Supporting Information).

Table 3.8-12 contains brief summaries of background information that is relevant to analyses of impacts for each energy substressor (in-water electromagnetic devices and high-energy lasers).

3.8.3.3.1 Impacts from In-Water Electromagnetic Devices

Table 3.8-12 contains a summary of the background information used to analyze the potential impacts of in-water electromagnetic devices on reptiles. For a listing of the types of activities that create an electromagnetic field under water, refer to Appendix B (Activity Stressor Matrices). The in-water devices producing an electromagnetic field are towed or unmanned mine countermeasure systems. The electromagnetic field is produced to simulate a vessel’s magnetic field. In an actual mine-clearing operation, the intent is that the electromagnetic field would trigger an enemy mine designed to sense a vessel’s magnetic field. In-water electromagnetic energy associated with the Proposed Action alternatives produce a strong enough field for effects on reptiles within a meter of their source.

Table 3.8-12: Energy Stressors Background Information Summary

Substressor	*Background Information Summary*
In-water electromagnetic devices	Available information suggests sensitivity of reptiles to magnetic and electric fields. The range of Earth’s magnetic field is 25 to 65 microteslas. • At all life stages, some sea turtle species orient to Earth’s magnetic field aiding in directional swimming and positioning within the oceanic currents (Christiansen et al., 2016; Putman & Mansfield, 2015). Growing evidence suggests that sea turtle

Table 3.8-12: Energy Stressors Background Information Summary (continued)

Substressor	***Background Information Summary***
	hatchlings imprint on the magnetic field of their natal beach, aiding them in the return for nesting once they reach maturity (Lohmann & Lohmann, 2019). • It is suspected that alligators and terrapins can detect electromagnetic fields, but these predominantly inshore reptiles typically exhibit low dispersal distances from natal beaches and are more likely to rely on environmental cues (e.g., visual, shoreline shape, currents) to navigate to natal beaches than Earth's magnetic field (Brothers & Lohmann, 2015, 2018; Mathis & Moore, 1988; Putman et al., 2015; Sheridan et al., 2010). • Use of in-water magnetic devices has the potential to mask navigation magnetic fields and cause disorientation of reptiles. Sea turtles have been shown to detect changes in magnetic fields, which may cause them to deviate from their original direction. For example, a loggerhead hatchling was recorded swimming eastward while exposed to a magnetic field of 52 microteslas and then switched to a westward direction when the magnetic field was decreased to 43 microteslas (Lohmann & Lohmann, 1996). • The static magnetic fields generated by electromagnetic devices used in training and testing activities are a maximum strength of approximately 2,300 microteslas with the strength of the field decreasing further from the device. At a distance of 4 meters (m) from the source of a 2,300-microtesla magnetic field, the strength of the field is approximately 50 microteslas, which is within the range of Earth's magnetic field (25 to 65 microteslas). At 8 m, the strength of the field is approximately 40% of Earth's magnetic field, and only 10% at 24 m away from a 2,300 microtesla magnetic field at the source. At a distance of 200 m, the magnetic field would be approximately 0.2 microteslas (U.S. Department of the Navy, 2005), which is less than 1% of the strength of Earth's magnetic field. This is likely within the range of detection for sea turtle species, but at the lower end of the sensitivity range. • Magnetic fields generated by electromagnetic devices used in military readiness activities are of relatively minute strength. Reptile reactions to fields and electrical pulses may include no reaction, avoidance, habituation, changes in activity level, or attraction, but effects would only occur near the source and would not significantly impact reptiles.
In-air electromagnetic devices	The use of in-air electromagnetic devices during training and testing activities is not applicable to reptiles because in-air electromagnetic energy does not transmit underwater, nor would use of these devices be close enough in proximity to crocodilian and terrapin habitat and sea turtle nesting locations to have an effect on these animals. As a result, in-air electromagnetic devices will not be analyzed further in this section.
High-energy lasers	High-energy laser weapons training and testing involves the use of up to 30 kilowatts of directed energy as a weapon against small surface vessels and airborne targets which are deployed from surface ships and helicopters and directed at targets in open-ocean areas where sea turtles may be present. • The primary concern for high-energy weapons training and testing is the potential for a sea turtle to be struck by a high-energy laser beam at or near the water's surface, which could result in injury or death from traumatic burns from the beam. • The potential for exposure to a high energy laser beam decreases as the water depth increases. Because laser platforms are typically helicopters and ships, sea turtles at sea would likely move away or submerge in response to other stressors, such as ship or aircraft noise, although some sea turtles would not exhibit a

Table 3.8-12: Energy Stressors Background Information Summary (continued)

Substressor	Background Information Summary
	response to an oncoming vessel or aircraft, increasing the risk of contact with the laser beam. • Per the Navy's strike analysis, the probability of a strike to green sea turtle in the Virginia Capes Range Complex and loggerhead sea turtles in the Jacksonville Range Complex from a high energy laser is less than a probability of 0.1 (see Appendix I, Military Expended Materials and Direct Strike Impact Analysis). • High-energy laser weapons are designed to disable surface targets and turn off when they lose track of the target. Marine reptiles cannot fly into the beam before it turns off and would therefore not be exposed to the laser.

Notes: % = percent; m = meters

3.8.3.3.1.1 Impacts from In-Water Electromagnetic Devices under Alternative 1

For both training and testing activities, in-water electromagnetic device activity decreased overall from the 2018 Final EIS/OEIS (see Table 3.0-6, Number and Location of Activities Using In-Water Electromagnetic Devices).

Under Alternative 1 for training:

- In-water electromagnetic device use would occur in two areas (Key West Range Complex and Virginia Capes Range Complex Inshore where it was not previously analyzed for the 2018 Final EIS/OEIS.
- There would also be notable increases in in-water electromagnetic devices in the Virginia Capes and Gulf of Mexico Range Complexes. For all other locations, there would either be a decrease or similar amount of in-water electromagnetic devices.

Under Alternative 1 for testing:

- In-water electromagnetic devices would occur in two areas (Northeast Range Complexes and Hampton Roads, Virginia) where they were not previously analyzed for the 2018 Final EIS/OEIS.
- There would also be a notable increase in in-water electromagnetic devices in the Naval Surface Warfare Center Panama City Testing Range. For all other locations, there would either be a decrease or cessation of in-water electromagnetic devices.

For locations without a notable increase in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity (to magnetic fields) of reptiles within the training locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of in-water electromagnetic device activity remains an accurate characterization of the Proposed Action in those locations.

For the locations not previously analyzed, introduction of electromagnetic device use has the potential to impact magnetic navigation and homing ability for sea turtles that may be exposed in those areas (see Table 3.8-12).

Based on the relative amount and location of in-water electromagnetic device use, and the general description of impacts, the potential exposure is not expected to yield any lasting effects to reptile habitat, reproduction, growth, survival, and is not expected to result in population-level impacts or affect the distribution or abundance of reptiles.

The analysis conclusions for in-water electromagnetic device use with training and testing activities under Alternative 1 are consistent with a negligible impact on reptile populations.

Under the ESA, the use of in-water electromagnetic devices during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of in-water electromagnetic devices during training would have no effect on American crocodiles. The use of in-water electromagnetic devices during testing would not be applicable to American crocodiles.

The use of in-water electromagnetic devices would not be applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. There would be no effect to proposed critical habitat for the green sea turtle, or designated critical habitat for the loggerhead sea turtle. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.8.3.3.1.2 Impacts from In-Water Electromagnetic Devices under Alternative 2

Impacts from in-water electromagnetic devices under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including use of in-water electromagnetic devices under Alternative 2 is the same as Alternative 1.

3.8.3.3.2 Impacts from High-Energy Lasers

Table 3.8-12 contains a summary of the background information used to analyze the potential impacts of high-energy lasers on reptiles. For a listing of the types of activities that use high-energy lasers, refer to Appendix B (Activity Stressor Matrices). High-energy lasers would only be used in open-ocean areas for training and testing activities; therefore, crocodilian and terrapin species are not included in the analysis for potential impacts from high-energy lasers because they would not be in areas where high-energy lasers would be used. High-energy laser weapons are designed to disable surface targets. Sea turtles could be exposed to the laser only if the beam misses the target.

3.8.3.3.2.1 Impacts from High-Energy Lasers under Alternative 1

For training activities, the use of high-energy lasers increased from the 2018 Final EIS/OEIS, and for testing activities, the use of high-energy lasers decreased (Table 3.0-7, Number and Location of Activities Using High-Energy Lasers).

Under Alternative 1 for training:

- High-energy lasers would occur in one location not previously analyzed (Navy Cherry Point Range Complex) in for the 2018 Final EIS/OEIS. There would also be notable increases in high-energy lasers at the Virginia Capes and Jacksonville Range Complexes.

Under Alternative 1 for testing:

- High-energy lasers would no longer occur in two locations (South Florida Ocean Measurement Facility and Key West Range Complex) that they occurred in for the 2018 Final EIS/OEIS. For all other locations, there would be a decrease in high-energy lasers.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of high-energy laser activity remains an accurate characterization of the Proposed Action in those locations.

High-energy lasers would only be used in open-ocean areas for training and testing activities; therefore, crocodilian and terrapin species are not included in the analysis for potential impacts from high-energy lasers because they would not be in areas where high-energy lasers would be used. The only potential effect on sea turtles from the use of high-energy lasers is direct exposure to laser light incident on the water's surface at the time a sea turtle is at or near the water's surface, and for the exposure to cause injury. A sea turtle could only be exposed if a laser beam missed the intended target and inadvertently struck a nearby sea turtle. The statistical probability analysis (see Appendix I [Military Expended Materials and Direct Strike Impact Analysis] indicates that the probability of a sea turtle being hit by a high-energy laser beam is less than 1 percent therefore it is considered discountable.

The probability analysis does not take into account that high-energy laser systems used in military readiness activities automatically shut down when target-lock is lost; meaning that is a high energy laser beam aimed at a small boat on the surface, either from an aircraft or surface vessel, moves off the target, the system ceases projecting laser light, preventing any energy from striking the water or a nearby sea turtle. Therefore, even though ESA-listed sea turtles may be present at the time the high-energy lasers are used, there is no plausible route of effects to these listed species. Further, high-energy laser use has no direct pathway to impact the physical and biological features identified for proposed or designated critical habitat (79 *Federal Register* 39856, 88 *Federal Register* 46572) due to the directed energy of the laser, the dissipation of energy as water depth increases, and the temporary duration of the activities.

The analysis conclusions for high energy laser use with training and testing activities under Alternative 1 are consistent with no impact on reptile populations.

Under the ESA, the use of high-energy lasers during training and testing activities as described under Alternative 1 would have no effect on the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, or loggerhead sea turtle or proposed and designated critical habitat. The use of high-energy laser would not be applicable to the American crocodile or its designated critical habitat. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

3.8.3.3.2.2 Impacts from High-Energy Lasers under Alternative 2

Impacts from high-energy lasers under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including high-energy lasers under Alternative 2 would be the same as Alternative 1.

3.8.3.4 Physical Disturbances and Strike Stressors

This section analyzes the potential impacts of the various types of physical disturbance and strike stressors used by the Action Proponents during military readiness activities in the Study Area. The physical disturbance and strike stressors that may impact reptiles include (1) vessels and in-water devices; (2) military expended materials, including non-explosive practice munitions and fragments from high-explosive munitions; (3) seafloor devices; and (4) pile driving. General discussion of impacts can also be found in Section 3.0.3.6.3 (Conceptual Framework for Assessing Effects from Physical Disturbance or Strike).

Table 3.8-13 contains brief summaries of background information that is relevant to analyses of impacts from physical disturbance and strike substressors (vessels and in-water devices, military expended materials, seafloor devices, and pile driving). Details on the updated information in general, as well as effects specific to each substressor, are provided in Appendix G (Non-Acoustic Impacts Supporting Information).

Table 3.8-13: Physical Disturbance and Strike Stressors Background Information Summary

Substressor	*Background Information Summary*
Vessels and in-water devices	Vessels: • In the Study Area, commercial traffic is heaviest in the nearshore waters, near major ports and in the shipping lanes along the entire United States (U.S.) East Coast and along the northern coast of the Gulf of Mexico while Navy vessel traffic is primarily concentrated between the mouth of the Chesapeake Bay, Virginia, and Jacksonville, Florida (Mintz, 2016). Action Proponent traffic (U.S. Navy and U.S. Coast Guard combined) accounted for less than 2% of all vessel traffic (in terms of ship hours) within the vicinity of U.S. East Coast range complexes (Mintz, 2016). While commercial traffic is relatively steady throughout the year, Action Proponent vessel usage within the range complexes is episodic, based on specific exercises being conducted at different times of the year (Mintz, 2016); however, Action Proponent vessel use within inshore waters occurs regularly and primarily consists of high-speed small vessel movements. • Strikes of reptiles could cause permanent injury or death from bleeding or other trauma, paralysis and subsequent drowning, infection, or inability to feed. The likelihood of recovery from a strike is influenced by the reptiles' age, reproductive state, and general condition. • With the exception of hatchlings and pre-recruitment juveniles, sea turtles spend a majority of their time submerged (Renaud & Carpenter, 1994; Sasso & Witzell, 2006), though green sea turtles were observed to stay within the top 3 meters of water despite deeper water being available (Hazel et al., 2009; Hazel et al., 2007). • Basking on the water's surface is common for all species in the Study Area as a strategy to thermoregulate and rest and is most common during inter-nesting periods. The reduced and idle activity associated with basking at the water's surface puts sea turtles at increased risk of a vessel strikes. • Foraging behavior for some reptile species would limit their time at the surface. For example, Kemp's ridley and loggerhead sea turtles can spend extended periods foraging at depth, even in open-ocean areas (DiMatteo et al., 2022; Roberts et al., 2022; Sasso & Witzell, 2006; Seney, 2016; Servis et al., 2015). • Increased occurrence of some sea turtle species within the nearshore areas of Chesapeake Bay (Barco et al., 2018a; Barco et al., 2017; Barco et al., 2018b; DiMatteo et al., 2022) expose them to smaller and faster vessels with increased risk of strike. • American alligators are likely sensitive to approaching vessels, often demonstrating avoidance behaviors to both motorized and non-motorized recreational boating in lakes (Lewis et al., 2014), and are likely at higher risk for strike in narrow shallow channels that would restrict the movements of a fleeing alligator. American crocodiles are also at risk of a strike along the nearshore areas of west and east coast of Florida where frequency of sightings has increased over the years (U.S. Fish and Wildlife Service, 2022). • Terrapins have been observed to not react to approaching vessels, which puts them at an increased risk of strike, particularly in high-density, small-vessel recreation areas (Lester, 2012; Lester et al., 2012). In-water devices: • In-water devices are generally smaller (several inches to 111 feet) than most Navy vessels. • Devices that could pose a collision risk to reptiles are those operated at high speeds and those that are unmanned. • Since some in-water devices are identical to support craft (typically less than 15 meters in length), reptiles could respond to the physical presence of the device similar to

Table 3.8-13: Physical Disturbance and Strike Stressors Background Information Summary (continued)

Substressor	Background Information Summary
	how they respond to the physical presence of a vessel. Physical disturbance from the use of in-water devices is not expected to result in more than a momentary behavioral response. These responses would likely include avoidance behaviors (swimming away or diving) and cessation of normal activities (e.g., foraging). • Most in-water devices, such as unmanned underwater vehicles, move slowly or are closely monitored by observers. However, detecting the presence of reptiles is more difficult than marine wildlife (i.e., marine mammals). • Towed devices are unlikely to strike a sea turtle because of the observers on the towing platform and other standard safety measures employed when towing in-water devices.
Military expended materials	Reptiles could be struck by military expended materials at the surface and on the seafloor as items settle on the bottom, and could also be disturbed by materials sinking through the water column, but the number of individuals affected would be low in the context of population size: • For sea turtles, although disturbance or strike from an item as it falls through the water column is possible, it is not likely because the objects generally sink through the water slowly and can be avoided by most sea turtles. Materials will slow in their velocity as they approach the bottom of the water. Juvenile or adult sea turtles (e.g., Kemp's ridley, green, loggerhead, or hawksbill sea turtles) that happen to be in the vicinity foraging in benthic habitats will likely avoid the object. Sea turtles that are sleeping on the bottom may exhibit a startle response and shift away from an object sinking slowly to the bottom with negligible risk of injury. • Direct strike potential is greatest at or near the surface for reptiles. However, reptiles may respond to other types of stressors (e.g., vessel noise or visual disturbance) and flee the vicinity of the inshore activity, thereby reducing the potential for physical disturbance and strike. • It is unlikely that military expended materials would strike American alligators in these waters because materials would not be expended in small creeks and similar habitats. American alligators would be at higher risk for strike in more relatively open waters like rivers and estuaries where materials may be expended. • Diamondback terrapins likely detect approaching vessels, but do not typically exhibit avoidance behaviors (Lester, 2012; Lester et al., 2012); therefore, terrapins are likely at increased strike risk by military expended materials when transiting an open water area or foraging at the surface. • Most missiles and projectiles are fired at and hit their targets, so only a very small portion hit the water with their maximum velocity and force. • Expended aerial targets and aerial target fragments hit the water's surface with relatively high velocity and force, although they fall rather than being fired. • Disturbance or strike as expended materials sink through the water column is possible but not likely because most objects sink slowly and can be avoided. • Propelled fragments produced by an exploding bomb are large and decelerate rapidly, posing little risk to reptiles. • Sediment disturbance and turbidity caused by materials settling on the seafloor would be temporary and localized to the immediate vicinity where the materials land. • The Navy reviewed torpedo design features and a large number of previous anti-submarine warfare torpedo exercises to assess the potential for torpedo strikes on marine mammals, and its conclusions are also relevant to reptiles. The acoustic homing programs of Navy torpedoes are sophisticated and would not confuse the

Table 3.8-13: Physical Disturbance and Strike Stressors Background Information Summary (continued)

Substressor	Background Information Summary
	acoustic signature of a marine mammal with a submarine/target. It is reasonable to assume that acoustic signatures of sea turtles would also not be confused with a submarine or target. • Review of torpedo records indicates there has never been an impact on a sea turtle or other reptile. In thousands of exercises in which torpedoes were fired or in-water devices used, there have been no recorded or reported instances of a marine species strike from a torpedo or any other in-water device.
Seafloor devices	Seafloor devices may be either stationary (e.g., mine shapes, anchors, bottom-placed instruments) or move slowly along the bottom (e.g., bottom-crawling unmanned underwater vehicles) where they may temporarily disturb the bottom and reptiles before being recovered. Strikes and disturbance of reptiles by seafloor devices are possible but not likely: • Benthic-foraging sea turtles (e.g., Kemp's ridley, green, loggerhead, or hawksbill sea turtles), American alligators, and diamondback terrapins would most likely encounter a seafloor device but would likely avoid it. • Seafloor devices do not pose a significant strike risk to sea turtles, terrapins, or alligators.
Pile driving	Reptiles are mobile and would be able to avoid the physical disturbance and strike stressors associated with pile driving activities. There is no direct pathway to impact reptiles from this stressor.
Aircraft and aerial targets	Aircraft and aerial targets do not overlap reptile species ranges, proposed, or designated critical habitat distributions and therefore will not be discussed further.

The Action Proponents will implement mitigation tailored to reducing the impact of physical disturbance and strike within sensitive areas where reptiles are known to occur, including areas of designated or proposed critical habitat (see Figure 3.8-11 through Figure 3.8-15). The mitigation areas referenced in Table 3.8-2 and in Chapter 5 (Mitigation) will reduce or eliminate the impact of disturbance from potential vessel strike or strikes associated with in-water devices, military expended material and seafloor devices.

3.8.3.4.1 Impacts from Vessels and In-Water Devices

Table 3.8-13 contains a summary of the background information used to analyze the potential impacts of vessels and in-water devices on reptiles. For a listing of the types of activities that involve vessels and in-water devices, refer to Appendix B (Activity Stressor Matrices).

The mitigation identified in Table 3.8-2 will reduce or eliminate the potential impacts from vessel disturbance within aquatic vegetation habitats (*Sargassum*) where reptiles may occur.

3.8.3.4.1.1 Impacts from Vessels and In-Water Devices under Alternative 1

For both training and testing activities, vessel and in-water device activity decreased overall from the 2018 Final EIS/OEIS (see Table 3.0-9, Number and Location of Activities Including Vessels and Table 3.0-10, Number and Location of Activities Including In-Water Devices).

Under Alternative 1 for training:

- Vessel activity would occur in one new port and pierside location (Gulfport, Mississippi) where it did not occur in the 2018 Final EIS/OEIS and one location (Pascagoula, Mississippi) that was not previously analyzed in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease or similar amount of vessel activity.

- In-water device activity (including both expended and recovered materials) would occur in one location (Northeast Range Complexes Inshore) where it was not previously analyzed. For all other locations, there would either be a decrease, similar amount, or cessation of in-water device activity.

Under Alternative 1 for testing:

- Vessel activity would occur in five locations (Other AFTT Areas; Northeast Range Complexes Inshore, Virginia Capes Range Complex Inshore, Gulf of Mexico Range Complexes Inshore, and Hampton Roads, Virginia) where it was not previously analyzed. There would also be notable increases in vessel activity at the Naval Surface Warfare Center Panama City Division Testing Range; Pascagoula, Mississippi; and Naval Station Norfolk. For all other locations, there would either be a decrease, similar amount, or cessation of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in four locations (Gulf of Mexico Range Complex Inshore; Bath, Maine; Newport, Rhode Island; and Pascagoula, Mississippi) where they were not previously analyzed. For all other locations, there would either be a decrease or similar amount of in-water device activity.

For locations without a notable increase in vessel and in-water device activity, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general occurrence of reptiles within the training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of vessel or in-water device activity remains an accurate characterization of the Proposed Action in those locations. Section 3.0 (Introduction) also describes high-speed vessel activity as not changing from what was analyzed in the 2018 Final EIS/OEIS and summarized below.

For the new inshore and port and pierside locations, the potential for a vessel strike to reptiles is a factor that was not previously a concern for those areas before. However, non-Action Proponent/recreational vessels already frequent these locations, and thus the risk of vessel strike to reptiles would not be anticipated to increase substantially with Action Proponent vessel activities.

Based on the relative amount and location of vessels and in-water devices under Alternative 1 for training and testing and the general description of impacts (see Table 3.8-13), there would be a small area of disturbance and potential risk of strike to reptiles that may occur but that would be mitigated through measures implemented as shown in Table 3.8-2 and discussed in Chapter 5 (Mitigation). The effects of the substressors on reptiles are not expected to result in detectable changes to reptile habitat, reproduction, growth, or survival, and are not expected to result in population-level impacts or affect the distribution or abundance of reptiles.

Due to the potential overlap of vessel and in-water device activity, particularly in areas where there may be increased distribution of sea turtles, there is the potential of injury and/or mortality from a strike. Therefore, the analysis conclusions for vessel and in-water device use with training and testing activities under Alternative 1 are consistent with a minor to moderate impact on reptile populations.

Under the ESA, the use of vessels and in-water devices during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. Vessel and in-water device use may affect American crocodile for training activities. The use of vessels and in-water devices with testing activities is not applicable to American crocodiles.

There would be no effect to proposed critical habitat for the green sea turtle, or designated critical habitat for the loggerhead sea turtle. The use of vessels and in-water devices is not applicable to the designated critical habitat for the hawksbill sea turtle, leatherback sea turtle, and American crocodile. For green sea turtle designated critical habitat, there would be no effect from vessel use, and the use of in-water devices would not be applicable. Training activities that use vessels and in-water devices would not impact the prey species found in *Sargassum* habitat or the nearshore habitat conditions that are essential for nearshore reproductive, benthic foraging, and resting habitat. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.8.3.4.1.2 Impacts from Vessels and In-Water Devices under Alternative 2

Impacts from vessels and in-water device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including vessels or in-water devices increases only slightly over that of Alternative 1.

3.8.3.4.2 Impacts from Military Expended Materials

Table 3.8-13 contains a summary of the background information used to analyze the potential impacts of military expended materials on reptiles. For a listing of the types of activities that include military expended materials, refer to Appendix B (Activity Stressor Matrices).

The mitigation measures identified in Table 3.8-2 will reduce or eliminate the potential impacts by locating some activities that include military expended materials away from nearshore areas that are designated and/or proposed critical habitat for reptiles which also include avoidance of *Sargassum* habitat (see Chapter 5, Mitigation). In other areas where activities that include military expended materials are proposed, the impact is limited by the distance from shore (e.g., most heavy munitions limited to areas outside of state coastal waters, depending on the state) which places most impacts seaward.

3.8.3.4.2.1 Impacts from Military Expended Materials under Alternative 1

For both training and testing activities, the number of military expended materials decreased overall from the 2018 Final EIS/OEIS (see Table 3.0-12, Number and Location of Explosives that May Result in Fragments Used during Military Readiness Activities; Table 3.0-13, Number and Location of Targets Expended during Military Readiness Activities; Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities; and Table 3.0-17, Number and Location of Wires and Cables Expended during Military Readiness Activities).

Under Alternative 1 for training:

- Military expended materials would occur in one location not previously analyzed (Gulf of Mexico Range Complex Inshore), and there would be a notable increase in the Key West Range Complex Inshore from the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease, similar amount, or cessation of military expended materials.

Under Alternative 1 for testing:

- Military expended materials would occur in three locations (Other AFTT Areas; Naval Submarine Base Kings Bay, and Port Canaveral, Florida) where it was not previously analyzed in the 2018 Final EIS/OEIS. For all other locations, there would be a decrease of military expended materials.

For locations without a notable increase in military expended materials, the analysis from the 2018 Final EIS/OEIS remains valid, and the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of reptiles within training and testing locations has not changed.

For locations not previously analyzed, the impact analysis that was conducted in the 2018 Final EIS/OEIS has changed. Aspects of the analysis include the potential for lighter expended materials (e.g., decelerators/parachutes) to drift into shallow, inshore habitats covered earlier in this section for military readiness activities.

The primary concern is the potential for a sea turtle, American crocodile, or diamondback terrapin to be struck with military expended material at or near the water's surface, which could result in injury or death. For sea turtles, although disturbance or strike from an item as it falls through the water column is possible, it is not likely because the objects generally sink through the water slowly and can be avoided by most sea turtles. Materials will slow in their velocity as they approach the bottom of the water and will likely be avoided by any juvenile or adult sea turtles (e.g., Kemp's ridley, green, loggerhead, or hawksbill sea turtles) that happen to be in the vicinity foraging in benthic habitats. Therefore, the discussion of military expended materials strikes focuses on the potential of a strike at the surface of the water. Other reptiles (such as American crocodiles and terrapins) could be on the water's surface. However, these reptiles may respond to other types of stressors (e.g., vessel noise or visual disturbance) and flee the vicinity of the inshore activity, thereby reducing the potential for physical disturbance and strike. Where inshore training and testing activities are adjacent to any terrapin rookery locations, terrapins (nesting females and hatchlings) may be at higher risk of physical disturbance and strike because more individual terrapins would be expected to occur in inshore waters in close proximity to these locations.

While no strike from military expended materials has ever been reported or recorded on a reptile, the possibility of a strike still exists. Therefore, the potential for sea turtles to be struck by military expended materials was evaluated using statistical probability modeling to estimate potential direct strike exposures to a sea turtle. American alligators, American crocodiles, and diamondback terrapins were not included in the model because these species occur in relatively more shallow water habitats and would likely respond to other stressors from inshore training and testing activities. Further, use of military expended materials would not occur in mitigation areas that protect nearshore habitats (i.e., *Sargassum* and designated critical habitats), thereby further protecting the species that occur within these nearshore waters, such as crocodilians or terrapins. Other mitigation measures would include lookouts and establishing distance restrictions from sea turtles for gunnery activities that are conducted using surface targets.

To estimate potential direct strike exposures of sea turtles, a scenario was calculated using the sea turtle species with the highest average monthly density in areas with the highest amounts of military expended material expenditures, specifically Virginia Capes and Jacksonville Range Complexes (see Appendix I, Military Expended Materials and Direct Strike Impact Analysis). To estimate the potential of military expended materials to strike a sea turtle, the impact area of all military expended materials was totaled over one year in the area with the highest combined amounts of military expended materials for the Proposed Action. Green sea turtles were used for Virginia Capes Range Complex and loggerhead sea turtles were used for Jacksonville Range Complex as a proxy species for modeling impacts because these sea turtle species have the highest seasonal density within the corresponding areas; therefore, green and loggerhead sea turtles provide the most conservative estimate of potential strikes. Under Alternative 1, the estimated potential exposure (strikes) probability to green sea turtles from military expended materials at Virginia Capes Range Complex and for loggerhead sea turtles in the Jacksonville Range Complex was less than 1 percent during training and testing (see Appendix I, Military Expended Materials and Direct Strike Impact Analysis).

Adult sea turtles are generally at the surface for short periods and spend most of their time submerged; however, hatchlings and juveniles of all sea turtle species spend more time at the surface while in ocean currents, and all sea turtle life stages bask on the surface. Leatherback sea turtles of all age classes are more likely to be foraging at or near the surface in the open ocean than other species, but the likelihood of being struck by a projectile remains very low because of the wide spatial distribution of leatherbacks relative to the point location of an activity. Furthermore, projectiles are aimed at targets, which will absorb the impact of the projectile. Other factors that further reduce the likelihood of a sea turtle being struck by an expended munition include the recovery of all non-explosive torpedoes as well as target-related materials that are intact after the activity.

Based on the relative amount, impact footprint, and location of material expended and the general description of impacts, activities involving military expended materials are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of reptile species at the population level. However, due to the potential for overlap of activities that expend military expended materials within areas where reptiles, particularly sea turtles, are abundant, behavioral or stress-related impacts may cause injury to or avoidance by individual sea turtles of foraging grounds. Therefore, the analysis conclusions for military expended materials used for training and testing activities under Alternative 1 are consistent with a minor to moderate impact on reptile populations.

Under the ESA, the use of military expended materials during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. Military expended materials may affect the American crocodile for training activities. Military expended materials not applicable to the American crocodile for testing activities.

The use of military expended materials is not applicable to the designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. There would be no effect to proposed critical habitat for green sea turtles, or designated critical habitat for loggerhead sea turtles. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.8.3.4.2.2 Impacts from Military Expended Materials under Alternative 2

Impacts from military expended materials under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species and critical habitat are the same for both training and testing. The increase in footprint from Alternative 1 to 2 is only 0.026 acres and located mostly in the Gulf of Mexico Range Complex, with relatively small footprints in the other range complexes.

3.8.3.4.3 Impacts from Seafloor Devices

Table 3.8-13 contains a summary of the background information used to analyze the potential impacts of seafloor devices on reptiles. For a listing of the types of activities that include seafloor devices, refer to Appendix B (Activity Stressor Matrices).

Proposed mitigation identified in Table 3.8-2 will reduce or eliminate the potential impacts by locating most seafloor devices away from sensitive habitats (i.e., *Sargassum* and designated critical habitats).

3.8.3.4.3.1 Impacts from Seafloor Devices under Alternative 1

For both training and testing activities, the proposed use of seafloor devices increased overall from the 2018 Final EIS/OEIS (see Table 3.0-15, Number and Location of Activities that Use Seafloor Devices).

Under Alternative 1 for training:

- Seafloor device use would occur in one new location (Gulfport, Mississippi) where it did not occur in the 2018 Final EIS/OEIS and four locations (Northeast Range Complexes; Other AFTT Areas; Jacksonville Range Complex Inshore, and Naval Station Mayport) where it was not previously analyzed in the 2018 Final EIS/OEIS. There would also be notable increases in seafloor devices at the Virginia Capes Range Complex (offshore and Inshore locations) and Key West Range Complex Inshore. For all other locations, there would either be a decrease, cessation, or similar amount of seafloor device use.

Under Alternative 1 for testing:

- Seafloor device use would occur in five locations (Virginia Cape Range Complex Inshore, Key West Range Complex Inshore, Naval Submarine Base New London, Naval Station Mayport, and Port Canaveral, Florida) where it was not previously analyzed in the 2018 Final EIS/OEIS. There would also be notable increases in seafloor devices in the Northeast and Jacksonville Range Complexes, and in the Naval Surface Warfare Center Panama City Division Testing Range. For all other locations, there would either be a decrease or similar amount of seafloor devices.

For locations without a notable increase in seafloor devices, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of reptiles within training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of seafloor device activity remains an accurate characterization of the Proposed Action in those locations.

For the new location and locations not previously analyzed, standard operating procedures and seafloor resource mitigation measures as well as avoidance of sensitive habitat (i.e., *Sargassum* and critical habitats) that apply to mine shapes and other devices moored to the bottom, help to avoid impacting sensitive habitats for reptiles.

Seafloor devices include items placed on, dropped on, or moved along the seafloor such as mine shapes, anchor blocks, anchors, bottom-placed instruments, and bottom-crawling unmanned underwater vehicles. The likelihood of any reptile species encountering seafloor devices is considered low because these items are either stationary or move very slowly along the bottom. The inshore training locations may potentially be inhabited by diamondback terrapins, American alligator, and American crocodile.

In the unlikely event that a reptile is in the vicinity of a seafloor device, the slow movement and stationary characteristics of these devices would not be expected to physically disturb or alter natural behaviors of sea turtles, alligators, or terrapins. Objects fall through the water slowly until they rest on the seafloor and could be avoided by most reptiles and do not pose a significant strike risk to sea turtles, terrapins, or alligators. However, presence of seafloor devices placed on the bottom for several hours, particularly in areas where sea turtles forage along the bottom, can cause behavioral responses such as startle responses and avoidance of the area. Therefore, the analysis conclusions for seafloor device use for training and testing activities under Alternative 1 are consistent with a negligible to minor impact on reptile populations.

Under the ESA, the use of seafloor devices during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of seafloor devices would have no effect on the American crocodile.

There would be no effect to proposed critical habitat for the green sea turtle, or designated critical habitat for the loggerhead sea turtle. The use of seafloor devices is not applicable to designated critical habitats for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

3.8.3.4.3.2 Impacts from Seafloor Devices under Alternative 2

Impacts from seafloor device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including seafloor devices under Alternative 2 would increase only slightly over Alternative 1.

3.8.3.4.4 Impacts from Pile Driving

Pile driving occurs during training activities and would have no effect on reptiles because they are mobile and would be able to avoid the physical disturbance and strike stressors associated with pile driving activities. However, pile driving is also analyzed as an acoustic substressor for reptiles found in Section 3.8.3.1 (Acoustic Stressors).

3.8.3.4.4.1 Impacts from Pile Driving under Alternative 1

Under Alternative 1 for training:

- Pile driving would occur in one new location (Gulfport, Mississippi) that it did not occur in for the 2018 Final EIS/OEIS.
- Pile driving would no longer occur as part of the Elevated Causeway System at Joint Expeditionary Base Little Creek in the Virginia Capes Range Complex or Marine Corps Base Camp Lejeune in the Navy Cherry Point Range Complex.

There would be no pile driving or removal associated with testing activities.

Pile driving is not expected to result in a strike or meaningful disturbance of marine reptiles that was not accounted for under the pile driving noise analysis. The analysis conclusions for physical disturbance and strike with training activities under Alternative 1 are consistent with no impact on reptile populations.

Under the ESA, pile driving during training and testing activities as described under Alternative 1 would have no effect to green, hawksbill, Kemp's ridley, leatherback, or loggerhead sea turtles or proposed and designated critical habitat. Pile driving would not be applicable to the American crocodile or its designated critical habitat. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

3.8.3.4.4.2 Impacts from Pile Driving under Alternative 2

Impacts from pile driving during training under Alternative 2 are no different from Alternative 1 and therefore the conclusions for ESA-listed species, critical habitat, and significance are the same.

There would be no pile driving associated with testing activities.

3.8.3.5 Entanglement Stressors

Most expended materials do not have the characteristics required to entangle marine species. Wires and cables, decelerators/parachutes, and biodegradable polymer are the expended materials most likely to entangle reptiles. Because expended materials that present entanglement risk to marine species are not expended in crocodilian or terrapin habitats, and because it is reasonable to assume that military expended materials would not drift into crocodilian or terrapin habitats, entanglement stressors are not analyzed for potential impacts on the American crocodile, American alligator, or the diamondback terrapin.

Table 3.8-14 contains a brief summary of background information that is relevant to analysis of impacts from entanglement substressors (wires and cables, decelerators/parachutes, and biodegradable polymer). Details on the updated information in general, as well as effects specific to each substressor are provided in Appendix G (Non-Acoustic Impacts Supporting Information).

Table 3.8-14: Entanglement Stressors Background Information Summary

Substressor	*Background Information Summary*
Wires and cables	Fiber-optic cables, torpedo guidance wires, sonobuoy wires, and expendable bathythermograph wires would be expended during military readiness activities. Risk factors for entanglement of sea turtles include animal size (and life stage), sensory capabilities, and foraging methods: • Most entanglements discussed in the literature are attributable to sea turtle entrapments with fishing gear or other non-military materials that float or are suspended at the surface. • Deployed tactical fiber breaks if it is looped beyond its bend radius (3.4 millimeters) or exceeds its tensile strength (12 pounds). If the fiber becomes looped around an underwater object or sea turtle, it does not tighten unless it is under tension. Such an event would be unlikely based on its method of deployment and its resistance to looping after it is expended. • The tactical fibers are often designed with controlled buoyancy to minimize the fiber's effect on vehicle movement. The tactical fiber would be suspended within the water column during the activity, and then be expended and sink to the seafloor [effective sink rate of 1.45 centimeters/second (Raytheon Company, 2015)] where it would be susceptible to abrasion and burial by sedimentation. • Encounter rates with fiber optic cables by sea turtles are limited by the small number of cables that are expended. Other factors that increase the risk of sea turtle interactions with fiber-optic cables include the amount of time a fiber-optic cable is in the same vicinity of a sea turtle; however, these cables will only be within the water column during the activity and while they sink.

Table 3.8-14: Entanglement Stressors Background Information Summary (continued)

Substressor	Background Information Summary
Decelerators/parachutes	At water impact, the decelerator/parachute assembly is expended and sinks away from the unit. • Small and medium decelerator/parachute assemblies may remain at the surface for 5 to 15 seconds before drifting to the bottom, where they become flattened and more of a physical disturbance stressor than an entanglement stressor. • Large and extra-large decelerators/parachutes may remain at the surface or suspended in the water column for a longer time due to the lack of weight, but eventually also sink to the bottom and become flattened. Decelerators/parachutes or decelerator/parachute cords may put sea turtles at risk of entanglement, particularly while at the surface. A sea turtle would have to surface to breathe or grab prey from under the decelerator/parachute and swim into the decelerator/parachute or its cords to become entangled.
Biodegradable polymers	Biodegradable polymer materials are configured into a non-woven mat that can be deployed on the water surface. Once wet, the fiber mats turn into more of a viscous fiber material which increases their ability to adhere to surfaces. The materials would degrade into smaller pieces within a few days to weeks, after which time the entanglement potential would cease. • Military readiness activities that use biodegradable polymers to cause vessel entanglement have the potential to also entangle reptiles. • Unlike other entanglement stressors, biodegradable polymers only retain their strength for a relatively short period of time; therefore, the potential for entanglement by a sea turtle would be limited. Furthermore, the longer the biodegradable polymer remains in the water, the weaker it becomes making it more brittle and likely to break. • Hatchlings, however, would not likely be able to escape entrapment if they became entangled in a biodegradable polymer. Biodegradable polymers would only be a risk to hatchlings while the biodegradable polymer retained its tensile strength. • For larger life stages, risk of entanglement is likely in the timeframe of a few hours after expenditure of the biodegradable polymers. For hatchlings, the risk would extend over a few weeks until the biodegradable polymer loses its tensile strength. • Due to the wide dispersion and low numbers of biodegradable polymers as well as the patchy distribution of sea turtles, there is a low likelihood of sea turtles, especially hatchlings, interacting with biodegradable polymers while they are an entanglement risk.

3.8.3.5.1 Impacts from Wires and Cables

Table 3.8-14 contains a summary of the background information used to analyze the potential impacts of wires and cables on sea turtles. For a listing of the types of activities that include wires and cables, refer to Appendix B (Activity Stressor Matrices).

3.8.3.5.1.1 Impacts from Wires and Cables under Alternative 1

For training activities, the use of wires and cables increased overall from the 2018 Final EIS/OEIS, and for testing activities, the use of wires and cables decreased overall (see Table 3.0-17, Number and Location of Wires and Cables Expended during Military Readiness Activities).

Under Alternative 1 for training:

- The use of wires and cables would occur in one location (Key West Range Complex) where it was not previously analyzed in the 2018 Final EIS/OEIS. There would also be a notable increase in the use of wires and cables in the Virginia Capes and Jacksonville Range Complexes. For all other locations, there would either be the same amount or a similar amount of wires and cables.

Under Alternative 1 for testing:

- The use of wires and cables would occur in one area (Other AFTT Areas) where it was not previously analyzed in the 2018 Final EIS/OEIS. There would also be a notable increase in wires and cables in the Virginia Capes and Key West Range Complexes. For all other locations, there would either be a decrease or similar amount of wires and cables.

For locations without a notable increase in wires and cables, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of sea turtles within the training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of wire and cable releases remains an accurate characterization of the Proposed Action in those locations.

For the training and testing locations not previously analyzed, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of sea turtles (including hatchlings and pre-recruitment juveniles) encountering a wire or cable and becoming entangled remains low.

Based on the relative amount and location of wires and cables and the general description of effects, the impact on individuals and populations would be minor to moderate because the area exposed to the stressor has potential to overlap with the distribution ranges of sea turtles. Therefore, the risk of entanglement and exposure to behavioral responses or potential injury would be increased in areas (e.g. foraging grounds) where densities of sea turtles may be more abundant. However, wire and cable use would be dispersed such that few individuals would likely be exposed to more than one event, and exposures would be localized. The effects of wire and cable use on sea turtles may result in changes to distribution or abundance of sea turtle species in the locations they are used. Therefore, the analysis conclusions for wire and cable use associated with training and testing activities under Alternative 1 are consistent with a minor to moderate impact on reptile populations.

Under the ESA, the use of wires and cables during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of wires and cables would not be applicable to the American crocodile.

There would be no effect to proposed critical habitat for the green sea turtle, or designated critical habitat for the loggerhead sea turtle. The use of wires and cables during military readiness activities would not be applicable to the designated or proposed critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

3.8.3.5.1.2 Impacts from Wires and Cables under Alternative 2

Impacts from wires and cables under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of wires and cables used under Alternative 2 would increase only slightly over Alternative 1.

3.8.3.5.2 Impacts from Decelerators/Parachutes

Table 3.8-14 contains a summary of the background information used to analyze the potential impacts of decelerators/parachutes on sea turtles. For a listing of the types of activities that include decelerators/parachutes, refer to Appendix B (Activity Stressor Matrices).

3.8.3.5.2.1 Impacts from Decelerators/Parachutes under Alternative 1

For both training and testing activities, decelerator/parachute use would increase from the 2018 Final EIS/OEIS (see Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities).

Under Alternative 1 for training:

- Decelerators/parachutes would be used in the same locations as they were used in the 2018 Final EIS/OEIS. However, there would be notable increases in the Virginia Capes and Jacksonville Range Complexes. For all other locations, there would be a similar amount of decelerators/parachutes.

Under Alternative 1 for testing:

- Decelerators/parachutes would be used in one area (Other AFTT Areas) where it was not previously analyzed in for the 2018 Final EIS/OEIS, and there would be a notable increase in the Northeast, Virginia Capes, and Key West Range Complexes. For all other locations, there would either be a decrease, or similar amount of decelerators/parachutes.

For locations without a notable increase in decelerators/parachutes, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of sea turtles within the training and testing locations has not changed. For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of ingestible munitions releases remains an accurate characterization of the Proposed Action in those locations.

For the training and testing locations not previously analyzed, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of reptiles encountering an ingestible munitions and consuming it remains low.

Although activities will occur in locations not previously analyzed, there would be no change in the impact analysis conducted in the 2018 Final EIS/OEIS because, although the increased number of decelerators/parachutes expended would cause a corresponding increase in the potential for entanglement, the probability would remain low relative to population numbers.

Based on the relative amount and location of decelerators/parachutes, most sea turtles would not encounter a decelerator/parachute. While in the water column, a sea turtle is less likely to become entangled because the decelerator/parachute would have to land directly on the sea turtle, or the sea turtle would have to swim into the decelerator/parachute or its cords before it sank. This is the case for the small and medium decelerators/parachutes; however, the likelihood for entanglement is higher for the large and extra-large decelerators/parachutes due to their size and the length of the attachment cords.

Hatchlings and pre-recruitment juveniles would not likely be able to escape entrapment if they became entangled in a decelerator/parachute at or near the water surface. The potential for a sea turtle to encounter an expended small or medium decelerator/parachute at the surface or in the water column is extremely low, and is even less probable at the seafloor, given the general improbability of a sea turtle being near the deployed decelerator/parachute, the sparse distribution of the small and medium decelerators/parachutes expended throughout the Study Area, as well as the patchy distribution and general behavior of sea turtles.

It should be noted that no known instances of sea turtle entanglement with a decelerator/parachute assembly have been reported.

The effects of decelerator/parachute use on sea turtles may result in detectable changes to reptile habitat, reproduction, growth, or survival, but are not expected to result in population-level impacts or affect the distribution or abundance of sea turtles. Decelerators/parachutes have no pathway to impact the physical and biological features identified for these habitats (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2013) due to the low concentration of decelerators/parachutes that are expended, the sparse distribution of the decelerators/parachutes expended in the deeper offshore waters throughout the Study Area, the fact that the wires and cables sink upon release, and the fact that assemblies are designed to sink rapidly through the water column . There is potential for overlap of activities that expend decelerators and parachutes with sea turtle distribution which increases risk of entanglement. Behavioral (stress-startle responses and avoidance) or potential for injury, especially for smaller sea turtles (juveniles), may occur in areas with higher density and abundance of sea turtles (such as foraging grounds). Therefore, the analysis conclusions for decelerator/parachute use associated with training and testing activities under Alternative 1 are consistent with a minor to moderate impact on reptile populations.

Under the ESA, the use of decelerators/parachutes during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of decelerators/parachutes would not be applicable to the American crocodile.

There would be no effect to proposed critical habitat for green sea turtles, or designated critical habitat for loggerhead sea turtles. The use of decelerators/parachutes would not be applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

3.8.3.5.2.2 Impacts from Decelerators/Parachutes under Alternative 2

Impacts from decelerators/parachutes under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of decelerators/parachutes used under Alternative 2 would increase only slightly over Alternative 1.

3.8.3.5.3 Impacts from Biodegradable Polymer

Table 3.8-14 contains a summary of the background information used to analyze the potential impacts of biodegradable polymer on sea turtles. For a listing of the types of activities that include biodegradable polymer, refer to Appendix B (Activity Stressor Matrices).

3.8.3.5.3.1 Impacts from Biodegradable Polymer under Alternative 1

Biodegradable polymers would not be used during Action Proponent training activities under Alternative 1. The proposed use of biodegradable polymer decreased overall for testing from the 2018 Final EIS/OEIS.

Under Alternative 1 for testing:

- Activities using biodegradable polymer would occur in three locations not previously analyzed (Northeast Range Complexes, Navy Cherry Point Range Complex, and Joint Expeditionary Base Little Creek Fort Story). For all other locations, there would be a decrease in activities using biodegradable polymer.

For locations with a decrease in biodegradable polymer use, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of sea turtles within these locations has not changed.

For the training and testing locations not previously analyzed, these changes would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of a sea turtle encountering a biodegradable polymer and becoming entangled remains low.

Based on the relative amount and location of biodegradable polymer use, the vast majority of marine sea turtles would not encounter a biodegradable polymer regardless of the configuration being used. Due to the wide dispersion and low numbers of biodegradable polymers as well as the patchy distribution of sea turtles, there is a low likelihood of sea turtles, especially hatchlings and early pelagic juveniles, interacting with biodegradable polymers while they are an entanglement risk.

The effects of biodegradable polymer use on sea turtles are not expected to result in detectable changes to sea turtle behavior, habitat, reproduction, growth, or survival, and are not expected to result in population-level impacts or affect the distribution or abundance of sea turtles. Therefore, the analysis conclusions for biodegradable polymer use associated with testing activities under Alternative 1 are consistent with a negligible impact on reptile populations.

Under the ESA, the use of biodegradable polymers during testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of biodegradable polymers would not be applicable to the American crocodile.

Biodegradable polymers may affect proposed critical habitat for green sea turtles and designated critical habitat for loggerhead sea turtles. The use of biodegradable polymers during testing activities would not be applicable to the designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

3.8.3.5.3.2 Impacts from Biodegradable Polymer under Alternative 2

There would be no use of biodegradable polymers associated with training activities.

Impacts from biodegradable polymer use during testing under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same.

3.8.3.6 Ingestion Stressors

The analysis of ingestion stressors on reptiles is differentiated by munitions and expended materials other than munitions.

The difference between the military expended materials categories is related to shape and material composition; munitions are aero- and/or hydrodynamic and composed of mostly hard metal or concrete whereas other types of military expended materials can be composed of a great variety of materials (e.g., metal, concrete, plastic, rubber, silicon, fabric) and components (e.g., circuit boards, batteries, electric motors).

This section analyzes the potential impacts of the various types of ingestion stressors used during military readiness activities in the Study Area. This analysis includes the potential impacts from the following types of military expended materials: non-explosive practice munitions (small- and medium-caliber), fragments from high-explosives, fragments from targets, chaff, flare casings (including plastic end caps and pistons), and decelerators/parachutes. As discussed in Appendix G (Non-Acoustic Impacts Supporting Information), biodegradable polymers break down and dissolve in the water column within weeks to a few months. Although they could be incidentally ingested by reptiles, the final breakdown product of biodegradable polymers is environmentally benign; therefore, it is not analyzed further as an ingestion stressor.

Table 3.8-15 contains a brief summary of background information that is relevant to analysis of impacts from ingestion stressors. Detailed background information supporting the ingestion stressor analysis is provided in Appendix G (Non-Acoustic Impacts Supporting Information).

Table 3.8-15: Ingestion Stressors Background Information Summary

Substressor	***Background Information Summary***
Military expended materials – munitions	Many different types of explosive and non-explosive practice munitions are expended at sea during military readiness activities. Types of non-explosive practice munitions generally include projectiles, missiles, and bombs. Of these, only small- or medium-caliber projectiles would be small enough for a reptile to ingest in offshore and inshore waters: • Small- and medium-caliber projectiles include all sizes up to and including 2.25 inches (57 millimeters) in diameter. These are solid metal munitions; therefore, even if a reptile did try to bite a larger munition, the munition would not break apart and be ingestible. • Solid metal materials from high-explosive munitions would quickly move through the water column and settle to the seafloor; therefore, ingestion is not expected by most species. • Ingestion of non-explosive practice munitions is not expected to occur in the water column because the munitions sink quickly. • Fragments are primarily encountered by species that forage on the bottom. Other munitions and munition fragments such as large-caliber projectiles or intact training and testing bombs are too large for loggerhead, green, Kemp's ridley, and hawksbill sea turtles to consume and are made of metal so they cannot be broken up by sea turtles. • Schuyler et al. (2014) noted that less than 10% of sea turtles (out of a sample size of 454 sea turtles) that ingested a wide range of debris suffered mortality, and 4% of sea turtles necropsied were killed by plastics ingestion (out of a sample size of 1,106 necropsied sea turtles). Because juvenile and adult green, loggerhead, Kemp's ridley, and hawksbill sea turtles feed along the seafloor, they are more likely to encounter munitions of ingestible size that settle on the bottom than leatherbacks that primarily feed at the surface and in the water column. • Although there is the potential, particularly within nearshore areas, for crocodilians to consume munitions materials, ingestion risk of non-prey items is generally not a concern (Nifong & Silliman, 2017). • Diamondback terrapins would be exposed to ingestion risks within inshore training and testing locations. They appear to be dietary generalists and opportunistic in foraging habits with a wide array of prey and forage items, which may increase the risk of ingestion for non-prey items. However, a large terrapin (particularly large females) are most at risk of ingesting non-prey items (Outerbridge et al., 2017).

Table 3.8-15: Ingestion Stressors Background Information Summary (continued)

Substressor	Background Information Summary
Military expended materials other than munitions	Several different types of materials other than munitions are expended during military readiness activities in the Study Area that have the potential to be ingested by reptiles. These include target-related materials, chaff, flares, decelerators/parachutes, AMNS neutralizer, grenades, torpedo accessories, and biodegradable polymer: • Sea turtles would be exposed to potential ingestion risk of target-related materials where these items are expended in offshore and inshore waters. American alligators may be exposed to target-related materials within inshore locations. • Although chaff fibers are too small for sea turtles to confuse with prey and forage, there is some potential for chaff to be incidentally ingested along with other prey items, particularly if the chaff attaches to other floating marine debris. If ingested, chaff is not expected to impact sea turtles due to the low concentration that would be ingested and the small size of the fibers. • Bottom-feeding sea turtles, such as green, hawksbill, Kemp's ridley, and loggerhead sea turtles, would be at increased risk if ingesting chaff end caps and pistons as these items could be deposited in potential benthic feeding areas before these items would be encrusted or buried. • An extensive literature review and controlled experiments conducted by the United States Air Force demonstrated that self-protection flare use poses little risk to the environment or animals (U.S. Department of the Air Force, 1997). For sea turtles, these types of flares are large enough to not be considered an ingestion hazard. Nonetheless, sea turtles within the vicinity of flares could be exposed to light generated by the flares. It is unlikely that sea turtles would be exposed to any chemicals that produce either flames or smoke since these components are consumed in their entirety during the burning process. Animals are unlikely to approach or get close enough to the flame to be exposed to any chemical components. • Ingestion of a small decelerator/parachute by a sea turtle at the surface or within the water column would be unlikely, since the decelerator/parachute would not be available for very long before it sinks. Once on the seafloor, if bottom currents are present, the canopy may temporarily billow and be available for potential ingestion by sea turtles within bottom-feeding habitats. • Bottom-feeding sea turtles (e.g., green, hawksbill, Kemp's ridley, and loggerhead sea turtles) tend to forage in nearshore and coastal areas rather than offshore, where the majority of these decelerators/parachutes are used. Since these materials would most likely be expended in offshore waters too deep for benthic foraging, it would be unlikely for bottom foraging sea turtles to interact with these materials once they sink; however, leatherbacks that feed offshore and in the water column could mistake a floating parachute for prey (i.e., jellyfish). • Although there is the potential, particularly within nearshore areas, for crocodilians to consume military expended materials other than munitions, ingestion risk of non-prey items is generally not a concern (Nifong & Silliman, 2017). • Diamondback terrapins would be exposed to ingestion risks within inshore training and testing locations. They appear to be dietary generalists and opportunistic in foraging habits with a wide array of prey and forage items, which may increase the risk of ingestion for non-prey items. However, a large terrapin (particularly large females) are most at risk of ingesting non-prey items (Outerbridge et al., 2017). • Within inshore waters, military readiness activities would expend shells into the water, which can potentially overlap with benthic foraging of sea turtles, American alligators, American crocodiles, or diamondback terrapins, placing them at a higher risk for ingestion. The risk is expected to be low due to the small vicinity in which these activities involving military expended material would occur.

Notes: % = percent; AMNS = Airborne Mine Neutralization System

3.8.3.6.1 Impacts from Military Expended Materials – Munitions

Table 3.8-15 contains a summary of the background information used to analyze the potential impacts of military expended materials that are munitions on reptiles. For a listing of the types of activities that include military expended materials - munitions, refer to Appendix B (Activity Stressor Matrices). Detailed analysis for ingestion stressors is provided in Appendix G (Non-Acoustic Impacts Supporting Information).

3.8.3.6.1.1 Impacts from Military Expended Materials – Munitions under Alternative 1

For both training and testing activities, military expended materials - munitions would decrease from the 2018 Final EIS/OEIS (see Table 3.0-11, Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities and Table 3.0-12, Number and Location of Explosives that May Result in Fragments Used during Military Readiness Activities).

Under Alternative 1 for training:

- Ingestible munitions (including fragments from explosive munitions) would occur in all but three of the locations they did in the 2018 Final EIS/OEIS. The three removed locations include Northeast Range Complexes Inshore, Virginia Capes Range Complex Inshore, and Jacksonville Range Complex Inshore. There would be a notable increase in the Key West Range Complex Inshore, but for all other locations, there would either be a decrease or similar amount of ingestible munitions.

Under Alternative 1 for testing:

- Ingestible munitions would occur in one location (Naval Undersea Warfare Center Division, Newport Testing Area) where they were not previously analyzed in the 2018 Final EIS/OEIS. For all other locations, there would be a decrease in the amount of ingestible munitions.

For locations without a notable increase in ingestible munitions, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of reptiles within the training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of ingestible munitions releases remains an accurate characterization of the Proposed Action in those locations.

For the training and testing locations not previously analyzed, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of reptiles encountering an ingestible munitions and consuming it remains low.

The heavy materials comprising munitions would degrade into fragments that remain in the sediment posing an ingestion risk through trophic transfer to sea turtles that forage on contaminated filter-feeder prey. Based on the relative amount and location of expended munitions and the general description of effects, an impact on individual reptiles is unlikely, and impacts on populations would probably not be detectable. The effects of military expended munitions use as an ingestion stressor on reptiles are not expected to result in detectable changes to reptile habitat, reproduction, growth, or survival, and are not expected to result in population-level impacts or affect the distribution or abundance of reptiles. However, due to the potential of overlap with expended munitions and that sea turtles, specifically, are known to ingest non-prey items, there is the risk to their digestion, foraging behavior, and injury. Therefore, the analysis conclusions for military expended material use associated with training and testing activities under Alternative 1 are consistent with a minor to moderate impact on reptile populations.

Under the ESA, the use of military expended materials - munitions during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of military expended materials - munitions during training may affect the American crocodile, but would not be applicable for testing activities.

There would be no effect to proposed critical habitat for green sea turtles, or designated critical habitat for loggerhead sea turtles. The use of military expended materials - munitions would not be applicable to the designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.8.3.6.1.2 Impacts from Military Expended Materials – Munitions under Alternative 2

Impacts from military expended materials – munitions under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of ingestible munitions or munition fragments used under Alternative 2 would increase only slightly over Alternative 1.

3.8.3.6.2 Impacts from Military Expended Materials Other Than Munitions

Table 3.8-15 contains a summary of the background information used to analyze the potential impacts of military expended materials other than munitions on reptiles. For a listing of the types of activities that include military expended materials other than munitions, refer to Appendix B (Activity Stressor Matrices). Detailed analysis for ingestion stressors is provided in Appendix G (Non-Acoustic Impacts Supporting Information).

3.8.3.6.2.1 Impacts from Military Expended Materials Other Than Munitions under Alternative 1

For both training and testing activities, military expended materials other than munitions would decrease from the 2018 Final EIS/OEIS (see Supplemental EIS/OEIS Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities).

Under Alternative 1 for training:

- Ingestible military expended materials other than munitions would no longer occur at one location (Virginia Capes Range Complex Inshore) that they did in the 2018 Final EIS/OEIS. However, there would be a notable increase in military expended materials other than munitions at the Virginia Capes Range Complex and the Key West Range Complex. For all other locations, there would either be a decrease or similar amount of military expended materials other than munitions.

Under Alternative 1 for testing:

- Ingestible military expended materials other than munitions would occur in one location (Other AFTT Areas) that was not previously analyzed in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease or similar amount of military expended materials other than munitions.
- Activities using biodegradable polymer would occur in three locations not previously analyzed (Northeast Range Complexes, Navy Cherry Point Range Complex, and Joint Expeditionary Base Little Creek) for the 2018 Final EIS/OEIS. For all other locations, there would be a decrease in the activities using biodegradable polymer (Table 3.0-18, Number and Location of Activities Including Biodegradable Polymers during Testing).

For locations without a notable increase in ingestible military expended materials other than munitions, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of reptiles within training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of ingestible military expended materials other than munitions releases remains an accurate characterization of the Proposed Action in those locations.

For the training and testing locations not previously analyzed, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of reptiles encountering ingestible military expended materials other than munitions and consuming it remains low.

The impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid because the likelihood of reptiles encountering ingestible military expended material other than munitions and consuming it remains low.

In addition to metal or concrete fragments in the sediment, small plastic (or otherwise light) fragments may be consumed by a wide variety of sea turtles. Hard plastics and synthetic particles have been documented in the stomach contents of sea turtles (Duncan et al., 2018; Velez-Rubio et al., 2017). Ingestion of these materials can occur through various pathways in addition to direct consumption (i.e., adherence to aquatic vegetation, through trophic transfer and ingesting contaminated filter-feeding prey). Action Proponent activities would result in a small number of plastic particles introduced to the marine environment compared to other sources. Overall, the effects of military expended materials other than munitions on reptiles are not expected to result in detectable changes to reptile habitat, reproduction, growth, or survival, and are not expected to result in population-level impacts or affect the distribution or abundance of reptiles. However, due to the potential of overlap with expended materials other than munitions and that sea turtles, specifically, are known to ingest non-prey items, there is the risk to their digestion, foraging behavior, and injury. Therefore, the analysis conclusions for military expended materials other than munitions use associated with training and testing activities under Alternative 1 are consistent with a minor to moderate impact on reptile populations.

Under the ESA, the use of military expended materials other than munitions during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of military expended materials other than munitions would not be applicable to the American crocodile.

There would be no effect to proposed critical habitat for green sea turtles, or designated critical habitat for loggerhead sea turtles. The use of military expended materials other than munitions would not be applicable to the designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.8.3.6.2.2 Impacts from Military Expended Materials Other Than Munitions under Alternative 2

Impacts from military expended materials other than munitions under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance impacts, ESA-listed species and critical habitat are the same for both training and testing. The number of ingestible non-munitions under Alternative 2 is the same as Alternative 1.

3.8.3.7 Secondary Stressors

This section analyzes potential impacts on reptiles exposed to stressors indirectly through impacts on their habitat (explosives and explosive byproducts, unexploded munitions, chemicals, and metals) and/or prey availability.

Table 3.8-16 contains brief summaries of background information that is relevant to the analyses of impacts for each substressor. Detailed updated information in general, as well as effects specific to each substressor are provided in Appendix G (Non-Acoustic Impacts Supporting Information).

Table 3.8-16: Secondary Stressor Background Information Summary

Indirect Links	*Substressors*	*Background Information Summary*
Habitat	Explosives	• Explosions on or near the bottom in areas of soft substrate would not cause an overall reduction in the surface area or volume of sediment available to benthic invertebrate prey sources for reptiles. • Activities that inadvertently result in explosions on or near hard bottom habitat or reefs could break hard structures and reduce the amount of colonizing surface available to encrusting organisms (e.g., corals, sponges). Refer to Section 3.3 (Habitats) for a more comprehensive summary of direct impacts to habitat.
	Explosive byproducts and unexploded munitions	Explosive byproducts and unconsumed explosives may potentially affect habitat, but the effects would likely be undetectable in the context of impacts on reptile populations because of extremely low concentrations and dilution of these materials in the Study Area: • High-order explosions consume most of the explosive material, and byproducts would therefore not degrade sediment or water quality or result in indirect stressors to reptiles. • Low-order detonations and unexploded munitions may result in the presence of explosive material in sediments or the water column. However, toxicity and other effects are generally associated with exposure to higher concentrations than those expected to occur due to military readiness activities. • Munitions constituents and degradation products in sediments would likely be detectable only within a few feet, and the range of toxic sediment conditions could be less (inches). Due to low solubility and dilution, reptiles would be exposed to chemical byproducts in the water column only in the immediate vicinity of degrading explosives (inches or less).
	Chemicals	• Potentially harmful chemicals introduced into the marine environment consist mostly of propellants and combustion products, other fuels, polychlorinated biphenyls in target vessels, other chemicals associated with munitions, and simulants. • Ammonium perchlorate (a rocket and missile propellant) is the most common chemical used. Other representative chemicals with potential to affect reptiles through impacts to their prey include propellant combustion products such as hydrogen cyanide and ammonia. • Perchlorate from failed expendable items is therefore unlikely to compromise water quality to that point that it would act as a secondary stressor to sea turtles. • Most propellants are consumed during normal operations, and the failure rate of munitions using propellants and other combustible materials is low.

Table 3.8-16: Secondary Stressor Background Information Summary (continued)

Indirect Links	*Substressors*	*Background Information Summary*
		• Most byproducts occur naturally in seawater and are readily degraded by biotic and abiotic processes. All chemicals are quickly diluted by water movement. • Target vessels are selected from a list of Navy-approved vessels that have been cleaned in accordance with U.S. Environmental Protection Agency guidelines. This procedure minimizes the amount of polychlorinated biphenyls entering the marine environment. • Overall, concentrations of chemicals in sediment and water are not likely to cause injury or mortality to reptiles.
	Metals	• Metals are introduced into seawater and sediments as a result of military readiness activities involving vessel hulks, targets, munitions, and other military expended materials. • Secondary effects may occur when marine invertebrates are exposed to concentrations above background levels by contact with the metal, contact with trace amounts in the sediment or water, and ingestion of contaminated sediments. This in turn creates trophic transfer when reptiles consume the contaminated prey source. • Because metals tend to precipitate out of seawater and often concentrate in sediments, potential adverse indirect impacts are much more likely via sediment than water. However, studies have found the concentrations of metals in the sediments within military ranges or munitions disposal sites, where deposition of metals is very high, to be localized and rarely above biological effects levels. • Impacts to sea turtle prey (i.e., invertebrates) would likely be limited to exposure in the sediment within a few inches of the object. • Concentrations of metals in sea water are unlikely to be high enough to cause injury or mortality to reptiles.
Prey availability	All stressors	The potential for primary stressors to impact reptile prey populations is directly related to their impacts on biological resources (e.g., habitats, invertebrates, aquatic vegetation). Prey availability can be disturbed during the use of secondary stressors (explosives, explosives byproducts, unexploded munitions, metals, and chemicals). • Metals and chemicals can be introduced into the seawater during training and testing activities, which could potentially impact the health or abundance of prey in the area. These impacts are expected to be negligible. • The use of explosives and explosive byproducts could disperse prey in the area used. This would be a localized and short-term impact, and therefore be considered negligible. • Inshore waters, which would receive small-caliber shells from training activities, have the potential to be deposited in substrates used by some sea turtles (in particular Kemp's ridley, loggerhead, and green sea turtles).

3.8.3.7.1 Impacts of Secondary Stressors under Alternative 1

The impacts of explosives and military expended materials in terms of physical habitat modification are described in Section 3.3 (Habitats). As stated previously, most detonations would occur in waters greater than 200 feet in depth and greater than 3 NM from shore, although mine warfare, demolition, and some testing of detonations would occur in shallow water close to shore. In deep waters, explosions would not likely remove habitat for sea turtles because explosions would not be on or proximate to the sea floor. These habitats include corals, seagrass beds, and other benthic habitats that are used by juvenile and adult sea turtle species.

The assessment of potential water and sediment quality degradation on aquatic life, including representative vegetation (seagrasses), is covered in Section 3.2 (Sediment and Water Quality). The analysis of sediment and water quality degradation in Section 3.2 is sufficient to cover the impact on habitat as utilized by reptiles.

The analysis included in Section 3.3 (Habitats) determined that, for Alternative 1, impacts to abiotic substrates from military expended materials would amount to 2.2 acres of habitat for vegetation that is not protected by standard operating procedures or mitigations measures (e.g., live hard bottom), resulting in little impact on the ability of substrates to support associated vegetated communities. Explosive craters would impact mostly microalgae growing in soft-intermediate substrate, where there are no mitigation areas. The indirect impact due to substrate disturbance would be relatively minor and inconsequential because of the small areas of the seafloor that would be affected and the temporary nature of the impact. Substrate would be disturbed, but not removed, and hence would be available for recovery of disturbed vegetation.

The analysis included in Section 3.2 (Sediment and Water Quality) determined that neither state nor federal standards/guidelines for sediments nor water quality would be violated by Alternative 1. Therefore, because these standards and guidelines are structured to protect human health and the environment, and the proposed activities do not violate them, no indirect impacts are anticipated on reptile habitat by military readiness activities proposed by under Alternative 1.

In-water explosions have the potential to injure or kill prey species that reptiles feed on within a small area affected by the blast; however, impacts would not substantially impact prey availability as discussed in Section 3.4 (Vegetation), Section 3.5 (Invertebrates), and Section 3.6 (Fishes). With respect to potential pollution as discussed under Section 3.2 (Sediment and Water Quality), literature on vegetation does not suggest any elevated sensitivity to pollutants from the Proposed Action. Military readiness activities in the Study Area would be unlikely to impact coral reefs (a direct or indirect source of prey and forage items for juvenile, sub-adult, and adult hawksbill sea turtles) because the Action Proponents implement measures within mitigation areas for shallow water coral reefs (see Chapter 5, Mitigation). Also, activities are not initiated near concentrated *Sargassum* mats (see Section 3.4, Vegetation, and Chapter 5, Mitigation), where hatchlings and pre-recruitment juvenile sea turtle prey is found. These mitigation measures would continue under the Proposed Action. Activities that involve the use of explosives typically occur at depths that exceed areas that support seagrass beds for foraging juvenile, sub-adult, and adult green sea turtles. For inshore military readiness activities, impacts on prey availability for crocodilians and terrapins, if they occurred, would not likely be measurable because of the types of activities that would occur in inshore training and testing locations, and because of the generalist diet of crocodilians and terrapins.

The impacts of the Proposed Action on secondary stressors were considered negligible to moderate (depending on the primary stressor) to reptiles.

Under the ESA, the secondary stressors associated with training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. Secondary stressors during training activities may affect the American crocodile, but would have no effect for testing activities.

There would be no effect to proposed critical habitat for green sea turtles, or designated critical habitat for loggerhead sea turtles. Secondary stressors would not be applicable to the designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

3.8.3.7.2 Impacts of Secondary Stressors under Alternative 2

Impacts from secondary stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

3.8.3.8 Combined Stressors

As described in Section 3.0.3.5 (Resource-Specific Impacts Analysis for Multiple Stressors), this section evaluates the potential for combined impacts of all stressors from the Proposed Action. The analysis and conclusions for the potential impacts from each of the individual stressors are discussed in the sections above. Stressors associated with proposed military readiness activities do not typically occur in isolation but rather occur in some combination. For example, mine neutralization activities include elements of acoustic, physical disturbance and strike, entanglement, ingestion, and secondary stressors that are all coincident in space and time. An analysis of the combined impacts of all stressors considers the potential consequences of additive and synergistic stressors from the Proposed Action, as described below.

There are generally two ways that a reptile could be exposed to multiple additive stressors. The first would be exposure to multiple sources of stress from a single event or activity (e.g., a mine warfare event may include the use of a sound source and a vessel). The potential for a combination of these impacts from a single activity would depend on the range of effects of each of the stressors and the response or lack of response to that stressor. Second, a reptile could be exposed to multiple military readiness activities over the course of its life, however, military readiness activities are generally separated in space and time in such a way that it would be unlikely that any individuals would be exposed to stressors from multiple activities within a short timeframe (hours to days). However, animals with a home range intersecting an area of concentrated activity have elevated exposure risks relative to animals that simply transit the area through a migratory corridor.

Multiple stressors may also have synergistic effects. For example, individuals that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors via a decreased ability to detect and avoid threats. Individuals that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to malnourishment and disorientation, leading to increase in likelihood of entanglement and physical strike stressors. These interactions are speculative, and without data on the combination of multiple stressors, the synergistic impacts from the combination of stressors are difficult to predict in any meaningful way.

The following analysis makes the reasonable assumption that the majority of exposures to individual stressors are non-lethal, and instead focuses on consequences potentially impacting fitness (e.g., physiology, behavior, reproductive potential).

3.8.3.8.1 Combined Impacts of All Stressors under Alternative 1

Based on the general description of impacts, the combined impacts under Alternative 1 of all stressors would not be expected to impact reptile populations because (1) a reptile could be exposed to multiple military readiness activities over the course of its life, however, military readiness activities are generally separated in space and time in such a way that it would be unlikely that any individual sea turtle would be exposed to stressors from multiple activities within a short timeframe, and (2) mitigation measures to reduce potential impacts to reptiles and their designated critical habitat would be implemented. Existing conditions would not change considerably from the 2018 Final EIS/OEIS. The combined impact of all stressors from Alternative 1 are considered moderate (due to limited potential for injury) to reptiles.

3.8.3.8.2 Combined Impacts of All Stressors under Alternative 2

The combined impacts of stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing.

3.8.4 Endangered Species Act Determinations

Under the ESA, the Action Proponents have concluded military readiness activities may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, loggerhead sea turtle, and leatherback sea turtle as summarized in Table 3.8-17. The Action Proponents have also concluded that military readiness activities may affect green sea turtle proposed critical habitat and loggerhead sea turtle designated critical habitat. Military readiness activities would have no effect on green, hawksbill, and leatherback sea turtle designated critical habitat. The Action Proponents have also concluded that military readiness activities may affect the American crocodile but would have no effect on its critical habitat. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA. The summary of effects determinations for each ESA-listed species is provided in Table 3.8-17 for training and testing.

Table 3.8-17: Summary of ESA-Effects Determinations for Reptiles under Alternative 1 (Preferred Alternative)

Species	*DPS/Critical Habitat*	*Effects Determinations by Stressor*																						
		Acoustic						*Explosive*		*Energy*			*Physical Disturbance and Strike*						*Entanglement*			*Ingestion*		
		Sonar and Other Transducers	*Air Guns*	*Pile Driving*	*Vessel Noise*	*Aircraft Noise*	*Weapons Noise*	*Explosives in Air*	*Explosives in Water*	*In-Air Electromagnetic Devices*	*In-Water Electromagnetic Devices*	*High-Energy Lasers*	*Vessels*	*In-Water Devices*	*Aircraft and Aerial Targets*	*Military Expended Materials*	*Seafloor Devices*	*Pile Driving*	*Wires and Cables*	*Decelerators/Parachutes*	*Biodegradable Polymers*	*Military Expended Materials-Munitions*	*Military Expended Materials – Other*	*Indirect/Secondary*
Training Activities																								
American Crocodile	Throughout range	NE	N/A	N/A	MA	MA	N/A	N/A	MA	N/A	NE	N/A	MA	MA	N/A	MA	NE	N/A	N/A	N/A	N/A	MA	N/A	MA
	Critical Habitat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Green sea turtle	North Atlantic DPS	MA	N/A	MA	MA	MA	MA	N/A	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	NE	MA	MA	N/A	MA	MA	MA
	Designated	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE	NE	N/A	N/A	N/A	N/A	NE	N/A	N/A	N/A	N/A	N/A	N/A
	Proposed	MA	N/A	N/A	MA	MA	MA	N/A	MA	N/A	NE	NE	NE	NE	N/A	NE	NE	NE	NE	NE	N/A	NE	NE	NE
Hawksbill sea turtle	Throughout range	MA	N/A	MA	MA	MA	MA	N/A	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	NE	MA	MA	N/A	MA	MA	MA
	Designated	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE	N/A	N/A	N/A	N/A	N/A	NE	N/A	N/A	N/A	N/A	N/A	N/A
Kemp's ridley sea turtle	Throughout range	MA	N/A	MA	MA	MA	MA	N/A	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	NE	MA	MA	N/A	MA	MA	MA
Loggerhead sea turtle	Northwest Atlantic DPS	MA	N/A	MA	MA	MA	MA	N/A	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	NE	MA	MA	N/A	MA	MA	MA
	Designated	MA	N/A	N/A	MA	MA	MA	N/A	MA	N/A	NE	NE	NE	NE	N/A	NE	NE	NE	NE	NE	N/A	NE	NE	NE
Leatherback sea turtle	Throughout range	MA	N/A	MA	MA	MA	MA	N/A	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	NE	MA	MA	N/A	MA	MA	MA
	Designated	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE	N/A	N/A	N/A	N/A	N/A	NE	N/A	N/A	N/A	N/A	N/A	N/A
Testing Activities																								
American Crocodile	Throughout range	NE	N/A	N/A	N/A	N/A	N/A	N/A	MA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE	N/A	N/A	N/A	N/A	MA	N/A	NE
	Critical Habitat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Green sea turtle	North Atlantic DPS	MA	MA	N/A	MA	MA	MA	N/A	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	NE	MA	MA	MA	MA	MA	MA
	Designated	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE	N/A	N/A	N/A	N/A	N/A	NE	N/A	N/A	N/A	N/A	N/A	N/A
	Proposed	MA	MA	N/A	MA	MA	MA	N/A	MA	N/A	NE	NE	NE	NE	N/A	NE	NE	NE	NE	NE	MA	NE	NE	NE
Hawksbill sea turtle	Throughout range	MA	MA	N/A	MA	MA	MA	N/A	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	NE	MA	MA	MA	MA	MA	MA
	Designated	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE	N/A	N/A	N/A	N/A	N/A	NE	N/A	N/A	N/A	N/A	N/A	N/A
Kemp's ridley sea turtle	Throughout range	MA	MA	N/A	MA	MA	MA	N/A	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	NE	MA	MA	MA	MA	MA	MA
Loggerhead sea turtle	Northwest Atlantic DPS	MA	MA	N/A	MA	MA	MA	N/A	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	NE	MA	MA	MA	MA	MA	MA
	Designated	MA	MA	N/A	MA	MA	MA	N/A	MA	N/A	NE	NE	NE	NE	N/A	NE	NE	NE	NE	NE	MA	NE	NE	NE
Leatherback sea turtle	Throughout range	MA	MA	N/A	MA	MA	MA	N/A	MA	N/A	MA	NE	MA	MA	N/A	MA	MA	NE	MA	MA	MA	MA	MA	MA
	Designated	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE	N/A	N/A	N/A	N/A	N/A	NE	N/A	N/A	N/A	N/A	N/A	N/A

Notes: DPS = Distinct Population Segment; MA = may affect; NE = no effect; N/A = not applicable due to lack of geographic overlap with the stressor

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References

Barco, S. G., M. L. Burt, R. A. DiGiovanni JR, W. M. Swingle, and A. S. Williard. (2018a). Loggerhead turtle *Caretta caretta* density and abundance in Chesapeake Bay and the temperate ocean waters of the southern portion of the Mid-Atlantic Bight. *Endangered Species Research, 37*, 269-287. DOI:10.3354/esr00917

Barco, S. G., S. A. Rose, and G. G. Lockhart. (2017). *Turtle Tagging and Tracking in Chesapeake Bay and Coastal Waters of Virginia: 2016 Annual Progress Report*. Norfolk, VA: Naval Facilities Engineering Command Atlantic.

Barco, S. G., S. A. Rose, G. G. Lockhart, and A. DiMatteo. (2018b). *Sea Turtle Tagging and Tracking in Chesapeake Bay and Coastal Waters of Virginia: 2017 Annual Progress Report*. Norfolk, VA: Naval Facilities Engineering Command Atlantic.

Brothers, J. R. and K. J. Lohmann. (2015). Evidence for geomagnetic imprinting and magnetic navigation in the natal homing of sea turtles. *Current Biology, 25*(3), 392–396.

Brothers, J. R. and K. J. Lohmann. (2018). Evidence that magnetic navigation and geomagnetic imprinting shape spatial genetic variation in sea turtles. *Current Biology, 28*(8), 1325–1329. DOI:https://doi.org/10.1016/j.cub.2018.03.022

Christiansen, F., N. F. Putman, R. Farman, D. M. Parker, M. R. Rice, J. J. Polovina, G. H. Balazs, and G. C. Hays. (2016). Spatial variation in directional swimming enables juvenile sea turtles to reach and remain in productive waters. *Marine Ecology Progress Series, 557*, 247–259.

DiMatteo, A., G. Lockhart, and S. Barco. (2022). Habitat models and assessment of habitat partitioning for Kemp's ridley and loggerhead marine turtles foraging in Chesapeake Bay (USA). *Endangered Species Research, 47*, 91–107. DOI:doi.org/10.3354/esr01168

Duncan, E. M., A. C. Broderick, W. J. Fuller, T. S. Galloway, M. H. Godfrey, M. Hamann, C. J. Limpus, P. K. Lindeque, A. G. Mayes, L. C. Omeyer, D. Santillo, R. T. E. Snape, and B. J. Godley. (2018). Microplastic ingestion ubiquitous in marine turtles. *Global Change Biology, 25*, 744–752. DOI:10.1111/gcb.14519

Hazel, J., I. R. Lawler, and M. Hamann. (2009). Diving at the shallow end: Green turtle behaviour in near-shore foraging habitat. *Journal of Experimental Marine Biology and Ecology, 371*(1), 84–92.

Hazel, J., I. R. Lawler, H. Marsh, and S. Robson. (2007). Vessel speed increases collision risk for the green turtle *Chelonia mydas*. *Endangered Species Research, 3*, 105–113.

Lester, L. A. (2012). *Direct and Indirect Effects of Recreational Boats on Diamondback Terrapins (Malaclemys terrapin).* (Unpublished doctoral dissertation). Drexel University, Philadelphia, PA. Retrieved from http://hdl.handle.net/1860/3982.

Lester, L. A., E. A. Standora, W. F. Bien, and H. W. Avery. (2012). Behavioral Responses of Diamondback Terrapins (*Malaclemys terrapin terrapin*) to Recreational Boat Sounds. In A. N. Popper & A. Hawkins (Eds.), *The Effects of Noise on Aquatic Life*. New York, NY: Springer Science + Business Media.

Lewis, J. D., J. W. Cain, III, and R. Denkhaus. (2014). Home range and habitat selection of an inland alligator (*Alligator mississippiensis*) population at the northwestern edge of the distribution range. *Southeastern Naturalist, 13*(2), 261–279.

Lohmann, K. J. and C. M. F. Lohmann. (1996). Orientation and open-sea navigation in sea turtles. *The Journal of Experimental Biology, 199*, 73–81.

Lohmann, K. J. and C. M. F. Lohmann. (2019). There and back again: natal homing by magnetic navigation in sea turtles and salmon. *Journal of Experimental Biology, 222*(Pt Suppl 1). DOI:10.1242/jeb.184077

Mathis, A. and F. R. Moore. (1988). Geomagnetism and the homeward orientation of the box turtle, *Terrapene carolina*. *Ethology, 78*(4), 265–274.

Mintz, J. D. (2016). *Characterization of Vessel Traffic in the Vicinities of HRC, SOCAL, and the Navy Operating Areas off the U.S. East Coast*. Alexandria, VA: Center for Naval Analyses.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. (2013). *Leatherback Turtle (Dermochelys coriacea) 5-Year Review: Summary and Evaluation*. Silver Spring, MD and Jacksonville, FL: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources; and U.S. Fish and Wildlife Service, Southeast Region, Jacksonville Ecological Services Field Office.

Nifong, J. C. and B. Silliman. (2017). Abiotic factors influence the dynamics of marine habitat use by a highly mobile “freshwater” top predator. *Hydrobiologia, 802*(1), 155–174.

Oliveira, E., M. DeAngelis, M. Chalek, J. Krumholz, and K. Anatone-Ruiz. (2024). *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy’s Atlantic and Hawaii-California Training and Testing Study Areas* (Undersea Warfare Center Division Newport Technical Report). Newport, RI: Undersea Warfare Center Division Newport.

Outerbridge, M. E., R. M. O'Riordan, T. Quirke, and J. Davenport. (2017). Restricted diet in a vulnerable native turtle, *Malaclemys terrapin* (Schoepff), on the oceanic islands of Bermuda. *Amphibian & Reptile Conservation, 11*(1), 25–35.

Putman, N. F. and K. L. Mansfield. (2015). Direct Evidence of Swimming Demonstrates Active Dispersal in the Sea Turtle “Lost Years.”. *Current Biology, 25*(9), 1221–1227.

Putman, N. F., P. Verley, C. S. Endres, and K. J. Lohmann. (2015). Magnetic navigation behavior and the oceanic ecology of young loggerhead sea turtles. *The Journal of Experimental Biology, 218*(7), 1044–1050.

Raytheon Company. (2015). *Airborne Mine Neutralization System (AMNS): Alternative Optical Fiber Engineering Study Final Report*. Portsmouth, RI: Integrated Defense Systems.

Renaud, M. L. and J. A. Carpenter. (1994). Movements and submergence patterns of loggerhead turtles (*Caretta caretta*) in the Gulf of Mexico determined through satellite telemetry. *Bulletin of Marine Science, 55*(1), 1–15.

Roberts, K. E., L. P. Garrison, J. Ortega-Ortiz, C. Hu, Y. Zhang, C. R. Sasso, M. Lamont, and K. M. Hart. (2022). The Influence of Satellite-Derived Environmental and Oceanographic Parameters on Marine Turtle Time at Surface in the Gulf of Mexico. *Remote Sensing, 14*(4534), 1-17. DOI:10.3390/rs14184534

Sasso, C. R. and W. N. Witzell. (2006). Diving behaviour of an immature Kemp's ridley turtle (*Lepidochelys kempii*) from Gullivan Bay, Ten Thousand Islands, southwest Florida. *Journal of the Marine Biological Association of the United Kingdom, 86*, 919–925.

Schuyler, Q., B. D. Hardesty, C. Wilcox, and K. Townsend. (2014). Global analysis of anthropogenic debris ingestion by sea turtles. *Conservation Biology, 28*(1), 129–139.

Seney, E. E. (2016). Diet of Kemp's ridley sea turtles incidentally caught on recreational fishing gear in the northwestern Gulf of Mexico. *Chelonian Conservation and Biology, 15*(1), 132–137.

Servis, J. A., G. Lovewell, and A. D. Tucker. (2015). Diet analysis of subadult Kemp's ridley (*Lepidochelys kempii*) turtles from west-central Florida. *Chelonian Conservation and Biology, 14*(2), 173–181.

Sheridan, C. M., J. R. Spotila, W. F. Bien, and H. W. Avery. (2010). Sex-biased dispersal and natal philopatry in the diamondback terrapin, *Malaclemys terrapin*. *Molecular Ecology, 19*(24), 5497–5510.

U.S. Department of the Air Force. (1997). *Environmental Effects of Self-Protection Chaff and Flares*. Langley Air Force Base, VA: U.S. Air Force, Headquarters Air Combat Command.

U.S. Department of the Navy. (2005). *Final Environmental Assessment and Overseas Environmental Assessment for Organic Airborne and Surface Influence Sweep Mission Tests*. Washington, DC: Airborne Mine Defense Program Office, Program Executive Office: Littoral and Mine Warfare.

U.S. Department of the Navy. (2024a). *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (Technical Report prepared by Naval Information Warfare Center Pacific). San Diego, CA: Naval Undersea Warfare Center.

U.S. Department of the Navy. (2024b). *U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area* (Naval Facilities Engineering Command Atlantic Technical Report). Norfolk, VA: Naval Facilities Engineering Command Atlantic.

U.S. Fish and Wildlife Service. (2022). *American crocodile (Crocodylus acutus) 5-Year Review: Summary and Evaluation*. Vero Beach, FL: U.S. Fish and Wildlife Service, South Atlantic–Gulf and Mississippi Basin Regions, Florida Ecological Services Office.

University of Georgia. (2023). *Diamondback Terrapin (Malaclemys terrapin)*. Retrieved January 27, 2023, from https://srelherp.uga.edu/turtles/malter.htm.

Velez-Rubio, G. M., N. Teryda, P. E. Asaroff, A. Estrades, D. Rodriguez, and J. Tomas. (2017). Differential impact of marine debris ingestion during ontogenetic dietary shift of green turtles in Uruguayan waters. *Marine Pollution Bulletin, 127*, 603–611. DOI:10.1016/j.marpolbul.2017.12.053

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Supplemental Environmental Impact Statement/ Overseas Environmental Impact Statement Atlantic Fleet Training and Testing

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3.9 Birds and Bats

BIRDS AND BATS SYNOPSIS

The Action Proponents considered the stressors to birds and bats that could result from the Proposed Action in the Study Area. The following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Acoustics: Unless very close to an intense sound source, responses by birds to acoustic stressors would likely be limited to short-term behavioral responses. Some birds may be temporarily displaced and there may be temporary increases in stress levels. Although individual birds may be impacted, no population-level impacts are expected to occur. Unlike other mammals, bats are not susceptible to temporary and permanent threshold shifts. Though bats are less likely than birds to be exposed to noise from the proposed activities, because of their infrequent presence above open water, they too may be temporarily displaced during foraging but would return shortly after the noise ceases. Although individual bats may be impacted, no population-level impacts are expected to occur.
- Explosives: Birds and bats could be exposed to in-air explosions. Sounds generated by most small underwater explosions are unlikely to disturb birds or bats above the water surface. However, a sufficiently large detonation near the water surface, could result in injury or mortality of birds and bats above the water surface. Detonations in air could injure birds or bats while either in flight or birds at the water surface; however, detonations in air during anti-air warfare training and testing would typically occur at much higher altitudes where seabirds, migrating birds, and bats are less likely to be present. Detonations can result in fish kills, which may attract birds. If this occurred in training or testing where multiple detonations take place, bird mortalities or injuries are possible. An explosive detonation would likely cause a startle reaction, as the exposure would be brief, and any reactions are expected to be short term. Although a few individuals may experience long-term impacts and potential mortality, no population-level impacts are expected to occur.
- Energy: The impact of energy stressors on birds and bats is expected to be negligible based on (1) the limited geographic area in which they are used, (2) the rare chance that an individual bird or bat would be exposed to these devices while in use, and (3) the tendency of birds and bats to temporarily avoid areas of activity when and where the devices are in use. The impacts of energy stressors would be limited to individual cases where a bird or bat might become temporarily disoriented or be injured. Although a small number of individuals may be impacted, no population-level impacts are expected to occur.
- Physical disturbance and strikes: There is the potential for individual birds to be injured or killed by physical disturbance and strikes during training and testing. However, there would not be long-term species or population-level impacts due to the vast area over which training and testing activities occur and the small size of birds and their ability to flee disturbance. Impacts to bats would be similar to, but less than, those described for birds since bats rarely occur in the Study Area compared to birds and because bats are most active from dusk through dawn when training and testing is limited.

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BIRDS AND BATS SYNOPSIS

- Entanglement: Entanglement stressors have the potential to impact birds. However, the likelihood is low because the relatively small quantities of materials that could cause entanglement would be dispersed over very wide areas, often in locations or depth zones outside the range or foraging abilities of most birds. A small number of individuals may be impacted, but no effects at the population level would be expected to occur. Since bats do not occur in the water column and rarely occur at the water surface in the Study Area, no impacts to bats are anticipated from entanglement stressors.
- Ingestion: It is possible that persistent expended materials could be accidentally ingested by birds while they were foraging for natural prey items, though the probability of this event is low as (1) foraging depths of diving birds is generally restricted to the surface of the water or shallow depths, (2) the material is unlikely to be mistaken for prey, and (3) most of the material remains at or near the sea surface for a short length of time. No population-level effect to any bird species would be expected to occur. Since bats do not occur in the water column and rarely feed at the water surface in the Study Area, no impacts to bats are anticipated from ingestion stressors.

3.9.1 Introduction

The following sections provide an overview of the birds and bats in the Study Area and the potential impacts of the proposed training and testing activities on them. Impacts to birds and bats from the Proposed Action were analyzed in the *2018 Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (hereinafter referred to as the 2018 Final EIS/OEIS). The primary changes from the analysis are provided in subsequent sections.

3.9.2 Affected Environment

The affected environment provides the context for evaluating the effects of the proposed military readiness (training and testing) activities on birds and bats. With noted exceptions, the affected environment for birds and bats in the Study Area is not meaningfully different from what is described in the 2018 Final EIS/OEIS. See Appendix F (Biological Resources Supplemental Information) for detailed information on the affected environment of resources.

The Study Area is generally consistent with that analyzed in the 2018 Final EIS/OEIS. Additions to the Study Area include pierside training and testing events and transit along established navigation channels from pierside locations to offshore range complexes in the Gulf of Mexico. United States (U.S.) Coast Guard activities are similar in nature to Navy activities and fall under the same stressor categories.

3.9.2.1 General Background

Much of the general background for birds and bats has not changed from that which was described in the 2018 Final EIS/OEIS. Exceptions include newer studies and information on bat records and migration offshore in the Study Area, additional research on seabird hearing and underwater sound, and updates to lists of threatened and endangered species and migratory birds. This updated information is described in Appendix F (Biological Resources Supplemental Information).

3.9.2.1.1 Group Size

A variety of bird group sizes may be encountered throughout the Study Area, ranging from the solitary migration of an individual to thousands of birds in single-species and mixed-species flocks. Group size varies based on species, location, weather conditions, time of year and time of day and can also fluctuate from year to year. Bats could occur in the Study Area as individuals or small groups foraging nearshore or migrating and this presence would vary with season, location, time of day, and weather, as well as among species.

3.9.2.1.2 Habitat Use

Habitat use by birds is described in terms of water column, shoreline, nearshore, and airspace of the Study Area. Habitat use by bats includes the shoreline and airspace. A description of taxonomic groups and their location/habitat use in the Study Area is provided in Appendix F (Biological Resources Supplemental Information).

Birds use the Study Area for all life history requirements including migration. Portions of the Atlantic, Mississippi, and Central flyways occur within the Study Area. These are used by a large number of seabird species as well shorebirds and songbirds. Birds forage in a variety of habitats in the Study Area including nearshore (immediately adjacent to the coastline) and on the open ocean. While all bats are terrestrial, some species forage or migrate over marine environments, sometimes at considerable distances from shore. Following a review of recent literature, the general information presented on the habitat use of birds and bats described in the 2018 Final EIS/OEIS has not changed.

3.9.2.1.3 Movement and Behavior

Seabird species dive, skim, plunge, pursue, and grasp prey at the water's surface or in the water column, some feed on the bottom at depths greater than 100 feet, and some obtain food by pursuing other birds in the air. Some seabirds aerial plunge, and others dive from the surface. Bats do not dive but may forage above water, typically adjacent to land.

3.9.2.1.4 Hearing and Vocalization

Following a review of recent literature, the general information presented on the hearing and vocalization of birds described in the 2018 Final EIS/OEIS (see Section 3.9.2.1.4, Hearing and Vocalization) had not changed; however, several studies of seabird hearing have been published since the 2018 Final EIS/OEIS that support previous work. Bats vocalize to communicate and to produce echolocation signals to better understand their surroundings and to find prey. The understanding of hearing and vocalization in bats has not changed since the publication of the 2018 Final EIS/OEIS.

3.9.2.1.5 General Threats

General threats to birds and bats are the same as those discussed in the 2018 Final EIS/OEIS (see Section 3.9.2.1.5, General Threats) including interaction with fishing gear; predation and competition with introduced species; degradation and disturbance of nesting areas; pollution; noise and light from human activities; collisions with structures and aircraft; and climate change. Bats are threatened by disease, habitat loss and degradation, human industry., and climate change. New research and updates regarding general threats to resources are provided in Appendix F (Biological Resources Supplemental Information).

3.9.2.2 Endangered Species Act-Listed Species

Table 3.9-1 shows the bird and bat species listed under the Endangered Species Act (ESA) and occurring in the Study Area. No critical habitat for these species occurs in the Study Area; however, piping plover critical habitat and red knot proposed critical habitat occur near the Study Area and are shown in Figure 3.9-1 through Figure 3.9-8. Detailed species descriptions, including status and management, habitat and geographic range, population trends, predator and prey interactions, species-specific threats, as well as designated critical habitat are provided in Appendix F (Biological Resources Supplemental Information). Changes in the ESA listings and critical habitat designations since the 2018 Final EIS/OEIS include:

- listing of the black-capped petrel as endangered in 2024
- listing of northern long-eared bat as endangered in 2023
- proposed listing of tricolored bat as endangered in 2021
- proposed establishment of red knot critical habitat in 2021 and 2023

Table 3.9-1: Status and Occurrence of Endangered Species Act-Listed Bird and Bat Species in the Study Area

Species Name and Regulatory Status			***Location in the Study Area***		
Common Name	***Scientific Name***	***ESA Status/Critical Habitat***	***Range Complex/ Testing Range***	***Range Complex Inshore Areas***	***Piers/Ports/Coast Guard Stations***
Piping plover	*Charadrius melodus*	Threatened/ Designated*	All locations	All locations	All locations
Red knot	*Calidris canutus rufa*	Threatened/ Proposed*	All locations	All locations	All locations
Roseate tern[1]	*Sterna dougallii dougallii*	Endangered[1] Threatened[2]/ None	Northeast RC; VACAPES RC; Navy Cherry Point RC; JAX RC; Key West RC	Northeast RC Inshore; VACAPES RC Inshore; JAX RC Inshore; Key West RC Inshore	Pierside Portsmouth Naval Shipyard; NSB New London; NS Newport; NS Norfolk; JEB Little Creek; Norfolk Naval Shipyard Civilian Ports Bath, ME; Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC; Wilmington, NC Coast Guard Stations Boston, MA; New London, CT; Newport, RI; Virginia Beach, VA; Portsmouth, VA; Elizabeth City, NC; Charleston, SC; Key West, FL
Bermuda petrel	*Pterodroma cahow*	Endangered/ None	Northeast RC; VACAPES RC; Navy Cherry Point RC; SINKEX Box; Other AFTT Areas	None	None

Table 3.9-1: Status and Occurrence of Endangered Species Act-Listed Bird and Bat Species in the Study Area (continued)

Species Name and Regulatory Status			*Location in the Study Area*		
Common Name	***Scientific Name***	***ESA Status/Critical Habitat***	***Range Complex/ Testing Range***	***Range Complex Inshore Areas***	***Piers/Ports/Coast Guard Stations***
Black- capped petrel	*Pterodroma hasitata*	Endangered/ None[3]	Northeast RC; VACAPES RC; Navy Cherry Point RC; JAX RC; Key West RC; GOMEX RC; SINKEX Box; Other AFTT Areas	None	None
Indiana bat	*Myotis sodalis*	Endangered/ None	Northeast RC; NUWC Division, Newport Testing Range	Northeast RC Inshore	<u>Pierside</u> NSB New London <u>Civilian Ports</u> Earle, NJ <u>Coast Guard Stations</u> New London, CT; Montauk, NY; Atlantic City, NJ
Northern long-eared bat	*Myotis septentrionalis*	Endangered/ None	Northeast RC; NUWC Division, Newport Testing Area; VACAPES RC; Navy Cherry Point RC; JAX RC	Northeast RC Inshore; VACAPES RC Inshore	<u>Pierside</u> Portsmouth Naval Shipyard, NSB New London NS Newport, NS Norfolk, JEB Little Creek, Norfolk Naval Shipyard <u>Civilian Ports</u> Bath, ME; Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC; Wilmington, NC <u>Coast Guard Stations</u> Boston, MA; New London, CT; Newport, RI; Montauk, NY; Atlantic City, NJ; Virginia Beach, VA; Portsmouth, VA; Elizabeth City, NC; Charleston, SC

Table 3.9-1: Status and Occurrence of Endangered Species Act-Listed Bird and Bat Species in the Study Area (continued)

<table>
<tr><th colspan="3">Species Name and Regulatory Status</th><th colspan="3">Location in the Study Area</th></tr>
<tr><th>Common Name</th><th>Scientific Name</th><th>ESA Status/Critical Habitat</th><th>Range Complex/ Testing Range</th><th>Range Complex Inshore Areas</th><th>Piers/Ports/Coast Guard Stations</th></tr>
<tr><td>Tricolored bat</td><td>Perimyotis subflavus</td><td>Proposed Endangered/ None</td><td>Northeast RC; NUWC Division, Newport Testing Range; VACAPES RC; Navy Cherry Point Range; JAX RC; GOMEX RC; NSWC Panama City, Division Testing Range</td><td>Northeast RC Inshore, VACAPES RC Inshore, JAX RC Inshore, GOMEX RC Inshore</td><td><u>Pierside</u>
Portsmouth Naval Shipyard, NSB New London, Naval Station Newport, NS Norfolk JEB Little Creek, Norfolk Naval Shipyard, NSB Kings Bay

<u>Civilian Ports</u>
Bath, ME; Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC; Wilmington, NC; Kings Bay, GA; Savannah, GA; Beaumont, TX; Corpus Christi, TX; Gulfport, MS; Pascagoula, MS

<u>Coast Guard Stations</u>
Southwest Harbor, ME; Boston, MA; New London, CT; Newport, RI; Montauk, NY; Atlantic City, NJ; Virginia Beach, VA; Portsmouth, VA; Elizabeth City, NC; Charleston, SC; Pensacola, FL; Corpus Christi, TX</td></tr>
</table>

Notes: AFTT = Atlantic Fleet Training and Testing; ESA = Endangered Species Act; GOMEX = Gulf of Mexico; JAX = Jacksonville; JEB = Joint Expeditionary Base; NS = Naval Station; NSB = Naval Submarine Base; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; RC = Range Complex; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

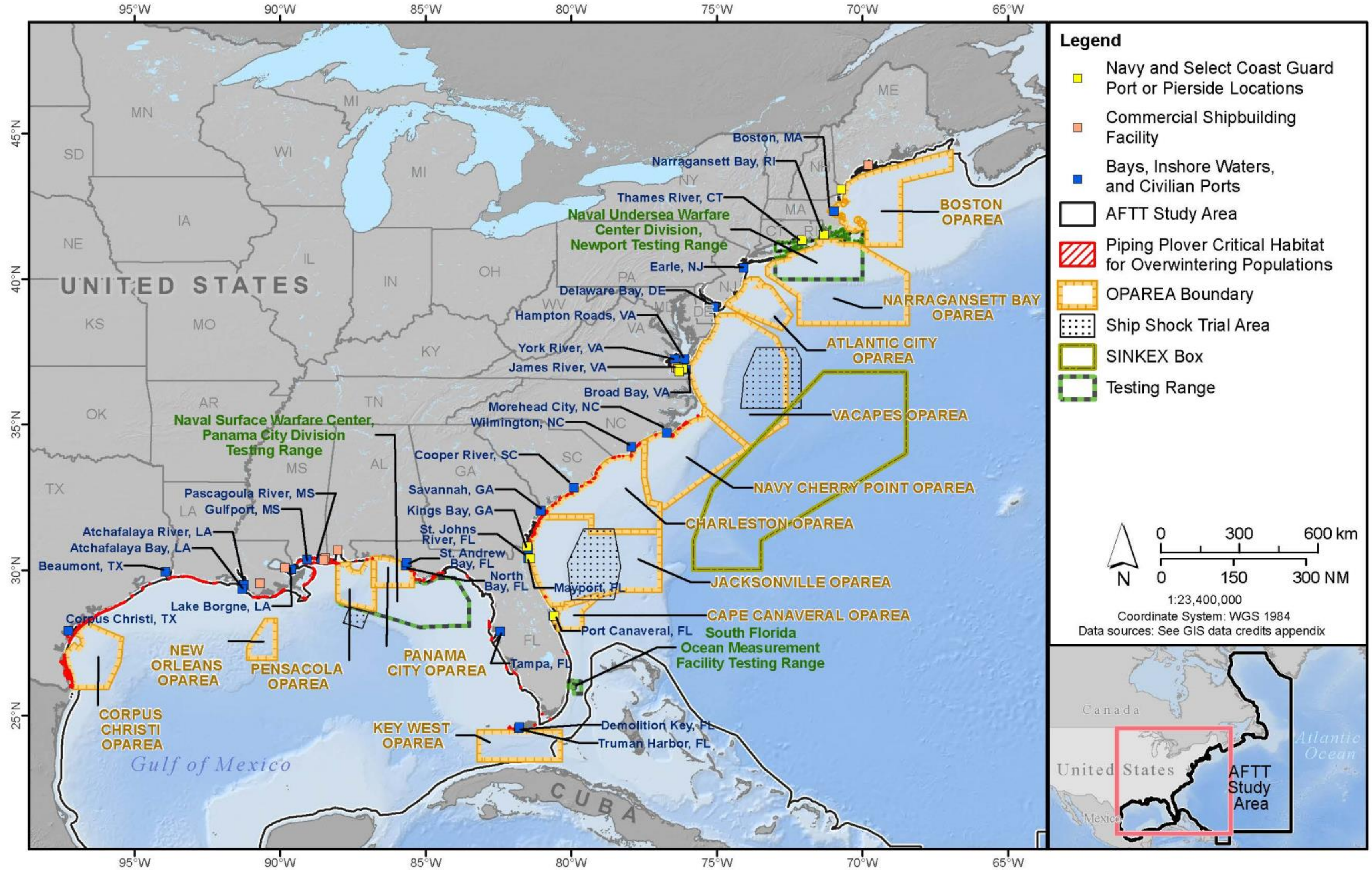
[1] The roseate tern is listed as endangered under the ESA along the Atlantic coast south to North Carolina, Canada (Newfoundland, Nova Scotia, Quebec), and Bermuda.

[2] The roseate tern is listed as threatened under the ESA in the Western Hemisphere and adjacent oceans, including Florida, Puerto Rico, and the Virgin Islands.

[3] USFWS anticipates proposing critical habitat for the black-capped petrel in 2024 (88 *Federal Register* 89611)

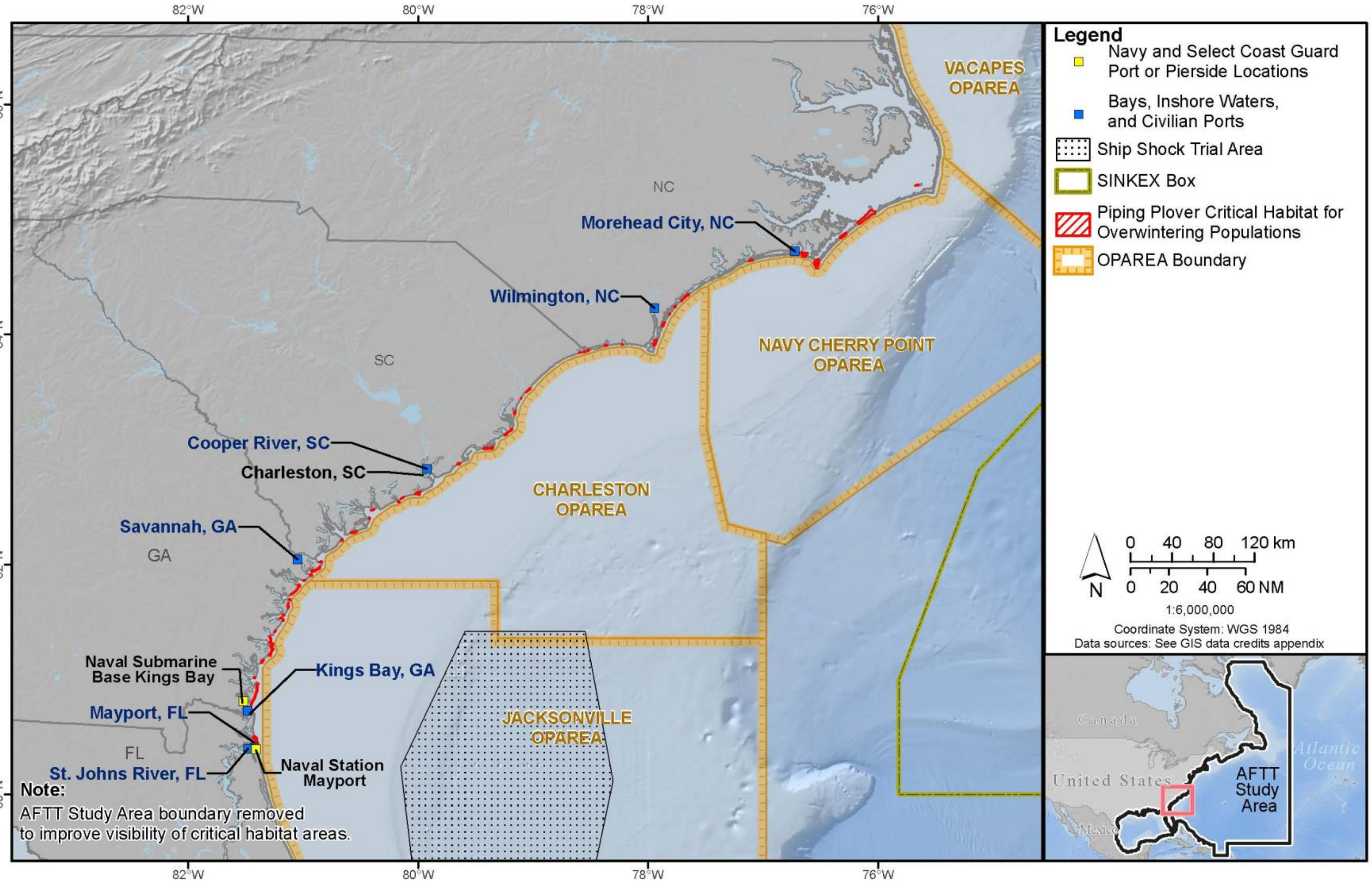
* Critical habitat is adjacent to the Study Area

Source: U.S. Fish and Wildlife Service (2023) for ESA Status.



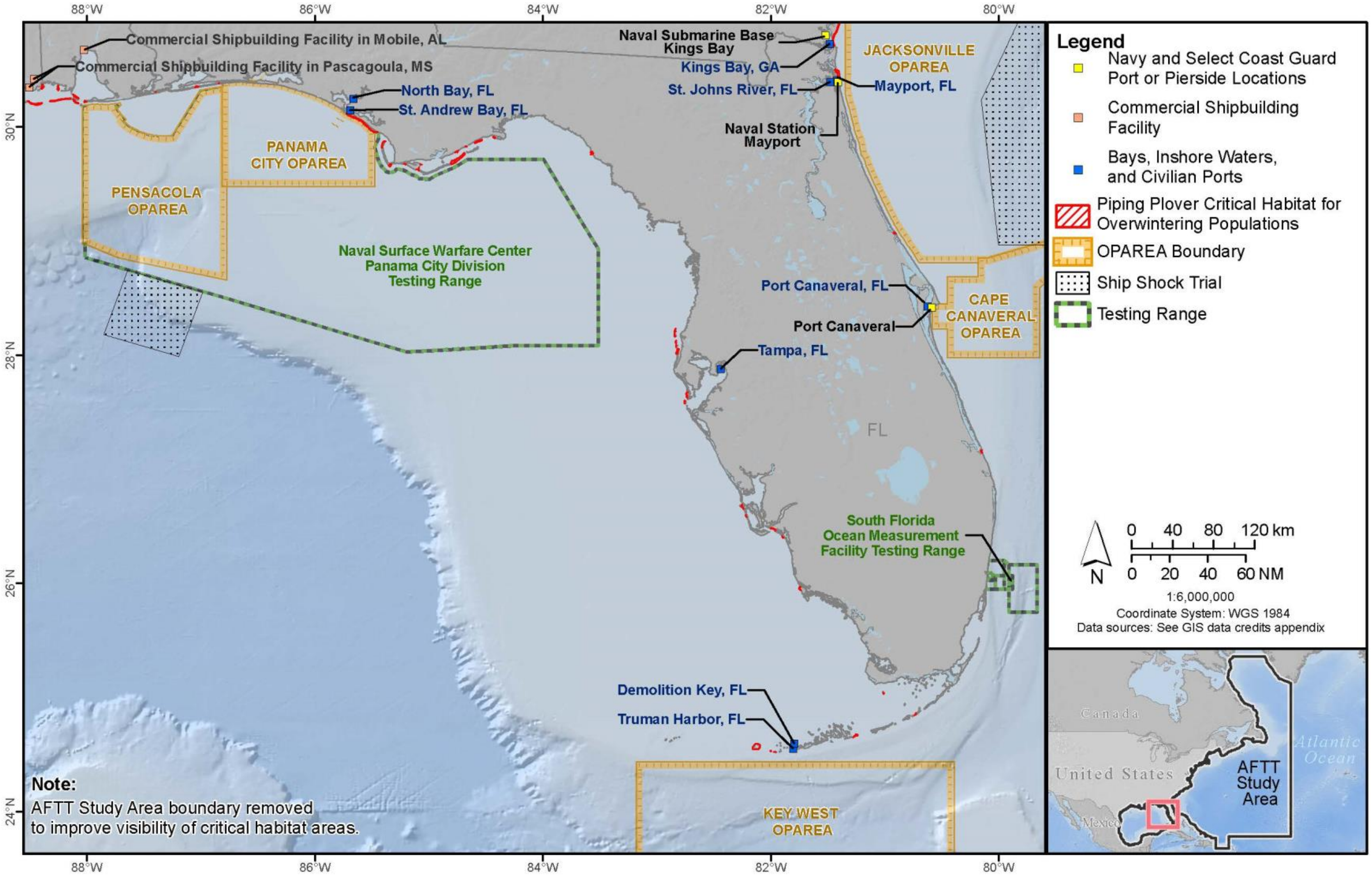
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.9-1: Piping Plover Critical Habitat near the Study Area



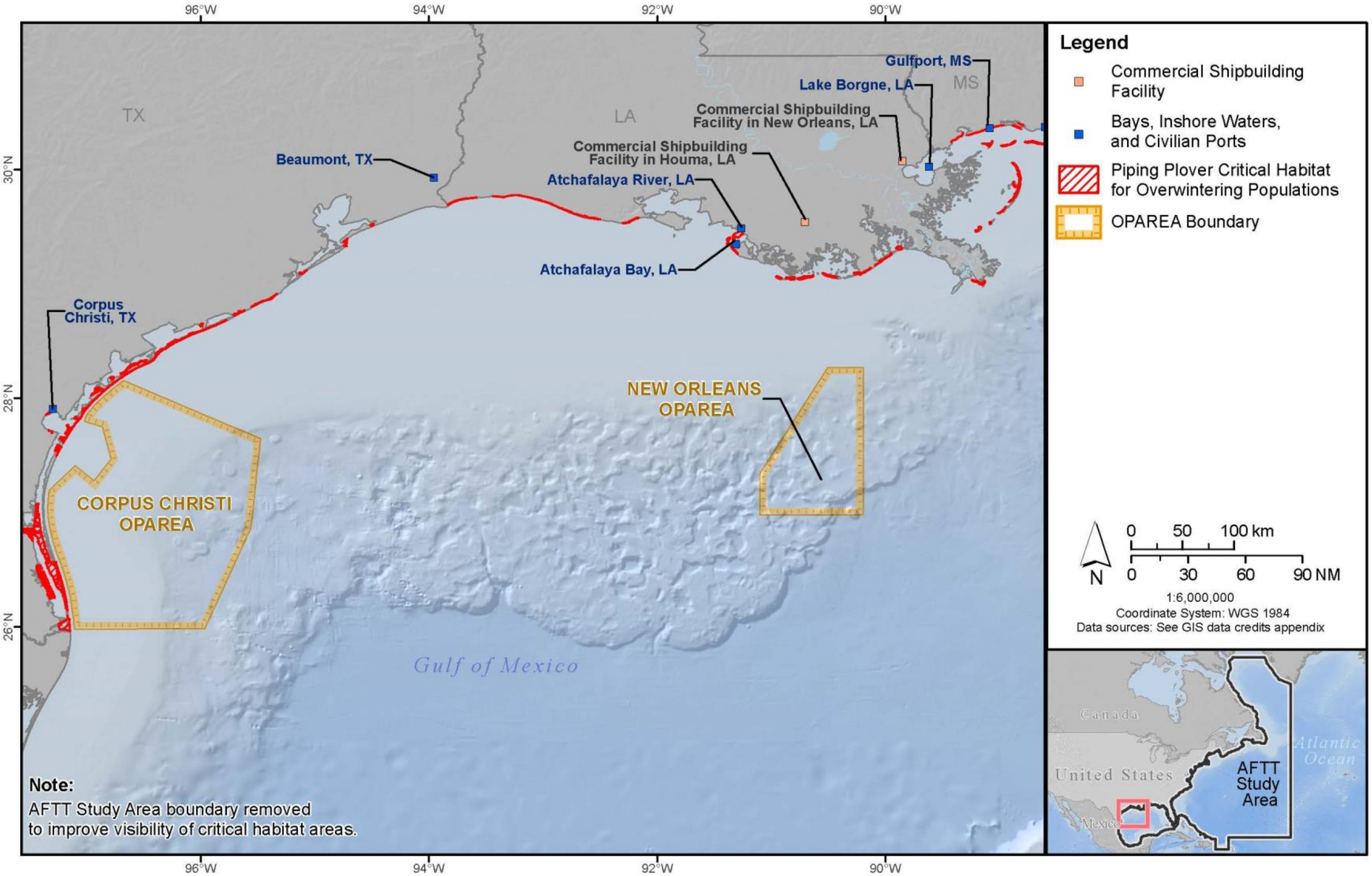
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.9-2: Piping Plover Critical Habitat near the Southeast Portion of the Study Area



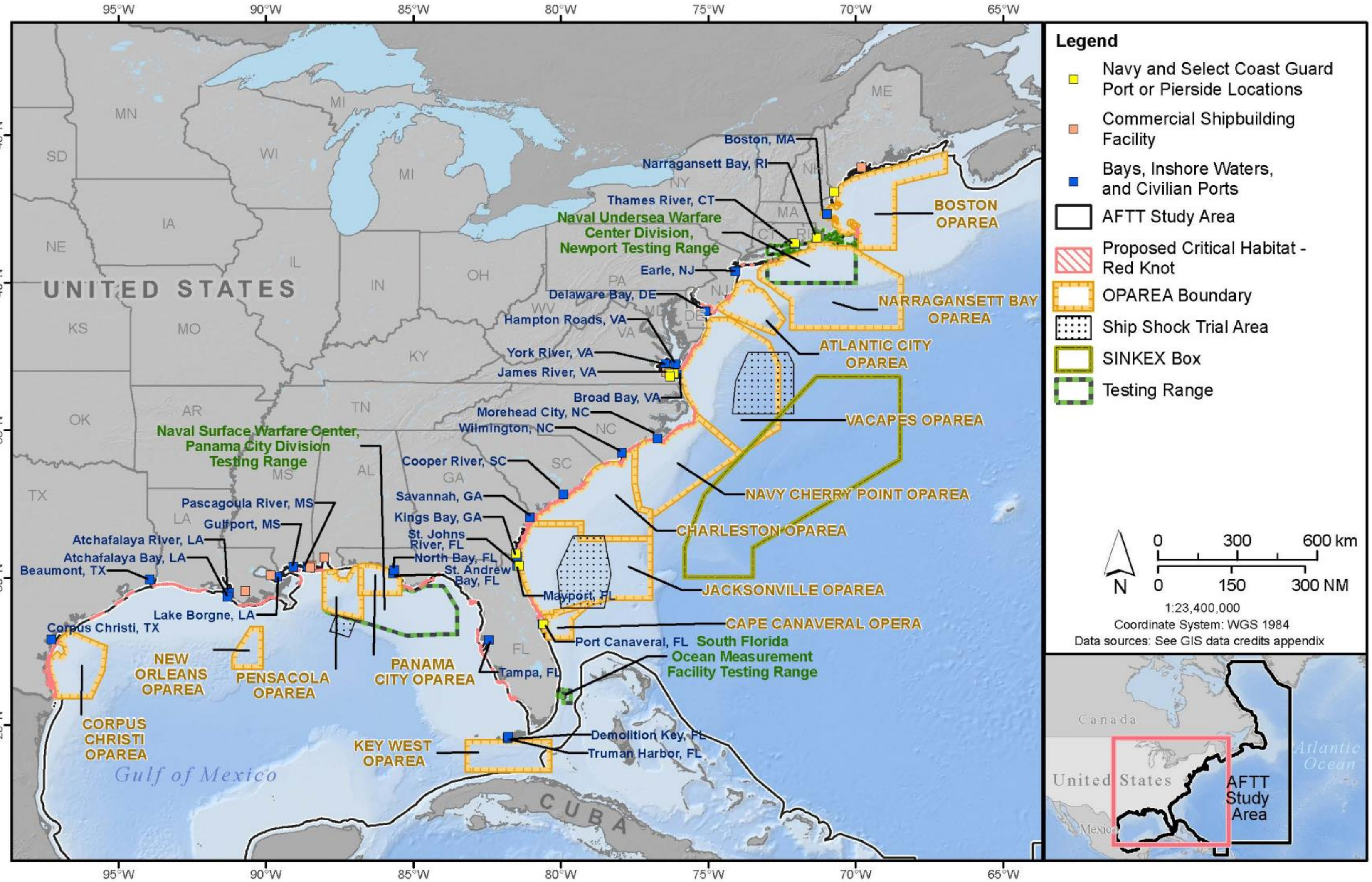
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.9-3: Piping Plover Critical Habitat near the Eastern Gulf of Mexico Portion of the Study Area



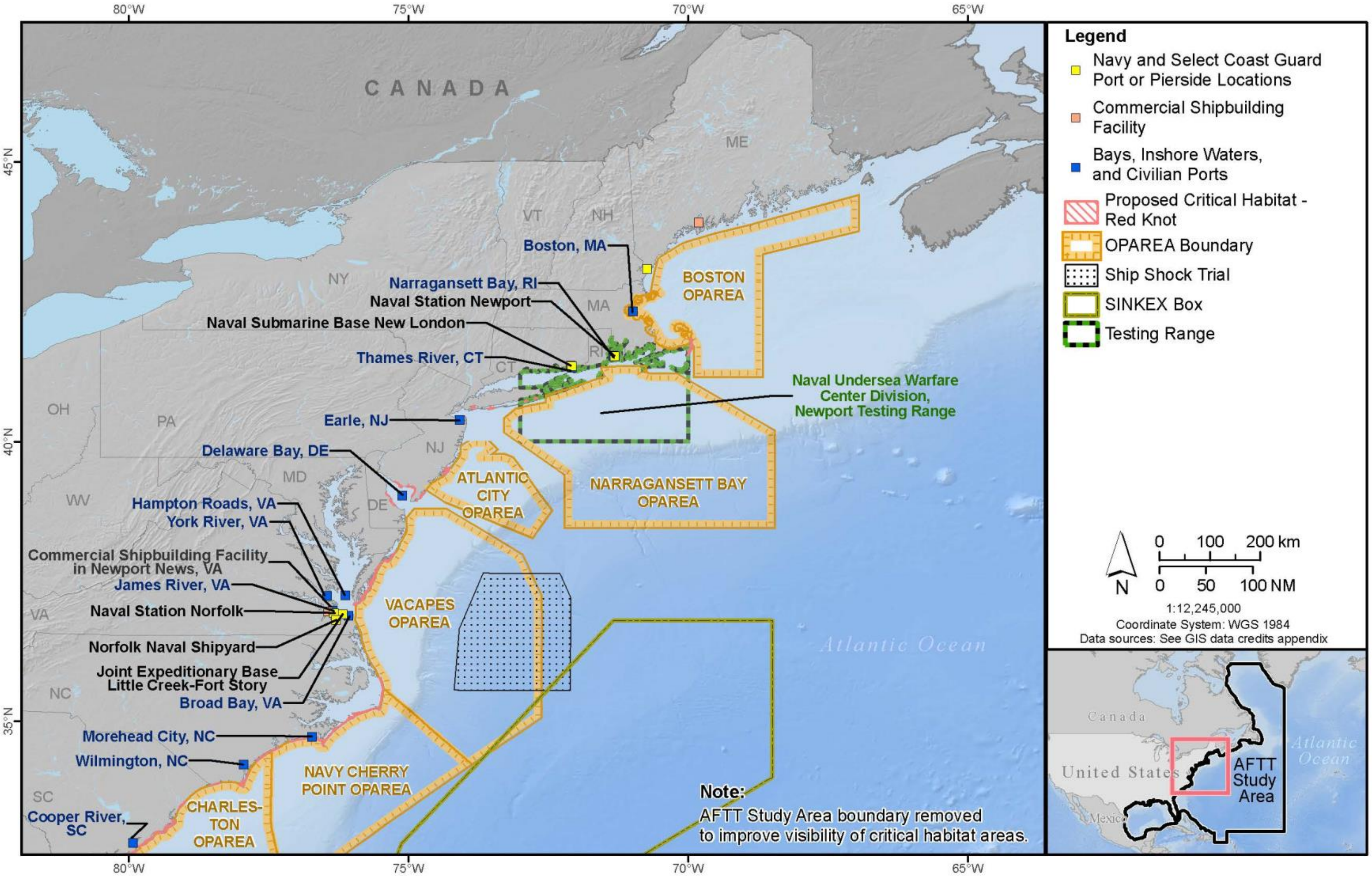
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.9-4: Piping Plover Critical Habitat near the Western Gulf of Mexico Portion of the Study Area



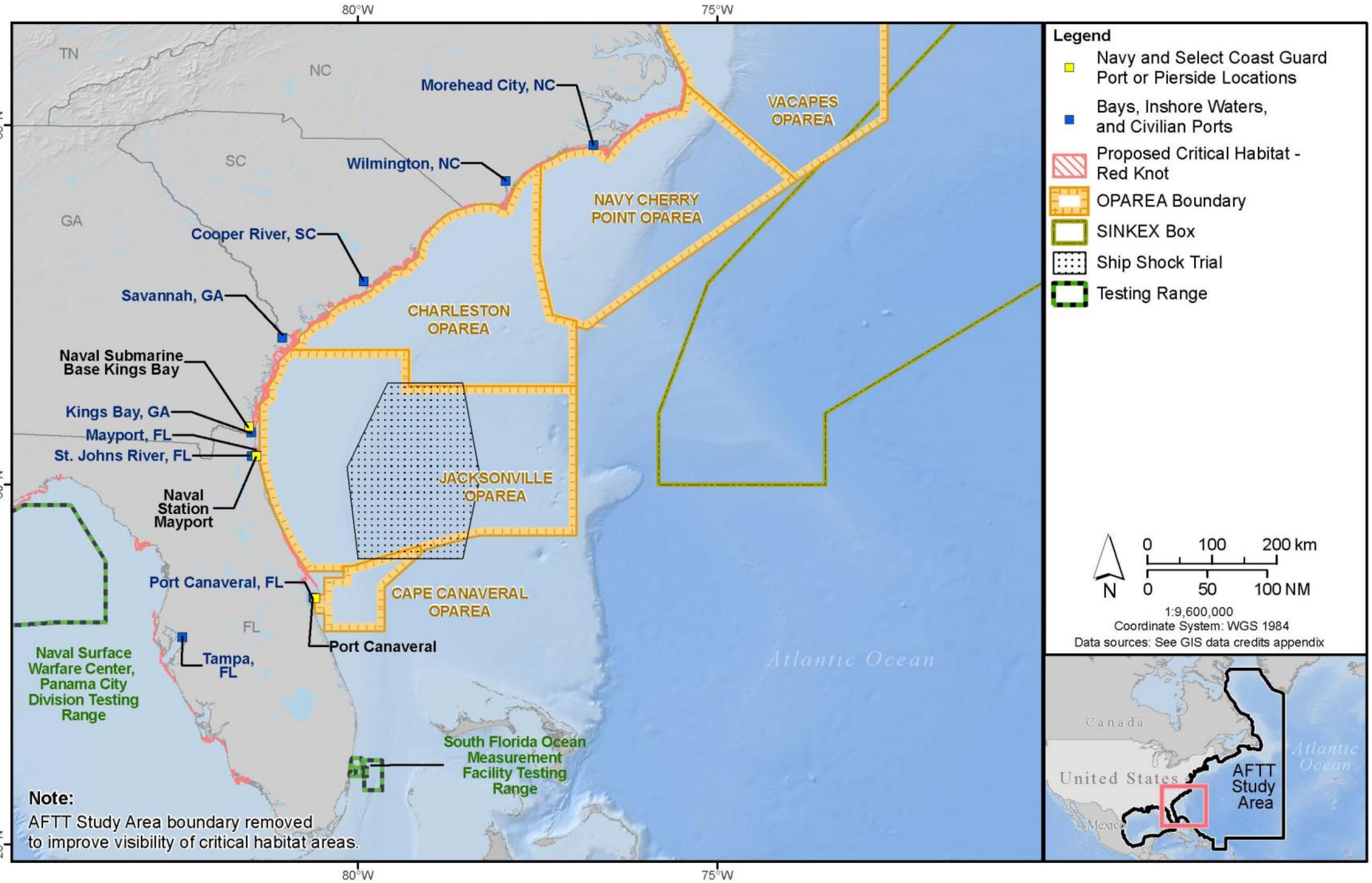
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.9-5: Red Knot Proposed Critical Habitat near the Study Area



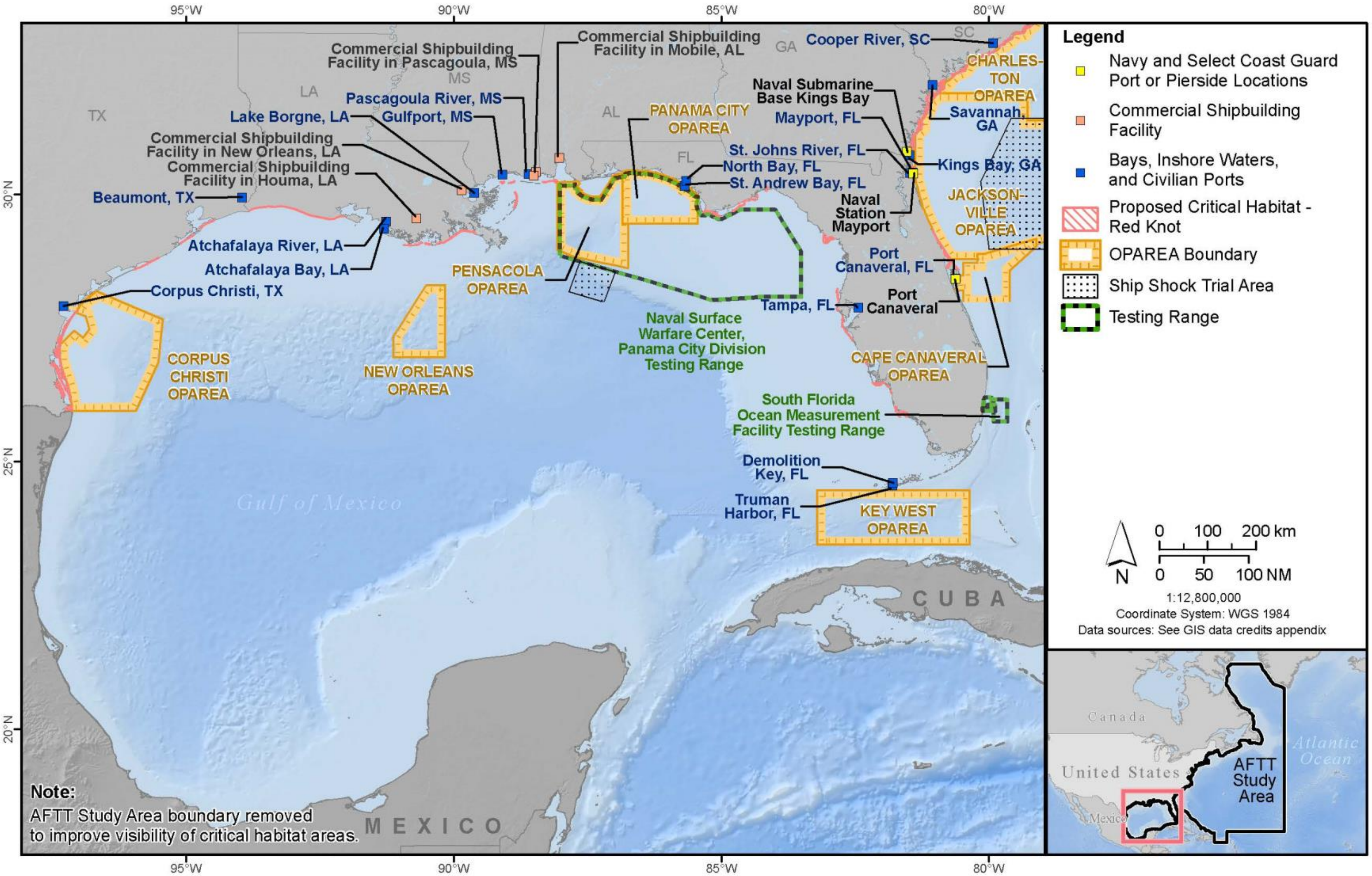
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.9-6: Red Knot Proposed Critical Habitat near the Northeast Portion of the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.9-7: Red Knot Proposed Critical Habitat near the Southeast Portion of the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.9-8: Red Knot Proposed Critical Habitat near the Gulf of Mexico Portion of the Study Area

3.9.2.3 Species Not Listed under the Endangered Species Act

There are at least 160 species of birds and 24 species of bats found in the Study Area that are not listed under the ESA. Table 3.9-2 and Table 3.9-3 provide general descriptions of the bird taxonomic groups and bat species and their location/habitat use in the Study Area. Specific habitats (e.g., shallow-water coral reefs, live hard bottom, seagrass beds, and coastal wetlands) are defined and mapped in Section 3.3 (Habitats). Additional information on each taxonomic group is provided in Appendix F (Biological Resources Supplemental Information). Bats are terrestrial but may be found within the Study Area transiting between islands, migrating along the coast, or searching for prey offshore; therefore, they may be found airborne above inshore training areas as well as ports/piers.

Table 3.9-2: Description and Occurrence of Major Taxonomic Groups of Birds in the Study Area

Birds Groups		*Occurrence in the Study Area*		
Name	***Description***	***Range Complex/Testing Range***	***Range Complex Inshore***	***Piers/Ports/ Coast Guard Stations***
Order Anseriformes: geese, swans, dabbling and diving ducks	Diverse group of birds that inhabit shallow waters, coastal areas, and deeper waters. Feed at the surface by dabbling or by diving in deeper water. Often occur in large flocks.	All locations: Airborne, surface, water column	All Locations: Airborne, surface, water column	All locations: Airborne, surface, water column
Order Gaviiformes: loons	Duck-like, fish-eating birds that capture prey by diving and underwater pursuit.	All locations: Airborne, surface, water column	All locations: Airborne, surface, water column	All locations: Airborne, surface, water column
Order Podicipediformes: grebes	Small diving birds, duck-like. May occur in small groups.	All locations: Airborne, surface, water column	All locations: Airborne, surface, water column	All locations: Airborne, surface, water column
Order Procellariiformes: albatrosses, fulmars, petrels, shearwaters, and storm-petrels	Group of largely pelagic seabirds. Fly nearly continuously when at sea. Soar low over the water surface to find prey. Some species dive below the surface.	All locations: Airborne, surface, water column	All locations: Airborne, surface, water column	None
Order Suliformes: boobies, gannets, cormorants, anhingas, and frigatebirds	Diverse group of large, fish-eating seabirds with four toes joined by webbing. Often occur in large flocks near high concentrations of bait fish.	All locations: Airborne, surface, water column	All locations: Airborne, surface, water column	All locations: airborne, surface, water column

Table 3.9-2: Description and Occurrence of Major Taxonomic Groups of Birds in the Study Area (continued)

Birds Groups		*Occurrence in the Study Area*		
Name	***Description***	***Range Complex/Testing Range***	***Range Complex Inshore***	***Piers/Ports/ Coast Guard Stations***
Order Pelecaniformes: pelicans, herons, egrets, ibis, and spoonbills	Large wading birds with dagger-like, down-curved, or spoon-shaped bills used to capture prey in water or mud.	All locations: airborne, surface, water column	All locations: Airborne, surface, water column	All locations: Airborne, surface, water column
Order Phoenicopteriformes: flamingos	Large, wading birds with unique angled bill to filter invertebrates from water or mud.	JAX RC, Key West Range RC: Airborne, surface, water column	Jacksonville and Key West Range Complexes Inshore: Airborne, surface, water column	Pierside Port Canaveral Civilian Ports Port Canaveral, FL; Tampa, FL Coast Guard Stations Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL: Key West, FL, St. Petersburg, FL
Orders Accipitriformes and Falconiformes: osprey, eagles, falcons	Large raptors that inhabit habitats with open water, including coastal areas. Feed on fish, waterfowl, or other mammals. Migrate and forage over open water.	All locations: airborne, surface, water column	All locations: Airborne, surface	All locations: Airborne, surface
Order Gruiformes: Coots, Cranes, Rails	This order is a highly variable assemblage of wading and terrestrial birds. In the Study Area, members would be coots, cranes and rails, which generally inhabit and forage in coastal areas along shorelines.	All locations: airborne, surface	All locations: Airborne, surface	All locations: Airborne, surface

Table 3.9-2: Description and Occurrence of Major Taxonomic Groups of Birds in the Study Area (continued)

Birds Groups		*Occurrence in the Study Area*		
Name	*Description*	*Range Complex/Testing Range*	*Range Complex Inshore*	*Piers/Ports/ Coast Guard Stations*
Order Caprimulgiformes: Nightjars	Nightjars are nocturnal or crepuscular birds that inhabit open country where they feed on insects on the wing and nest on the ground.	All locations: Airborne	All locations: Airborne	All locations: Airborne
Order Charadriiformes: shorebirds, phalaropes, gulls, noddies, terns, skua, jaegers, and alcids	Diverse group of small- to medium-sized shorebirds, seabirds and allies inhabiting coastal, nearshore, and open-ocean waters.	All locations: Airborne, surface, water column	All locations: Airborne, surface, water column	All locations: Airborne, surface, water column
Orders Passeriformes Cuculiformes, Strigiformes, and Apodiformes: neotropical migrant songbirds, warblers, thrushes, cuckoos, owls, swifts	Largest and most diverse group of birds in North America, primarily occur in coastal, and inland areas, but occur in large numbers over the open ocean (particularly over the Gulf of Mexico) during annual spring and fall migration periods.	All locations: Airborne	All locations: Airborne	All locations: Airborne

Notes: JAX = Jacksonville; RC = Range Complex

As shown in Table 3.9-3, the range of some of the bat species in the Study Area is highly limited (e.g., to Puerto Rico), whereas the range of other bat species includes the vast portions of the Study Area. Most of these bat species eat insects, but some eat fruit and one species eats fish.

Table 3.9-3: Description and Occurrence of Bats in the Study Area

Bat Species		*Occurrence in the Study Area*		
Common Name	***Scientific Name***	***Range Complex/ Testing Range***	***Range Complex Inshore***	***Piers/Ports/Coast Guard Stations***
Big brown bat	*Eptesicus fuscus*	Northeast RC; NUWC Division, Newport Testing Range; VACAPES RC; Navy Cherry Point Range; JAX RC; GOMEX RC; NSWC Panama City, Division Testing Range: Airborne	Northeast RC Inshore, VACAPES RC Inshore, JAX RC Inshore, GOMEX RC Inshore: Airborne	All locations: Airborne
Silver-haired bat	*Lasionycteris noctivagans*	Northeast RC; NUWC Division, Newport Testing Range; VACAPES RC; Navy Cherry Point Range; JAX RC; GOMEX RC; NSWC Panama City, Division Testing Range: Airborne	Northeast RC Inshore, VACAPES RC Inshore, JAX RC Inshore, GOMEX RC Inshore: Airborne	All locations: Airborne
Eastern red bat	*Lasiurus borealis*	Northeast RC; NUWC Division, Newport Testing Range; VACAPES RC; Navy Cherry Point Range; JAX RC; GOMEX RC; NSWC Panama City, Division Testing Range: Airborne	Northeast RC Inshore, VACAPES RC Inshore, JAX RC Inshore, GOMEX RC Inshore: Airborne	All locations: Airborne
Hoary bat	*Lasiurus cinereus*	Northeast RC; NUWC Division, Newport Testing Range; VACAPES RC; Navy Cherry Point Range; JAX RC; GOMEX RC; NSWC Panama City, Division Testing Range: Airborne	Northeast RC Inshore, VACAPES RC Inshore, JAX RC Inshore, GOMEX RC Inshore: Airborne	All locations: Airborne
Northern yellow bat	*Lasiurus intermedius*	Northeast RC; NUWC Division, Newport Testing Range; VACAPES RC; Navy Cherry Point Range; JAX RC; GOMEX RC; NSWC Panama City, Division Testing Range: Airborne	Northeast RC Inshore, VACAPES RC Inshore, JAX RC Inshore, GOMEX RC Inshore: Airborne	All locations: Airborne

Table 3.9-3: Description and Occurrence of Bats in the Study Area (continued)

Bat Species		*Occurrence in the Study Area*		
Common Name	***Scientific Name***	***Range Complex/ Testing Range***	***Range Complex Inshore***	***Piers/Ports/Coast Guard Stations***
Seminole bat	*Lasiurus seminolus*	Northeast RC; NUWC Division, Newport Testing Range; VACAPES RC; Navy Cherry Point Range; JAX RC; GOMEX RC; NSWC Panama City, Division Testing Range: Airborne	Northeast RC Inshore, VACAPES RC Inshore, JAX RC Inshore, GOMEX RC Inshore: Airborne	All locations: Airborne
Pallas's mastiff bat or Pallas's free-tailed bat	*Molossus molossus*	Key West RC: Airborne	Key West RC Inshore: Airborne	Coast Guard Stations Key West, FL Airborne
Leach's single leaf bat	*Monophyllus redmani*	Key West RC: Airborne	None	None
Antillean ghostfaced bat	*Mormoops blainvillei*	GOMEX RC; NSWC Panama City, Division Testing Range: Airborne	None	None
Ghostfaced bat	*Mormoops megalophylla*	GOMEX RC: Airborne	GOMEX RC Inshore: Airborne	Civilian Ports Beaumont, TX; Corpus Christi, TX Coast Guard Stations Corpus Christi, TX Airborne
Southeastern myotis bat	*Myotis austroriparius*	GOMEX RC; NSWC Panama City, Division Testing Range: Airborne	GOMEX RC Inshore: Airborne	Pierside NSB Kings Bay; NS Mayport: Port Canaveral Civilian Ports Kings Bay, GA; Savannah, GA; Mayport, FL; Port Canaveral, FL; Tampa, FL; Mobile, AL; Gulfport, MS; Pascagoula, MS Coast Guard Stations Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; St. Petersburg, FL; Pensacola, FL; New Orleans, LA Airborne

Table 3.9-3: Description and Occurrence of Bats in the Study Area (continued)

Bat Species		*Occurrence in the Study Area*		
Common Name	***Scientific Name***	***Range Complex/ Testing Range***	***Range Complex Inshore***	***Piers/Ports/Coast Guard Stations***
Eastern small-footed bat	*Myotis leibii*	Northeast RC; NUWC Division, Newport Testing Range: Airborne	Northeast RC Inshore: Airborne	Pierside Portsmouth Naval Shipyard; NSB New London; NS Newport Civilian Ports Bath, ME; Boston, MA; Earle, NJ; Delaware Bay, DE Coast Guard Stations Southwest Harbor, ME; Boston, MA; New London, CT; Newport, RI; Montauk, NY; Atlantic City, NJ Airborne
Little brown bat	*Myotis lucifugus*	Northeast RC; NUWC Division, Newport Testing Range; VACAPES RC; Navy Cherry Point Range; JAX RC: Airborne	Northeast RC Inshore; VACAPES RC Inshore; JAX RC Inshore: Airborne	Pierside Portsmouth Naval Shipyard; NSB New London; NS Newport; NS Norfolk; JEB Little Creek Fort Story; Norfolk Naval Shipyard; NSB Kings Bay Civilian Ports Bath, ME; Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC; Wilmington, NC; Kings Bay, GA; Savannah, GA; Mayport, FL; Mobile, AL; Gulfport, MS; Pascagoula, MS Coast Guard Stations Southwest Harbor, ME; Boston, MA; New London, CT; Newport, RI; Montauk, NY; Atlantic City, NJ; Virginia Beach, VA; Portsmouth, VA; Elizabeth City, NC; Charleston, SC; Mayport, FL; Pensacola, FL; New Orleans, LA Airborne

Table 3.9-3: Description and Occurrence of Bats in the Study Area (continued)

Bat Species		*Occurrence in the Study Area*		
Common Name	***Scientific Name***	***Range Complex/ Testing Range***	***Range Complex Inshore***	***Piers/Ports/Coast Guard Stations***
Evening bat	*Nycticeius humeralis*	VACAPES RC; Navy Cherry Point Range; JAX RC; GOMEX RC; NSWC Panama City, Division Testing Range: Airborne	VACAPES RC Inshore; JAX RC Inshore; GOMEX RC Inshore: Airborne	Pierside NS Norfolk; JEB Little Creek Fort Story; Norfolk Naval Shipyard; NSB Kings Bay; NS Mayport; Port Canaveral Civilian Ports Hampton Roads, VA; Morehead City, NC; Wilmington, NC; Kings Bay, GA; Savannah, GA; Mayport, FL; Port Canaveral, FL; Tampa, FL; Beaumont, TX; Corpus Christi, TX; Mobile, AL; Gulfport, MS; Pascagoula, MS Coast Guard Stations Virginia Beach, VA; Portsmouth, VA; Elizabeth City, NC; Charleston, SC; Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL; Key West, FL; St. Petersburg, FL; Pensacola, FL; New Orleans, LA; Corpus Christi, TX Airborne
Mexican free-tailed bat	*Tadarida brasiliensis*	JAX RC; GOMEX RC; NSWC Panama City, Division Testing Range: Airborne	JAX RC Inshore; GOMEX RC Inshore: Airborne	Pierside NSB Kings Bay; NS Mayport; Port Canaveral Civilian Ports Kings Bay, GA; Savannah, GA; Mayport, FL; Port Canaveral, FL; Tampa, FL; Beaumont, TX; Corpus Christi, TX; Mobile, AL; Gulfport, MS; Pascagoula, MS Coast Guard Stations Charleston, SC; Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL; Key West, FL; St.

Table 3.9-3: Description and Occurrence of Bats in the Study Area (continued)

Bat Species		*Occurrence in the Study Area*		
Common Name	***Scientific Name***	***Range Complex/ Testing Range***	***Range Complex Inshore***	***Piers/Ports/Coast Guard Stations***
				Petersburg, FL; Pensacola, FL; New Orleans, LA; Corpus Christi, TX Airborne
Mexican bulldog bat or greater bulldog bat	*Noctilio leporinus*	GOMEX RC: Airborne	None	None
Rafinesque's big-eared bat	*Plecotus rafinesquii*	VACAPES RC; Navy Cherry Point Range; JAX RC; GOMEX RC; NSWC Panama City, Division Testing Range: Airborne	VACAPES RC Inshore; JAX RC Inshore; GOMEX RC Inshore: Airborne	<u>Pierside</u> NS Norfolk; JEB Little Creek Fort Story; Norfolk Naval Shipyard; NSB Kings Bay; NS Mayport; Port Canaveral <u>Civilian Ports</u> Hampton Roads, VA; Morehead City, NC; Wilmington, NC; Kings Bay, GA; Savannah, GA; Mayport, FL; Port Canaveral, FL; Tampa, FL; Beaumont, TX; Corpus Christi, TX; Mobile, AL; Gulfport, MS; Pascagoula, MS <u>Coast Guard Stations</u> Virginia Beach, VA; Portsmouth, VA; Elizabeth City, NC; Charleston, SC; Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL; Key West, FL; St. Petersburg, FL; Pensacola, FL; New Orleans, LA; Corpus Christi, TX Airborne
Sooty mustached bat	*Pteronotus quadridens*	GOMEX RC: Airborne	GOMEX RC Inshore: Airborne	None

Sources: Constantine (2003); International Union for Conservation of Nature (2017); Placer (1998); Tetra Tech Inc (2016).
Notes: GOMEX = Gulf of Mexico; JAX = Jacksonville; JEB = Joint Expeditionary Base; NS = Naval Station; NSB = Naval Submarine Base; NSWC = Naval Surface Warfare Center; NUWC = Naval Undersea Warfare Center; RC = Range Complex; VACAPES = Virginia Capes

3.9.2.3.1 Migratory Birds

Migratory birds are those that undertake periodic seasonal movement from one region to another, typically coinciding with available food supplies, breeding requirements, and seasonal changes. A variety of bird species would be encountered in the Study Area including those listed under the Migratory Bird Treaty Act, which protects nearly all migratory species of birds, eggs, and nests and establishes federal responsibilities for protecting these species.

Of the 1,106 species protected under the Migratory Bird Treaty Act, over 100 species occur in the Study Area (88 *Federal Register* 49310). For the analysis of impacts, these species are not analyzed individually but are grouped based on taxonomic or behavioral similarities based on the stressor that is being analyzed. Determinations of potential impacts on species protected under the Migratory Bird Treaty Act are presented in Section 3.9.5 (Migratory Bird Treaty Act Determinations).

Birds of Conservation Concern are species, subspecies, and populations of migratory birds that the U.S. Fish and Wildlife Service (USFWS) determined to be the highest priority for conservation actions to prevent the need to list birds under the ESA (U.S. Fish and Wildlife Service, 2021). The USFWS updated the list of Birds of Conservation Concern in 2021 after preparation of the 2018 Final EIS/OEIS. Table 3.9-4 lists the species with potential to occur in the Study Area.

Table 3.9-4: Birds of Conservation Concern with Potential to Occur in the Study Area

Order/Family	*Common Name*	*Scientific Name*
Order Procellariiformes		
Family Procellariidae	Black-capped petrel	*Pterodroma hasitata*
	Fea's petrel	*Pterodroma feae*
	Cory's shearwater	*Calonectris borealis*
	Manx shearwater	*Puffinus puffinu*
	Audubon's shearwater	*Puffinus lherminieri*
Family Hydrobatidae	Band-rumped storm petrel	*Oceanodroma castro*
Order Sulifromes		
Family Sulidae	Masked booby	*Sula dactylatra*
	Red-footed booby	*Sula sula sula*
Family Frigatidae	Magnificent frigatebird	*Fregata magnificens*
Order Pelecaniformes		
Family Ardeidae	Reddish egret	*Egretta rufescens*
	Great blue heron	*Ardea herodias*
Order Falconiformes		
Family Falconidae	Swallow-tailed kite	*Elanoides forficatus*
Order Gruiformes		
Family Rallidae	King rail	*Rallus elegans*
	Yellow rail	*Coturnicops noveboracensis*
Order Charadriiformes		
Family Haematopodidae	American oystercatcher	*Haematopus palliatus*
Family Charadriidae	American golden plover	*Pluvialis dominica*
	Wilson's plover	*Charadrius wilsonia*
	Mountain plover	*Charadrius montanus*
	Snowy plover	*Charadrius nivosus*
Family Scolopacidae	Whimbrel	*Numenius phaeopus*

Table 3.9-4: Birds of Conservation Concern with Potential to Occur in the Study Area (continued)

Order/Family	*Common Name*	*Scientific Name*
Subfamily Scolopacinae	Long-billed curlew	*Numenius americanus*
	Hudsonian godwit	*Limosa haemastica*
	Marbled godwit	*Limosa fedoa*
	Ruddy turnstone	*Arenaria interpres morinella*
	Dunlin	*Calidris alpina*
	Red knot	*Calidris canutus*
	Buff-breasted sandpiper	*Calidris subruficollis*
	Purple sandpiper	*Calidris maritima*
	Pectoral sandpiper	*Calidris melanotos*
	Semipalmated sandpiper	*Calidris pusilla*
	Short-billed dowitcher	*Limnodromus griseus*
	Lesser yellowlegs	*Tringa flavipes*
	Willet	*Tringa semipalmata*
Family Laridae Subfamily Rynchopinae	Black skimmer	*Rynchops niger*
Family Laridae Subfamily Sterninae	Gull-billed tern	*Gelochelidon nilotica*
	Least tern	*Sternula antillarum*
	Sandwich tern	*Thalasseus sandvicensis*
	Forster's tern	*Sterna forster*
Order Caprimulgiformes		
Family Caprimulgidae	Chuck-will's-widow	*Antrostomus carolinensis*
	Eastern whip-poor-will	*Antrostomus vociferus*
Order Passeriformes		
Family Turdidae	Wood thrush	*Hylocichla mustelina*
Family Parulidae	Bay-breasted warbler	*Dendroica castanea*
	Blue-winged warbler	*Vermivora pinus*
	Canada warbler	*Wilsonia canadensis*
	Cerulean warbler	*Dendroica cerulea*
	Black-throated green warbler	*Setophaga virens*
	Kentucky warbler	*Oporornis formosus*
	Prairie warbler	*Dendroica discolor*
	Prothonotary warbler	*Protonotaria citrea*
Family Cardinalidae	Dickcissel	*Spiza americana*
	Scarlet tanager	*Piranga olivacea*
	Painted bunting	*Passerina ciris*
Family Troglodytidae	Marsh wren	*Cistothorus palustris*
Family Passerellidae	Grasshopper sparrow	*Ammodramus savannarum*
Family Icteriidae	Yellow-breasted chat	*Icteria virens*
	Bobolink	*Dolichonyx oryzivorus*
Order Cuculiformes		
Family Cuculidae	Mangrove cuckoo	*Coccyzus minor*
	Black-billed cuckoo	*Coccyzus erythropthalmus*
Order Apodiformes		
Family Apodidae	Chimney swift	*Chaetura pelagica*

Source: U.S. Fish and Wildlife Service (2021)

3.9.3 Environmental Consequences

Under the No Action Alternative for all stressors and substressors the Action Proponents would not conduct any of the proposed military readiness activities in the Study Area. Therefore, baseline conditions of the existing environment for resources would either remain unchanged or would improve after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further in this section.

This section describes and evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) and Section 3.0.3.3 (Identifying Stressors for Analysis) could potentially impact birds and bats known to occur in the Study Area.

Designated critical habitat for the piping plover and proposed critical habitat for red knot are near, but not within the Study Area, and the Proposed Action would not affect the physical and biological features of the critical habitat. Bermuda petrels and roseate terns do not have designated critical habitat. Therefore, impacts from the Proposed Action would not be applicable to any ESA-listed bird critical habitat.

The stressors vary in intensity, frequency, duration, and location in the Study Area. General characteristics of all stressors were introduced in the 2018 Final EIS/OEIS Section 3.0.3.3 (Identifying Stressors for Analysis) and living resources' general susceptibilities to stressors were introduced in Section 3.0.3.6 (Biological Resource Methods) in this Supplemental EIS/OEIS. The stressors and substressors analyzed for birds and bats include the following:

- **acoustics** (sonar and other transducers; air guns; pile driving; aircraft noise; vessel noise; and weapons noise)
- **explosives** (explosions in-air and in-water)
- **energy** (in-water electromagnetic devices; in-air electromagnetic devices; high-energy lasers)
- **physical disturbance and strike** (vessels and in-water devices; aircraft and aerial targets; military expended materials)
- **entanglement** (wires and cables; decelerators/parachutes)
- **ingestion** (military expended materials other than munitions)

A discussion of secondary stressors, to include the potential impacts to habitat or prey availability, and the potential impacts of all the stressors combined are provided at the end of the section.

The analysis of potential impacts considers standard operating procedures and mitigation measures that would potentially provide protection to birds and bats. Standard operating procedures are detailed in Appendix A (Section A.2.7, Standard Operating Procedures). Mitigation measures relevant to birds and bats are referenced in Table 3.9-5. Details on all mitigation measures are provided in Chapter 5 (Mitigation).

The criteria for determining the significance of Proposed Action stressors on birds and bats are described in

Table 3.9-6. The abbreviated analysis under each substressor and alternative provides the technical support for these determinations, with reference to supporting appendices for details.

Table 3.9-5: Mitigation Requirements Summary by Stressor

Applicable Stressor	*Protection Focus*	*Section Reference*
Acoustics (Aircraft Noise)	Piping plover nesting habitat	Chapter 5 (Mitigation) Section 5.7 (Geographic Mitigation)
Acoustics (Aircraft Noise)	Roseate tern nesting habitat	Chapter 5 (Mitigation) Section 5.7 (Geographic Mitigation)
Explosives (Ship Shock Trials)	Large flocks of seabirds (any species)[1]	Chapter 5 (Mitigation) Section 5.6 (Visual Observations)
Physical Disturbance and Strike (Aircraft)	Large flocks of birds and bats (any species)	Appendix A (Activity Descriptions) Section A.2.7 (Standard Operating Procedures)

[1] The mitigation was developed to protect possible indicators of marine mammal presence, which includes large flocks of seabirds.

Table 3.9-6: Criteria for Determining the Significance of Proposed Action Stressors on Birds and Bats

Impact Descriptor	*Context and Intensity*	*Significance Conclusion*
Negligible	Impacts to birds or bats would be limited to temporary (lasting several hours) behavioral disturbances to individuals located in the project area. No mortality or debilitating injury to any individual bird or bat would occur. There would be no displacement of birds or bats from preferred breeding and feeding areas, nest sites, nursery grounds, or migratory routes. Impacts on bird or bat habitat would be temporary (e.g., temporary displacement of finfish prey) with no lasting damage or alteration.	Less than significant
Minor	Impacts to birds or bats would be temporary or short term (lasting several days to several weeks) and in the natural range of variability of species' populations, habitats, and the natural processes sustaining them. This could include non-life-threatening injury to individual birds or bats and small disruptions of time-sensitive behaviors such as breeding. Displacement of birds or bats from preferred breeding and feeding areas, nursery grounds, or migratory routes would be short term and limited to the project area. Any resulting increased competition, additional energy expenditure, or loss of young would not affect overall bird or bat population numbers or demographic structure. Impacts on habitat (e.g., short-term displacement of finfish prey, increased turbidity, trampled vegetation) would be easily recoverable with no long-term or permanent damage or alteration.	Less than significant
Moderate	Impacts to birds or bats would be short term or long term (lasting several months or longer) and outside the natural range of variability of species' populations, habitats, and the natural processes sustaining them. This could include debilitating injury or mortality and disruptions of time-sensitive behaviors such as breeding. Behavioral responses and displacement would be expected from individuals in the project area, its immediate surroundings, or beyond. Long-term displacement of individuals from preferred breeding and feeding areas, nursery grounds, or migratory routes would occur. Resulting increased competition and energy expenditure would cause a loss of breeding or egg-bearing adults and young at large enough scales to negatively impact overall bird or bat population numbers or demographic structure but would not threaten the continued existence of any species. Habitat would be damaged or altered potentially over the long term but would continue to support dependent species.	Less than significant

Table 3.9-6: Criteria for Determining the Significance of Proposed Action Stressors on Birds and Bats (continued)

Impact Descriptor	*Context and Intensity*	*Significance Conclusion*
Major	Impacts to birds or bats would be short term or long term and well outside the natural range of variability of species' populations, habitats, or the natural processes sustaining them. This could include extensive (i.e., affecting a large proportion of the local population), life-threatening, or debilitating injury and mortality and substantial disruption of time-sensitive behaviors such as breeding. Displacement of birds or bats from preferred breeding or feeding areas, nursery grounds, or migratory routes would occur in project areas, their immediate surroundings, and beyond. Behavioral disruptions and displacement would result in the loss of breeding (or egg-bearing adults) and young due to increased competition or energy expenditure at scales large enough to affect overall bird or bat population numbers or demographic structure. Impacts would also be considered major if they threatened the continued existence of any bird or bat species. Full recovery of bird or bat populations would not be expected to occur in a reasonable time. Habitat would be degraded over the long term or permanently such that it would no longer be able to support dependent populations of birds or bats.	Significant

With noted exceptions, the stressor background information and environmental consequences are not meaningfully different from what is described in the 2018 Final EIS/OEIS (Section 3.9.3, Environmental Consequences).

3.9.3.1 Acoustic Stressors

Table 3.9-7 contains brief summaries of background information that is relevant to the analysis of impacts for each acoustic substressor. Detailed information on acoustic impact categories as well as effects specific to each substressor are provided in Appendix D (Acoustic and Explosive Impacts Supporting Information).

While each of these substressors could affect birds and bats, the following analysis focuses on those substressors that would occur in new areas and those that would occur more often than what was analyzed in the 2018 Final EIS/OEIS.

Table 3.9-7: Acoustic Stressors Background Information Summary

Substressor	*Background Information Summary*
Sonar and other transducers	• Bats would not be affected by sonar and other transducers as bats are not found in the water column. • Pursuit-diving bird species may be exposed to sonar and other transducers while foraging underwater; however, diving occurs for only for a few minutes at a time. • Injury of the lungs from sonar and other transducers is unlikely in birds. • Hearing loss would only occur if a bird were close to a sound source of sufficient intensity and duration. It is unlikely that a diving bird would experience underwater exposure to sonar or other transducers that would impact hearing.

Table 3.9-7: Acoustic Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
Air guns	• Bats would not be affected by air guns as they are not found in the water column. • Sound from military air guns lack the strong shock wave and rapid pressure increases of explosions that can cause primary blast injury or barotraumas. Generated impulses would have short durations, typically a few hundred milliseconds. Noise may result in hearing loss, masking, physiological stress, or behavioral reaction. However, the intermittent nature of this noise is unlikely to result in masking and is likely to cause startle or avoidance responses. • The exposure to these sounds by birds, other than pursuit-diving species, would be negligible because they spend a very short time underwater. • Pursuit divers may experience underwater sound exposure. However, exposure is unlikely because of the short duration of an air gun pulse; relatively low source (exposure would require a bird to be very close to the source at the moment of discharge); and generally, air guns are used at depths greater than birds forage.
Pile driving	• Impact pile driving produces repetitive, impulsive, broadband sound. Vibratory pile removal produces nearly continuous sound. Sounds are emitted both in the air and in the water in nearshore areas where some birds and bats forage. Noise may result in hearing loss, masking, physiological stress, or behavioral reaction. However, the intermittent nature of most pile driving noise is unlikely to result in masking and is likely to cause startle or avoidance responses. • Rapid large pressure change near impulsive sound sources may cause physical injury (barotrauma). • Most individuals would avoid the locations during pile driving and removal activities. However, if prey species such as fishes are killed or injured as a result of pile driving, some birds may be attracted to the area for foraging and be exposed to noise. • Behavioral responses and displacement from the area are expected to be temporary for the duration of the pile driving and extraction activities.
Vessel noise	• Birds respond to vessels in various ways; some follow vessels while others avoid vessels. • Bats are attracted to vessels as roosting habitat and, if lighted, may be attracted to them for foraging purposes. • Vessel noise could elicit short-term behavioral or physiological responses but is not likely to disrupt migrating, breeding, feeding, and sheltering, or result in serious injury to any birds and bats. • Harmful bird/vessel interactions are commonly associated with commercial fishing vessels because birds are attracted to concentrated food sources. Such concentrations are not present around military vessels. • While bats may be attracted to military vessels, they are expected to be able to detect and avoid bat/vessel interactions utilizing their echolocation capabilities. • Given the rare occurrence of bats in areas where vessels operate, acoustic disturbance of bats in the Study Area is not expected to occur.
Aircraft noise	• Birds and bats could be exposed to noise associated with subsonic and supersonic fixed-wing aircraft and rotary-wing aircraft overflights. • Exposure to fixed-wing aircraft noise would be brief and infrequent and repeated exposure of individuals in a short period of time (hours or days) is unlikely. • Common behavioral responses to aircraft noise include no response or stationary alert behavior, startle response, flight, and changes in vocalization. • There is also the potential for noise to mask calls. • In some instances of frequent exposure or exposure to intense noise, behavioral responses could affect breeding, foraging, habitat use, and energy budgets.

Table 3.9-7: Acoustic Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
Weapons noise	• Sounds produced by weapons are potential stressors to birds and bats. • Large-caliber weapons firing occurs generally greater than 12 nautical miles from shore and medium and small caliber could occur closer to shore and inshore waters. • Sound generated by a muzzle blast is intense, but very brief. A bird or bat very close to a large weapons blast could be injured or experience hearing loss. Birds could also experience threshold shift due to acoustic trauma. • Sound generated by a projectile travelling at speeds greater than the speed of sound can produce a low amplitude bow shock wave in a narrow area around its flight path, which may disturb birds and bats. • Inert objects hitting the water surface would generate a splash and the noise may disturb nearby birds and bats. • Bird and bat responses to weapons firing and projectile travel noise may include short-term behavioral or physiological responses such as alert responses, startle responses, or temporary increases in heart rate. • Studies of impacts of weapons noise on raptors show that these birds show little reaction (e.g., head turn) and do not alter behavior in the presence of noise from weapons testing (Brown et al., 1999; Schueck et al., 2001; Stalmaster & Kaiser, 1997). • Once surface weapons firing activities begin, birds and bats would likely disperse away from the area around the ship and the path of projectiles.

3.9.3.1.1 Impacts from Sonar and Other Transducers

Table 3.9-7 contains a summary of the background information used to analyze the potential impacts of sonar and other transducers on birds and bats. For information on sonar and other transducers hours or counts proposed for each alternative, see Table 3.0-2 (Sonar and Transducer Sources Quantitatively Analyzed).

3.9.3.1.1.1 Impacts from Sonar and Other Transducers under Alternative 1

As discussed, in Section 3.0.3.3.1 (Acoustic Stressors), a detailed comparison of sonar quantities analyzed in the 2018 Final EIS/OEIS with sonar quantities under this Proposed Action is not feasible due to changes in the source binning process. However, the overall use of sonar and other transducers would decrease from the 2018 Final EIS/OEIS for both training and testing activities.

Under Alternative 1, changes from the 2018 Final EIS/OEIS for training activities using low-frequency sonar (in addition to other types of sonar) would include the following:

- There would be a small increase in unit-level Anti-Submarine Warfare activities in the Gulf of Mexico Range Complex.

Under Alternative 1, changes from the 2018 Final EIS/OEIS for testing activities using low-frequency sonars would include the following:

- Under Anti-Submarine Warfare testing activities, there would be new events in the high seas, Gulf of Mexico Range Complex Inshore, Joint Expeditionary Base Little Creek, Naval Station Mayport, Naval Station Norfolk, Naval Submarine Base King Bay, and Naval Submarine Base New London.
- There would also be a notable increase in Anti-Submarine Warfare activities in Bath, Maine, and Pascagoula, Mississippi.

For all other locations, there would be a decrease or a similar number of activities that involve the use of low-frequency sonar to the 2018 Final EIS/OEIS.

Pursuit-diving birds could be exposed to low-, mid-, and high-frequency sonar and sound produced by sonar and other transducers during military readiness activities. The greatest potential for measurable effects would be near the sources of low-frequency and high-intensity sonar. For Alternative 1 activities this would occur mostly in the offshore marine environment and would therefore only impact seabirds. Sonar and other transducers would not be regularly used in nearshore areas that could be used by foraging shorebirds, except during maintenance and for navigation in areas around ports. Therefore, seabirds that forage in open-ocean areas would have a greater chance of underwater sound exposure than birds that forage in coastal areas. Sonar and other transducer sounds associated with Alternative 1 activities may result in brief, intermittent impacts to individual birds. The analysis conclusions for the use of sonar and other transducers during training and testing activities under Alternative 1 are consistent with a minor impact on bird and bat populations.

Under the ESA, the use of sonar and other transducers during training and testing activities described under Alternative 1 may affect Bermuda petrels and black-capped petrels. The use of sonar and other transducers would have no effect on piping plovers, red knots, or roseate terns. The use of sonar and other transducers would not be applicable to Indiana bats, northern long-eared bats, or tricolored bats.

The use of sonar and transducers during training and testing is not applicable to designated critical habitat for piping plover or proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.1.1.2 Impacts from Sonar and Other Transducers under Alternative 2

Under Alternative 2, sonar use during training activities would increase compared to Alternative 1:

- The maximum number of composite training exercises would occur each year, and an additional composite training exercise would occur in the Gulf of Mexico Range Complex.

Impacts from sonar and other transducers under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The quantities of sonar and other transducer activity (e.g., hours, counts) under Alternative 2 would increase only slightly over Alternative 1.

3.9.3.1.2 Impacts from Air Guns

Refer to Table 3.9-7 for a summary of the background information used to analyze the potential impacts of air guns on birds and bats. For information on air gun counts proposed for each alternative, see Table 3.0-3 (Training and Testing Air Gun and Non-Explosive Impulsive Sources Quantitatively Analyzed in the Study Area).

3.9.3.1.2.1 Impacts from Air Guns under Alternative 1

Air guns would not be used for training activities. The proposed use of air guns for testing would decrease as compared to the 2018 Final EIS/OEIS. Small air guns would be fired over a limited period within a single day. Air gun use would only occur during two testing activities: semi-stationary equipment testing and acoustic and oceanographic research. While air gun use during semi-stationary equipment testing may occur nearshore at Newport, Rhode Island, air gun use during acoustic and oceanographic research may occur in the Northeast, Virginia Capes, Jacksonville, and Gulf of Mexico Range Complexes.

Pursuit-diving birds could be exposed to sound produced by air guns during testing activities. Sounds produced by air guns are described in Appendix D (Acoustic and Explosive Impacts Supporting

Information). Sound caused by air gun events would be brief, intermittent, and localized. Although multiple firings would occur per event, activities would be conducted infrequently. Although some individuals would be exposed to noise, the numbers of individuals would be small. Impacts could include behavioral and physiological responses (startle, alert, increased heart rate, dispersal), and activities would be unlikely to impact populations or individual survival, growth, or reproduction. The analysis conclusions for air gun use during testing activities under Alternative 1 are consistent with a negligible impact on bird and bat populations.

Under the ESA, the use of air guns during testing activities as described under Alternative 1 may affect Bermuda petrels and black-capped petrels. The use of air guns would have no effect on piping plovers, red knots, or roseate terns. The use of air guns during testing activities would not be applicable to Indiana bats, northern long-eared bats, or tricolored bats.

The use of air guns is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.1.2.2 Impacts from Air Guns under Alternative 2

Air guns would not be used during training activities. Alternative 2 includes the maximum number of air gun blasts (the upper end of the range of blasts under Alternative 1). Impacts from air guns under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for testing activities.

3.9.3.1.3 Impacts from Pile Driving

Refer to Table 3.9-7 for a summary of the background information used to analyze the potential impacts of pile driving on birds and bats. Only port damage repair training includes pile driving. For information on pile driving quantities proposed for each alternative, see Table 3.0-4 (Number of Piles/Sheets Quantitatively Analyzed under Pile Driving and Removal Training Activities).

3.9.3.1.3.1 Impacts from Pile Driving under Alternative 1

Pile driving or removal would not occur as testing activities. The activity type and location for pile driving activities for training have changed from the 2018 Final EIS/OEIS.

Under Alternative 1 for training:

- Pile driving would occur as part of Port Damage Repair activities in Gulfport, Mississippi.
- Pile driving would no longer occur as part of the Elevated Causeway System at Joint Expeditionary Base Little Creek in the Virginia Capes Range Complex or Marine Corps Base Camp Lejeune in the Navy Cherry Point Range Complex.

Although some individual birds or bats could be exposed to noise from pile driving, the activities would occur intermittently (one event occurring intermittently over approximately 30 days per year) in very limited areas and would be of short duration (maximum of 90 minutes per 24-hour period). The activity would occur in highly disturbed estuarine habitats. Birds and bats in the vicinity are expected to avoid the area and these are disturbed areas where nesting is not expected to occur. The analysis conclusions for pile driving during training activities under Alternative 1 are consistent with a negligible impact on bird and bat populations.

Under the ESA, the use of pile driving during training activities as described under Alternative 1 may affect piping plovers, red knots, roseate tern, and tricolored bats. Pile driving would not be applicable to Bermuda petrels, black-capped petrels, Indiana bats, or northern long-eared bats.

Pile driving is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.1.3.2 Impacts from Pile Driving under Alternative 2

There would be no pile driving or removal associated with testing activities. Impacts from pile driving during training under Alternative 2 are the same as Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same.

3.9.3.1.4 Impacts from Vessel Noise

Refer to Table 3.9-7 for a summary of the background information used to analyze the potential impacts of vessel noise on birds and bats. For information on the number of activities including vessel noise, see Table 3.0-9 (Number and Location of Activities Including Vessels) and Table 3.0-10 (Number and Location of Activities Including In-Water Devices).

3.9.3.1.4.1 Impacts from Vessel Noise under Alternative 1

For both training and testing activities, vessel activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of vessel noise, so impacts would be expected to be similar or lesser than previously concluded.

Under Alternative 1 for training:

- Vessel noise would occur in two locations that are new or not previously analyzed (Gulfport and Pascagoula, Mississippi, respectively). For all other locations, there would either be a decrease or similar events including vessel activity.

Under Alternative 1 for testing:

- Vessel noise would occur in locations not previous analyzed (inshore locations of the Northeast, Virginia Capes, and Gulf of Mexico Range Complexes; Other AFTT Areas; Hampton Roads, Virginia). There would also be notable increases in vessel activity at the Naval Surface Warfare Center Panama City Division Testing Range, Naval Station Norfolk, and Pascagoula, Mississippi. For all other locations, there would either be a decrease or similar amount of vessel activity.

Vessel noise produced during testing and training activities may briefly impact some individuals, but exposures would be brief, localized, and intermittent and would not be expected to impact populations or to impact survival, growth, or reproduction. Birds and bats in the open ocean, foraging or migrating, could be exposed to vessel noise as the vessel passes and may respond by avoiding areas of temporarily concentrated vessel noise. Individual exposure to noise would be infrequent. If a bird or bat responds to vessel noise, only short-term behavioral responses such as startle, head turning, or avoidance would be expected. There is little likelihood of repeated exposures because of the transient nature of vessels and regular movement of birds and bats. The analysis conclusions for vessel noise during training and testing activities under Alternative 1 are consistent with a negligible impact on bird and bat populations.

Under the ESA, vessel noise generated during training and testing activities as described under Alternative 1 may affect piping plovers, red knots, roseate terns, Bermuda petrels, black-capped petrels, Indiana bats, northern long-eared bats, and tricolored bats.

Vessel noise is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.1.4.2 Impacts from Vessel Noise under Alternative 2

Impacts from vessel noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including vessels or in-water devices increases only slightly over that of Alternative 1.

3.9.3.1.5 Impacts from Aircraft Noise

Refer to Table 3.9-7 for a summary of the background information used to analyze the potential impacts of aircraft noise on birds and bats. For information on the number of activities including aircraft noise, see Table 3.0-16 (Number and Location of Activities with Aircraft).

Detailed information on mitigation that the Action Proponents will implement during training activities to reduce aircraft noise exposure on ESA-listed piping plover and roseate tern nesting habitats is provided in Chapter 5 (Mitigation).

The Action Proponents will implement mitigation tailored to reducing aircraft noise from military readiness activities in the ESA-listed bird nesting habitats identified in Table 3.9-8 and shown in Figure 3.9-9 through Figure 3.9-12. The Coastal Virginia Bird Mitigation Area will reduce aircraft noise exposure where the highest concentration of rotary-wing aircraft training is located adjacent to ESA-listed piping plover nesting habitat. The Dry Tortugas Bird and Cultural Resource Mitigation Area will reduce aircraft noise exposure to nesting ESA-listed roseate terns in a location where they would otherwise be exposed to sonic booms and other high levels of noise disturbance.

Table 3.9-8: Important Resource Features for Birds in Mitigation Areas

Species	*Important Resource Feature*	*Coastal Virginia Bird Mitigation Area (Year-Round)*	*Dry Tortugas Bird and Cultural Resource Mitigation Area (Year-Round)*
Piping plover	ESA-Nesting habitat along Virginia Beaches and in the Fisherman Island National Wildlife Refuge (year-round)	X	
Red knot	Proposed critical habitat along Virginia beaches (year-round)	X	
Roseate tern	ESA-listed species nesting habitat (year-round)		X

Note: ESA = Endangered Species Act

3.9.3.1.5.1 Impacts from Aircraft Noise under Alternative 1

For both training and testing activities, aircraft activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of aircraft noise, so impacts would be expected to be similar or lesser than previously concluded.

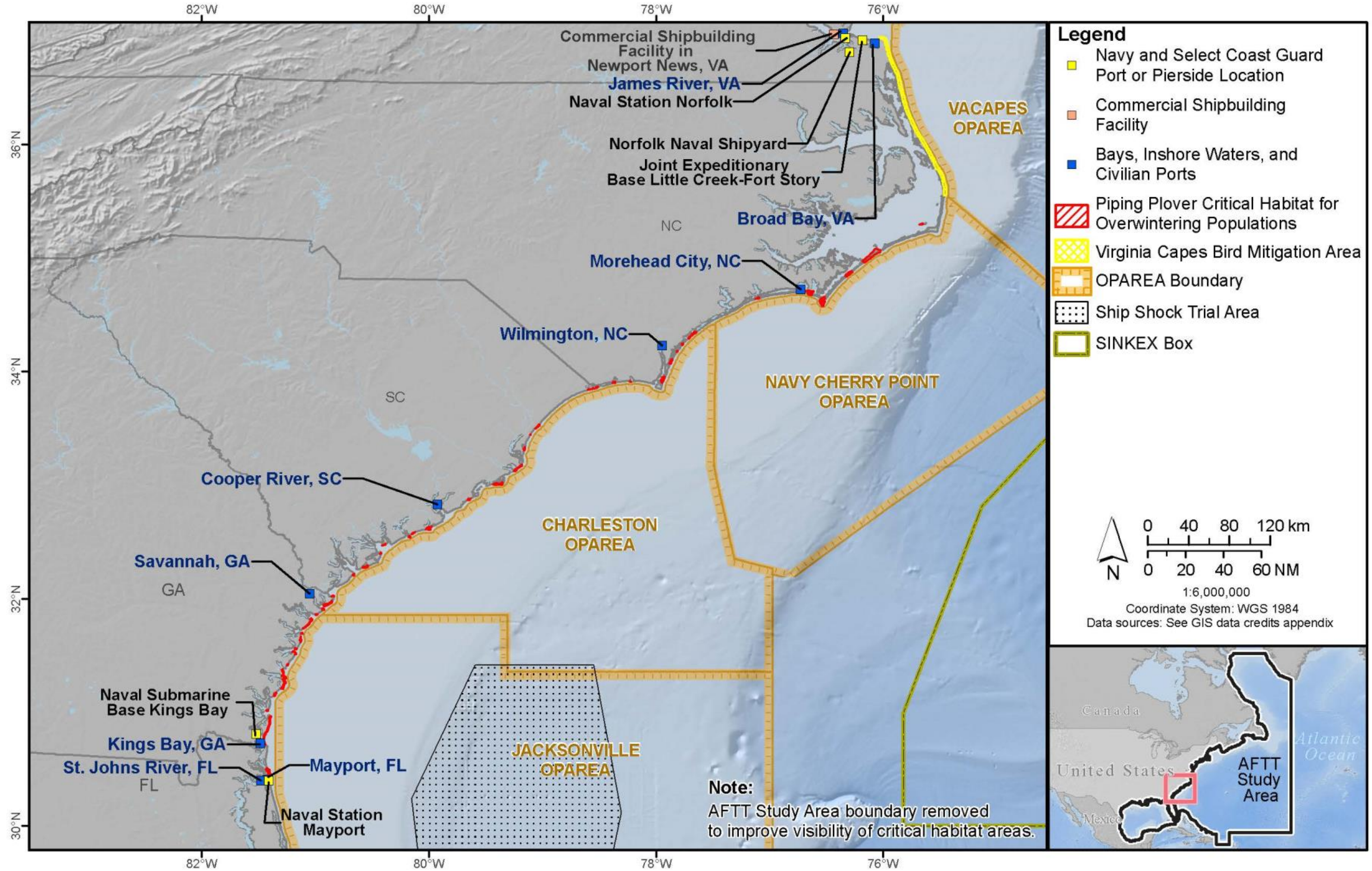
Under Alternative 1, the following changes exist from the 2018 Final EIS/OEIS for training activities:

- A notable increase in the Navy Cherry Point Range Complex.

Under Alternative 1, the following changes exist from the 2018 Final EIS/OEIS for testing activities:

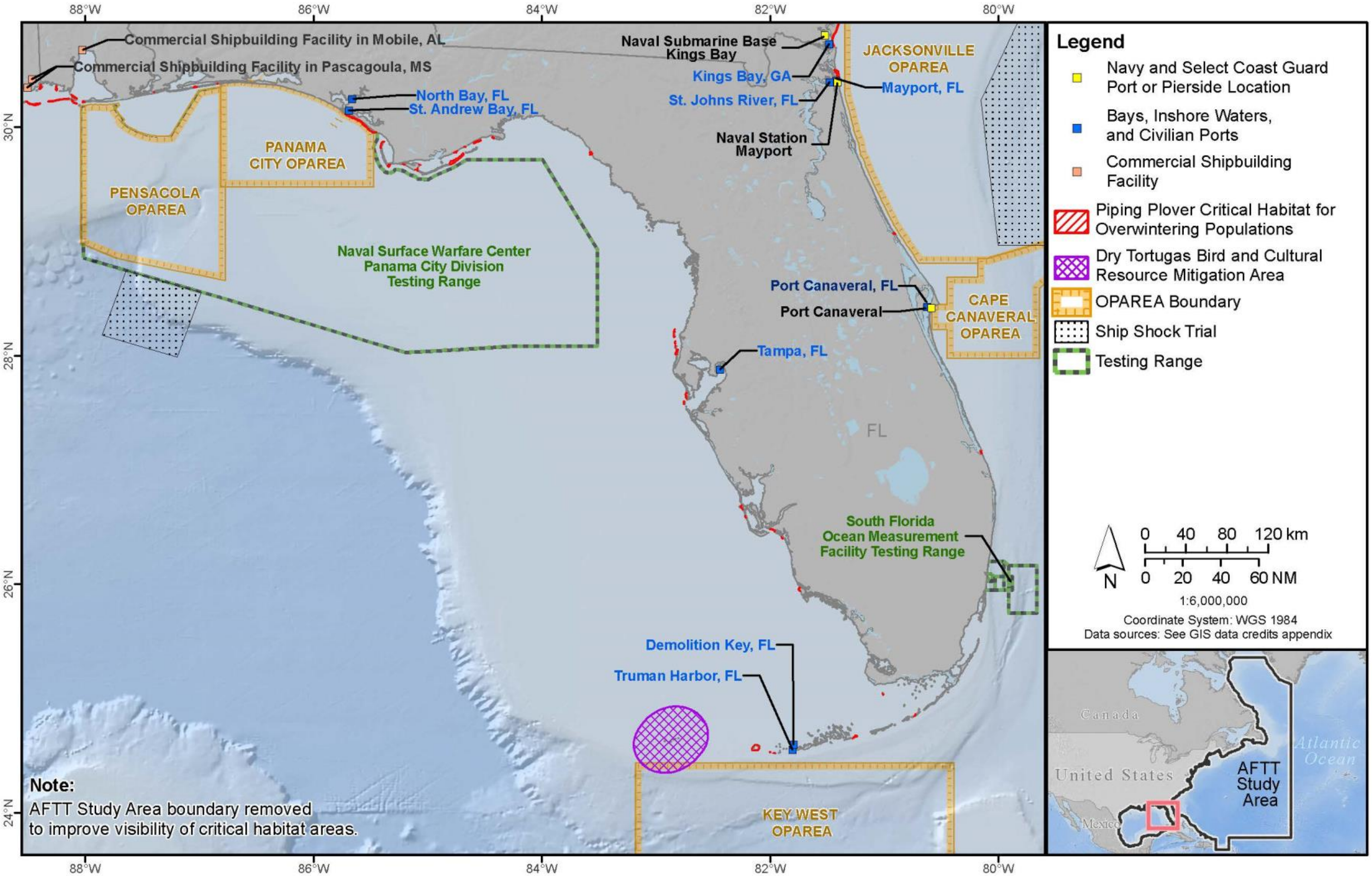
- Aircraft use in the following area that was not previously analyzed: Other AFTT Areas.

For all other locations, there is either a decrease or a similar amount of use, therefore the analysis from the 2018 Final EIS/OEIS remains valid for these areas.



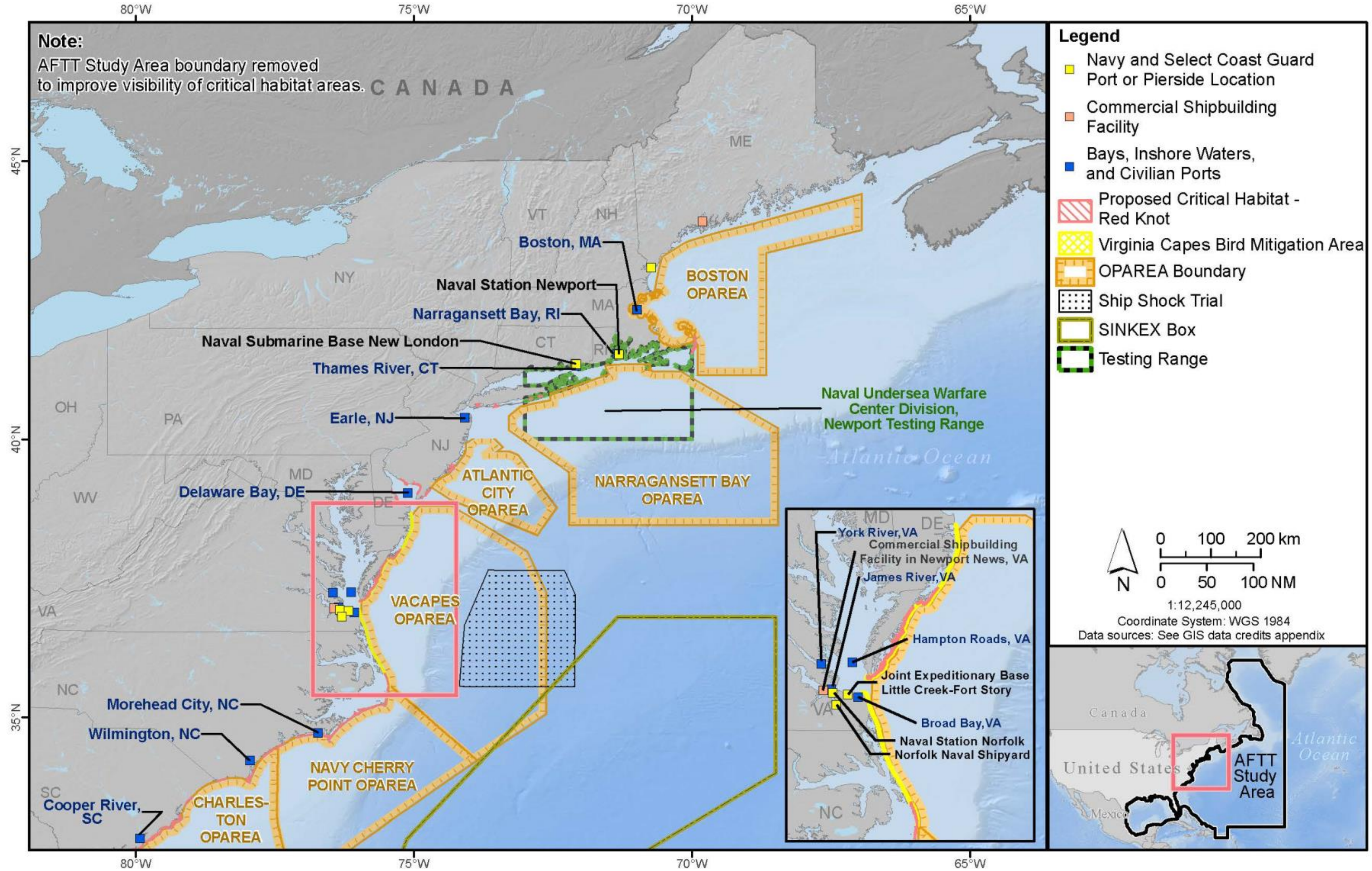
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.9-9: Mitigation Areas and Critical Habitat for Piping Plover in the Southeast Portion of the Study Area



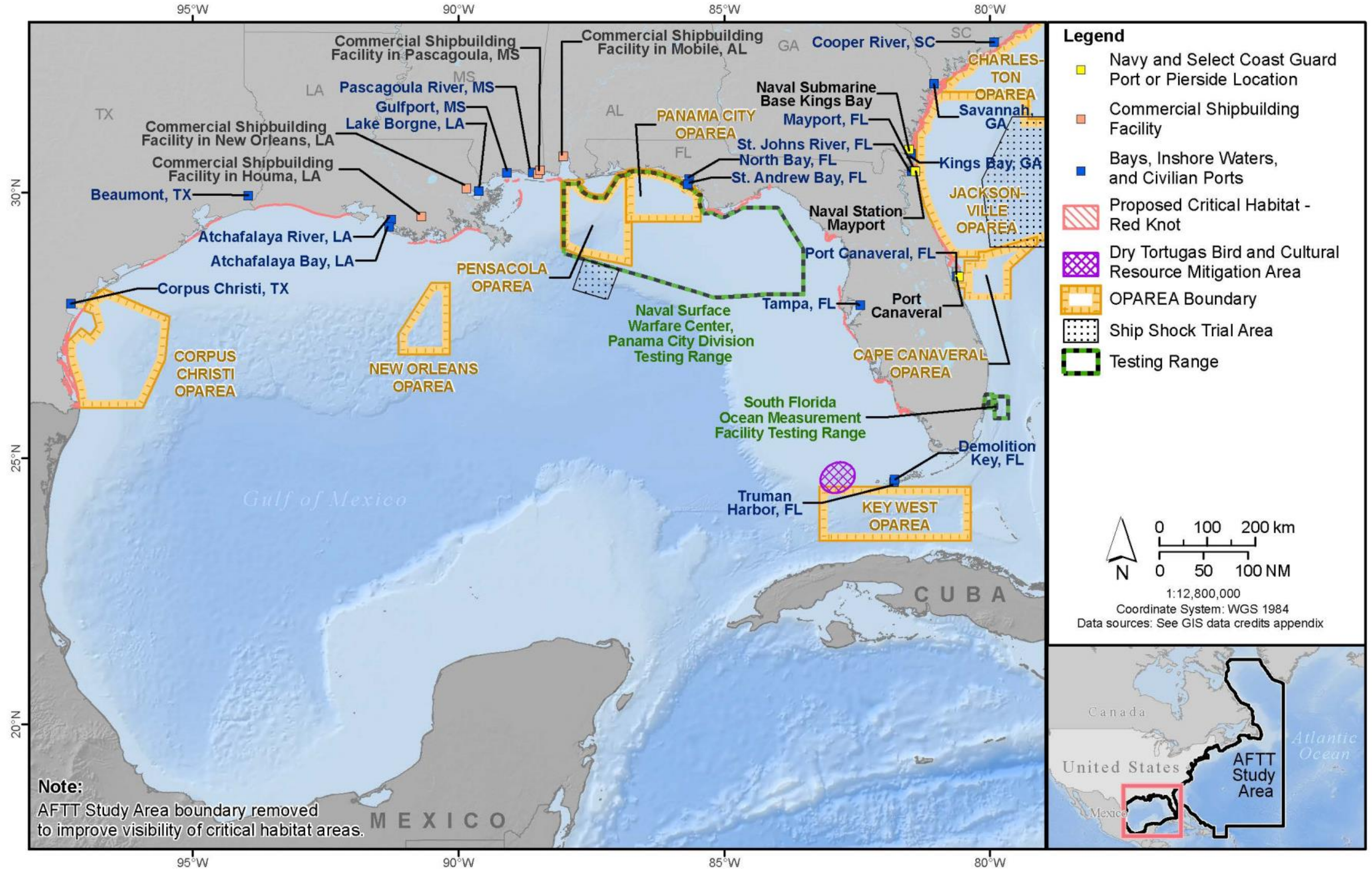
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.9-10: Mitigation Areas and Critical Habitat for Piping Plover in the Gulf of Mexico Portion of the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 3.9-11: Mitigation Areas and Proposed Critical Habitat for Red Knot in the Northeast Portion of the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 3.9-12: Mitigation Areas and Proposed Critical Habitat for Red Knot in the Gulf of Mexico Portion of the Study Area

A bird or bat could be exposed to transient noise from aircraft passing overhead and may respond by avoiding areas where aircraft operations are temporarily concentrated. Aircraft activity would be dispersed, and exposures would be infrequent and brief. This is true of fixed- or rotary-winged aircraft though helicopters could hover for longer periods and helicopter activities would also occur closer to the coast and inshore, increasing the potential to expose birds and bats to aircraft noise. Most training activities would occur during the day, reducing the potential to expose bats in flight. Exposures to aircraft noise, particularly those of longer duration, could result in behavioral responses and physiological stress. However, it is likely that birds or bats present at the beginning of training, would leave the area to avoid exposure to aircraft noise, human presence, and other training-associated stressors. Any reactions are expected to be short term and minor. Repeated exposures of individuals would be unlikely. The analysis conclusions for aircraft noise during training and testing activities under Alternative 1 are consistent with a minor impact on bird and bat populations.

Under the ESA, aircraft noise during training and testing activities as described under Alternative 1 may affect piping plovers, red knots, roseate terns, Bermuda petrels, black-capped petrels, Indiana bats, northern long-eared bats, and tricolored bats.

Aircraft noise is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.1.5.2 Impacts from Aircraft Noise under Alternative 2

Impacts from aircraft noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including aircraft under Alternative 2 would increase only slightly over Alternative 1.

3.9.3.1.6 Impacts from Weapons Noise

Refer to Table 3.9-7 for a summary of the background information used to analyze the potential impacts of weapons noise on birds and bats. For information on the number of activities including weapons noise, see Table 3.0-11 (Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities).

3.9.3.1.6.1 Impacts from Weapons Noise under Alternative 1

For both training and testing activities, weapons activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of weapons noise, so impacts would be expected to be similar or lesser than previously concluded.

Most sounds would be brief, lasting from less than a second for a blast or inert impact to a few seconds for other launch and object travel sounds. Most incidents of impulsive sounds produced by weapons firing, launch, or inert object impacts would be single events, with the exception of gunfire activities.

Because most large-caliber weapon firing would occur more than 12 nautical miles offshore, birds and bats that migrate or forage in open-ocean areas could be exposed to large-caliber weapons noise. All species could be exposed to small- and medium-caliber weapons noise that may occur closer to shore. Because weapon firing occurs at varying locations over a short time period and bird and bat presence changes seasonally and on a short-term basis, individual birds and bats would not be expected to be repeatedly exposed to weapons firing, launch, or projectile noise. Any impacts on migratory or breeding birds and bats related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short term and infrequent. Because impacts to individual birds and bats, if any, are expected to be minor and limited. The analysis conclusions for weapons noise during training and testing activities under Alternative 1 are consistent with a minor impact on bird and bat populations.

Under the ESA, weapons noise during training and testing activities as described under Alternative 1 may affect piping plovers, red knots, roseate terns, Bermuda petrels, black-capped petrels, Indiana bats, northern long-eared bats, and tricolored bats.

Weapons noise is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.1.6.2 Impacts from Weapons Noise under Alternative 2

Impacts from weapons noise under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of items generating weapons firing noise (e.g., non-explosive and explosive practice munitions) under Alternative 2 is the same as Alternative 1.

3.9.3.2 Explosive Stressors

Table 3.9-9 contains brief summaries of background information that is relevant to the analyses of impacts for each explosive substressor. Detailed information on acoustic impact categories in general, as well as effects specific to each substressor, is provided in Appendix D (Acoustic and Explosive Impacts Supporting Information).

While each of these substressors could affect birds and bats, the following analysis focuses on those substressors that would occur in new areas, areas not previously analyzed, and those that would occur more often than what was analyzed in the 2018 Final EIS/OEIS.

Table 3.9-9: Explosives Stressors Background Information Summary

Substressor	*Background Information Summary*
In-air explosives	• Detonations in-air during anti-air warfare training would typically occur at much higher altitudes (greater than 3,000 feet [914 meters] above sea level) where seabirds, migrating birds, and bats are not likely to be present. • Explosives detonated at or just above the water surface, such as those used in anti-surface warfare, would create blast waves that would propagate through both the water and air. • Detonations in-air could also result in mortality or injury to birds and bats. • If prey species (e.g., fishes) are killed or injured as a result of detonations, some birds may be attracted to forage in the area and be exposed to subsequent detonations. • A fleeing response to an initial explosion may reduce bird and bat exposure to any additional explosions that occur in a short time. • Detonations either in-air or underwater have the potential to cause a permanent or temporary hearing loss or auditory threshold shift, which could affect the ability of a bird or bat to communicate or detect biologically relevant sounds. • An explosive detonation would likely cause a startle reaction, as the exposure would be brief, and any reactions are expected to be short term. Startle impacts range from altering behavior (e.g., stop feeding or preening), minor behavioral changes (e.g., head turning), or a flight response. The range of impacts could depend on the charge size, distance from the charge, and the animal's behavior at the time of the exposure. Any impacts related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short term and infrequent.

Table 3.9-9: Explosives Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
	• Because most events would consist of a limited number of detonations, exposures would not occur over long durations; and since events occur at varying locations, it is expected there would be an opportunity to recover from an incurred energetic cost and individual birds and bats would not be repeatedly exposed to explosive detonations.
In-water explosives	• The majority of underwater explosions occur on the surface and typically in offshore locations with depths greater than 100 feet (30 meters). • Sound and energy generated by most small underwater explosions are unlikely to disturb birds and bats at or above the water surface. If a detonation is sufficiently large or is near the water surface, however, pressure would be released at the air-water interface, which could result in injury or mortality of birds and bats. • If prey species (e.g., fishes) are killed or injured as a result of detonations, some birds may be attracted to forage in the area and be exposed to subsequent detonations.

3.9.3.2.1 Impacts from In-Air Explosives

Table 3.9-9 contains a summary of the background information used to analyze the potential impacts of in-air explosives on birds and bats. For information on explosive sizes and quantities for each alternative, see Table 3.0-5 (Explosive Sources Quantitatively Analyzed that Could Be Used Underwater or at the Water Surface).

The Action Proponents will implement mitigation that would reduce the potential for large flocks of seabirds to be exposed to explosives during Ship Shock Trials. The mitigation relies on the presence of indicators, such as large flocks of birds, to indicate the presence of and protect marine mammals, which in turn also protects seabirds.

3.9.3.2.1.1 Impacts from In-Air Explosives under Alternative 1

The use of explosives would decrease overall from the 2018 Final EIS/OEIS for both training and testing activities. Table 3.0-5 (Explosive Sources Quantitatively Analyzed that Could Be Used Underwater or at the Water Surface) provides the explosive sources quantitatively analyzed.

Because most events would consist of a limited number of detonations, exposures would not occur over long durations; and since events occur at varying locations, it is expected there would be an opportunity to recover from an incurred energetic cost and individual birds and bats would not be repeatedly exposed to explosive detonations. Although a few individuals may experience impacts (including injury, hearing impacts, masking, startle response) and potential mortality, population-level impacts are not expected, and explosives would not have a significant adverse effect on populations of birds and bats. The analysis conclusions for in-air explosives use during training and testing activities under Alternative 1 are consistent with a moderate impact on bird and bat populations.

Under the ESA, the use of in-air explosives during training and testing activities as described under Alternative 1 may affect piping plovers, red knots, roseate terns, Bermuda petrels, black-capped petrels, Indiana bats, northern long-eared bats, and tricolored bats.

The use of in-air explosives is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.2.1.2 Impacts from In-Air Explosives under Alternative 2

Impacts under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

3.9.3.2.2 Impacts from In-Water Explosives

Table 3.9-9 contains a summary of the background information used to analyze the potential impacts of explosives on resources. For information on explosive sizes and quantities for each alternative, see Table 3.0-5 (Explosive Sources Quantitatively Analyzed that Could Be Used Underwater or at the Water Surface).

3.9.3.2.2.1 Impacts from In-Water Explosives under Alternative 1

The use of explosives would decrease overall from the 2018 Final EIS/OEIS for both training and testing activities. Notably, for testing there would be no use of bin E17 (greater than 14,500 – 58,000 pounds [lb.] net explosive weight [NEW]) and reduced use of bin E16 (greater than 7,250 to 14,500 lb. NEW) for ship shock trials. There is also a reduction in use of most of the largest explosive bins for both training and testing, and an extremely large decrease in explosives associated with medium-caliber gunnery (bin E1 [0.1 to 0.25 lb. NEW]).

Most activities involving large-caliber naval gunfire, or the launching of targets, missiles, bombs, or other munitions are conducted more than three nautical miles from shore. Very few detonations would occur at inshore locations and would involve the use of smaller charge sizes (E5 or below). Additionally, small ship shock trials could occur in Virginia Capes, Jacksonville, or the Gulf of Mexico Range Complexes. Because most events would consist of a limited number of detonations, exposures would not occur over long durations; and since events occur at varying locations, it is expected there would be an opportunity to recover from an incurred energetic cost and individual birds and bats would not be repeatedly exposed to explosive detonations. Although a few individuals may experience long-term impacts and potential mortality, population-level impacts are not expected, and explosives would not have a significant adverse effect on populations of migratory bird species. The analysis conclusions for in-water explosives use during training and testing activities under Alternative 1 are consistent with a moderate impact on bird and bat populations.

Under the ESA, the use of in-water explosives during training and testing activities as described under Alternative 1 may affect piping plovers, red knots, roseate terns, Bermuda petrels, black-capped petrels, and tricolored bats. The use of in-water explosives would have no effect on Indiana bats and northern long-eared bats.

The use of in-water explosives is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.2.2.2 Impacts from In-Water Explosives under Alternative 2

Impacts from explosives in water under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The explosive sizes and numbers under Alternative 2 are the same as Alternative 1.

3.9.3.3 Energy Stressors

Table 3.9-10 contains brief summaries of background information that is relevant to the analyses of impacts for each energy substressor.

Following a review of recent literature, the background information for energy stressor effects on birds and bats in the Study Area as described in Section 3.9.3.3 (Energy Stressors) of the 2018 Final EIS/OEIS has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS remains valid.

While each of these substressors could affect birds and bats, the following analysis focuses on those substressors that would occur in new areas and those that would occur more often than what was analyzed in the 2018 Final EIS/OEIS.

Table 3.9-10: Energy Stressors Background Information Summary

Substressor	*Background Information Summary*
In-water electromagnetic devices	• Towed in-water electromagnetic devices could impact diving bird species or species on the surface in the immediate area where the device is deployed. There is no information available on how birds react to electromagnetic fields underwater. • Since bats do not dive into water, in-water electromagnetic devices would not affect bats.
In-air electromagnetic devices	• Several different types of in-air electromagnetic devices are used during military readiness activities, including an array of communications transmitters, radars, and electronic countermeasures transmitters. In-air electromagnetic effects can be categorized as thermal (i.e., capable of causing damage by heating tissue) or non-thermal. • Thermal effects are most likely to occur when near high-power systems. Should such effects occur, they would likely cause birds and bats to temporarily avoid the area receiving the electromagnetic radiation until the stressor ceases (Ahlén et al., 2009; Manville, 2016; Nicholls & Racey, 2007, 2009). • Currently, questions exist about the non-thermal effects from low power, in-air electromagnetic devices that occur at a distance from the source. Manville (2016) performed a literature review of this topic. Although findings are not always consistent, the review of several peer-reviewed studies have shown non-thermal effects can include (1) affecting behavior by preventing birds from using their magnetic compass, which may in turn affect migration; (2) fragmenting the DNA of reproductive cells, decreasing the reproductive capacity of living organisms; (3) increasing the permeability of the blood-brain barrier; (4) other behavioral effects; (5) other molecular, cellular, and metabolic changes; and (6) increasing cancer risk. • Cucurachi et al. (2013) also performed a literature review of 113 studies and reported that (1) few field studies were performed (the majority were conducted in a laboratory setting); (2) 65% of the studies reported ecological effects both at high as well as low dosages (i.e., those that are compatible with real field situations, at least on land); (3) no clear dose-effect relationship could be discerned but that studies finding an effect applied higher durations of exposure and focused more on mobile phone frequency ranges; and (4) a lack of standardization and a limited number of observations limited the possibility of generalizing results from an organism to an ecosystem level. • Any temporary disorientation experienced by birds from electromagnetic changes caused by in-air electromagnetic devices may be considered a short-term impact and would not hinder bird navigation abilities due to their use of other orientation cues such as the sun and moon, visual cues, wind direction, infrasound, and scent. • Given the infrequent and seasonal use of the Study Area by bats, the localized nature of the area affected by in-air electromagnetic radiation, and that impacts would be limited to temporary behavioral responses and displacement from the affected area, few, if

Table 3.9-10: Energy Stressors Background Information Summary (continued)

Substressor	Background Information Summary
	any, individual bats would be affected, and exposure would not have persistent or accumulating effects. • Given the dispersed nature of military readiness activities at sea and the relatively low-level and dispersed use of these systems at sea, it is unlikely that birds or bats would be affected by these activities and population-level impacts are not expected. • Similarly, the potential to affect ESA-listed birds and bats is low based on the low numbers of individuals and the transient and brief nature of the use of these devices. No effects are anticipated.
High-energy lasers	• Impacts would occur if individuals were struck directly with a laser beam, which could result in injury or mortality resulting from the thermal effects of radiation exposure. • Birds or bats could be exposed to a laser only if they fly through the beam, a very unlikely occurrence because of the limited use of high-energy lasers and small area, the small area, and the time that the beam would be present.

Notes: % = percent; DNA = deoxyribonucleic acid; ESA = Endangered Species Act

3.9.3.3.1 Impacts from In-Water Electromagnetic Devices

Table 3.9-10 contains a summary of background information used to analyze the potential impacts of in-water electromagnetic devices on birds and bats.

3.9.3.3.1.1 Impacts from In-Water Electromagnetic Devices under Alternative 1

For both training and testing activities, in-water electromagnetic device activity would decrease overall from the 2018 Final EIS/OEIS (Table 3.0-6, Number and Location of Activities Using In-Water Electromagnetic Devices).

Under Alternative 1 for training:

- In-water electromagnetic devices would occur in two areas not previously analyzed (Key West Range Complex and Virginia Capes Range Complex Inshore). There would also be notable increases in in-water electromagnetic devices in the Virginia Capes and Gulf of Mexico Range Complexes. For all other locations, there would either be a decrease or similar amount of in-water electromagnetic devices.

Under Alternative 1 for testing:

- In-water electromagnetic devices would occur in two areas not previously analyzed (Northeast Range Complexes and Hampton Roads, Virginia) for the 2018 Final EIS/OEIS. There would also be a notable increase in in-water electromagnetic devices in the Naval Surface Warfare Center Panama City Testing Area. For all other locations, there would either be a decrease or cessation of in-water electromagnetic devices.

For locations without a notable increase in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.9.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of birds and bats has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of in-water electromagnetic device activity remains an accurate characterization of the Proposed Action in those locations.

For the locations not previously analyzed, introduction of in-water electromagnetic device use has the potential to impact birds that may be exposed in those areas.

Exposure of birds would be limited to those foraging at or below the surface (e.g., terns, cormorants, loons, petrels, or grebes) because that is where the devices are used. The in-water electromagnetic fields generated would be distributed over time and any influence on the surrounding environment would be temporary and localized. In-water electromagnetic devices are typically towed by a helicopter, surface ship, or unmanned vehicle. It is likely that any birds in the vicinity of an approaching vehicle towing an in-water electromagnetic device would be dispersed by the sound and disturbance generated by the vehicle and therefore move away from the vehicle and device before any exposure could occur.

Impacts on birds from potential exposure to in-water electromagnetic devices would be temporary and negligible based on the (1) relatively low intensity of the magnetic fields generated (0.2 microtesla at 656 feet [200 meters] from the source), (2) very localized potential impact area, (3) temporary duration of the activities (hours), (4) occurrence only underwater, and (5) the likelihood that any birds in the vicinity of the approaching vehicles towing an in-water electromagnetic devices would move away from the vehicle and device before any exposure could occur. Bats would not be affected by in-water electromagnetic devices. The analysis conclusions for in-water electromagnetic device use during training and testing activities under Alternative 1 are consistent with a negligible impact on bird and bat populations.

Under the ESA, the use of in-water electromagnetic devices during training and testing activities as described under Alternative 1 may affect roseate terns, Bermuda petrels, and black-capped petrels. The use of in-water electromagnetic devices would not be applicable to piping plovers, red knots, Indiana bats, northern long-eared bats, and tricolored bats.

The use of in-water electromagnetic devices is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.3.1.2 Impacts from In-Water Electromagnetic Devices under Alternative 2

Impacts from in-water electromagnetic devices under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including use of in-water electromagnetic devices under Alternative 2 is the same as Alternative 1.

3.9.3.3.2 Impacts from In-Air Electromagnetic Devices

Refer to Table 3.9-10 for a summary of background information used to analyze the potential impacts of in-air electromagnetic devices on birds and bats. Detailed information is provided in Appendix G (Non-Acoustic Impacts Supporting Information).

3.9.3.3.2.1 Impacts from In-Air Electromagnetic Devices under Alternative 1

The training and testing activities involving in-air electromagnetic devices would occur in all of the training and testing areas both inshore and offshore. Given the dispersed nature of training and testing activities, and the relatively low-level and dispersed use of these systems, the chance that in-air electromagnetic devices would cause thermal damage to an individual bird is low. It is possible, although unlikely, that some individuals would be exposed to levels of electromagnetic radiation that would cause discomfort, in which case they would likely avoid the immediate vicinity of the activity. Possible non-thermal effects could include (1) affecting behavior by preventing birds from using their magnetic compass, which may in turn affect migration; (2) fragmenting the DNA of reproductive cells, decreasing the reproductive capacity of living organisms; (3) increasing the permeability of the blood-brain barrier; (4) other behavioral effects; (5) other molecular, cellular, and metabolic changes; and (6) increasing cancer risk (Manville, 2016). These strong effects would likely only occur as a result of direct, close field exposure to strong electromagnetic radiation. The strength of any avoidance response would also decrease with increasing distance from the in-air electromagnetic devices. The analysis conclusions for in-air electromagnetic device use during training and testing activities under Alternative 1 are consistent with a negligible impact on bird and bat populations.

Under the ESA, the use of in-air electromagnetic devices during training and testing activities as described under Alternative 1 may affect piping plovers, red knots, roseate terns, Bermuda petrels, black-capped petrels, Indiana bats, northern long-eared bats, and tricolored bats.

The use of in-air electromagnetic devices is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.3.2.2 Impacts from In-Air Electromagnetic Devices under Alternative 2

Impacts from in-air electromagnetic devices under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including aircraft under Alternative 2 would increase only slightly over Alternative 1.

3.9.3.3.3 Impacts from High-Energy Lasers

Refer to Table 3.9-10 for a summary of background information used to analyze the potential impacts of high-energy lasers on birds and bats. For information on the number of activities including high energy lasers, see Table 3.0-7 (Number and Location of Activities Using High-Energy Lasers).

3.9.3.3.3.1 Impacts from High-Energy Lasers under Alternative 1

Under Alternative 1 for training:

- High-energy lasers would occur in one area not previously analyzed (Navy Cherry Point Range Complex) in the 2018 Final EIS/OEIS. There would also be notable increases in high-energy lasers at the Virginia Capes and Jacksonville Range Complexes.

Under Alternative 1 for testing:

- High-energy lasers would no longer occur in two locations (South Florida Ocean Measurement Facility and Key West Range Complex) that they occurred in for the 2018 Final EIS/OEIS. For all other locations, there would be a decrease in high-energy lasers. Therefore, the analysis from the 2018 Final EIS/OEIS remains valid for these areas.

For all other locations, there is either a decrease or a similar amount of use, therefore the analysis from the 2018 Final EIS/OEIS remains valid for these areas.

Due to changes in the understanding of how high-energy lasers operate during military readiness activities (i.e., that the high-energy lasers are used in short ranges and the laser shuts off when it loses contact with the target), the analysis has been updated from the 2018 Final EIS/OEIS.

Impacts would occur if individuals were struck directly with a laser beam, which could result in injury or mortality resulting from the thermal effects of radiation exposure. However, impacts from high-energy lasers are unlikely based on the: (1) relatively low number of activities, (2) very localized potential impact area of the laser beam, (3) temporary duration of potential impact (seconds), and (4) the features of the system that further reduce the potential for impacts.

As in the 2018 Final EIS/OEIS, neither birds nor bats are likely to be exposed to high-energy lasers and no population-level impacts are expected. The analysis conclusions for high-energy laser use during training and testing activities under Alternative 1 are consistent with a negligible impact on bird and bat populations.

High-energy laser activities would not overlap with the occurrence of the piping plover or red knot. The likelihood of a roseate tern, Bermuda petrel, or black-capped petrel being present in these areas at the time of these events and crossing the laser beam at the instant the laser is fired is remote but possible. The likelihood that an ESA-listed bird would be struck by a high-energy laser beam is so small as to be discountable.

Under the ESA, the use of high-energy lasers during training and testing activities as described under Alternative 1 may affect roseate terns, Bermuda petrels, black-capped petrels, Indiana bats, northern long-eared bats, and tricolored bats. The use of high-energy lasers would not be applicable to piping plovers and red knots.

The use of high-energy lasers is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.3.3.2 Impacts from High-Energy Lasers under Alternative 2

Impacts from high-energy lasers under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including high-energy lasers under Alternative 2 would be the same as Alternative 1.

3.9.3.4 Physical Disturbance and Strike Stressors

Table 3.9-11 contains brief summaries of background information that is relevant to the analyses of impacts for each physical disturbance and strike substressor. Following a review of recent literature, the background information for physical disturbance and strike stressor effects on birds and bats in the Study Area as described in Section 3.9.3.4 (Physical Disturbance and Strike Stressors) of the 2018 Final EIS/OEIS has not appreciably changed.

For birds and bats, it is not expected that seafloor devices or pile driving would cause physical disturbance or strike. Therefore, this analysis focuses on vessels, in-water devices, aircraft and aerial targets, and military expended materials. Additionally, the following analysis focuses on those substressors that would occur in new areas, areas not previously analyzed, and those that have a notable increase from what was analyzed in the 2018 Final EIS/OEIS.

Table 3.9-11: Physical Disturbance and Strike Stressors Background Information Summary

Substressor	*Background Information Summary*
Vessels and in-water devices	• Vessel strike and collision with in-water devices has the potential to impact all taxonomic groups found in the Study Area and could cause injury or mortality. • There would be a higher likelihood of vessel and in-water device disturbance or strike in the coastal areas than in the open ocean because of the concentration of activities and higher numbers of birds and bats closer to shore. • Direct collisions of birds with vessels and in-water devices are unlikely but may occur, especially at night when birds can become disoriented by or attracted to

Table 3.9-11: Physical Disturbance and Strike Stressors Background Information Summary (continued)

Substressor	Background Information Summary
	artificial light (Favero et al., 2011; Hamilton, 1958; Hyrenbach, 2001, 2006; Merkel & Johansen, 2011). • Though collisions of bats with vessels and in-water devices is unlikely, bats are known to collide with buildings and communication towers (Cryan & Brown, 2007; Hatch et al., 2013) and therefore may also collide with vessels.
Aircraft and aerial targets	• Bird or bat strikes could occur during military readiness activities that use aircraft, particularly in nearshore areas, where birds and bats are more concentrated in the Study Area. • Bird or bat strike potential is greatest in foraging or resting areas, in migration corridors at night, and at low altitudes during the periods around dawn and dusk. • Bird-aircraft strikes are a serious concern for the Navy because these incidents can result in injury to aircrews and damage equipment as well as injure or kill birds (Bies et al., 2006). Pilots have safety procedures they follow to reduce potential bird strikes. • While wildlife strikes can occur anywhere aircraft are operated, Navy data indicate that they occur most often in the airfield environment (Naval Air Station Jacksonville, 2012). • Unmanned drones could also strike birds or bats; however, evidence from returned drones indicates the probability is low.
Military expended materials	• Exposure of birds or bats to military expended materials during military readiness activities could result in physical injury or behavioral disturbances to birds or bats in-air, at the surface, or underwater during foraging dives. • The large area where materials would be used, coupled with the patchy distribution of seabirds and the infrequent use of the Study Area by foraging bats suggests that the probability of these types of ordnance striking a seabird or bat would be low. • Human activity associated with training and testing could cause birds or bats to flee a target area before the onset of firing, thus avoiding harm. • The potential likelihood of individual birds or bats being struck by munitions is very low; thus, impacts on bird or bat populations would not be expected.
Seafloor devices	• Neither birds nor bats are likely to encounter seafloor devices therefore this substressor is not applicable to birds and bats.
Pile driving	• Neither birds nor bats are likely to be physically affected by pile driving therefore this substressor is not applicable to birds and bats.

3.9.3.4.1 Impacts from Vessels and In-Water Devices

Table 3.9-11 contains a summary of background information used to analyze the potential impacts of vessels and in-water devices on birds and bats. For information on the number of activities including vessels and in-water devices, see Table 3.0-9 (Number and Location of Activities Including Vessels) and Table 3.0-10 (Number and Location of Activities Including In-Water Devices).

3.9.3.4.1.1 Impacts from Vessels and In-Water Devices under Alternative 1

For both training and testing activities, vessel and in-water device activity would decrease overall from the 2018 Final EIS/OEIS (Table 3.0-9, Number and Location of Activities Including Vessels).

Under Alternative 1 for training:

- Vessel activity would occur in two locations that are new or not previously analyzed (Gulfport and Pascagoula, Mississippi, respectively). For all other locations, there would either be a decrease or similar amount of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in one location not previously analyzed (Northeast Range Complexes Inshore). For all other locations, there would either be a decrease, similar amount, or cessation of in-water device activity.

Under Alternative 1 for testing:

- Vessel activity would occur in five locations not previously analyzed (inshore locations of the Northeast, Virginia Capes, and Gulf of Mexico Range Complexes; Other AFTT Areas; Hampton Roads, Virginia). There would also be notable increases in vessel activity at the Naval Surface Warfare Center Panama City Division Testing Range; Naval Station Norfolk; and Pascagoula, Mississippi. For all other locations, there would either be a decrease or similar amount of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in four locations not previously analyzed (Gulf of Mexico Range Complex Inshore; Bath, Maine; Newport, Rhode Island; Pascagoula, Mississippi). For all other locations, there would either be a decrease, similar amount, or cessation of in-water device activity.

Under Alternative 1, vessel and in-water device use would generally continue as described in the 2018 Final EIS/OEIS. Overall, the area exposed to vessel and in-water device disturbance would be a very small portion of the surface and water column in the Study Area.

For locations without a notable increase in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.9.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of birds and bats has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of vessel and in-water device use remains an accurate characterization of the Proposed Action in those locations.

For the locations not previously analyzed, introduction of vessel and in-water device use has the potential to impact birds and bats that may be exposed in those areas.

The potential for these activities to affect birds and bats is greater in coastal areas than open ocean areas where vessel use is less concentrated. However, even in areas of concentrated vessel use, the probability of bird or bat interaction with a vessel is low because of the dispersed nature of activities and ability of the animals to leave the area. Flushing of birds is expected to be greatest when vessels, towed devices, and unmanned surface vehicles are operated at relatively high speeds. Amphibious vessels and especially amphibious landings could impact birds that nest and forage at the shoreline. These activities also have a greater probability of temporarily displacing bats than offshore activities since bats occur more frequently above nearshore portions of the Study Area where they may forage. The analysis conclusions for vessel and in-water device use during training and testing activities under Alternative 1 are consistent with a negligible impact on bird and bat populations.

In-water devices are typically towed by a boat or helicopter, unmanned vehicles, or fired from a ship. It is likely that any birds or bats in the vicinity of the approaching boat, helicopter, unmanned vehicle, or ship firing torpedoes would be dispersed by their sound and move away from the in-water device before any exposure occurs. Therefore, the use of in-water devices is expected to have only short-term negligible impacts on individual birds and bats.

Under the ESA, the use of vessels and in-water devices during training and testing activities as described under Alternative 1 may affect piping plovers, red knots, roseate terns, Bermuda petrels, black-capped petrels, Indiana bats, northern long-eared bats, and tricolored bats.

The use of vessels and in-water devices is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.4.1.2 Impacts from Vessels and In-Water Devices under Alternative 2

Impacts from vessels and in-water device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including vessels or in-water devices increases only slightly over that of Alternative 1.

3.9.3.4.2 Impacts from Aircraft and Aerial Targets

Refer to Table 3.9-11 for a summary of background information used to analyze the potential impacts of aircraft and aerial targets on birds and bats. For information on the number of activities including aircraft and aerial targets, see Table 3.0-16 (Number and Location of Activities with Aircraft) and Table 3.0-13 (Number and Location of Targets Expended during Military Readiness Activities).

The Action Proponents' standard operating procedures will reduce manned aircraft strike hazards from large flocks of birds and bats. Based on a total of 38,961 strike reports from 1990 to 2004, 74 percent (28,806) of bird strikes occurred below 500 feet above ground level, 19 percent (5,448) between 501 and 3,500 feet above ground level, and 7 percent (2,355) above 3,500 feet above ground level (Dolbeer, 2006).

3.9.3.4.2.1 Impacts from Aircraft and Aerial Targets under Alternative 1

For both training and testing activities, aircraft activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of aircraft noise, so impacts would be expected to be similar or lesser than previously concluded.

Under Alternative 1 for training:

- Aircraft and aerial targets would have a notable increase in the Navy Cherry Point Range Complex from the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease, similar amount, or cessation of aircraft and aerial target use.

Under Alternative 1 for testing:

- Aircraft and aerial targets would occur in one location not previously analyzed (Other AFTT Areas) in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease, similar amount, or cessation of aircraft and aerial target use.

For locations without a notable increase in aircraft and aerial target activity, the analysis from the 2018 Final EIS/OEIS remains valid, and the updates to the affected environment noted in Section 3.9.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of birds and bats has not changed.

For locations not previously analyzed and with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the risk of strike would remain low.

As a result of Standard Operating Procedures and Navy Bird Aircraft Strike Hazard policies, for aircraft safety, strikes of large flocks of birds and bats by manned aircraft are avoided and would be expected to occur infrequently. The analysis conclusions for aircraft and aerial target use during training and testing activities under Alternative 1 are consistent with a moderate impact on bird and bat populations.

Under the ESA, the use of aircraft and aerial targets during training and testing activities as described under Alternative 1 may affect piping plover, red knot, roseate terns, Bermuda petrels, black-capped petrels, Indiana bats, northern long-eared bats, and tricolored bats.

The use of aircraft and aerial targets is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.4.2.2 Impacts from Aircraft and Aerial Targets under Alternative 2

Impacts from aircraft and aerial target activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including aircraft and aerial targets under Alternative 2 would increase only slightly over Alternative 1.

3.9.3.4.3 Impacts from Military Expended Materials

Refer to Table 3.9-11 for a summary of background information used to analyze the potential impacts of military expended materials on birds and bats. For information on the type, number, and location of military expended materials, see Table 3.0-11 (Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities), Table 3.0-12 (Number and Location of Explosives that May Result in Fragments during Military Readiness Activities), Table 3.0-13 (Number of Location of Targets Expended during Military Readiness Activities), Table 3.0-14 (Number and Location of Other Military Materials Expended during Military Readiness Activities), Table 3.0-17 (Number and Location of Wires and Cables Expended during Military Readiness Activities), and Table 3.0-18 (Number and Location of Activities Including Biodegradable Polymers during Testing).

3.9.3.4.3.1 Impacts from Military Expended Materials under Alternative 1

For both training and testing activities, the number of military expended materials would decrease overall from the 2018 Final EIS/OEIS (Table 3.0-11 through Table 3.0-14, and Table 3.0-17 through Table 3.0-18).

Under Alternative 1 for training:

- Military expended materials would occur in one location not previously analyzed (Key West Range Complex Inshore) in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease, similar amount, or cessation of military expended materials.

Under Alternative 1 for testing:

- Military expended materials would occur in three locations not previously analyzed (Other AFTT Areas; Naval Submarine Base Kings Bay, and Port Canaveral, Florida) in the 2018 Final EIS/OEIS. For all other locations, there would be a decrease in the amount of military expended materials.

For locations without a notable increase in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.9.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of birds and bats has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of military expended materials remains an accurate characterization of the Proposed Action in those locations.

For the locations not previously analyzed, introduction of military expended materials has the potential to impact birds and bats that may be exposed in those areas.

The potential impact of military expended materials on birds or bats in the Study Area is dependent on the probability that birds or bats are present in areas where such materials are used as well as the ability of birds or bats to detect and avoid foreign objects. The amount of materials expended over the vast area over which military readiness activities occur, combined with the ability of birds and bats to flee disturbance and the infrequent use of the Study Area by foraging bats (Ahlén et al., 2009; Johnson et al., 2011; Pelletier et al., 2013; U.S. Department of Energy, 2016), would make direct strikes unlikely. Individual birds or bats may be impacted, but strikes would have no impact on species or populations. Since bats occur in the Study Area much less frequently than birds, it is expected that the likelihood of a bat strike is proportionally less than that for a bird strike. The analysis conclusions for military expended materials during training and testing activities under Alternative 1 are consistent with a negligible impact on bird and bat populations.

Under the ESA, the use of military expended materials during training and testing activities as described under Alternative 1 may affect piping plovers, red knots, roseate terns, Bermuda petrels, black-capped petrels, Indiana bats, northern long-eared bats, and tricolored bats.

The use of military expended material is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.4.3.2 Impacts from Military Expended Materials under Alternative 2

Impacts from military expended materials under Alternative 2 are not meaningfully different from Alternative 1 and therefore the impact conclusions are the same for both training and testing. The increase in footprint from Alternative 1 to 2 is only 0.026 acres and located mostly in the Gulf of Mexico Range Complex, with relatively small footprints in the other range complexes.

3.9.3.5 Entanglement Stressors

The evaluation of entanglement stressors on birds identified for analysis in this Supplemental EIS/OEIS are the same as those in Section 3.9.3.5 (Entanglement Stressors) of the 2018 Final EIS/OEIS (wires and cables, decelerators/parachutes). Because bats do not use these habitats, bats would not be affected by entanglement stressors.

Table 3.9-12 contains brief summaries of background information that is relevant to the analyses of impacts for each entanglement substressor. Following a review of recent literature, the background information for entanglement stressor effects on birds and bats in the Study Area as described in the 2018 Final EIS/OEIS has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS remains valid.

Table 3.9-12: Entanglement Stressors Background Information Summary

Substressor	*Background Information Summary*
Wires and cables	• Given the limited time that wires and cables would remain suspended in-air and the ability of birds and bats to detect and avoid parachutes in-air, the likelihood that a bird or bat would become entangled in-air is considered remote and discountable. • This analysis is focused on the potential for entanglement at the water surface, in the water column, or on the seafloor.

Table 3.9-12: Entanglement Stressors Background Information Summary (continued)

Substressor	Background Information Summary
	• Wires and cables are readily avoidable by birds foraging or resting in the water. • The entanglement risk from these components would only occur when a bird and these components were in close proximity at the water surface, in the water column, or on the seafloor. • However, these materials would be readily avoided by birds that may be foraging or resting in the water and do not pose the same entanglement risks as fishing gear because they are relatively conspicuous in contrast to fishing lines, do not form long loops of line that are hard to break, do not tend to snag animals that swim through them, and do not persist for a long time in the water column. • Once on the bottom, it is unlikely that bottom feeding birds would encounter these items, which are used far offshore and would sink to depths deeper than the bird foraging depths. • Some components, once they sink to the bottom, may be transported by bottom currents or active tidal influence, and can present an enduring entanglement risk. In the benthic environment, however, subsequent colonization by encrusting organisms, burying by sediment, and chemical breakdown of the various materials would further reduce the potential for entanglement.
Decelerators and parachutes	• Given the limited time that parachutes and decelerators would remain suspended in-air and the ability of birds and bats to detect and avoid parachutes in-air, the likelihood that a bird or bat would become entangled in-air is considered remote and discountable. • This analysis is focused on the potential for entanglement at the water surface, in the water column, or on the seafloor. • As with wires and cables, these materials would be readily avoided on the surface, in the water column, and on the bottom by visually oriented seabirds and do not pose the same entanglement risks as fishing gear because they are relatively conspicuous in contrast to fishing lines, do not form long loops of line that are hard to break, do not tend to snag animals that swim through them, and do not persist for a long time in the water column. • Once on the bottom, it is unlikely that bottom feeding birds would encounter these items, which are used far offshore and would sink to depths deeper than the bird foraging depths. • Similarly, the potential for a bird to encounter an expended decelerator/parachute at the surface or in the water column is extremely low.
Biodegradable polymer	• The possibility of entanglement in the biodegradable polymer is considered remote and discountable given that the material is deployed on a small scale, is short-lived in the water, and that diving birds routinely navigate through floating vegetation without becoming entangled. Therefore, this substressor will not be further analyzed.

3.9.3.5.1 Impacts from Wires and Cables

Table 3.9-12 contains a summary of the background information used to analyze the potential impacts of wires and cables on birds and bats. Table 3.0-17 indicates the number and location of wires and cables expended during military readiness activities for Alternatives 1 and 2.

3.9.3.5.1.1 Impacts from Wires and Cables under Alternative 1

For training activities, the use of wires and cables would increase overall from the 2018 Final EIS/OEIS, and for testing activities, the use of wires and cables would decrease overall (Table 3.0-17, Number and Location of Wires and Cables Expended during Military Readiness Activities).

Under Alternative 1 for training:

- The use of wires and cables would occur in one location not previously analyzed (Key West Range Complex). There would also be a notable increase in the use of wires and cables in the Virginia Capes and Jacksonville Range Complexes. For all other locations, there would be a similar amount of wires and cables.

Under Alternative 1 for testing:

- The use of wires and cables would occur in one area not previously analyzed (Other AFTT Areas) for the 2018 Final EIS/OEIS. There would also be a notable increase in wires and cables in the Virginia Capes and Key West Range Complexes. For all other locations, there would either be a decrease or similar amount of wires and cables.

For locations without a notable increase in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.9.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of birds and bats has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of wire and cable use remains an accurate characterization of the Proposed Action in those locations.

For the locations not previously analyzed, introduction of wires and cables has the potential to impact birds that may be exposed in those areas.

Given that these stressors are widely dispersed over vast areas and do not persist or accumulate at the surface or in the water column where seabirds forage, encounters with seabirds would be infrequent. This is coupled with a remote likelihood that a bird encountering the expended material would become entangled. The analysis conclusions for wire and cable use during training and testing activities under Alternative 1 are consistent with a negligible impact on bird and bat populations.

Under the ESA, the use of wires and cables during training and testing activities as described under Alternative 1 would have no effect on piping plovers, red knots, roseate terns, Bermuda petrels, and black-capped petrels. The use of wires and cables would not be applicable to Indiana bats, northern long-eared bats, and tricolored bats.

The use of wires and cables is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.5.1.2 Impacts from Wires and Cables under Alternative 2

Impacts from wires and cables under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of wires and cables used under Alternative 2 would increase only slightly over Alternative 1.

3.9.3.5.2 Impacts from Decelerators/Parachutes

Table 3.9-12 contains a summary of the background information used to analyze the potential impacts of decelerators/parachutes on resources. Table 3.0-13 (Number and Location of Targets Expended during Military Readiness Activities) indicates the number and location of decelerators/parachutes expended during military readiness activities for Alternatives 1 and 2.

3.9.3.5.2.1 Impacts from Decelerators/Parachutes under Alternative 1

For both training and testing activities, decelerator/parachute use would increase from the 2018 Final EIS/OEIS (Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities).

Under Alternative 1 for training:

- Decelerators/parachutes would be used in the same locations as for the 2018 Final EIS/OEIS. However, there would be notable increases in the Virginia Capes and Jacksonville Range Complexes. For all other locations, there would be a similar amount of decelerators/parachutes.

Under Alternative 1 for testing:

- Decelerators/parachutes would be used in one area (Other AFTT Areas) that was not previously analyzed, and there would be notable increases in the Northeast, Virginia Capes, and Key West Range Complexes. For all other locations, there would either be a decrease or similar amount of decelerators/parachutes.

For locations without a notable increase in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.9.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of birds and bats has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of decelerator/parachute use remains an accurate characterization of the Proposed Action in those locations.

For the locations not previously analyzed, introduction of decelerators/parachutes has the potential to impact birds that may be exposed in those areas.

Given that decelerators and parachutes would be widely dispersed over vast areas and do not persist or accumulate at the surface or in the water column where seabirds forage, encounters with seabirds would be infrequent. This is coupled with a remote likelihood that a bird encountering the expended material would become entangled, as described above. The analysis conclusions for decelerator/parachute use during training and testing activities under Alternative 1 are consistent with a negligible impact on bird and bat populations.

Under the ESA, the use of decelerators/parachutes during training and testing activities as described under Alternative 1 would have no effect on piping plovers, red knots, roseate terns, Bermuda petrels, or black-capped petrels. The use of decelerators/parachutes would not be applicable to Indian bats, northern long-eared bats, and tricolored bats.

The use of wires and cables is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.5.2.2 Impacts from Decelerators/Parachutes under Alternative 2

Impacts from decelerators/parachutes under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of decelerators/parachutes used under Alternative 2 would increase only slightly over Alternative 1.

3.9.3.6 Ingestion Stressors

Table 3.9-13 contains brief summaries of background information that is relevant to the analyses of impacts for each ingestion substressor. Following a review of recent literature, the background information for ingestion stressor effects on birds and bats in the Study Area as described in Section 3.9.3.6 (Ingestion Stressors) of the 2018 Final EIS/OEIS has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS remains valid. Ingestions stressors would not affect bats, and they will not be discussed further.

It is not expected that birds would ingest munitions or target fragments, as these are too large to be mistaken for food and are dense enough to sink rapidly and bury in the bottom, being both inaccessible and not attractive as sources of food. The types of expended materials that are potential ingestion stressors include: fragments from chaff, plastic end caps from chaff cartridges, the plastic compression pads, and end caps from pistons and flares. Additionally biodegradable polymer could theoretically be ingested by birds; however, the likelihood is low because the material degrades and dissolves rapidly (within an hour). Accordingly, this analysis will focus on other military expended materials, which could be ingested by birds. Additionally, the following analysis focuses on those substressors that would occur in new areas and those that would occur more often than what was analyzed in the 2018 Final EIS/OEIS.

Table 3.9-13: Ingestion Stressors Background Information Summary

Substressor	*Background Information Summary*
Military expended materials - munitions	• Birds are not expected to ingest munitions, as these are too large to be mistaken for food and are dense enough to sink rapidly and bury in the bottom, being both inaccessible and not attractive as sources of food. Therefore, this substressor will not be further analyzed.
Military expended materials (other than munitions)	• Ingestion of expended materials by birds could occur in any training or testing area at the surface or just below the surface portion of the water column. • Floating material of ingestible size could be eaten by birds that feed at or near the water surface, while materials that sink pose a potential risk to diving birds that feed just below the water's surface (Titmus & Hyrenbach, 2011). • Physiological impacts to birds from ingestion include blocked digestive tracts, blockage of digestive enzymes, lowered hormone levels, delayed ovulation, reproductive failure, nutrient dilution, exposure to indirect effects from harmful chemicals found in and on the plastic material, and altered appetite satiation, which can lead to starvation (Azzarello & Van Vleet, 1987; Provencher et al., 2014). • While ingestion of marine debris has been linked to bird mortalities, sublethal impacts are more common (Moser & Lee, 1992).

3.9.3.6.1 Impacts from Military Expended Materials Other Than Munitions

Table 3.9-13 contains a summary of background information used to analyze the potential impacts of military expended materials (other than munitions) on birds. For more information on the location and number of military expended materials other than munitions see Table 3.0-14, (Number and Location of Other Military Materials Expended during Military Readiness Activities).

3.9.3.6.1.1 Impacts from Military Expended Materials Other Than Munitions under Alternative 1

For both training and testing activities, military expended materials other than munitions, would decrease from the 2018 Final EIS/OEIS (Table 3.0-14).

Under Alternative 1 for training:

- Ingestible military expended materials other than munitions would no longer occur at one location (Virginia Capes Range Complex Inshore) that they did in the 2018 Final EIS/OEIS. However, there would be a notable increase in military expended materials other than munitions at the Virginia Capes Range Complex and the Key West Range Complex. For all other locations, there would either be a decrease or similar amount of military expended materials other than munitions.

Under Alternative 1 for testing:

- Ingestible military expended materials other than munitions would occur in one location not previously analyzed (Other AFTT Areas). For all other locations, there would either be a decrease or similar amount of military expended materials other than munitions.

For locations without a notable increase in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.9.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of birds and bats has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of military expended materials remains an accurate characterization of the Proposed Action in those locations.

For the locations not previously analyzed, introduction of military expended materials has the potential to impact birds that may be exposed in those areas.

Although the overall concentration of military expended materials would be low, military expended materials would not be evenly distributed. There is some potential for expended materials that float (e.g., some types of target fragments or chaff end caps or flare compression pads and pistons) to become concentrated along frontal zones, along with food resources that tend to attract foraging birds, resulting in the incidental ingestion of such materials, most likely as very small fragments. Military expended materials would constitute a minute portion of the floating debris but could nevertheless contribute to harmful effects of manmade debris on some birds. The likelihood that individual birds would be negatively impacted by ingestion of military expended materials in the Study Area under Alternative 1 for training is considered low, but not discountable. Population-level effects would be very unlikely given the relatively small quantities and limited persistence of military expended materials in habitats where birds are most likely to forage. The analysis conclusions for military expended materials other than munitions during training and testing activities under Alternative 1 are consistent with a negligible impact on bird and bat populations.

Under the ESA, the use of military expended materials other than munitions during training and testing activities as described under Alternative 1 may affect piping plovers, red knots, roseate terns, Bermuda petrels, and black-capped petrels. The use of military expended materials other than munitions would not be applicable to Indiana bats, northern long-eared bats, and tricolored bats.

The use of military expended material other than munitions is not applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.6.1.2 Impacts from Military Expended Materials Other Than Munitions under Alternative 2

Impacts from military expended materials other than munitions under Alternative 2 are no different from Alternative 1 and therefore the conclusions for significance impacts, ESA-listed species and critical habitat are the same for both training and testing. The number of ingestible non-munitions under Alternative 2 is the same as Alternative 1.

3.9.3.7 Secondary Stressors

This section analyzes the potential impacts to birds exposed to stressors indirectly through impacts to habitat and prey availability. Since bats considered in this analysis do not occur in the water column and rarely feed at the water surface in the Study Area, no secondary stressors impacts to bats are anticipated. Table 3.9-14 contains brief summaries of background information that is relevant to the analysis of impacts for each substressor. No secondary stressors would result in significant impacts.

Table 3.9-14: Secondary Stressor Background Information Summary

Indirect Links	*Substressors*	*Background Information Summary*
Habitat	Explosives	• Explosions would not result in loss of bird or bat habitat.
	Explosive byproducts and unexploded munitions	• Explosions consume most of the explosive material, and byproducts would therefore not degrade sediment or water quality or result in indirect stressors to birds. • Low-order detonations and unexploded munitions may result in the presence of explosive material in sediments or the water column. However, toxicity and other effects are generally associated with exposure to higher concentrations than those expected to occur due to military readiness activities. • Munitions constituents and degradation products in sediments would likely be detectable only within a few feet, and the range of toxic sediment conditions could be less (inches). Due to low solubility and dilution, it is unlikely that birds would be exposed.
	Chemicals	• Potentially harmful chemicals introduced into the marine environment consist mostly of propellants and combustion products, other fuels, polychlorinated biphenyls in target vessels, other chemicals associated with munitions, and simulants. • Ammonium perchlorate (a rocket and missile propellant) is the most common chemical used. Other representative chemicals with potential to affect invertebrates include propellant combustion products such as hydrogen cyanide and ammonia. • Most propellants are consumed during normal operations, and the failure rate of munitions using propellants and other combustible materials is low. • Most byproducts occur naturally in seawater and are readily degraded by biotic and abiotic processes. All chemicals are quickly diluted by water movement. • Overall, concentrations of chemicals in sediment and water are not likely to cause injury or mortality to birds.

Table 3.9-14: Secondary Stressor Background Information Summary (continued)

Indirect Links	*Substressors*	*Background Information Summary*
	Metals	• Metals are introduced into seawater and sediments as a result of military readiness activities involving vessel hulls, targets, munitions, and other military expended materials. • Concentrations of metals in sea water are unlikely to be high enough to cause injury or mortality to birds.
Prey availability	All stressors	The potential for primary stressors to impact prey quality and availability is directly related to their impacts on biological resources consumed by birds (e.g., invertebrates and fishes), which are analyzed in Section 3.5 and Section 3.6 of this document. Overall impacts to invertebrates are considered negligible and from minor to moderate for fish, but are not expected to meaningfully impact fish availability for birds as a prey item.

3.9.3.7.1 Impact of Secondary Stressors

3.9.3.7.1.1 Impacts from Secondary Stressors Under Alternative 1

The impacts of explosives and military expended materials in terms of abiotic substrate disturbance are described in Section 3.3 (Habitats). The assessment of potential sediment and water quality degradation on aquatic life, including representative marine invertebrates, is covered in Section 3.2 (Sediment and Water Quality). Impacts to invertebrates and fishes, which could be prey for birds, are presented in Section 3.5 (Invertebrates) and Section 3.6 (Fishes).

The impact of the Proposed Action on secondary stressors were considered negligible to moderate (depending on the primary stressor).

Under the ESA, the secondary stressors associated with training and testing activities as described under Alternative 1 may affect piping plovers, red knots, roseate terns, Bermuda petrels, and black-capped petrels. Secondary stressors during training and testing activities would have no effect on Indiana bats, northern long-eared bats, and tricolored bats.

Secondary stressors would not be applicable to designated critical habitat for piping plover and proposed critical habitat for red knot. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA.

3.9.3.7.1.2 Impacts from Secondary Stressors Under Alternative 2

Impacts from secondary stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

3.9.3.8 Combined Stressors

As described in Section 3.0.3.5 (Resource-Specific Impacts Analysis for Multiple Stressors), this section evaluates the potential for combined impacts of all stressors from the Proposed Action. The analysis and conclusions for the potential impacts from each of the individual stressors are discussed in the sections above. Stressors associated with proposed military readiness activities do not typically occur in isolation but rather occur in some combination. For example, mine neutralization activities include elements of acoustic, physical disturbance and strike, entanglement, ingestion, and secondary stressors that are all coincident in space and time. An analysis of the combined impacts of all stressors considers the potential consequences of additive and synergistic stressors from the Proposed Action, as described below.

There are generally two ways that a bird or bat could be exposed to multiple additive stressors. The first would be exposure to multiple sources of stress from a single event or activity (e.g., a mine warfare event may include the use of a sound source and a vessel). The potential for a combination of these impacts from a single activity would depend on the range of effects of each of the stressors and the response or lack of response to that stressor. Secondly, a bird or bat could be exposed to multiple military readiness activities over the course of its life, however, military readiness activities are generally separated in space and time in such a way that it would be unlikely that any individuals would be exposed to stressors from multiple activities. However, animals with a home range intersecting an area of concentrated activity have elevated exposure risks relative to animals that simply transit the area through a migratory corridor.

Multiple stressors may also have synergistic effects. For example, individuals that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors via a decreased ability to detect and avoid threats. Individuals that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to entanglement and physical strike stressors via malnourishment and disorientation. These interactions are speculative, and without data on the combination of multiple stressors, the synergistic impacts from the combination of stressors are difficult to predict in any meaningful way.

The following analysis makes the reasonable assumption that the majority of exposures to individual stressors are non-lethal, and instead focuses on consequences potentially impacting fitness (e.g., physiology, behavior, reproductive potential).

3.9.3.8.1 Combined Impacts of All Stressors under Alternative 1

Most of the activities proposed under Alternative 1 generally involve the use of moving platforms (e.g., ships, torpedoes) that may produce one or more stressors; therefore, if birds or bats were in the range of those activities, they may be introduced to multiple stressors. The minimal effects of far-reaching stressors (e.g., sound pressures, particle motion) may also trigger some animals to leave the area ahead of a more damaging impact (e.g., physical disturbance or strike). Individual stressors that would otherwise have minimal to no impact may combine to have a measurable effect. Due to the wide dispersion of stressor sources, speed of the platforms, and general dynamic movement of many military readiness activities, it is unlikely that highly mobile birds and bats would occur in the potential effects range of multiple sources or sequential exercises.

Although potential impacts on birds and bats from military readiness activities under Alternative 1 may include injury and mortality, in addition to other effects such as physiological stress, masking, and behavioral effects, the combined impacts are not expected to lead to long-term consequences to populations. Based on the general description of impacts, the number of individuals impacted is expected to be small relative to overall population sizes and would not be expected to yield any lasting effects on the survival, growth, recruitment, or reproduction of any species. The combined impact of all stressors from Alternative 1 are considered moderate for bird and bat populations.

3.9.3.8.2 Combined Impacts of All Stressors under Alternative 2

Impacts under Alternative 2 are not meaningfully different from Alternative 1 and therefore the impacts conclusions are the same for both training and testing.

3.9.4 Endangered Species Act Determinations

The Action Proponents have concluded that military readiness activities may affect piping plovers, red knots, roseate terns, Bermuda petrels, black-capped petrels, Indiana bats, northern long-eared bats, and tricolored bats. The Action Proponents have also concluded that military readiness activities would not be applicable to designated critical habitat for piping plovers or proposed critical habitat for red knots. The Action Proponents are consulting with the USFWS as required by section 7(a)(2) of the ESA. The summary of effects determinations for each ESA-listed species is provided in Table 3.9-15 for training and testing.

3.9.5 Migratory Bird Treaty Act Determinations

The Action Proponents have determined that the Proposed Action may result in “take” of migratory birds, however the Proposed Action is a military readiness activity; therefore, “take” is in compliance with the Migratory Bird Treaty Act. Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 CFR part 21), the USFWS has promulgated a rule that authorizes the incidental take of migratory birds provided they do not result in a significant adverse effect on a population of a migratory species. As discussed in Section 3.9.3 (Environmental Consequences), the proposed military readiness activities would not result in a significant adverse impact on any migratory bird species.

Table 3.9-15: Effects Determinations for ESA-Listed Species and Critical Habitats for Military Readiness Activities under Alternative 1 (Preferred Alternative)

Species	DPS/Critical Habitat	*Effect Determinations by Stressor*																						
		Acoustic						*Explosives*		*Energy*			*Physical Disturbance and Strike*						*Entanglement*			*Ingestion*		
		Sonar and Other Transducers	*Air Guns*	*Pile Driving*	*Vessel Noise*	*Aircraft Noise*	*Weapons Noise*	*In-Water Explosives*	*In-Air Explosives*	*In-Water Electromagnetic Devices*	*In-Air Electromagnetic Devices*	*High-Energy Lasers*	*Vessels*	*In-Water Devices*	*Aircraft and Aerial Targets*	*Military Expended Materials*	*Seafloor Devices*	*Pile Driving*	*Wires and Cables*	*Decelerators/Parachutes*	*Biodegradable Polymer*	*Military Expended Materials-Munitions*	*Military Expended Materials Other Than Munitions*	*Indirect/Secondary*
Training																								
Piping plover	Atlantic Coast	NE	N/A	MA	MA	MA	MA	MA	MA	N/A	MA	N/A	MA	MA	MA	MA	N/A	N/A	NE	NE	N/A	N/A	MA	MA
	Designated	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Red knot	Throughout range	NE	N/A	MA	MA	MA	MA	MA	MA	N/A	MA	N/A	MA	MA	MA	MA	N/A	N/A	NE	NE	N/A	N/A	MA	MA
	Proposed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roseate tern	Throughout range	NE	N/A	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	N/A	N/A	NE	NE	N/A	N/A	MA	MA
Bermuda petrel	Throughout range	MA	N/A	N/A	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	N/A	N/A	NE	NE	N/A	N/A	MA	MA
Black-capped petrel*	Throughout range	MA	N/A	N/A	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	N/A	N/A	NE	NE	N/A	N/A	MA	MA
Indiana bat	Throughout range	N/A	N/A	N/A	MA	MA	MA	N/A	MA	N/A	MA	N/A	MA	MA	MA	MA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE
Northern long-eared bat	Throughout range	N/A	N/A	N/A	MA	MA	MA	N/A	MA	N/A	MA	MA	MA	MA	MA	MA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE
Tricolored bat	Throughout range	N/A	N/A	MA	MA	MA	MA	MA	MA	N/A	MA	MA	MA	MA	MA	MA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE
Testing																								
Piping plover	Atlantic Coast	NE	NE	N/A	MA	MA	MA	MA	MA	N/A	MA	N/A	MA	MA	MA	MA	N/A	N/A	NE	NE	NE	N/A	MA	MA
	Designated	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Red knot	Throughout range	NE	NE	N/A	MA	MA	MA	MA	MA	N/A	MA	N/A	MA	MA	MA	MA	N/A	N/A	NE	NE	NE	N/A	MA	MA
	Proposed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roseate tern	Throughout range	NE	NE	N/A	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	N/A	N/A	NE	NE	NE	N/A	MA	MA
Bermuda petrel	Throughout range	MA	MA	N/A	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	N/A	NE	NE	NE	N/A	MA	MA
Black-capped petrel*	Throughout range	MA	MA	N/A	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	N/A	NE	NE	NE	N/A	MA	MA
Indiana bat	Throughout range	N/A	N/A	N/A	MA	MA	MA	N/A	N/A	N/A	MA	MA	MA	MA	MA	MA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE
Northern long-eared bat	Throughout range	N/A	N/A	N/A	MA	MA	MA	N/A	N/A	N/A	MA	MA	MA	MA	MA	MA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE
Tricolored bat	Throughout range	N/A	N/A	N/A	MA	MA	MA	MA	N/A	N/A	MA	MA	MA	MA	MA	MA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NE

Notes: MA = may affect; N/A = not applicable; NE = no effect

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References

Ahlén, I., H. J. Baagøe, and L. Bach. (2009). Behavior of Scandinavian bats during migration and foraging at sea. *Journal of Mammology 90* (6): 1318–1323.

Azzarello, M. Y. and E. S. Van Vleet. (1987). Marine birds and plastic pollution. *Marine Ecology - Progress Series 37* 295–303.

Bies, L., T. B. Balzer, and W. Blystone. (2006). Pocosin Lakes National Wildlife Refuge: Can the military and migratory birds mix? *Wildlife Society Bulletin 34* 502–503.

Brown, B. T., G. S. Mills, C. Powels, W. A. Russell, G. D. Therres, and J. J. Pottie. (1999). The influence of weapons-testing noise on bald eagle behavior. *Journal of Raptor Research 33* (3): 227–232.

Constantine, D. (2003). Geographic translocation of bats: Known and potential problems. *Emerging Infectious Diseases 9* (1): 17–21.

Cryan, P. and A. Brown. (2007). Migration of bats past a remote island offers clues toward the problem of bat fatalities at wind turbines. *Biological Conservation* 1–11. DOI:10.1016/j.biocon.2007.05.019

Cucurachi, S., W. L. M. Tamis, M. G. Vijver, W. J. G. M. Peijnenburg, J. F. B. Bolte, and G. R. de Snoo. (2013). A review of the ecological effects of radiofrequency electromagnetic fields (RF-EMF). *Environment International 51* 116–140.

Dolbeer, R. A. (2006). *Height Distribution of Birds Recorded by Collisions with Civil Aircraft* (Wildlife Damage Management Internet Center for Publications). Lincoln, NE: U.S. Department of Agriculture Wildlife Services.

Favero, M., G. Blanco, G. Garcia, S. Copello, J. P. S. Pon, E. Frere, F. Quintana, P. Yorio, F. Rabuffetti, G. Canete, and P. Gandini. (2011). Seabird mortality associated with ice trawlers in the Patagonian shelf: Effect of discards on the occurrence of interactions with fishing gear. *Animal Conservation 14* (2): 131–139.

Hamilton, W. J., III. (1958). Pelagic birds observed on a North Pacific crossing. *The Condor 60* (3): 159–164.

Hatch, S. K., E. E. Connelly, T. J. Divoll, I. J. Stenhouse, and K. A. Williams. (2013). Offshore observations of Eastern red bats (*Lasiurus borealis*) in the mid-Atlantic United States using multiple survey methods. *PLoS ONE 8* (12): e83803. DOI:10.1371/journal.pone.0083803

Hyrenbach, K. (2001). Albatross response to survey vessels: Implications for studies of the distribution, abundance, and prey consumption of seabird populations. *Marine Ecology Progress Series 212* 283–295.

Hyrenbach, K. (2006, 2 & 3 October). *Training and Problem-Solving to Address Population Information Needs for Priority Species, Pelagic Species and Other Birds at Sea*. Presented at the Waterbird Monitoring Techniques Workshop, IV North American Ornithological Conference. Veracruz, Mexico.

International Union for Conservation of Nature. (2017). *Leporillus conditor*. Retrieved May 15, 2017, from http://www.iucnredlist.org/details/11634/0.

Johnson, J., J. Gates, and N. Zegre. (2011). Monitoring seasonal bat activity on a coastal barrier island in Maryland, USA. *Environmental Monitoring and Assessment 173* 685–699.

Manville, A. (2016). *A Briefing Memorandum: What We Know, Can Infer, and Don't Yet Know about Impacts from Thermal and Non-thermal Non-ionizing Radiation to Birds and Other Wildlife—for Public Release*. Washington, DC: U.S. Fish and Wildlife Service.

Merkel, F. R. and K. L. Johansen. (2011). Light-induced bird strikes on vessels in Southwest Greenland. *Marine Pollution Bulletin 62* (11): 2330–2336.

Moser, M. L. and D. S. Lee. (1992). A fourteen-year survey of plastic ingestion by western north Atlantic seabirds. *Colonial Waterbirds 15* (1): 83–94.

Naval Air Station Jacksonville. (2012). *Bird Aircraft Strike Hazard (BASH) Reduction Program*. Jacksonville, FL: U.S. Department of the Navy.

Nicholls, B. and P. A. Racey. (2007). Bats avoid radar installations: Could electromagnetic fields deter bats from colliding with wind turbines? *PLoS ONE 2* (3): e297. DOI:10.1371/journal.pone.0000297

Nicholls, B. and P. A. Racey. (2009). The aversive effect of electromagnetic radiation on foraging bats: A possible means of discouraging bats from approaching wind turbines. *PLoS ONE 4* (7): e6246. DOI:10.1371/journal.pone.0006246

Pelletier, S. K., K. Omland, K. S. Watrous, and T. S. Peterson. (2013). *Information Synthesis on the Potential for Bat Interactions with Offshore Wind Facilities–Final Report* (U.S. Department of the Interior, Bureau of Ocean Energy Management, Headquarters, Herndon, VA. Outer Continental Shelf Study Bureau of Energy Management). Herndon, VA: U.S. Department of the Interior, Bureau of Ocean Energy Management.

Placer, J. (1998). The Bats of Puerto Rico. *BATS Magazine 16* (2): 1–6.

Provencher, J., A. Bond, A. Hedd, W. Montevecchi, S. Muzaffar, S. Courchesne, H. Gilchrist, S. Jamieson, F. Merkel, K. Falk, J. Durinck, and M. Mallory. (2014). Prevalence of marine debris in marine birds from the North Atlantic. *Marine Pollution Bulletin 84* 411–417.

Schueck, L. S., J. M. Marzluff, and K. Steenhof. (2001). Influence of military activities on raptor abundance and behavior. *The Condor 103* (3): 606–615.

Stalmaster, M. V. and J. L. Kaiser. (1997). Flushing responses of wintering bald eagles to military activity. *The Journal of Wildlife Management 61* (4): 1307–1313.

Tetra Tech Inc. (2016). *Pre-Final Integrated Natural Resources Management Plan Naval Station Norfolk & Craney Island Fuel Terminal*. Norfolk, VA: Naval Facilities Engineering Command Mid-Atlantic.

Titmus, A. J. and K. D. Hyrenbach. (2011). Habitat associations of floating debris and marine birds in the North East Pacific Ocean at coarse and meso spatial scales. *Marine Pollution Bulletin 62* (11): 2496–2506.

U.S. Department of Energy. (2016). *Long-term Bat Monitoring on Islands, Offshore Structures, and Coastal Sites in the Gulf of Maine, Mid-Atlantic, and Great Lakes—Final Report*. Topsham, ME: Stantec.

U.S. Fish and Wildlife Service. (2021). *Birds of Conservation Concern 2021: Migratory Bird Program*. Migratory Birds, Falls Church, VA.

U.S. Fish and Wildlife Service. (2023). *List of Threatened and Endangered Species that may occur in AFTT Study Area*. Vero Beach, FL: U.S. Fish and Wildlife Service, Florida Ecological Services Field Office.

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Supplemental Environmental Impact Statement/ Overseas Environmental Impact Statement Atlantic Fleet Training and Testing

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4 CUMULATIVE IMPACTS

4.1 Principles of Cumulative Impacts Analysis

The approach taken herein to analyze cumulative effects meets the objectives of the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality (CEQ) regulations, and CEQ guidance. CEQ regulations (40 Code of Federal Regulations [CFR] sections 1500-1508) provide the implementing procedures for NEPA. The regulations define "cumulative effects" as:

> *Effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from actions with individually minor but collectively significant effects taking place over a period of time* (40 CFR 1508.1(i)(3)).

CEQ guidance further identifies cumulative effects as those environmental effects resulting from spatial (geographic) and temporal (time) crowding of environmental perturbations. The CEQ provides detailed guidance and direction on cumulative impacts analysis in Considering Cumulative Effects Under the National Environmental Policy Act (Council on Environmental Quality, 1997).

4.1.1 Determination of Significance

The CEQ defines "effects or impacts" for the purposes of environmental impact analysis at 40 CFR section 1508.1(i) as "changes to the human environment resulting from the Proposed Action or alternatives that are reasonably foreseeable." "Effects or impacts" include direct effects, indirect effects, and cumulative effects. For a Proposed Action to have a cumulatively significant impact on an environmental resource the combined effects of all identified past, present, and reasonably foreseeable projects, activities, and processes on a resource, including the effects of the Proposed Action, must be significant.

4.1.2 Identifying the Region of Influence or Geographical Boundaries for Cumulative Impacts Analysis

The region of influence or geographic boundaries for analyses of cumulative impacts can vary for different resources and environmental media. CEQ guidance (Council on Environmental Quality, 1997) indicates that geographic boundaries for cumulative impacts almost always should be expanded beyond those for the project-specific analyses. One method of evaluating geographic boundaries that is proposed by the CEQ guidance is to consider the distance an effect can travel and to identify potential cumulative assessment boundaries accordingly.

A region of influence for evaluating the cumulative impacts of the Proposed Action is defined for each resource in Section 4.4 (Resource-Specific Cumulative Impacts) of the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (hereinafter referred to as the 2018 Final EIS/OEIS). Changes to the region of influence and analysis methods for air quality impacts are discussed in Section 3.1 (Air Quality). The basic region of influence or geographic boundary for the majority of resources analyzed for cumulative impacts in this Supplemental Environmental Impact Statement (EIS)/Overseas EIS (OEIS) is the entire Study Area (Figure 2.1-1, Atlantic Fleet Training and Testing Study Area), although the geographic boundaries for cumulative impacts analysis for some resources are expanded to include activities outside the Study Area that might impact migratory or wide-ranging animals. Other activities potentially originating from outside the Study Area that are considered in this analysis include impacts associated with maritime traffic (e.g., vessel strikes and underwater noise) and commercial fishing (e.g., bycatch and entanglement).

4.2 Projects and Other Activities Analyzed for Cumulative Impacts

Cumulative impacts analysis includes consideration of past, present, and reasonably foreseeable future actions. For past actions, the cumulative impacts analysis only considers those actions or activities that have had ongoing impacts that may be additive to impacts of the Proposed Action. Likewise, present and reasonably foreseeable future actions selected for inclusion in the analysis are those that may have effects additive to the effects of the Proposed Action as experienced by specific environmental receptors.

The cumulative impacts analysis makes use of the best available data, quantifying impacts where possible and relying on qualitative description and best professional judgement where detailed measurement is unavailable. Because specific information and data on past projects and actions are typically scarce, the analysis of past effects is often qualitative (Council on Environmental Quality, 1997). Likewise, analysis for ongoing actions is often inconsistent or unavailable. All likely future development or use of the region is considered to the greatest extent possible, even when a foreseeable future action is not planned in sufficient detail to permit complete analysis (Council on Environmental Quality, 1997).

This cumulative impacts analysis is not bounded by a specific future timeframe (e.g., seven years). The Proposed Action includes general types of activities addressed by this Supplemental EIS/OEIS that are expected to continue indefinitely, and the associated impacts could occur indefinitely. Likewise, some reasonably foreseeable future actions and other environmental considerations addressed in the cumulative impacts analysis are expected to continue indefinitely (e.g., oil and gas production, maritime traffic, commercial fishing). While the Proposed Action training and testing requirements change over time in response to world events, it should be recognized that available information, uncertainties, and other practical constraints limit the ability to analyze cumulative impacts for the indefinite future. Environmental planning and compliance for military readiness activities is an ongoing process, and the Action Proponents anticipate preparing new or supplemental environmental planning documents covering changes in military readiness activities in the Study Area as necessary. These future environmental planning documents would include cumulative impacts analysis based on information available at that time.

Table 4.2-1 and Table 4.2-2 describe other actions that have had, continue to have, or would be expected to have some impact upon resources also impacted by the Proposed Action within the Study Area and surrounding areas. These activities are selected based on information obtained during the scoping process (refer to Appendix M, Public Involvement and Distribution), communications with other agencies, a review of other military activities, literature review, previous NEPA analyses, and other available information. Table 4.2-1 focuses on identifying past and reasonably foreseeable future actions (military mission, testing, and training; offshore energy development; ocean-dependent commercial industries; and research). Table 4.2-2 focuses on other major environmental stressors or trends that tend to be widespread and arise from routine human activities and multiple past, present, and future actions. Detailed activity descriptions and summaries of mitigation and minimization measures are provided in Appendix J (Cumulative Impacts Supporting Information). For perspective of general project locations, please refer to Figure 2.1-1 (Atlantic Fleet Training and Testing Study Area) through Figure 2.1-6 (Atlantic Fleet Training and Testing Study Area – Coastal Zones and Designated Ship Shock Trial and Sinking Exercise Area) in Chapter 2 (Description of Proposed Action and Alternatives), which depict the Study Area, boundaries of individual training and testing locations and open-ocean areas within and adjacent to the Study Area.

4.2.1 Past, Present, and Reasonably Foreseeable Future Actions

This section focuses on past, present, and reasonably foreseeable future actions that occur within or potentially impact resources analyzed in the Study Area.

Table 4.2-1 describes past and reasonably foreseeable future actions (military mission, testing, and training; offshore energy development; ocean-dependent commercial industries; and research) and provides a geographic and time overlap for each activity.

Table 4.2-1: Past, Present, and Reasonably Foreseeable Future Actions

Action	*Geographic Overlap*	*Time Overlap*	*Description*
Military Mission, Training, and Testing Activities			
Atlantic Fleet Training and Testing	New England Mid-Atlantic Southeast Gulf of Mexico	Past Present Future	Prior to this Supplemental EIS/OEIS, the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (hereinafter referred to as the 2018 Final EIS/OEIS) provided the most recent comprehensive analysis of the full geographic scope of areas where Action Proponent military readiness activities have historically occurred as well as those projected into the reasonably foreseeable future (U.S. Department of the Navy, 2018). The Navy uses these analyses to support incidental take authorizations under the MMPA. In August 2018, the MMPA was amended to allow for 7-year authorizations for military readiness activities, increasing the previous authorization timeframe from 5 years. As such, the National Oceanic Atmospheric Administration Fisheries extended the MMPA incidental take permit for AFTT from November 2023 to November 2025 (National Marine Fisheries Service, 2018).
Eglin Gulf Test and Training Range	Gulf of Mexico	Past Present Future	The Air Force has consulted NMFS regarding effects to marine mammals and sea turtles through a Letter of Authorization that provides authorization for takes of marine mammals by Level A and Level B harassment for the period 2023 to 2030.
Undersea Warfare Training Range	Southeast	Past Present Future	Use of the range for anti-submarine warfare military readiness activities.
Joint Logistics Over-the-Shore Training	Mid-Atlantic	Past Present Future	May be conducted jointly by the Navy, Marine Corps, and Army and consists of loading/unloading of cargo and personnel onto ships without fixed port facilities.
Joint Base Langley-Eustis	Mid-Atlantic	Past Present Future	The Army conducts approximately 10 surface-to-surface gunnery training events per year in the Virginia Capes RC.

Table 4.2-1: Past, Present, and Reasonably Foreseeable Actions (continued)

Action	Geographic Overlap	Time Overlap	Description
United States Coast Guard	New England Mid-Atlantic Southeast Gulf of Mexico	Past Present Future	The U.S. Coast Guard performs maritime humanitarian, law enforcement, and safety services in estuarine, coastal, and offshore waters.
National Aeronautics and Space Administration	Southeast	Past Present Future	NMFS concluded that Wallops operations are infrequent enough to not warrant the need for an Incidental Take Statement for marine mammals or sea turtles from over-ocean rocket operations (National Aeronautics and Space Administration, 2018).
U.S. Outer Continental Shelf Energy Development			
Oil and Gas Leases	Southeast Gulf of Mexico	Past Present Future	As of August 1, 2023, there were 2,193 active oil and gas leases over 11,748,568 acres in the Gulf of Mexico Outer Continental Shelf Region (Western Area-Texas: 387 leases over 2,124,673 acres; Central Area-Alabama, Louisiana: 1,793 leases over 9,549,015 acres; and Eastern Area-Florida: 13 leases over 74,880 acres) (Bureau of Ocean Energy Management, 2023b).
Floating Systems	Gulf of Mexico	Past Present Future	At this time, two systems occur in the Walker Ridge area of the Gulf of Mexico: (1) Petrobras America, Inc., located 165 miles from Louisiana in approximately 2,500 meters of water (Bureau of Ocean Energy Management & Regulation and Enforcement, 2011) and (2) Royal Dutch Shell, located 200 miles southwest of New Orleans in 2,900 meters of water (The Times-Picayune, 2015).
Liquefied Natural Gas Terminals	New England Mid-Atlantic Southeast Gulf of Mexico	Past Present Future	The following Liquefied Natural Gas terminals are within the Study Area: Nine Existing Import: six Gulf of Mexico, three Atlantic (Federal Energy Regulatory Commission, 2023b) Seven Existing Export: five Gulf of Mexico, two Atlantic (Federal Energy Regulatory Commission, 2023a) Six Approved and under Construction Export: Gulf of Mexico (Federal Energy Regulatory Commission, 2023a) Eleven Approved Not Yet under Construction Export: Gulf of Mexico (Federal Energy Regulatory Commission, 2023a) Six Proposed Export: Gulf of Mexico (Federal Energy Regulatory Commission, 2023a) Three Projects in Pre-Filing Export: Gulf of Mexico (Federal Energy Regulatory Commission, 2023a)
Oil and Gas Structure Removal Operations	Southeast Gulf of Mexico	Past Present Future	Roughly 189 oil and gas structures are removed annually in the Gulf of Mexico (U.S. Government Accountability Office, 2015). Of these about half are removed using explosives, which are detonated inside pilings and well conductors at a depth of 15 feet below the seafloor (National Marine Fisheries Service, 2021b).

Table 4.2-1: Past, Present, and Reasonably Foreseeable Actions (continued)

Action	Geographic Overlap	Time Overlap	Description
Wind Energy Development	New England Mid-Atlantic Southeast	Past Present Future	Five wind turbines are established and active at Block Island, Rhode Island. Two wind turbines are established and active off the coast of Virginia Beach, Virginia. Twenty-nine commercial wind energy leases have been issued in federal waters on the Outer Continental Shelf, including those offshore Delaware, Massachusetts, Maryland, New Jersey, Rhode Island, Virginia, New York, and North Carolina (Bureau of Ocean Energy Management, 2023d). Various state offshore wind energy programs are also under development.
Marine Hydrokinetic Power Generation	New England	Future	There are no existing licensed hydrokinetic projects on the Atlantic coast. There is one hydrokinetic preliminary permit for the Bourne Tidal Test Site project located in the Cape Cod Canal in Massachusetts state waters; the preliminary permit expired March 1, 2023 (U.S. Department of Energy, 2015).
Other Commercial Industries			
Undersea Communication Cables	New England Mid-Atlantic Southeast	Past Present Future	Over 550,000 miles of cables currently exist in the world’s oceans.
Marine Mineral Extraction	Mid-Atlantic Southeast	Past Present Future	Since 1995, 66 leases have been executed to extract minerals; there are currently six active leases and three proposed leases in seven states (Florida, Louisiana, Maryland, Mississippi, North Carolina, New Jersey, and Virginia) (Bureau of Ocean Energy Management, 2023c).
Commercial Fishing	New England Mid-Atlantic Southeast Gulf of Mexico	Past Present Future	There are more than 50 different fisheries in the Greater Atlantic region (National Oceanic and Atmospheric Administration, 2019). In the southeast region, there are 21 separate fisheries.
Recreational Fishing	New England Mid-Atlantic Southeast Gulf of Mexico	Past Present Future	Approximately 9% of the recreational fishing catch comes from federal waters, 54% from estuaries, and 36% from state territorial seas (National Marine Fisheries Service, 2021a).
Aquaculture	New England Mid-Atlantic Southeast Gulf of Mexico	Past Present Future	Although present throughout the Study Area, Florida and Massachusetts have the greatest number of saltwater farms in the Study Area, with 178 and 161, respectively (U.S. Department of Agriculture, 2019).

Table 4.2-1: Past, Present, and Reasonably Foreseeable Actions (continued)

Action	*Geographic Overlap*	*Time Overlap*	*Description*
Coastal Land Development & Tourism	New England Mid-Atlantic Southeast Gulf of Mexico	Past Present Future	Coastal land development adjacent to the Study Area is both intensive and extensive, including development of homes, businesses, recreation, vacation, and ship traffic at port facilities and marinas. The Study Area coastline also includes extensive coastal tourism and its supporting infrastructure.
Maritime Traffic	New England Mid-Atlantic Southeast Gulf of Mexico	Past Present Future	The East Coast of the United States is heavily traveled by commercial, recreational, and government marine vessels with several commercial ports near Navy operating areas (see Figure 3.11-4 in the 2018 Final EIS/OEIS for commercially used waterways in the Study Area).
Research			
Geological and Geophysical Oil and Gas Survey Activities	Mid-Atlantic Southeast	Past Present Future	The Bureau of Ocean Energy Management is reviewing one application from a single permittee for Atlantic Outer Continental Shelf seismic survey activities; the application area covers waters from Delaware to Florida (Bureau of Ocean Energy Management, 2023a).
Academic Research	New England Mid-Atlantic Southeast Gulf of Mexico	Past Present Future	Wide-scale academic research is conducted in the Study Area by federal entities, such as the Navy and the National Oceanic and Atmospheric Association/NMFS, as well as state and private entities and other partnerships. Academic geologists use seismic surveys/air gun arrays to study the ocean floor and beyond, including plate tectonics and volcanic activity.
Field Operations at National Marine Sanctuaries and Marine National Monuments (see Section 6.1.2, Marine Protected Areas)	New England Mid-Atlantic Southeast Gulf of Mexico	Past Present Future	The Programmatic Environmental Assessment of Field Operations in the Southeast and Gulf of Mexico National Marine Sanctuaries (National Oceanic and Atmospheric Administration, 2018b) and the Programmatic Environmental Assessment of Field Operations in the Northeast and Great Lakes National Marine Sanctuaries (National Oceanic and Atmospheric Administration, 2018a) analyze the options of maintaining the status quo and existing level of operations in national marine sanctuaries and monuments for the next five years, or increasing the number of small boat operations and stopping the requirement for small boat best management practices in some locations.

Notes: % = percent; AFTT = Atlantic Fleet Training and Testing; EIS = Environmental Impact Statement; MMPA = Marine Mammal Protection Act; NMFS = National Marine Fisheries Service; OEIS = Overseas Environmental Impact Statement; RC = Range Complex; U.S. = United States

Table 4.2-2 describes other major environmental stressors or trends that tend to be widespread and arise from routine human activities and multiple past, present, and future actions.

Table 4.2-2: Ocean Pollution and Ecosystem Alteration Trends

Stressor	*Location*	*Description*
Hypoxic zones	Global	Hypoxia, or low oxygen, is an environmental phenomenon where the concentration of dissolved oxygen in the water column decreases to a level that can no longer support living aquatic organisms. Hypoxia occurs from the rapid growth and decay of algal blooms in response to excess nutrient loading (primarily nitrogen and phosphorus from agriculture runoff, sewage treatment plants, bilge water, and atmospheric deposition). Animals that encounter the hypoxic zones flee, experience physiological stress, or suffocate (National Oceanic and Atmospheric Administration, 2016; Texas A&M University, 2011, 2014). Hypoxic zones can be natural phenomena but are occurring in increasing size and frequency due to human-induced nonpoint source water pollution (National Oceanic and Atmospheric Administration, 2016, 2017b).
	Gulf of Mexico	The northern Gulf of Mexico adjacent to the Mississippi River has the largest hypoxic zone in the United States and the second largest hypoxic zone worldwide. The 2023 Gulf of Mexico hypoxic zone measured 3,058 square miles and was the seventh smallest in the 36-year record of surveys. The 5-year average is now down to 4,347 square miles (U.S. Environmental Protection Agency, 2023a).
Harmful algal blooms	Global	Elevated nutrient loading has also been identified as a potential contributing cause of the increased incidence of harmful algal blooms, proliferations of certain marine and freshwater toxin-producing algae (National Oceanic and Atmospheric Administration, 2016, 2017b). Of the 5,000 known species of phytoplankton, there are about 100 species known to be toxic or harmful. Harmful algal blooms cause human illness and animal mortalities, including fish, bird, and marine mammals (Anderson et al., 2002; Corcoran et al., 2013; Sellner et al., 2003). Harmful algal blooms can be natural phenomena but are occurring in increasing size and frequency due to human-induced nonpoint source water pollution (National Oceanic and Atmospheric Administration, 2016, 2017b). With the projection of warming ocean waters, these harmful blooms may become more prevalent beginning earlier, lasting longer, and covering larger geographic areas (Edwards, 2013; Moore et al., 2008).
	Gulf of Mexico	In Florida, the deaths of 107 bottlenose dolphins in 2004 and 277 manatees in 2013 were linked to harmful algal blooms (Edwards, 2013; Flewelling et al., 2005).
	Atlantic Ocean	In the Saint Lawrence Estuary, unprecedented mass mortalities of multiple species including marine fish, birds, and marine mammals were linked to a harmful algal bloom that occurred in 2008 (Starr et al., 2017).
Major spill events	Global	Oil and other chemical spills related to oil and gas production activities are common throughout the Gulf of Mexico and Atlantic.
	Gulf of Mexico	From 2017 to 2021, there were a total of 72 spills, which includes spills of oil, drilling mud, and other chemicals (Bureau of Safety and Environmental Enforcement, 2023). In April 2010, the *Deepwater Horizon* offshore drill rig, 41 miles southeast of the Louisiana coast, exploded and sank during exploratory well drilling and resulted in the largest accidental marine oil spill in U.S. history releasing 4.9 million barrels (210 million gallons) of crude oil into the Gulf of Mexico (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011). Environmental impacts continue to be observed, including those arising from direct exposure of marine life to oil and oil dispersants, habitat degradation, and disturbances caused by cleanup activities. There has been extensive documentation of negative effects of the spill to deep-sea corals and benthos, fish, marine mammals,

Table 4.2-2: Ocean Pollution and Ecosystem Alteration Trends (continued)

Stressor	*Location*	*Description*
		Sargassum, sea turtles, and other shoreline species and habitats (National Oceanic and Atmospheric Administration, 2017a).
Marine debris (Section 3.2.2.2.1, Marine Debris and Water Quality)	Global	Marine debris is any anthropogenic object intentionally or unintentionally discarded, disposed of, or abandoned that enters the marine environment. An estimated 75% or more of marine debris consists of plastic (Hardesty & Wilcox, 2017). Approximately 80% of marine debris originates onshore and 20% from offshore sources. Marine debris is governed internationally by the 1972 London Convention and 1996 London Protocol and regulated in the United States through the Marine Protection, Research, and Sanctuaries Act. Marine debris has been discovered to be accumulating in gyres throughout the oceans, and a major accumulation zone exists in both the Pacific Ocean and in the Atlantic east of Bermuda. Marine debris degrades marine habitat and water quality and poses ingestion and entanglement risks to marine life and birds (National Marine Fisheries Service, 2006).
Noise	Global	Ambient noise is the collection of ever-present sounds of both natural and human origin. Ambient noise in the ocean is generated by sources that are natural physical (earthquakes, rainfall, waves breaking, and lightning hitting the ocean); natural biological (snapping shrimp and the vocalizations of marine mammals), and anthropogenic (human-generated) sources. Anthropogenic sources have substantially increased ocean noise since the 1960s, and include commercial shipping, oil and gas exploration and production activities (including air gun, drilling, and explosive decommissioning), commercial and recreational fishing (including vessel noise, fish-finding sonar, fathometers, and acoustic deterrent and harassment devices), military (testing, training, and mission activities), shoreline construction projects (including pile driving), recreational boating and whale watching activities, offshore power generation (including offshore windfarms), and research (including sound from air guns, sonar, and telemetry).
Climate change (Section 3.1, Air Quality)	Global	Predictions of long-term negative environmental impacts due to climate change include sea level rise; changes in ocean surface temperature, acidity/alkalinity, and salinity; changing weather patterns with increases in the severity of storms and droughts; changes to local and regional ecosystems (including the potential loss of species); shrinking glaciers and sea ice; thawing permafrost; a longer growing season; and shifts in plant and animal ranges, fecundity, and productivity. Anthropogenic greenhouse gas emissions have changed the physical and chemical properties of the oceans, including a 1-degree Celsius temperature rise, increased carbon dioxide absorption, decreased pH, alteration of carbonate chemistry, decline in dissolved oxygen, and disruption of ocean circulation (Poloczanska et al., 2016). Observations of species responses that have been linked to anthropogenic climate change are widespread, and trends include shifts in species distribution to higher latitudes and to deeper locations, earlier onset of spring and later arrival of fall, declines in calcification, and increases in the abundance of warm-water species. Climate change is likely to negatively impact the Study Area and will contribute added stressors to all resources in the Study Area.

Notes: % = percent; U.S. = United States

4.3 Cumulative Impacts on Environmental Resources

Since the information available on past, present, and reasonably foreseeable actions varies in quality and level of detail, impacts of these actions were quantified where available data made it possible; otherwise, professional judgement and experience were used to make a qualitative assessment of impacts. Due to the large scale of the Study Area and multiple activities and stressors interacting in the ocean environment (Table 4.2-1 and Table 4.2-2), the analysis for the incremental contribution to cumulative stress that the Proposed Action may have on a given resource is largely qualitative and speculative. The resource sections in Chapter 3 (Affected Environment and Environmental Consequences) of this Supplemental EIS/OEIS include a discussion of the threats affecting each resource, analysis of impacts from each stressor and substressor specific to areas where activities are concentrated (i.e., ranges/operating areas), and an analysis of the combined impacts of all stressors. A robust discussion of the general threats to each biological resource and all Endangered Species Act and Marine Mammal Protection Act listed species is included in Appendix F (Biological Resources Supplemental Information). The Chapter 3 analysis is referenced and briefly summarized below in order to provide the necessary context to support the conclusion that the Proposed Action will have an insignificant contribution to the cumulative stress experienced by these resources when specific past, present, and reasonably foreseeable future actions are added to the analysis.

Each resource section (Section 3.1, Air Quality, through Section 3.9, Birds and Bats) presents unique criteria for determining the significance of Proposed Action stressors. These criteria define impact descriptors through the context and intensity of stressor impacts in order to present consistent analysis throughout the resource sections. These impact descriptors (Negligible, Minor, Moderate, Major) from each resource section have been incorporated into the cumulative impacts analysis below.

Further, analysis was not separated by Alternative because the data available for the cumulative effects analysis was mostly qualitative in nature and, from a landscape-level perspective, these qualitative impacts are expected to be similar. Under Alternative 1 or Alternative 2 of the Proposed Action, the Action Proponents will implement the mitigation measures detailed in Chapter 5 (Mitigation) to avoid or reduce potential impacts on biological, socioeconomic, and cultural resources in the Study Area.

4.3.1 Air Quality

The region of influence for assessing cumulative air quality impacts from criteria pollutants and hazardous air pollutants includes the Study Area as well as adjoining land areas several miles inland, which at times would be downwind from emission sources associated with the action alternatives. The region of influence for the cumulative analysis of proposed greenhouse gas (GHG) emissions is worldwide because global sources of GHGs contribute to global climate change. These global impacts would be manifested as impacts to resources and ecosystems within the Study Area.

Section 3.1 (Air Quality) describes the existing air quality conditions, which reflect the aggregate impacts of past and present actions within the Study Area. Due to these actions, portions of coastal regions within the Study Area are in nonattainment and/or maintenance of national ambient air quality standards. Most activities associated with the action alternatives have been ongoing and therefore are captured in the current air quality conditions of the Study Area. The context for air quality analysis provided in Section 3.1 includes adherence to state and federal plans enacted to achieve and maintain ambient air quality standards.

Past, present, and future activities that could contribute to air quality impacts from the action alternatives and produce cumulative air quality impacts include oil and gas production, other military training activities, wind energy development, and non-military vessel operations, as identified in Table 4.2-1. Cumulative air quality impacts from the action alternatives are based on the increase in emissions that would occur from an action, in combination with emissions from these cumulative actions. The qualitative analysis considered the cumulative effects of these emissions in regard to their potential to (1) contribute to an exceedance of an ambient air quality standard, (2) contribute to significant public health impacts from hazardous air pollutants, and (3) affect climate change.

Criteria Pollutants and Hazardous Air Pollutants

The analysis in Section 3.1 (Air Quality) concluded that the proposed training and testing activities would result in negligible to minor impacts to all air quality stressors (criteria pollutants and hazardous air pollutants). The Proposed Action would result in localized and temporarily elevated emissions, but criteria pollutant emissions would not exceed conformity *de minimis* thresholds in any nonattainment or maintenance area. Thus, based on the analysis presented in Section 3.1 and given the meteorology of the Study Area, the frequency and isolation of proposed training and testing activities (Table 2.2-1 through Table 2.2-5 in Chapter 2, Description of Proposed Action and Alternatives), and the quantities of expected emissions, it is anticipated that the incremental contribution of the Proposed Action, when added to the impacts of all other past, present, and reasonably foreseeable future actions, would result in negligible to minor impacts on air quality in the Study Area or beyond.

Climate Change

Table 4.3-1 presents annual GHG emissions estimated for all training and testing activities proposed within the entire Study Area for each action alternative. Table 4.3-1 compares annual GHG emissions from each action alternative to those estimated for the preferred alternative in the 2018 Final EIS/OEIS. These data show that Alternatives 1 and 2 would result in minor decreases and increases in GHG emissions within the Study Area compared to those estimated for the preferred alternative in the 2018 Final EIS/OEIS. GHG emissions from either action alternative would incrementally contribute to future climate change, some effects of which are identified below.

Table 4.3-1: Total Annual Greenhouse Gas Emissions from All Study Area Training and Testing Activities (metric tons/year)

2018 Final EIS/OEIS Emission Estimates	*Alternative 1 Emissions*	*Alternative 1 Net Change from 2018 Estimates*	*Alternative 2 Emissions*	*Alternative 2 Net Change from 2018 Estimates*
1,188,000	1,160,000	-28,000	1,338,000	150,000

The CEQ has released interim guidance on when and how federal agencies should consider GHG emissions and climate change in NEPA analyses (Council on Environmental Quality, 2023). The guidance emphasizes when conducting climate change analyses in NEPA reviews, agencies should consider the following: (1) the potential effects of a proposed action on climate change, including by assessing both GHG emissions and reductions from the proposed action and (2) the effects of climate change on a proposed action and its environmental impacts. The guidance states that federal agencies should quantify the reasonably foreseeable direct and indirect GHG emissions of their proposed actions and reasonable alternatives (as well as the No Action Alternative). The guidance also recommends that agencies provide additional context for GHG emissions, including through the use of the best available social cost of GHG (SC-GHG) estimates (Council on Environmental Quality, 2023).

The SC-GHG is the estimated monetary value of the future stream of net damages associated with adding GHGs such as those from the Proposed Action to the atmosphere (U.S. Environmental Protection Agency, 2023b). These costs include the value associated with impacts such as changes in net agricultural productivity, property damage from increased flood risk, and disruption of energy services. An SC-GHG estimate, when based on the best available science, can provide in many circumstances additional context to GHG emissions estimates, particularly to support a comparison of alternatives. Agencies can also provide accessible comparisons or equivalents to help the public and decision makers understand GHG emissions in more familiar terms. For example, the estimated SC-GHG emissions from Alternatives 1 and 2 are similar to that of electricity used by 197,000 and 232,100 average U.S. households annually (U.S. Environmental Protection Agency, 2024).

To minimize GHG emissions from the action alternatives, proposed emission sources would comply with applicable regulations and GHG policies, and for mobile sources, federal vehicle clean fuels, mileage efficiency, and emissions regulations. The Navy would continue to implement proactive measures to reduce their overall GHG emissions by decreasing the use of fossil fuels and increasing the use of alternative energy sources in accordance with the goals set by Executive Orders, the Energy Policy Acts of 2005 and 2020, and Navy and Department of Defense policies (such as the Navy Climate Action Plan; U.S. Department of the Navy, 2022). These GHG initiatives are not emission reductions proposed to offset GHG emissions generated by the action alternatives, but rather demonstrate initial responses for the Navy to factor GHG management into Navy proposals and impact analyses.

Climate change could impact implementation of the action alternatives and the adaptation strategies needed to respond to future conditions. For the greater Study Area region, the main effect of climate change is increased storminess and sea level rise, with additional effects documented by climate analyses presented in the Fifth National Climate Assessment (U.S. Global Change Research Program, 2023). Operations by the Navy and U.S. Coast Guard have adapted to these changes. However, exacerbation of these conditions in the future could impede proposed activities during extreme events. Regarding sea level rise, the Department of Defense has an active program that develops measures for installations to adapt to this threat and its potential to displace coastal operations and infrastructure (Strategic Environmental Research and Development Program, 2023).

4.3.2 Sediment and Water Quality

The analysis in Section 3.2 (Sediment and Water Quality) concludes that the combined impacts from all training and testing activity stressors on sediments and water quality, related to explosives and explosive byproducts, metals, chemicals and other materials not associated with explosives, would be minor and would not result in measurable additional impacts on sediment or water quality in the Study Area or beyond.

Stressors associated with training and testing activities within offshore locations typically would be dispersed over large expanses of the ranges. Due to the large size of the ranges, it is unlikely that released materials (e.g., explosives and byproducts) from these activities would accumulate at a single location and therefore, would not be concentrated within a small geographic area. Past, present, and future activities with the potential to affect sediments and water quality include offshore oil and gas removal and mineral extraction. However, it is unlikely that these activities would overlap spatially with the Action Proponents' training and testing activities to an extent that would result in measurable additional impacts.

It is possible that Action Proponent stressors could combine with non-Action Proponent stressors in nearshore areas (bays and estuaries) that are already impaired as a result of industrial and/or watershed inputs. The magnitude of contaminant inputs (e.g., metals) associated with the Action Proponents' training and testing activities would be discountable relative to those of other existing and legacy inputs. Additionally, the Action Proponents would comply with all federal, state, and local laws, regulations, and executive orders applicable to sediment and water quality (see Section 6.1, Consistency with Regulatory Considerations). Compliance with the applicable laws and regulations, including any existing and future Total Maximum Daily Loads for portions of the Study Area designated as impaired water bodies under Section 303(d) of the Clean Water Act, would ensure cumulative impacts from the Proposed Action would be minor and would not result in measurable additional impacts on sediment and water quality.

4.3.3 Habitats

The analysis presented in Section 3.3 (Habitats) indicates that marine habitats could be affected by underwater detonations and physical disturbance from vessels, military expended materials, seafloor devices, and pile driving.

Commercial activities that could impact marine habitats (e.g., fishing, coastal development, dredging, offshore energy and resource development) are conducted under permits and regulations that require companies to avoid and minimize impacts on sensitive habitats (e.g., live hard bottom). Further, the Action Proponents will implement mitigations to minimize impacts from explosives, some physical disturbances (e.g., anchoring, seafloor devices), and strike stressors on seafloor resources, including shallow-water coral reefs, live hard bottom, artificial reefs, and shipwrecks, as described in Chapter 5 (Mitigation) and National Marine Sanctuaries, as described in Chapter 6 (Regulatory Considerations). Proposed Action activities are not likely to occur at the same time/place as other activities in the Study Area that have a large effect on bottom habitats (e.g., commercial fishing operations). And in some locations, the impacts would not overlap at all, as nearly 30 percent of the seafloor impacted by the Proposed Action would be deeper than live hard bottom is expected (e.g., bathyal/abyssal zone). Thus, it is likely that the mostly soft bottom habitats impacted would have the opportunity to recover from the Proposed Action before impacts from fishing or other activities could interact or compound additional stress to the ecosystems.

The mostly temporary impact footprint from the Proposed Action of approximately 145 acres per year (from explosive crater, military expended materials, and seafloor devices) affects mostly soft substrate. The impact of the Proposed Action is also dwarfed by the estimated impact area of commercial trawling in the Gulf of Mexico alone; an estimated 23 million acres of bottom in the Gulf of Mexico was trawled per year from 2007 to 2009 (Amoroso et al., 2018). Per analysis detailed in Appendix I (Military Expended Materials and Direct Strike Impact Analysis), the area of hard bottom potentially impacted by military expended materials represents a negligible percentage (less than 0.01 percent) of the total hard bottom habitat in the Study Area.

Based on an assessment of cumulative impacts in the U.S. Northeast and Mid-Atlantic Planning regions, the greatest risk to the marine environment is from rapidly increasing sea surface temperatures, fisheries (mostly commercial), and shipping at 10 percent each. Military activities ranked very low at about 2 percent for stressors on offshore habitats (Wyatt et al., 2017); to explore cumulative risk to inshore and offshore habitats in the U.S. Northeast and Mid-Atlantic Ocean Planning regions, Wyatt et al. (2017) applied an open-source assessment model to 13 habitats and 31 stressors (including military activities) in an exposure-consequence framework.

Potential impacts would be negligible to moderate (depending on the stressor) and include localized disturbance of the seafloor sediment (e.g., turbulence/turbidity), cratering and material burial in soft bottom habitats, accumulation of artificial material on hard bottom, and structural damage to unmapped hard bottom habitats. Although some habitats are impacted by stressors throughout the Study Area, the incremental contribution of the Proposed Action when added to the impacts of all other past, present, and reasonably foreseeable future actions would not result in measurable additional impacts on habitats in the Study Area.

4.3.4 Vegetation

The analysis presented in Section 3.4 (Vegetation) indicates that marine vegetation could be affected by underwater detonations and physical disturbance from vessels, military expended materials, seafloor devices, and pile driving. Potential impacts would be negligible to moderate (depending on the stressor) and include localized disturbance of the seafloor sediment (e.g., turbulence/turbidity), cratering and material burial in soft bottom habitats, accumulation of artificial material on hard bottom, and structural damage to unmapped hard bottom habitats.

Commercial activities that could impact marine vegetation (e.g., fishing, dredging, offshore energy development) are conducted under permits and regulations that require companies to avoid and minimize impacts on sensitive vegetation (e.g., coastal wetlands, seagrass beds), and some harvested seaweeds are managed under Fishery Management Plans. The Action Proponents will implement mitigation to minimize impacts from explosives, some physical disturbances (e.g., anchoring, seafloor devices), and strike stressors on seafloor resources, including habitats that feature vegetation (shallow-water coral reefs, live hard bottom, artificial reefs, and shipwrecks) as described in Chapter 5 (Mitigation) and National Marine Sanctuaries, as described in Chapter 6 (Other Regulatory Considerations). The Navy will also implement observer-based mitigation for floating *Sargassum* to avoid impacts to associated biota from explosive ordnance on or near the surface (e.g., torpedoes).

The mostly temporary impact footprint from the Proposed Action of approximately 145 acres per year (from explosive crater, military expended materials, and seafloor devices) affects mostly resilience organisms and habitats (e.g., benthic microalgae on soft bottom habitats). The impact from the Proposed Action is also dwarfed by the estimated impact area of commercial trawling in the Gulf of Mexico alone; an estimated 23 million acres of bottom in the Gulf of Mexico was trawled per year from 2007 to 2009 (Amoroso et al., 2018). Per analysis detailed in Appendix I (Military Expended Materials and Direct Strike Impact Analysis), the area of live hard bottom (a habitat for benthic macroalgae) potentially impacted by military expended materials represents a negligible percentage (less than 0.01 percent) of the total live hard bottom in the Study Area.

Proposed Action activities are not likely to occur at the same time/place as other activities in the Study Area that have a large effect on vegetated bottom habitats (e.g., commercial fishing operations). And in some locations, the impacts would not overlap at all, as nearly 70 percent of the area impacted by the Proposed Action would be deeper than where vegetated hard bottom is expected. The impacted vegetation (mostly benthic microalgae, but also some benthic macroalgae and floating *Sargassum*) would likely have the opportunity to recover from the Proposed Action before impacts from fishing or other activities could interact or compound additional stress to the ecosystems.

Although some vegetation is impacted by stressors throughout the Study Area, the incremental contribution of the Proposed Action when added to the impacts of all other past, present, and reasonably foreseeable future actions would not result in measurable additional impacts on vegetation in the Study Area.

4.3.5 INVERTEBRATES

The analysis presented in Section 3.5 (Invertebrates) indicates that marine invertebrates could be affected by all the underwater stressors associated with the Proposed Action. Potential impacts would be negligible to moderate (depending on the stressor) and include impacts to individual marine invertebrates, localized disturbance of the seafloor sediment (e.g., turbulence/turbidity), cratering and material burial in soft bottom habitats, accumulation of artificial material on hard bottom, and structural damage to unmapped hard bottom habitats.

Commercial activities that could impact invertebrate habitats (e.g., commercial fishing, dredging, offshore energy development) are conducted under permits and regulations that require companies to avoid and minimize impacts on sensitive habitats (e.g., shallow-water coral reefs, oyster beds/reefs), and some harvested invertebrates are managed under Fishery Management Plans (e.g., shrimp, scallops). The Action Proponents will implement mitigations to avoid impacts from explosives, some physical disturbances (e.g., anchoring, seafloor devices), and strike stressors on seafloor resources, including shallow-water coral reefs, live hard bottom, artificial reefs, and shipwrecks, as described in Chapter 5 (Mitigation) and National Marine Sanctuaries, as described in Chapter 6 (Regulatory Considerations). The Action Proponents will also implement observer-based mitigation for jellyfish aggregations to avoid impacts to associated biota from explosive ordnance on or near the surface (e.g., torpedoes).

The mostly temporary impact footprint from the Proposed Action of approximately 145 acres per year (from explosive crater, military expended materials, and seafloor devices) affects mostly resilient soft substrate. The impact of the Proposed Action is also dwarfed by the estimated impact area of commercial trawling in the Gulf of Mexico alone; an estimated 23 million acres of bottom in the Gulf of Mexico was trawled per year from 2007 to 2009 (Amoroso et al., 2018). Per analysis detailed in Appendix I (Military Expended Materials and Direct Strike Impact Analysis), the area of live hard bottom potentially impacted by military expended materials represents a negligible percentage (less than 0.01 percent) of the total live hard bottom habitat in the Study Area.

Proposed Action activities are not likely to occur at the same time/place as other activities in the Study Area that have a large effect on bottom habitats (e.g., commercial fishing operations). And in some locations, the impacts would not overlap at all, as nearly 30 percent of the seafloor impacted by the Proposed Action would be deeper than live hard bottom communities are expected (e.g., bathyal/abyssal zone). Thus, the mostly soft bottom communities impacted would have the opportunity to recover from the Proposed Action before impacts from fishing or other activities could interact or compound additional stress to the ecosystems.

Invertebrates are generally abundant and relatively short-lived, and with the exception of sessile species located near areas of repeated Navy activities (e.g., highly altered pierside locations, established channels near large naval port facilities), few individuals would likely be affected repeatedly by the same event. With the exception of some species such as deep-water corals and sponges, invertebrates generally have high reproductive rates, short reproductive cycles, and resilient dispersal mechanisms; thus, the mostly soft bottom communities impacted would likely reestablish quickly and deep-water corals/sponges would not likely be impacted based on their generally low percent coverage on live hard bottom habitat.

Although some invertebrate habitats are impacted by stressors throughout the Study Area, it is anticipated that the Proposed Action when added to the impacts of all other past, present, and reasonably foreseeable future actions would not result in measurable additional impacts on invertebrates in the Study Area.

4.3.6 Fishes

Section 3.6.2.1.4 (General Threats) includes an extensive discussion of the existing stressors, which often act on fish populations simultaneously, including habitat alteration, vessel strikes, diseases and parasites (susceptibility and incidence increases with habitat alteration and exposure to individuals that escaped sea farms), introduction of non-native species, pollution, and climate change. The additional threat of living in a noisy environment, such as that produced by offshore wind energy developments, construction noise within inshore waters, pile driving, sonar, seismic activity, shipping, and offshore construction projects, may contribute to cumulative stress experienced by fish populations.

It is anticipated that the Proposed Action would affect fish species within the Study Area, including Endangered Species Act (ESA)-listed fish species. Fishes could be affected by all the underwater stressors associated with the Proposed Action. The analysis in Section 3.6 (Fishes) concludes that the impacts on fishes would range from negligible to moderate, depending on the stressor. The majority of potential impacts include short-term behavioral and physiological responses (e.g., brief periods of masking or behavioral reactions, such as startle or avoidance responses, or no reaction at all). Some stressors (such as explosives) could also result in injury or mortality to a relatively small number of individuals. Overall, long-term consequences for most individual fishes or populations are unlikely because exposures from the majority of stressors are intermittent, transient, and unlikely to repeat over short periods. Some ESA-listed fish species that are known to occur within inshore water areas would be at higher risk during training and testing activities in these locations.

The aggregate impacts of past, present, and other reasonably foreseeable future actions contributing multiple water quality, noise, and physical risks to fishes will likely continue to have effects on individual fishes and fish populations. However, military readiness activities are generally isolated from other activities in space and time and the majority of the proposed training and testing activities occur in well-known, previously established training and testing range areas; are spatially distributed and not generally concentrated in any one location for any extended period of time; have few participants; and are of a short duration. Thus, although it is possible that the Proposed Action could contribute incremental stressors to a small number of individuals, which would further compound effects on a given individual already experiencing stress, it is not anticipated that the Proposed Action has the potential to put additional stress on entire populations. Therefore, it is anticipated that the incremental contribution of the Proposed Action, when added to the impacts of all other past, present, and reasonably foreseeable future actions would not result in measurable additional impacts on fishes in the Study Area.

4.3.7 Marine Mammals

In general, bycatch, vessel strikes, and entanglement are leading causes of injury and direct mortality to marine mammals throughout the Study Area. Although mitigated to the greatest extent practicable, the Proposed Action could result in injury and mortality to individuals of some marine mammal species from sonar, underwater explosions, and vessel strikes. The analysis in Section 3.7 (Marine Mammals) concludes that the impacts on marine mammals would range from negligible to moderate, depending on the stressor. Implementation of measures discussed in Chapter 5 (Mitigation) would help avoid, but not absolutely eliminate, the risk for potential impacts, and any incidence of injury and mortality that might occur under the Proposed Action could be additive to injury and mortality associated with other non-military actions in the Study Area. While it is more likely that an individual of an abundant, common stock or species would be affected, there is a chance that a less abundant stock could be affected.

Ocean noise is already significantly elevated over historic, natural levels. Acoustic stressors (underwater explosions and sonar as well as vessel noise) associated with the Proposed Action could also result in additive acoustic impacts on marine mammals. However, sonar is not known to be a major threat to marine mammal populations or a significant portion of the overall ocean noise budget (Bassett et al., 2010; Baumann-Pickering et al., 2010; International Council for the Exploration of the Sea, 2005; McDonald et al., 2006). Other current and future non-military actions such as construction and operation of liquefied natural gas terminals; characterization, construction, and operation of offshore wind energy projects; seismic surveys; and construction, operation, and removal of oil and gas facilities could result in underwater sound levels that could cause behavioral harassment, temporary threshold shift, auditory injury (AINJ), or injury. Additionally, elevated ambient noise levels may cause physiological stress in individuals, to which the Proposed Action would contribute.

It is possible that some sounds from many of these non-military activities could travel over long distances and overlap in time and space with sounds from underwater explosions or Action Proponent sonar use, in particular distant shipping noise, which is more widespread and continuous. It is not known whether the co-occurrence of shipping noise and sounds associated with underwater explosions and sonar use would result in harmful additive impacts on marine mammals. However, these activities are widely dispersed, the sound sources are intermittent, and mitigation measures would be implemented. Furthermore, safety, security, and operational considerations would preclude some training and testing activities in the immediate vicinity of other actions, further reducing the likelihood of simultaneous or overlapping exposure. For these reasons, it is unlikely that an individual marine mammal would be simultaneously exposed to sound levels from multiple actions that could cause behavioral harassment, temporary threshold shift, AINJ, or injury.

The behavioral and physiological responses of any marine mammal to a potential stressor, such as underwater sound, could be influenced by various factors, including disease, dietary stress, body burden of toxic chemicals, energetic stress, percentage body fat, age, reproductive state, and social position. If the health of an individual marine mammal were already compromised, it is possible this condition could alter the animal's expected response to stressors associated with the Proposed Action. Synergistic impacts are also possible; for example, animals exposed to some chemicals may be more susceptible to noise-induced loss of hearing sensitivity (Fechter & Pouyatos, 2005). While the response of a previously stressed animal might be different from the response of an unstressed animal, no data is available at this time to accurately predict how stress caused by various ocean pollutants would alter a marine mammal's response to stressors associated with the Proposed Action.

In summary, the aggregate impacts of past, present, and other reasonably foreseeable future actions continue to impact some marine mammal species in the Study Area. The Proposed Action could contribute incremental stressors to individuals, which would further compound effects on a given individual already experiencing stress. However, with the implementation of standard operating procedures reducing the likelihood of overlap in time and space with other stressors and the implementation of mitigation measures reducing the likelihood of impacts, it is anticipated that the incremental contribution of the Proposed Action, when added to the impacts of all other past, present, and reasonably foreseeable future actions, would not result in measurable additional impacts on marine mammals in the Study Area or beyond. Furthermore, the regulatory process administered by the National Marine Fisheries Service (NMFS), which includes Stock Assessments for all marine mammals and a 5-year reviews for all ESA-listed species, provides a backstop that informs decisions on take authorizations and Biological Opinions. Stock Assessments include estimates of Potential Biological Removal that stocks of marine mammals can sustainably absorb. The Marine Mammal Protection Act (MMPA) take authorizations require that the proposed action have no more than a negligible impact on species or stocks, and that the proposed action imposes the least practicable adverse impact on the species. MMPA authorizations are reinforced by monitoring and reporting requirements so that NMFS is kept informed of deviations from what has been approved. Biological Opinions for federal and nonfederal actions are similarly grounded in status reviews and conditioned to avoid jeopardy and to allow continued progress toward recovery. These processes help to ensure that, through compliance with these regulatory requirements, the Proposed Actions would not have measurable additional impacts on marine mammals.

4.3.8 Reptiles

According to scientific studies, reptiles may rely primarily on senses other than hearing for interacting with their environment and appear to quickly recover from noise stressors (Appendix D, Acoustic and Explosive Impacts Supporting Information); thus, the acoustic stressors produced by military readiness activities are anticipated to have minimal cumulative impact on reptiles. The Proposed Action will not affect turtle nesting or crocodilian habitat, and contaminants and debris discharged into the marine environment are not expected to be measurable or persistent (Section 3.2, Sediment and Water Quality). Effects from the Proposed Action to reptile food sources are avoided or insignificant (Section 4.3.3, Habitats; Section 4.3.4, Vegetation; and Section 4.3.5, Invertebrates). Likewise, Action Proponents' activities generally would not overlap in space and time with other stressors as they occur as dispersed, infrequent, and isolated events that do not last for extended periods of time.

The potential exists for the impacts of ocean pollution (disease, malnourishment), injury, nesting habitat loss, starvation, and the potential that in increased underwater noise environment can contribute multiple stressors to an individual animal. Further, it is possible that the response of a previously stressed animal to impacts associated with the Proposed Action could be more severe than the response of an unstressed animal, or that impacts from the Proposed Action could make an individual more susceptible to other stressors.

Aggregate impacts of past, present, and other reasonably foreseeable future actions continue to impact all reptile species in the Study Area. The Proposed Action would have minor to moderate impacts on reptiles and could contribute incremental stressors to individuals, which would further compound effects on a given individual already experiencing stress. However, with the implementation of standard operating procedures reducing the likelihood of overlap in time and space with other stressors and the implementation of mitigation measures reducing the likelihood of impacts, the incremental stressors anticipated from the Proposed Action are not anticipated to result in measurable additional impacts to reptiles. Additionally, as with marine mammals, the regulatory process includes population assessments and 5-year reviews for all ESA-listed species, which provides a backstop that informs decisions on take authorizations and Biological Opinions. Biological Opinions for federal and nonfederal actions are grounded in status reviews and conditioned to avoid jeopardy and to allow continued progress toward recovery. This process helps to ensure that, through compliance with these regulatory requirements, the

Proposed Action would not have measurable additional impacts on reptiles. Therefore, it is anticipated that the incremental contribution of the Proposed Action, when added to the impacts of all other past, present, and reasonably foreseeable future actions, would not result in measurable additional impacts on reptiles in the Study Area or beyond.

4.3.9 Birds and Bats

All projects in the Study Area that affect ESA-listed species, species protected under the Migratory Bird Treaty Act, and U.S. Fish and Wildlife Service Birds of Conservation Concern are subject to regulatory processes and permitting.

The analysis in Section 3.9 (Birds and Bats) indicates that birds and bats (to a lesser extent) could potentially be impacted by acoustic stressors, explosives, energy stressors, physical disturbance and strikes, entanglement, ingestion, secondary, and combined stressors. The Proposed Action is unlikely to result in injury or mortality of bird or bats. The most likely responses to training and testing activities are short-term behavioral or physiological responses, such as alert response, startle response, cessation of feeding, fleeing the immediate area, and a temporary increase in heart rate. Recovery from the impacts of most stressor exposures that elicit such short-term behavioral or physiological responses would occur quickly. Impacts from one stressor could combine with other stressors and contribute to combined impacts. However, most of the proposed activities would be widely dispersed in offshore areas where bats are infrequent, bird distribution is patchy, and concentrations of individuals are often low; therefore, the potential for interactions between bats, birds, and military readiness activities is low.

The potential exists for the impacts of other threats (habitat loss, interactions with fishing gear, predation and competition with introduced species, pollution, noise and light from human activities, collisions with structures, climate change, and disease) to affect individual birds and bats cumulatively along with the impacts of military readiness activities. It is also possible that the response of a previously stressed animal to impacts associated with the Proposed Action could be more severe than the response of an unstressed animal, or that impacts from the Proposed Action could make an individual more susceptible to other stressors.

The aggregate impacts of past, present, and other reasonably foreseeable future actions continue to impact all bird and bat species in the Study Area. The Proposed Action would have minor to moderate impacts on birds and bats and could contribute incremental stressors to individuals, which would further compound effects on a given individual already experiencing stress. However, with the implementation of standard operating procedures reducing the likelihood of overlap in time and space with other stressors and the implementation of mitigation measures reducing the likelihood of impacts, the incremental stressors anticipated from the Proposed Action are not anticipated to result in measurable additional impacts to birds. It is anticipated that the incremental contribution of the Proposed Action, when added to the impacts of all other past, present, and reasonably foreseeable future actions, would not result in measurable additional impacts on birds and bats in the Study Area.

References

Amoroso, R. O., C. R. Pitcher, A. D. DRijnsdorp, R. A. McConnaughey, A. M. Parma, P. Suuronen, O. R. Eigaard, F. Bastardie, N. T. Hintzen, F. Althaus, S. J. Baird, J. Black, L. Buhl-Mortensen, A. B. Campbell, R. Catarino, J. Collie, J. H. Cowan Jr, D. Durholz, N. Engstorm, T. P. Fairweather, H. O. Fock, R. E. Ford, P. A. Galvez, H. Gerritsen, M. E. Gongora, J. A. Gonzales, J. G. Hiddink, K. M. Hughes, S. S. Intelmann, C. J. Jenkins, P. Josnsson, P. Kainage, M. Kangas, J. N. Kathena, S. Kavadas, R. W. Leslie, S. G. Lewis, M. Lundy, D. Makin, J. Marin, T. Mazor, G. Gonzalez-Mirelis, S. J. Newman, N. Papadopoulou, P. E. Posen, W. Rochester, T. Russo, A. Sala, J. M. Semmens, C. Silva, A. Tsolos, B. Vanelslander, C. B. Wakefield, B. A. Wood, R. Hilborn, M. J. Kaiser, and S. Jennings. (2018). Bottom trawl fishing footprints on the world's continential shelves. *Proceedings of the National Academy of Sciences 115* (43): E10275–E10282.

Anderson, D. M., P. M. Glibert, and J. M. Burkholder. (2002). Harmful algal blooms and eutrophication: Nutrient sources, composition, and consequences. *Estuaries 25* (4, Part B): 704–726.

Bassett, C., J. Thomson, and B. Polagye. (2010). *Characteristics of Underwater Ambient Noise at a Proposed Tidal Energy Site in Puget Sound*. Seattle, WA: Northwest National Marine Renewable Energy Center.

Baumann-Pickering, S., L. K. Baldwin, A. E. Simonis, M. A. Roche, M. L. Melcon, J. A. Hildebrand, E. M. Oleson, R. W. Baird, G. S. Schorr, D. L. Webster, and D. J. McSweeney. (2010). *Characterization of Marine Mammal Recordings from the Hawaii Range Complex*. Monterey, CA: Naval Postgraduate School.

Bureau of Ocean Energy Management. (2023a). *Atlantic Permit Applications*. Retrieved February 10, 2023, from https://www.boem.gov/sites/default/files/documents/Atlantic-Pending-Permit-Map_6.pdf.

Bureau of Ocean Energy Management. (2023b, August 1). *BOEM Gulf of Mexico OCS Region Blocks and Active Leases by Planning Area*. Retrieved August 16, 2023, from https://www.boem.gov/sites/default/files/documents/oil-gas-energy/leasing/regional-leasing/gulf-mexico-region/Lease%20Statistics%20August%202023.pdf.

Bureau of Ocean Energy Management. (2023c). *Current Marine Minerals Statistics*. Retrieved August 16, 2023, from https://www.boem.gov/current-marine-minerals-statistics#:~:text=Current.

Bureau of Ocean Energy Management. (2023d). *Lease and Grant Information*. Retrieved August 16, 2023, from https://www.boem.gov/renewable-energy/lease-and-grant-information.

Bureau of Ocean Energy Management and Regulation and Enforcement. (2011). *BOEMRE approves first-ever use of deepwater floating production storage offloading facility in Gulf of Mexico*. Retrieved from http://www.boemre.gov/ooc/press/2011/press0317.htm.

Bureau of Safety and Environmental Enforcement. (2023). *Offshore Incident Statistics*. Retrieved February 14, 2023, from https://www.bsee.gov/stats-facts/offshore-incident-statistics.

Corcoran, A., M. Dornback, B. Kirkpatrick, and A. Jochens. (2013). *A Primer on Gulf of Mexico Harmful Algal Blooms*. College Station, TX: Gulf of Mexico Alliance and the Gulf of Mexico Coastal Ocean Observing System.

Council on Environmental Quality. (1997). *Considering Cumulative Effects Under the National Environmental Policy Act*. Washington, DC: Council on Environmental Quality.

Council on Environmental Quality. (2023). *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change*. Washington, DC: Council on Environmental Quality.

Edwards, H. H. (2013). Potential impacts of climate change on warmwater megafauna: The Florida manatee example (*Trichechus manatus latirostris*). *Climatic Change 121* (4): 727–738. DOI:10.1007/s10584-013-0921-2

Fechter, L. D. and B. Pouyatos. (2005). Ototoxicity. *Environmental Health Perspectives 113* (7): 443–444.

Federal Energy Regulatory Commission. (2023a, August 8). *North American LNG Export Terminals – Existing, Approved not Yet Built, and Proposed*. Retrieved August 16, 2023, from https://cms.ferc.gov/media/north-american-lng-export-terminals-existing-approved-not-yet-built-and-proposed-8.

Federal Energy Regulatory Commission. (2023b, August 8). *North American LNG Import Terminals – Existing, Approved not Yet Built, and Proposed*. Retrieved August 23, 2023, from https://cms.ferc.gov/media/north-american-lng-import-terminals-existing-approved-not-yet-built-and-proposed-8.

Flewelling, L. J., J. P. Naar, J. Abbott, D. Baden, N. Barros, G. Bossart, M.-Y. Bottein, D. Hammond, E. Haubold, C. Heil, M. Henry, H. Jacocks, T. Leighfield, R. Pierce, T. Pitchford, R. Sentiel, P. Scott, K. Steidinger, E. Truby, F. Van Dolah, and J. Landsberg. (2005). Red tides and marine mammal mortalities: Unexpected brevetoxin vectors may account for deaths long after or remote from an algal bloom. *Nature 435* (7043): 755–756.

Hardesty, B. D. and C. Wilcox. (2017). A risk framework for tackling marine debris. *Royal Society of Chemistry 9* 1429–1436. DOI:10.1039/c6ay02934e

International Council for the Exploration of the Sea. (2005). *Report of the Ad-hoc Group on the Impacts of Sonar on Cetaceans and Fish (AGISC)*. Copenhagen, Denmark: International Council for the Exploration of the Sea.

McDonald, M., J. Hildebrand, and S. Wiggins. (2006). Increases in deep ocean ambient noise in the Northeast Pacific west of San Nicolas Island, California. *The Journal of the Acoustical Society of America 120* (2): 711–718.

Moore, S. K., V. L. Trainer, N. J. Mantua, M. S. Parker, E. A. Laws, L. C. Backer, and L. E. Fleming. (2008). Impacts of climate variability and future climate change on harmful algal blooms and human health. *Environmental Health 7* (Supplement 2): S4. DOI:10.1186/1476-069X-7-S2-S4

National Aeronautics and Space Administration. (2018). *Wallops Flight Facility Site-wide Programmatic Environmental Impact Statement*. Wallops Island, VA: National Aeronautics and Space Administration.

National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling. (2011). *Deepwater: The Gulf Oil Disaster and the Future of Offshore Drilling* (Report to the President). Washington, DC.

National Marine Fisheries Service. (2006). *Marine Debris: Impacts in the Gulf of Mexico*. Lafayette, LA: Southeast Regional Office, Protected Resources Division.

National Marine Fisheries Service. (2018). *Incidental Take Authorization: U.S. Navy Atlantic Fleet Training and Testing (AFTT) along Atlantic and Gulf Coasts (2018-2025)*. Silver Spring, MD: NOAA Fisheries.

National Marine Fisheries Service. (2021a). *Fisheries of the United States, 2019*. Silver Spring, MD: National Oceanic and Atmospheric Administration.

National Marine Fisheries Service. (2021b, February 4). *Platform Removal Observer Program*. Retrieved August 16, 2023, from https://www.fisheries.noaa.gov/southeast/fisheries-observers/platform-removal-observer-program#:~:text=Observers%20perform%20biological%20monitoring%20during,the%20U.S.%20Gulf%20of%20Mexico.

National Oceanic and Atmospheric Administration. (2016). *Average 'Dead Zone' for Gulf of Mexico Predicted*. Silver Spring, MD: National Oceanic and Atmospheric Administration.

National Oceanic and Atmospheric Administration. (2017a, April 11). *National Oceanic and Atmospheric Administration Studies Documenting the Impacts of the Deepwater Horizon Oil Spill*. Retrieved April 12, 2017, from https://response.restoration.noaa.gov/deepwater-horizon-oil-spill/noaa-studies-documenting-impacts-deepwater-horizon-oil-spill.html.

National Oceanic and Atmospheric Administration. (2017b). *What are HABs.* Retrieved April 12, 2017, from https://habsos.noaa.gov/about/.

National Oceanic and Atmospheric Administration. (2018a). *Programmatic Enviornmental Assessment of Field Operations in the Northeast and Great Lakes National Marine Sanctuaries*. Silver Spring, MD: National Oceanic and Atmospheric Administration, National Ocean Service, National Marine Sanctuary Program.

National Oceanic and Atmospheric Administration. (2018b). *Programmatic Environmental Assessment of Field Operations in the Southeast and Gulf of Mexico*. Silver Spring, MD: National Oceanic and Atmospheric Administration, National Ocean Service, National Marine Sanctuary Program.

National Oceanic and Atmospheric Administration. (2019). *U.S. National Bycatch Report First Edition Update 3*. Silver Spring, MD: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

Poloczanska, E. S., M. T. Burrows, C. J. Brown, J. G. Molinos, B. S. Halpern, O. Hoegh-Guldberg, C. V. Kappel, P. J. Moore, A. J. Richardson, D. S. Schoeman, and W. J. Sydeman. (2016). Responses of marine organisms to climate change across oceans. *Frontiers in Marine Science 3* (62): 1–21. DOI:10.3389/fmars.2016.00062

Sellner, K., G. Doucette, and G. Kirkpatrick. (2003). Harmful algal blooms: Causes, impacts and detection. *Society for Industrial Microbiology 30* 383–406. DOI:10.1007/s10295-003-0074-9

Starr, M., S. Lair, S. Michaud, M. Scarratt, M. Quilliam, D. Lefaivre, M. Robert, A. Wotherspoon, R. Michaud, N. Menard, G. Sauve, S. Lessard, P. Beland, and L. Measures. (2017). Multispecies mass mortality of marine fauna linked to a toxic dinoflagellate bloom. *PLoS ONE 12* (5): e0176299. DOI:10.1371/journal.pone.0176299

Strategic Environmental Research and Development Program. (2023). *Focus Areas*. Retrieved May 21, 2024, from https://serdp-estcp.mil/focusareas/landing.

Texas A&M University. (2011). *2011 Gulf of Mexico "Dead Zone" could be biggest ever*. Retrieved from http://www.sciencedaily.com/releases/2011/07/110718141618.htm.

Texas A&M University. (2014, July 15). *Gulf Dead Zone this year is smaller*. Retrieved February 18, 2016, from http://today.tamu.edu/2014/07/15/gulf-dead-zone-this-year-is-smaller/.

The Times-Picayune. (2015, September 11). *Shell Bringing World's Deepest Floating Oil Production Vessel to Gulf of Mexico*. Retrieved April 12, 2017, from http://www.nola.com/business/index.ssf/2015/09/shell_turritella_gulf_of_mexic.html.

U.S. Department of Agriculture. (2019). *2018 Census of Aquaculture* (Special Studies).

U.S. Department of Energy. (2015). *Marine and Hydrokinetic Energy Research and Development*. Retrieved September 12, 2016, from http://energy.gov/eere/water/marine-and-hydrokinetic-energy-research-development.

U.S. Department of the Navy. (2018). *Atlantic Fleet Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement*. Norfolk, VA: Naval Facilities Engineering Command Atlantic.

U.S. Department of the Navy. (2022). *Department of the Navy Climate Action 2030*. Washington, DC: Office of the Assistant Secretary of the Navy for Energy, Installations, and Environment.

U.S. Environmental Protection Agency. (2023a). *Northern Gulf of Mexico Hypoxic Zone*. Retrieved February 20, 2024, from https://www.epa.gov/ms-htf/northern-gulf-mexico-hypoxic-zone.

U.S. Environmental Protection Agency. (2023b). *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances*. Washington, DC.

U.S. Environmental Protection Agency. (2024). *Greenhouse Gas Equivalencies Calculator*. Retrieved from https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator#results.

U.S. Global Change Research Program. (2023). *National Climate Assessment*. Washington DC: U.S. Global Change Research Program.

U.S. Government Accountability Office. (2015). *Offshore Oil and Gas Resources: Actions Needed to Better Protect Against Billions of Dollars in Federal Exposure to Decommissioning Liabilities*. Washington, DC: U.S. Government Accountability Office.

Wyatt, K. H., R. Griffin, A. D. Guerry, M. Ruckelshaus, M. Fogarty, and K. K. Arkema. (2017). Habitat risk assessment for regional ocean planning in the U.S. Northeast and Mid-Atlantic. *PLoS ONE 12* (12): e0188776. DOI:10.1371/journal.pone.0188776

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5 MITIGATION

5.1 INTRODUCTION

The terms "mitigation" and "mitigation measures" mean actions taken to completely avoid, partially reduce, or minimize the potential for a stressor to impact a resource. This chapter describes and assesses mitigation the United States (U.S.) Department of the Navy (Navy) and U.S. Coast Guard (collectively referred to as the "Action Proponents") will implement under Alternatives 1 or 2 of the Proposed Action. The Action Proponents developed mitigation separate from, and after, the National Environmental Policy Act (NEPA) alternatives development process described in Chapter 2 (Description of the Proposed Action and Alternatives). Mitigation was designed to be implemented under every action alternative carried forward, an approach supported by NEPA regulations that allows agencies to "include appropriate mitigation measures not already included in the Proposed Action or alternatives" (40 Code of Federal Regulations [CFR] section 1502.14(e)). In addition to developing mitigation pursuant to NEPA, the Action Proponents developed mitigation in coordination with regulators and cooperating agencies, including the National Marine Fisheries Service (NMFS). Mitigation is designed to achieve one or more of the following overarching benefits:

- ensure that the Proposed Action has a negligible impact on marine mammal species and stocks, and effects the least practicable adverse impact on marine mammal species or stocks and their habitat (as required under the Marine Mammal Protection Act [MMPA])
- ensure that the Proposed Action does not jeopardize the continued existence of endangered or threatened species, or result in destruction or adverse modification of critical habitat (as required under the Endangered Species Act [ESA])
- avoid or minimize adverse effects on Essential Fish Habitat and habitats that provide critical ecosystem functions (as required under the Magnuson-Stevens Fishery Conservation and Management Act)
- avoid adversely impacting historic shipwrecks (as required under the Abandoned Shipwreck Act and National Historic Preservation Act)

For requirements under the MMPA, NMFS has supported the position that the reduction of impacts on marine mammal stocks and species (e.g., impacts on reproductive success or survivorship) may accrue through the application of mitigation that limits impacts on individual animals (National Marine Fisheries Service, 2023). Mitigation developed for the following types of impacts is thought to have greater value in reducing the likelihood or severity of adverse effects on marine mammal populations (National Marine Fisheries Service, 2023):

- avoiding injury or mortality
- limiting interruption of known feeding, breeding, mother/young, or resting behaviors
- minimizing abandonment of important habitat (temporally and spatially)
- minimizing the number of individuals subjected to these types of disruptions
- limiting degradation of habitat

NMFS has also described species-correlated factors that may (alone, or in combination) result in mitigation having a greater benefit toward reducing potential impacts on marine mammal species or stocks: (1) the stock is known to be decreasing or status is unknown, but believed to be declining; (2) the known annual mortality (from any source) is approaching or exceeding the potential biological removal level (as defined in section 3(20) of the MMPA); (3) the species or stock is a small, resident population; or (4) the stock is involved in an unusual mortality event or has other known vulnerabilities, such as recovering from an oil spill. Visual observations and geographic mitigation (which can include year-round or seasonal measures to reduce impacts on marine mammals or their prey and physical habitat), particularly within feeding, breeding, mother/young, migration, and resting areas (National Marine Fisheries Service, 2023), are relevant to achieving the mitigation goals described above. Using this guidance from NMFS, the Action Proponents considered the potential benefits of mitigation for marine mammals in terms of the degree, likelihood, and context of the anticipated avoidance of impacts to individuals (and how many individuals), and within the context of the species-correlated factors. Similar considerations were applied to mitigation developed for ESA-listed species, including sea turtles, fish, birds, and corals.

The Navy standardizes its mitigation across the Atlantic, Hawaii-California, Mariana Islands, Northwest, and Gulf of Alaska Study Areas to the maximum extent practical. Mitigation is tailored to each Study Area as needed and appropriate based on the following:

- the Proposed Action
- best available science on species occurrence and potential impacts from the Proposed Action
- expected mitigation benefits
- operational practicality assessments
- consultations and coordination with regulatory agencies or departments, such as NMFS, the National Oceanic and Atmospheric Administration, the U.S. Fish and Wildlife Service (USFWS), state Coastal Zone Management program offices, and State Historic Preservation Officers
- consultations and coordination with Alaska Native federally recognized tribes, Native Hawaiian organizations, and Native American Tribes, nations, and tribal organizations
- suggestions received through public comments during scoping and on the Draft Supplemental Environmental Impact Statement (EIS)/Overseas EIS (OEIS)

Mitigation was initially developed for Phase I of at-sea environmental planning (2009 to 2014) and subsequently revised for Phase II (2013 to 2018) and Phase III (2018 to 2025 for the 2018 Final EIS/OEIS). This Draft Supplemental EIS/OEIS (which represents Phase IV) uses the 2018 Final EIS/OEIS mitigation as the baseline for refining mitigation specific to the Proposed Action. For additional information about the at-sea environmental planning process, see Chapter 1 (Purpose and Need).

The Action Proponents analyzed potential mitigation measures individually and then collectively as a holistic mitigation package to determine if mitigation would meet the appropriate balance between being environmentally beneficial and practical to implement. Mitigation measures are expected to have some degree of impact on the military readiness activities that implement them. The Action Proponents are willing to accept a certain level of impact on their military readiness activities to implement mitigation that is expected to be sufficiently beneficial (i.e., effective) at avoiding specific impacts from the Proposed Action. To determine if mitigation measures would be practical to implement, operational communities from each Action Proponent conducted a comprehensive assessment to determine how and to what degree each individual measure and the iterative and cumulative impact of all potential measures would be compatible with planning, scheduling, and conducting military readiness activities under the Proposed Action. Mitigation was considered practical to implement if it met all three criteria discussed in Table 5.1-1.

Table 5.1-1: Practicality Assessment Criterion

Criterion	Description of Practicality Assessment Criterion
Criterion 1. Safety: Implementing mitigation must be safe	• Assessments considered if mitigation would increase safety risks to personnel, equipment, or the public through: – increased fatigue of pilots or other personnel – accelerated fatigue-life of vessels, aircraft, and other systems or platforms – increased distance to aircraft emergency landing fields, critical medical facilities, and search and rescue capabilities – exceedance of aircraft fuel restrictions (e.g., lengthened event duration, increased distance to refueling stations) – exceedance of space restrictions on visual observation platforms – decreased ability to de-conflict sea space or airspace conflicts (e.g., ensuring military readiness activities do not impact each other, avoiding interaction with established commercial air traffic routes, commercial vessel shipping lanes, and areas used for energy exploration or alternative energy development) – decreased ability for Lookouts to safely and effectively maintain situational awareness while observing the mitigation zones during typical activity conditions – decreased ability for Lookouts to safely perform other assigned job responsibilities – decreased proficiency in the use of sensors and weapon systems, or reduced ability to complete shipboard maintenance, repairs, or testing prior to at-sea use (which would result in a significant risk to personnel or equipment safety during training, testing, and real-world missions) – increased administrative burden that would significantly distract from safe conduct of primary mission objectives
Criterion 2. Sustainability: Implementing mitigation must be sustainable for the duration of the Proposed Action	• Assessments considered if mitigation would be unsustainable for the duration of the Proposed Action by: – requiring personnel to spend an inordinate amount of time on station or away from their homeport – requiring the use or obligation of additional resources (i.e., personnel and equipment) in excess of what is available – requiring expenditure of additional funding for increased operational costs associated with higher fuel consumption, additional maintenance of existing equipment, or acquisition of new equipment – reducing efficiency in travel time and associated costs by increasing distance between activities and homeports, home bases, associated training ranges, testing facilities, air squadrons, and existing infrastructure (e.g., instrumented underwater ranges)
Criterion 3. Mission: Implementing mitigation must allow for the Action Proponents to continue meeting mission objectives and statutory mandates	• Assessments considered if mitigation would modify military readiness activities in a way that would prevent them from meeting mission objectives, and the implications for the ability to continue meeting statutory mandates. Example barriers to meeting mission objectives and statutory mandates include: – degraded training or testing realism – decreased ready access to ranges, operating areas, (OPAREAs), airspace, or sea space with a variety of realistic tactical oceanographic and environmental conditions (e.g., variations in bathymetry, topography, surface fronts, and sea surface temperatures) that is extensive enough to allow for completion of activities without physical or logistical obstructions, to provide personnel the ability to develop competence and confidence in their capabilities across multiple types of weapons and sensors, and the ability to train to communicate and operate in a coordinated fashion as required during real-world missions and to avoid observation by potential adversaries – decreased proficiency, erosion of capabilities, or reduction in perishable skills related to the use of sensors or weapon systems – decreased ready access to facilities, range support structures, or systems command support facilities that provide critical infrastructure support and technical expertise necessary to conduct testing – reduced ability to meet individual training and testing schedules, pre-deployment certification requirements, deployment schedules, and to deploy on time (factoring in variables such as maintenance and weather when scheduling event locations and timing) with the required level of skill and flexibility to accomplish any tasking by Combatant Commanders, national command authorities, or other national security tasking, including responding to national emergencies or emerging national security challenges – reduced ability to conduct accurate oceanographic or acoustic research to meet research objectives, validate acoustic models, and conduct accurate engineering tests of acoustic sources, signal processing algorithms, and acoustic interactions – reduced ability to ensure the safety, functionality, and accuracy of systems, platforms, and components through maintenance, repairs, or testing prior to use at sea as needed or required by acquisition milestones – reduced ability to effectively test systems, platforms, and components before full-scale production or delivery in order to validate whether they perform as expected and determine whether they are operationally effective, suitable, survivable, and safe for their intended use by the fleet – increased administrative burden that would significantly distract from efficient and effective conduct of primary mission objectives – increased national security concerns related to providing advance notification of specific times and locations of platforms, such as those using active sonar – measures that extend outside of the Action Proponents' legal authority to implement

The Action Proponents' Senior Leadership has reviewed, determined the practicality of, and approved all mitigation measures included in this Draft Supplemental EIS/OEIS. Through the mitigation development and assessment processes, the Action Proponents will ultimately commit to the maximum level of mitigation that is both beneficial and practical to implement under the Proposed Action. The Records of Decision, MMPA Regulations and Letters of Authorization, ESA Biological Opinion, and other associated consultation documents will detail the mitigation to be implemented under the Proposed Action. Should the Action Proponents require a change in how they implement mitigation based on national security concerns, evolving readiness requirements, or other factors (e.g., significant changes in best available science), they will engage the appropriate agencies and reevaluate their mitigation or verify that potential impacts are adequately addressed in this Supplemental EIS/OEIS and consultation documents through the appropriate consultations or Adaptive Management (as described in Section 5.5, Monitoring, Research, and Adaptive Management). Table 5.8-1 summarizes new or substantively modified mitigation measures included in this document (as compared to the 2018 Final EIS/OEIS). Mitigation measures that were considered but eliminated because they did not meet the appropriate balance between being environmentally beneficial and practical to implement are discussed in Section 5.9 (Mitigation Considered but Eliminated).

5.2 Mitigation Dissemination

The Action Proponents will publish, broadcast, disseminate, or distribute mitigation instructions through pre-event briefs, governing instructions, broadcast messages, the Protective Measures Assessment Protocol, or other established internal processes. The Protective Measures Assessment Protocol is a software program accessed by appointed personnel during pre-event planning (see Figure 5.2-1). The program provides operators with notification of the required mitigation measures applicable to a particular training or testing event, as well as a visual display of the planned event location overlaid with relevant environmental data. Its text and mapping data will be updated to align with best available science and the final mitigation that results from this Draft Supplemental EIS/OEIS and associated consultation documents.

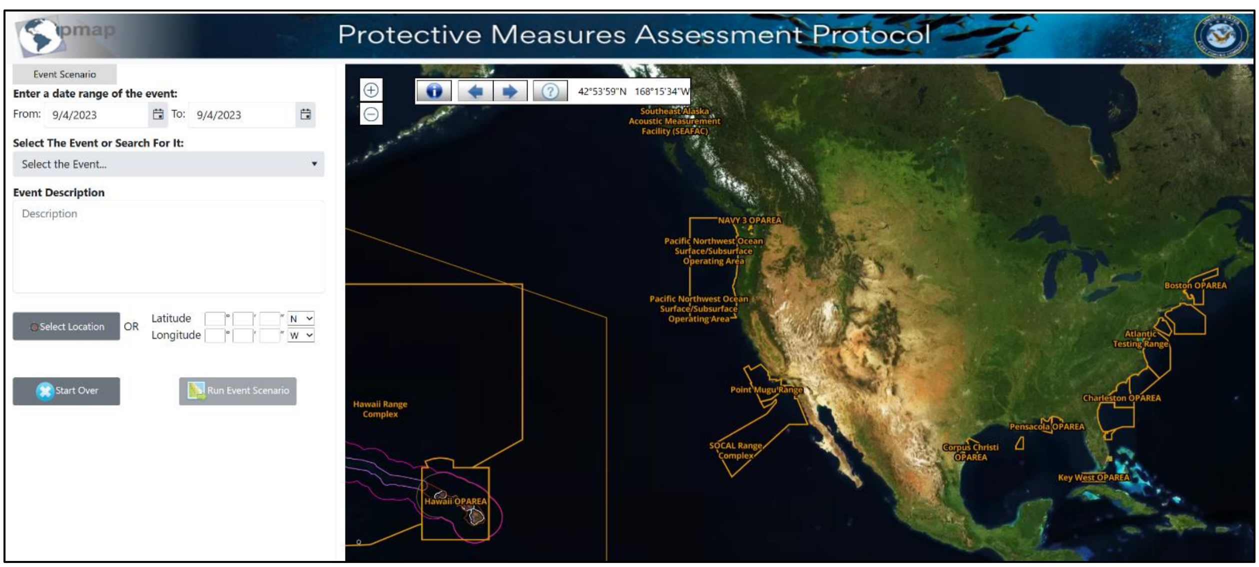


Figure 5.2-1: Protective Measures Assessment Protocol Home Screen

Mitigation requirements are mandatory for the Action Proponents when conducting activities under the Proposed Action. In furtherance of national security objectives, foreign militaries may participate in multinational training and testing events in the Study Area. Foreign military participation is not part of the federal action unless the U.S. military exercises substantial control and responsibility over those foreign military activities. Foreign military vessels operate pursuant to their own national authorities and have independent rights under customary international law, embodied in the principle of sovereign immunity, to engage in various activities on the world's oceans and seas. During U.S.-led training events within the U.S. territorial seas (0 to 12 nautical miles [NM] from shore), the Action Proponents will request a foreign military unit's voluntary compliance with the applicable mitigations. When a foreign military unit participates in a training event with the Action Proponents beyond the U.S. territorial seas but within the U.S. Exclusive Economic Zone (12 to 200 NM from shore), the Action Proponents will encourage that unit's voluntary compliance with the mitigation when practical.

5.3 Personnel Training

As described in Section A.2.7 (Standard Operating Procedures), underway surface ships operated by or for the Action Proponents have personnel assigned to stand watch at all times (day and night) for safety of navigation, collision avoidance, range clearance, and man-overboard precautions. Personnel on underway small boats (e.g., crewmembers responsible for navigation) fulfill similar watch standing responsibilities to those positioned on surface ships. To qualify to stand watch as a Lookout, personnel undertake a training program that includes computer-based training, on-the-job instruction, and a formal qualification program. Lookouts are trained in accordance with the *U.S. Navy Lookout Training Handbook* or equivalent to use correct scanning procedures while monitoring assigned sectors, to estimate the relative bearing, range, position angle, and target angle of sighted objects, and to rapidly communicate accurate sighting reports. The *U.S. Navy Lookout Training Handbook* was updated in 2022 to include a more robust chapter on environmental compliance, mitigation, and marine species observation tools and techniques (NAVEDTRA 12968-E). Environmental awareness and education training is also provided to personnel through the Afloat Environmental Compliance Training program (described below) or equivalent. Training is designed to help personnel gain an understanding of their personal environmental compliance roles and responsibilities (including mitigation implementation). Upon reporting aboard and annually thereafter, appointed personnel must complete training identified in their career path training plan.

- **Introduction to Afloat Environmental Compliance.** Developed in 2014, the introduction module provides information on at-sea environmental laws, regulations, and compliance roles.
- **Marine Species Awareness Training.** This module was developed by civilian marine biologists employed by the Navy, and was reviewed and approved by NMFS. It provides information on marine species sighting cues, visual observation tools and techniques, and sighting notification procedures. It is a video-based complement to the *U.S. Navy Lookout Training Handbook* or equivalent. Since 2007, this module has been required for commanding officers, executive officers, equivalent civilian personnel, and personnel who will stand watch as a Lookout.
- **Protective Measures Assessment Protocol.** This module provides information on how personnel should access and operate the Protective Measures Assessment Protocol. Since 2014, this module has been required for personnel tasked with generating mitigation reports.
- **Sonar Positional Reporting System and Marine Mammal Incident Reporting.** This module provides information on sonar reporting requirements and marine mammal incident reporting

procedures, which are described in Section 5.4 (Reporting). Since 2014, this module has been required for personnel tasked with preparing, approving, or submitting applicable reports.

5.4 Reporting

Reporting requirements are designed to track compliance with MMPA and ESA authorizations. They also provide the Action Proponents and regulators sufficient information to consider if changes to mitigation, monitoring, or reporting requirements might be appropriate. Report content and submission details will be included in the NMFS MMPA Regulations and Letters of Authorization. The Navy developed a classified data repository known as the Sonar Positional Reporting System to maintain internal records of in-water sound source use and to facilitate reporting pursuant to its MMPA Regulations and Letters of Authorization. Applicable data will be provided to the NMFS Office of Protected Resources with annual reports describing the level of training and testing conducted in the Study Area and the special reporting mitigation areas described in Section 5.7 (Geographic Mitigation). The reports will include additional information for major training exercises and the Sinking Exercise (SINKEX) such as records of individual marine mammal sightings for when mitigation was implemented during the events. The Action Proponents will also submit an annual report to NMFS on monitoring conducted under the U.S. Navy Marine Species Monitoring Program (described in Section 5.5, Monitoring, Research, and Adaptive Management). Unclassified reports previously submitted to NMFS are available on the NMFS Office of Protected Resources (https://www.fisheries.noaa.gov/about/office-protected-resources) and U.S. Navy's Marine Species Monitoring Program (https://www.navymarinespeciesmonitoring.us) webpages.

As needed, the Action Proponents will follow established internal communication methods directed by Office of Chief of Naval Operations Instruction 3100.6 (series) if reportable incidents applicable to their activities are observed. Further, the Action Proponents will:

- Notify the appropriate regulatory agency, which may include NMFS or the USFWS, immediately (or as soon as operational security considerations allow) if a vessel strike, injury, or mortality of a marine mammal or sea turtle occurs that is (or may be) attributable to activities conducted under the Proposed Action. The notification will include relevant information pertaining to the incident, including, but not limited to, vessel speed or event type.
- Comply with the communication protocol for incidents involving marine mammals under NMFS' jurisdiction as outlined in the Notification and Reporting Plan, which will be publicly available on the NMFS Office of Protected Resources webpage.
- Comply with the reporting requirements for incidents involving ESA-listed species under NMFS' jurisdiction as outlined in the NMFS Biological Opinion.
- Comply with the reporting and response requirements for incidents involving ESA-listed species under USFWS' jurisdiction as outlined in the USFWS consultation documents, which would include immediately halting an event if harassment, injury, or death of a manatee is observed.
- Commence consultation with the appropriate State Historic Preservation Officer or Tribal Historic Preservation Officer in accordance with 36 Code of Federal Regulations section 800.13(b)(3) in the event a submerged historic property (e.g., archaeological resource) is found to have been incidentally impacted during a training or testing event.

5.5 Monitoring, Research, and Adaptive Management

The Action Proponents are one of the nation's largest sponsors of scientific research on, and monitoring of, protected marine species (Marine Mammal Commission, 2023). Details about the U.S. Navy Marine Species Monitoring Program, Living Marine Resources Program, and U.S. Navy Office of Naval Research is provided in Section 3.0.1.1 (Marine Species Monitoring and Research Programs). Through the Action Proponents' environmental offices and programs, the U.S. Navy Marine Species Monitoring Program, the Living Marine Resources Program, and the Office of Naval Research, the Action Proponents have been sponsoring research and monitoring for over 30 years in areas where they conduct military readiness activities. This includes investments of nearly $46 million in compliance-monitoring activities in the Study Area since 2009 (U.S. Department of the Navy, 2022b). Additionally, the Coast Guard spends tens of millions of dollars annually protecting living marine resources through its maritime response, prevention, and law enforcement missions, which have a direct and positive impact on the maritime environment. The Navy, Coast Guard, U.S. Army Corps of Engineers, and NMFS collaboratively sponsor aerial surveys to observe for North Atlantic right whales as part of the Early Warning System, which is a comprehensive information exchange network dedicated to reducing the risk of vessel strikes from all mariners, including military, Coast Guard, recreational, and commercial vessels. Early Warning System aerial surveys are flown daily off the coasts of Florida and Georgia from December 1 through March 31 (weather permitting) to observe for North Atlantic right whales from the shoreline out to approximately 30 to 35 NM offshore. Aerial surveyors relay sightings data to the Early Warning System network, which then disseminates information to mariners through Fleet Area Control and Surveillance Facility, Jacksonville. Geographic mitigation associated with the Early Warning System is described in Section 5.7.12 (Jacksonville Operating Area North Atlantic Right Whale Mitigation Area) and Section 5.7.13 (Southeast North Atlantic Right Whale Mitigation Area).

Thanks in part to advancements in science from these programs, the understanding of military readiness activity impacts on protected marine species continues to evolve. The programs have also made significant advancements in research on and development of emergent mitigation technologies, such as thermal detection systems, infrared systems, radar systems, passive acoustic range instrumentation, and autonomous and unmanned platforms with automated passive acoustic detection capabilities. Technological advancements are also being made through research sponsored by other entities (e.g., commercial off-the-shelf products). While these technologies have not reached the level of performance needed for deployment during military readiness activities, the Action Proponents plan to continue researching, testing, and developing them. If mitigation technologies mature to the state where they are determined to be sufficiently effective at mitigating marine mammal impacts when considering the range of environmental conditions analogous to where the Action Proponents train and test, the species that could co-occur in space and time with the activities, and the characteristics of the sound sources and platforms used during the activities, then the Action Proponents will assess their compatibility with military readiness applications. This would include a practicality assessment of the budget and acquisition process (including costs associated with designing, building, installing, maintaining, and manning equipment), the logistical and physical considerations for retrofitting platforms with the appropriate equipment and their associated maintenance, repairs, or replacements (e.g., conducting engineering studies to ensure compatibility with existing shipboard systems), the resource considerations for training personnel to effectively operate the equipment, and the potential security and classification issues.

The Action Proponents will continue to host marine species monitoring technical review meetings with NMFS, to include researchers and the Marine Mammal Commission. Additionally, routine Adaptive Management meetings will continue to be held with NMFS and the Marine Mammal Commission as a systematic approach to help account for advancements in science and technology made after the issuance of MMPA Regulations and Letters of Authorization. The Action Proponents will provide information about the status and findings of sponsored mitigation technology research and any associated practicality assessments at these meetings. Through Adaptive Management, decisions, policies, or actions can be adjusted as the science and outcomes from management actions become better understood over time (Williams et al., 2009).

5.6 VISUAL OBSERVATIONS

Visual observations were referred to as "Procedural Mitigation" in the 2018 Final EIS/OEIS. Visual observation procedures are fundamentally consistent across stressors; however, there are activity-specific variations to account for differences in platform configurations, event characteristics, and stressor types. Visual observations have a primary objective of reducing overlap of individual marine mammals and sea turtles in real time with stressors that have the potential to cause injury or mortality.

Observations for "indicator species" are also conducted to offer an additional layer of protection for marine mammals and sea turtles. Floating vegetation can be an indicator of potential marine mammal or sea turtle presence because these animals have been known to seek shelter in, feed on, or feed among concentrations of floating vegetation. *Sargassum* habitat has been identified as a critical habitat feature for juvenile loggerhead sea turtles in portions of the Study Area (National Marine Fisheries Service, 2014). For mitigation purposes, the term "floating vegetation" refers specifically to floating concentrations of detached kelp paddies and S*argassum*. For events with the largest net explosive weights (NEW; described in pounds [lb.]), indicator species also include other prey species or co-feeding species, such as jellyfish aggregations, large schools of fish, or flocks of seabirds, depending on the event and observation platforms involved.

Visual observations will be conducted by trained Lookouts. For mitigation purposes, the minimum number of Lookouts required is provided in Table 5.6-1 through Table 5.6-4. Some events may have additional personnel (beyond the minimum number of required Lookouts) who are already standing watch in or on the platform conducting the event or additional participating platforms, and would have eyes on the water for all or part of an event. For example, Bridge Watch Teams on underway surface ships typically include numerous personnel on the bridge, bridge wings, and aft deck. These additional personnel will serve as members of the "Lookout Team" for all acoustic, explosive, and physical disturbance and strike stressor mitigation categories. While performing their primary duties, the Lookout Team will perform ad hoc visual observations before, during, or after events as a secondary task when doing so is compatible with, and does not compromise, safety and primary duty performance.

Lookouts may be positioned on surface vessels, aircraft, piers, or the shore. Lookouts positioned on U.S. Navy surface vessels (including surfaced submarines) will be solely dedicated to visually observing their assigned sectors. On platforms with limited crew, Lookouts may also fulfill other duties. For example, a Lookout on a small boat may also be responsible for navigation or personnel supervision. A Lookout in an aircraft is typically an existing crewmember such as a pilot or Flight Officer whose primary duty is navigation or other mission-essential tasks. Observation platforms will be positioned according to safety, mission, and environmental conditions. For example, small boats observing explosive mine events would always be positioned outside of the detonation plume and human safety zone.

Lookouts will employ standard visual search techniques using naked-eye scanning, potentially in combination with the use of handheld binoculars, high-powered "big-eye" binoculars mounted on the deck of a surface ship (depending on the event and observation platform), and night search techniques (e.g., the use of night vision devices) if events occur after sunset or prior to sunrise. Lookouts will be advised that personal use of polarized sunglasses, when available, may help reduce sea surface glare, which could improve the sightability of marine resources. Prior to the start of an event (or use of a stressor) and throughout the duration of the event (or stressor use), Lookouts will observe a "mitigation zone" and the sea space surrounding the mitigation zone; within the direct path of underway vessels, unmanned surface or underwater vehicles that are already being escorted and operated under positive control by manned surface vessels, or towed in-water devices; and throughout the range of visibility (e.g., to the horizon, depending on weather and observation platform characteristics). Mitigation zones are distances from a stressor (typically a radius measured in yards [yd]), as specified in Table 5.6-1 through Table 5.6-4. The specified mitigation zones are the largest areas Lookouts can reasonably be expected to observe during typical activity conditions and that are practical to implement from an operational standpoint. Lookouts may be responsible for observing multiple mitigation zones. For example, a Lookout positioned on a surface ship during an explosive large-caliber gunnery event may be responsible for observing both the weapon firing noise mitigation zone and the mitigation zone around the intended detonation location.

Lookouts will immediately relay relevant sightings information (e.g., animal or indicator species type, bearing, distance, direction of travel or drift, position relative to the mitigation zone) to the appropriate watch station through established communication methods. Lookouts will continue to observe for new sightings while maintaining situational awareness of the originally sighted animal or indicator species' position relative to the mitigation zone (to the extent possible). Lookouts will immediately relay any relevant new or updated information to the watch station. The watch station will disseminate relevant information to other participating assets as needed for their situational awareness. When passive acoustic devices are already being used in an event, sonar technicians will relay information about any passive acoustic detections of marine mammals to Lookouts prior to or during an event (when applicable, as indicated in Table 5.6-1 and Table 5.6-2) using established communication methods. Lookouts will use the information received to help inform their visual observations.

5.6.1 Mitigation Specific to Acoustic Stressors, Explosives, and Non-Explosive Ordnance

The mitigation measures described below will be implemented (as appropriate) in response to an applicable sighting within or entering the relevant mitigation zone for acoustic stressors, explosives, and non-explosive practice munitions:

- Prior to the initial start of an event (or stressor use), the Action Proponents will (1) relocate the event to a location where applicable species are not observed, or (2) delay the initial start of the event (or stressor use) until one of the "Mitigation Zone All-Clear Conditions" has been met.
- During the event (i.e., during use of a stressor) the Action Proponents will (until one of the Mitigation Zone All-Clear Conditions has been met) (1) power down or shut down active acoustic transmissions, (2) cease air gun use, (3) cease pile driving or pile removal, (4) cease weapon firing or ordnance deployment, (5) or cease explosive detonations or fuse initiations.

Mitigation Zone All-Clear Conditions indicate that the mitigation zone is determined to be free of applicable species. The conditions include (1) a Lookout observes the applicable species exiting the mitigation zone, (2) a Lookout determines the applicable species has exited the mitigation zone based on its observed course and speed relative to the mitigation zone, (3) a Lookout affirms the mitigation zone has been clear from additional sightings for an applicable "wait period," or (4) for mobile events, the stressor has transited a distance equal to double the mitigation zone size beyond the location of the last sighting. Wait periods were established because events cannot be delayed or ceased indefinitely for the purpose of mitigation due to impacts on safety, sustainability, and the ability to meet mission requirements. Wait periods are designed to allow animals the maximum amount of time practical to resurface (i.e., become available to be observed) before activities resume. The assumption that mitigation may need to be implemented more than once was factored when developing wait period durations. Wait periods are 10 minutes or 30 minutes depending on the fuel constraints of the platform.

5.6.1.1 Additional Details for Acoustic Stressors

Additional details on the visual observation requirements for acoustic stressors are described in Table 5.6-1. Visual observation mitigation will not apply to:

- sources not operated under positive control
- sources used for safety of navigation
- sources used or deployed by aircraft operating at high altitudes
- sources used, deployed, or towed by unmanned platforms except when escort vessels are already participating in the event and have positive control over the source
- sources used by submerged submarines
- *de minimis* sources
- long-duration sources, including those used for acoustic and oceanographic research
- vessel-based, unmanned vehicle-based, or towed in-water sources when marine mammals (e.g., dolphins) are determined to be intentionally swimming at the bow or alongside or directly behind the vessel, vehicle, or device (e.g., to bow-ride or wake-ride)
- sources above 2 kilohertz (kHz) for sea turtles (based on their hearing capabilities)

5.6.1.2 Additional Details for Explosives

Additional details on the visual observation requirements for explosives are described in Table 5.6-2. Mitigation will not apply to explosives (1) deployed by aircraft operating at high altitudes, (2) deployed by submerged submarines, (3) deployed against aerial targets, (4) during vessel-launched missile or rocket events, (5) used at or below the *de minimis* threshold, and (6) deployed by unmanned platforms except when escort vessels are already participating in the event and have positive control over the explosive. Post-event observations are intended to aid incident reporting requirements for marine mammals and sea turtles. Practicality and the duration of post-event observations will be determined on site by fuel restrictions and mission-essential follow-on commitments.

5.6.1.3 Additional Details for Non-Explosive Ordnance

Additional details on the visual observation requirements for non-explosive ordnance are described in Table 5.6-3. Explosive aerial-deployed mines do not detonate upon contact with the water surface and are therefore considered non-explosive when mitigating the potential for a mine shape to strike a marine mammal or sea turtle at the water surface. Mitigation for the explosive component of aerial-deployed mines is described in Table 5.6-2. Mitigation does not apply to non-explosive ordnance deployed (1) by aircraft operating at high altitudes, (2) against aerial targets, (3) during vessel-launched missile or rocket events, and (4) by unmanned platforms except when escort vessels are already participating in the event and have positive control over ordnance deployment.

Table 5.6-1: Visual Observations for Acoustic Stressors

Mitigation Category	*Mitigation Zones*	*Lookouts*	*Mitigation Requirement Timing*	*Wait Period*
Active Acoustic Sources				
• Active acoustic sources with power down and shut down capabilities: — Low-frequency active sonar ≥200 dB — Mid-frequency active sonar sources that are hull mounted on a surface ship (including surfaced submarines) — Broadband and other active acoustic sources >200 dB	• 200 yd from active acoustic sources (shut down) • 500 yd from active acoustic sources (power down of 10 dB total) • 1,000 yd from active acoustic sources (power down of 6 dB total)	• One Lookout in/on one of the following: — Aircraft — Pierside, moored, or anchored vessel — Underway vessel with space/crew restrictions (including small boats) — Underway vessel already participating in the event that is escorting (and has positive control over sources used, deployed, or towed by) an unmanned platform • Two Lookouts on an underway vessel without space/crew restrictions • Lookouts would use information from passive acoustic detections to inform visual observations when passive acoustic devices are already being used in the event	• Immediately prior to the initial start of using active acoustic sources (e.g., while maneuvering on station) for: — Marine mammals — Sea turtles (for sources <2 kHz) — Floating vegetation • During use of active acoustic sources for: — Marine mammals — Sea turtles (for sources <2 kHz)	• 10 or 30 minutes (depending on fuel constraints of the platform)
• Active acoustic sources with shut down (but not power down) capabilities: — Low-frequency active sonar <200 dB — Mid-frequency active sonar sources that are not hull mounted on a surface ship (e.g., dipping sonar, towed arrays) — High-frequency active sonar — Air guns — Broadband and other active acoustic sources <200 dB	• 200 yd from active acoustic sources (shut down)			
Pile Driving and Pile Removal				
• Vibratory and impact pile driving and removal	• 100 yd from piles being driven or removed (cease pile driving or removal)	• One Lookout on one of the following: — Shore — Pier — Small boat	• 30 minutes prior to the initial start of pile driving or pile removal for: — Marine mammals — Sea turtles — Floating vegetation • During pile driving or removal for: — Marine mammals — Sea turtles	• 15 minutes
Weapon Firing Noise				
• Explosive and non-explosive large-caliber gunnery firing noise (surface-to-surface and surface-to-air)	• 30 degrees on either side of the firing line out to 70 yd from the gun muzzle (cease fire)	• One Lookout on a vessel	• Immediately prior to the initial start of large-caliber gun firing (e.g., during target deployment) for: — Marine mammals — Sea turtles — Floating vegetation • During large-caliber gun firing for: — Marine mammals — Sea turtles	• 30 minutes

Table 5.6-2: Visual Observations for Explosives

Mitigation Category	*Mitigation Zones*	*Lookouts*	*Mitigation Requirement Timing*	*Wait Period*
Explosive Bombs				
• Any NEW	• 2,500 yd from the intended target (cease fire)	• One Lookout in an aircraft	• Immediately prior to the initial start of bomb delivery (e.g., when arriving on station) for: – Marine mammals – Sea turtles – Floating vegetation • During bomb delivery for: – Marine mammals – Sea turtles • After the event, when practical, observe the detonation vicinity for incidents involving: – Marine mammals – Sea turtles	• 10 minutes
Explosive Gunnery				
• Air-to-surface medium-caliber	• 200 yd from the intended impact location (cease fire)	• One Lookout on a vessel or in an aircraft	• Immediately prior to the initial start of gun firing (e.g., while maneuvering on station) for: – Marine mammals – Sea turtles – Floating vegetation • During gunnery firing for: – Marine mammals – Sea turtles • After the event, when practical, observe the detonation vicinity for incidents involving: – Marine mammals – Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)
Explosive Line Charges				
• Any NEW	• 900 yd from the detonation site (cease fire)	• One Lookout on a vessel	• Immediately prior to the initial start of detonations (e.g., while maneuvering on station) for: – Marine mammals – Sea turtles – Floating vegetation • During detonations for: – Marine mammals – Sea turtles • After the event, when practical, observe the detonation vicinity for incidents involving: – Marine mammals – Sea turtles	• 30 minutes

Table 5.6-2: Visual Observations for Explosives (continued)

Mitigation Category	*Mitigation Zones*	*Lookouts*	*Mitigation Requirement Timing*	*Wait Period*
Explosive Mine Countermeasure and Neutralization (No Divers)				
• 0.1–5 lb. NEW	• 600 yd from the detonation site (cease fire)	• One Lookout on a vessel or in an aircraft	• Immediately prior to the initial start of detonations (e.g., while maneuvering on station; typically, 10 or 30 minutes depending on fuel constraints) for: – Marine mammals – Sea turtles – Floating vegetation • During detonations or fuse initiation for: – Marine mammals – Sea turtles • After the event, observe the detonation vicinity for 10 or 30 minutes (depending on fuel constraints), for incidents involving: – Marine mammals – Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)
• >5 lb. NEW	• 2,100 yd from the detonation site (cease fire)	• Two Lookouts: one on a small boat and one in an aircraft		
Explosive Mine Neutralization (With Divers)				
• 0.1–20 lb. NEW (positive control)	• 500 yd from the detonation site (cease fire)	• Two Lookouts in two small boats (one Lookout per boat), or one small boat and one rotary-wing aircraft (with one Lookout each)	• Time-delay devices will be set not to exceed 10 minutes • Immediately prior to the initial start of detonations or fuse initiation for positive control events (e.g., while maneuvering on station) or for 30 minutes prior for time-delay events for: – Marine mammals – Sea turtles – Floating vegetation • During detonations or fuse initiation for: – Marine mammals – Sea turtles • When practical based on mission, safety, and environmental conditions: – Boats will observe from the mitigation zone radius mid-point – When two are used, boats will observe from opposite sides of the mine location – Platforms will travel a circular pattern around the mine location – Boats will have one Lookout observe inward toward the mine location and one observe outward toward the mitigation zone perimeter – Divers will be part of the Lookout Team • After the event, observe the detonation vicinity for 30 minutes for incidents involving: – Marine mammals – Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)
• 0.1–20 lb. NEW (time-delay) • >20–60 lb. NEW (positive control)	• 1,000 yd from the detonation site (cease fire)	• Four Lookouts in two small boats (two Lookouts per boat), and one additional Lookout in an aircraft if used in the event		
Explosive Missiles and Rockets				
• 0.6–20 lb. NEW (air-to-surface)	• 900 yd from the intended impact location (cease fire)	• One Lookout in an aircraft		• 10 or 30 minutes

Table 5.6-2: Visual Observations for Explosives (continued)

Mitigation Category	*Mitigation Zones*	*Lookouts*	*Mitigation Requirement Timing*	*Wait Period*
• >20–500 lb. NEW (air-to-surface)	• 2,000 yd from the intended impact location (cease fire)		• Immediately prior to the initial start of missile or rocket delivery (e.g., during a fly-over of the mitigation zone) for: — Marine mammals — Sea turtles — Floating vegetation • During missile or rocket delivery for: — Marine mammals — Sea turtles • After the event, when practical, observe the detonation vicinity for incidents involving: — Marine mammals — Sea turtles	(depending on fuel constraints of the platform)
Explosive Sonobuoys and Research-Based Sub-Surface Explosives				
• Any NEW of sonobuoys • 0.1–5 lb. NEW for other types of sub-surface explosives used in research applications	• 600 yd from the device or detonation site (cease fire)	• One Lookout on a small boat or in an aircraft • Lookouts would use information from passive acoustic detections to inform visual observations when passive acoustic devices are already being used prior to the initial start of detonations	• Immediately prior to the initial start of detonations (e.g., during sonobuoy deployment, which typically lasts 20 to 30 minutes) for: — Marine mammals — Sea turtles — Floating vegetation • During detonations for: — Marine mammals — Sea turtles • After the event, when practical, observe the detonation vicinity for incidents involving: — Marine mammals — Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)
Explosive Torpedoes				
• Any NEW	• 2,100 yd from the intended impact location (cease fire)	• One Lookout in an aircraft • Lookouts would use information from passive acoustic detections to inform visual observations when passive acoustic devices are already being used prior to the initial start of detonations	• Immediately prior to the initial start of detonations (e.g., during target deployment) for: — Marine mammals — Sea turtles — Floating vegetation — Jellyfish aggregations • During torpedo launches for: — Marine mammals — Sea turtles — Jellyfish aggregations • After the event, when practical, observe the detonation vicinity for incidents involving: — Marine mammals — Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)

Table 5.6-2: Visual Observations for Explosives (continued)

Mitigation Category	Mitigation Zones	Lookouts	Mitigation Requirement Timing	Wait Period
Ship Shock Trials				
• Any NEW	• 3.5 NM from the target ship hull (cease fire)	• On the day of the event, 10 observers (Lookouts and third-party observers combined), spread between aircraft or multiple vessels as specified in the event-specific mitigation plan	• The Navy will develop a detailed event-specific monitoring and mitigation plan in the year prior to the event and provide it to NMFS for review • Beginning at first light on days of detonation, until the moment of detonation (as allowed by safety measures), for: — Marine mammals — Sea turtles — Floating vegetation — Jellyfish aggregations — Large schools of fish — Flocks of seabirds • If an incident involving a marine mammal or sea turtle is observed after an individual detonation, the Navy will follow established incident reporting procedures and halt any remaining detonations until the Navy can consult with NMFS and review or adapt the event-specific mitigation plan, if necessary • During the 2 days following the event at a minimum and up to 7 days at a maximum, and as specified in the event-specific mitigation plan, observe the detonation vicinity for incidents involving: — Marine mammals — Sea turtles	• 30 minutes
SINKEX				
• Any NEW	• 2.5 NM from the target ship hull (cease fire)	• Two Lookouts: one on a vessel and one in an aircraft • Lookouts would use information from passive acoustic detections to inform visual observations when passive acoustic devices are already being used during weapon firing	• During aerial observations for 90 minutes prior to the initial start of weapon firing for: — Marine mammals — Sea turtles — Floating vegetation — Jellyfish aggregations • From the vessel during weapon firing, and from the aircraft and vessel immediately after planned or unplanned breaks in weapon firing of more than 2 hours for: — Marine mammals — Sea turtles • Observe the detonation vicinity for 2 hours after sinking the vessel or until sunset, whichever comes first, for incidents involving: — Marine mammals — Sea turtles	• 30 minutes

Table 5.6-3: Visual Observations for Non-Explosive Ordnance

Mitigation Category	*Mitigation Zones*	*Lookouts*	*Mitigation Requirement Timing*	*Wait Period*
Non-Explosive Aerial-Deployed Mines and Bombs				
• Non-explosive aerial-deployed mines • Non-explosive bombs	• 1,000 yd from the intended target (cease fire)	• One Lookout in an aircraft	• Immediately prior to the initial start of mine or bomb delivery (e.g., when arriving on station) for: — Marine mammals — Sea turtles — Floating vegetation • During mine or bomb delivery for: — Marine mammals — Sea turtles	• 10 minutes
Non-Explosive Gunnery				
• Non-explosive surface-to-surface large-caliber ordnance • Non-explosive surface-to-surface and air-to-surface medium-caliber ordnance • Non-explosive surface-to-surface and air-to-surface small-caliber ordnance	• 200 yd from the intended impact location (cease fire)	• One Lookout on a vessel or in an aircraft	• Immediately prior to the initial start of gun firing (e.g., while maneuvering on station) for: — Marine mammals — Sea turtles — Floating vegetation • During gunnery firing for: — Marine mammals — Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)
Non-Explosive Missiles and Rockets				
• Non-explosives (air-to-surface)	• 900 yd from the intended impact location (cease fire)	• One Lookout in an aircraft	• Immediately prior to the start of missile or rocket delivery (e.g., during a fly-over of the mitigation zone) for: — Marine mammals — Sea turtles — Floating vegetation • During missile or rocket delivery for: — Marine mammals — Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)

5.6.2 Mitigation Specific to Vessels, Vehicles, and Towed In-Water Devices

Additional details on the visual observation requirements for vessels, unmanned vehicles, and towed in-water devices are described in Table 5.6-4. For ship classes required to maintain more than one Lookout, the specific requirement is subject to change over time in accordance with the applicable navigation instruction, such as the Surface Ship Navigation Department Organization and Regulations Manual (U.S. Department of the Navy, 2021). The Action Proponents will notify NMFS should their Lookout policies change, including in the Surface Ship Navigation Department Organization and Regulations Manual. Mitigation will be implemented to the maximum extent practical based on the prevailing circumstances, including consideration of safety of vessels, unmanned vehicles, towing platforms, and crews, as well as maneuverability restrictions. Mitigation will not be implemented (1) by submerged submarines, (2) by unmanned vehicles except when escort vessels are already participating in the event and have positive control over the unmanned vehicle movements, (3) when marine mammals (e.g., dolphins) are determined to be intentionally swimming at the bow, alongside the vessel or vehicle, or directly behind the vessel or vehicle (e.g., to bow-ride or wake-ride), (4) when pinnipeds are hauled out on man-made navigational structures, port structures, and vessels, and (5) when impractical based on mission requirements (e.g., during certain aspects of amphibious exercises).

Table 5.6-4: Visual Observations for Vessels, Vehicles, and Towed In-Water Devices

Mitigation Category	*Lookouts*	*Mitigation Zones and Requirements*
Manned Surface Vessels		
• Manned surface vessels, including surfaced submarines	• One or more Lookouts on manned underway surface vessels in accordance with the most recent navigation safety instruction	• Immediately prior to manned surface vessels getting underway and while underway, the Lookout(s) will observe for: — Marine mammals — Sea turtles • Underway manned surface vessels will maneuver themselves (which may include reducing speed) to maintain the following distances as mission and circumstances allow: — 500 yd from whales — 200 yd from other marine mammals — Vicinity of sea turtles
Unmanned Vehicles		
• Unmanned Surface Vehicles and Unmanned Underwater Vehicles already being escorted (and operated under positive control) by a manned surface vessel	• One Lookout on a support vessel that is already participating in the event, and has positive control over the unmanned vehicle	• Immediately prior to unmanned vehicles getting underway and while underway, the Lookout will observe for: — Marine mammals — Sea turtles • A support vessel that is already participating in the event, and has positive control over the unmanned vehicle, will maneuver the unmanned vehicle (which may include reducing its speed) to ensure it maintains the following distances as mission and circumstances allow: — 500 yd from whales — 200 yd from other marine mammals — Vicinity of sea turtles
Towed In-Water Devices		
• In-water devices towed by an aircraft, a manned surface vessel, or an Unmanned Surface Vehicle or Unmanned Underwater Vehicle already being escorted (and operated under positive control) by a manned surface vessel	• One Lookout on the manned towing vessel, or on a support vessel that is already participating in the event and has positive control over an unmanned vehicle that is towing an in-water device	• Immediately prior to and while in-water devices are being towed, the Lookout will observe for: — Marine mammals — Sea turtles • Manned towing platforms, or support vessels already participating in the event that have positive control over an unmanned vehicle that is towing an in-water device, will maneuver itself or the unmanned vehicle (which may include reducing speed) to ensure towed in-water devices maintain the following distances as mission and circumstances allow: — 250 yd from marine mammals — Vicinity of sea turtles

5.6.3 Visual Observation Effectiveness

Oedekoven and Thomas (2022) evaluated the effectiveness of Navy Lookout Teams at detecting marine mammals before they entered a defined set of mitigation zones (i.e., 200, 500, and 1,000 yd). The study analyzed sighting data collected by the Navy over 27 embarks from 2010 to 2019. Results indicated that the effectiveness of Navy Lookout Teams was generally less than that of trained biologist observer teams, and varied by sighted species, group size, and distance. The Navy reviewed the same dataset used by Oedekoven and Thomas (2022), plus sonar use data, and found that sonar status (i.e., on versus off) was an important factor in evaluating how species availability may influence the prevalence of marine mammal sightings for Navy Lookouts and biologists alike. Sighting rates near vessels using hull-mounted active sonar were lower when sonar was on versus off, suggesting that a portion of marine mammals were not available to be sighted when the sonar was on (due to changed surfacing behavior or avoiding close exposures to sonar) (U.S. Department of the Navy, 2023). Table 5.6-5 provides a summary of the factors that could potentially influence the real-time effectiveness of the Action Proponents' visual observations (Barlow, 2015; Jefferson et al., 2015; Oedekoven & Thomas, 2022; U.S. Department of the Navy, 2023). As described in Appendix E (Acoustic and Explosives Impacts Analysis), the quantitative analysis for this Draft Supplemental EIS/OEIS does not reduce model-impacts to account for visual observation mitigation.

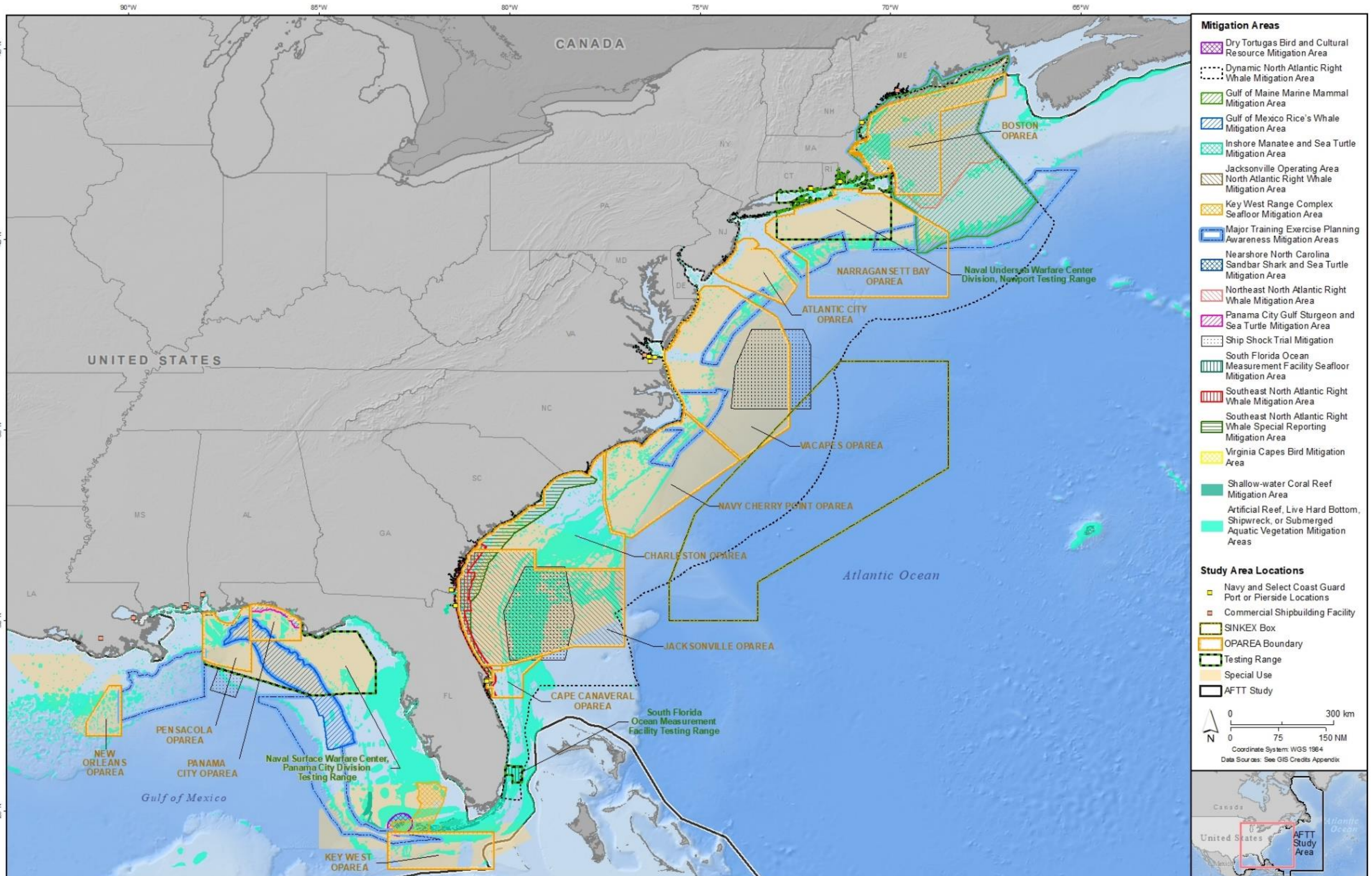
Table 5.6-5: Potential Factors Influencing Visual Observation Effectiveness

Factor	***Description of Influence on Sightability***
Species dive behavior	Long-duration and deep-diving species are not at the surface often or for long periods of time, which limits the amount of time they are available to be seen by Lookouts. Group size also influences sightability. Species that travel in groups or large pods (e.g., delphinids, sperm whales, fin whales) are generally easier to detect than solitary individuals or pairs. Information on dive behaviors and group sizes for species that occur in the Study Area is provided in the technical reports titled *Dive Distribution for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii and California Training and Testing Study Areas* the *U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area (U.S. Department of the Navy, 2024b)*.
Species group size	
Species physical traits and surface behaviors	Larger-bodied species (e.g., baleen and sperm whales) or species with tall dorsal fins (e.g., killer whales) would generally be easier to detect relative to small-bodied species and species without dorsal fins (e.g., pinnipeds, sea turtles). Similarly, species with highly conspicuous surface-active behaviors (e.g., breaching, leaping, bow-riding) are generally easier to detect than cryptic species. For example, whales that fluke regularly (e.g., humpback and North Atlantic right whales) or variably (e.g., blue and fin whales) before they dive may be easier to detect than those that fluke rarely (e.g., sei, common minke, and Bryde's whales). Similarly, species that are active at the surface (e.g., bottlenose and spinner dolphins) or remain at the surface for extended periods of time as they forage or socialize (e.g., sperm and North Atlantic right whales) would be easier to detect than cryptic species that surface inconspicuously (e.g., harbor porpoises, beaked whales, dwarf and pygmy sperm whales, sea turtles). Prominent blows, such as those exhibited by many species of baleen whales (e.g., humpback whales) are easier to detect than small or less visible blows (e.g., Bryde's and common minke whales). Some species do not exhibit a blow when they surface to breathe (e.g., pinnipeds, manatees, sea turtles).
Observation conditions	Weather conditions, such as clear daytime skies, low sea states, low winds (i.e., low prevalence of white caps), and low glare are optimal for marine species observations. Animal sightability generally declines as viewing conditions decline.
Observation area and platform	Marine mammal and sea turtle sightability may be influenced by the mitigation zone size, observation platform, and distance between the two. Aircraft (when not operating at high altitudes) generally have the best vantage point for observing throughout an entire mitigation zone due to their height and speed over the water, and ability to conduct close-approach flyovers (depending on the event). Aircraft Lookouts are typically existing crewmembers responsible for other essential tasks (e.g., navigation), and some types of aircraft may have windows that are small or positioned in a way that partially obstruct views of the sea space directly beneath the aircraft. Due to their low vantage point on the water, Lookouts in small boats may be more likely to detect animals in close proximity to the boat or that display conspicuous visual cues (e.g., blows, splashes, flukes, travel in groups) than animals at further distances (e.g., near a mitigation zone perimeter) or that display inconspicuous visual cues (e.g., solitary sea turtles surfacing without a splash). The bridges of surface ships offer a higher vantage point relative to small boats. For certain events, such as hull-mounted active sonar, the mitigation zone is located directly around the hull of the ship on which the Lookout is positioned. Species sightability would generally decrease with distance, particularly for mitigation zones located far from the observation platform (e.g., a gunnery mitigation zone several NM down range). The use of hand-held or big-eye binoculars can help compensate for the difficulty of sighting animals at distance (depending on the event).

5.7 Geographic Mitigation

Designated portions of the Study Area where the Action Proponents will implement geographic mitigation for physical habitats, marine species habitats, or cultural resources are referred to as "mitigation areas" (see **Figure** 5.7-1 through Figure 5.7-6). Table 5.7-1 demonstrates which mitigation areas pertain to which stressor or mitigation type (i.e., acoustic stressors, explosives, physical disturbance and strike stressors, or special reporting requirements). Table 5.7-2 provides a mitigation area naming convention crosswalk between the 2018 Final EIS/OEIS and this Draft Supplemental EIS/OEIS. The remainder of this section provides the geographic mitigation requirements and a qualitative discussion of their environmental benefits. Mitigation areas apply year-round unless specified otherwise, and do not apply to *de minimis* sources. Detailed descriptions of important seafloor habitats (e.g., for corals), marine mammal habitats, ESA-listed fish, sea turtle, and bird habitats, and cultural resources (e.g., shipwrecks) within the Study Area, as well as maps depicting how these features overlap the mitigation areas, are provided in Appendix F (Biological Resources Supplemental Information) or within Section 3.3 (Habitats), Section 3.4 (Vegetation), Section 3.6 (Fishes), Section 3.7 (Marine Mammals), Section 3.8 (Reptiles), and Section 3.9 (Birds and Bats).

If there should be any need to modify the geographic mitigation described in this section during the conduct of training or testing, event participants will be required to obtain permission from the appropriate designated point of contact (e.g., Naval Command Authority) prior to commencement of the applicable event. The Action Proponents would provide NMFS with advance notification and include relevant information about the event (e.g., sonar hours, use of explosives) in their annual training and testing activity reports.



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise

Figure 5.7-1: Mitigation Areas in the Study Area

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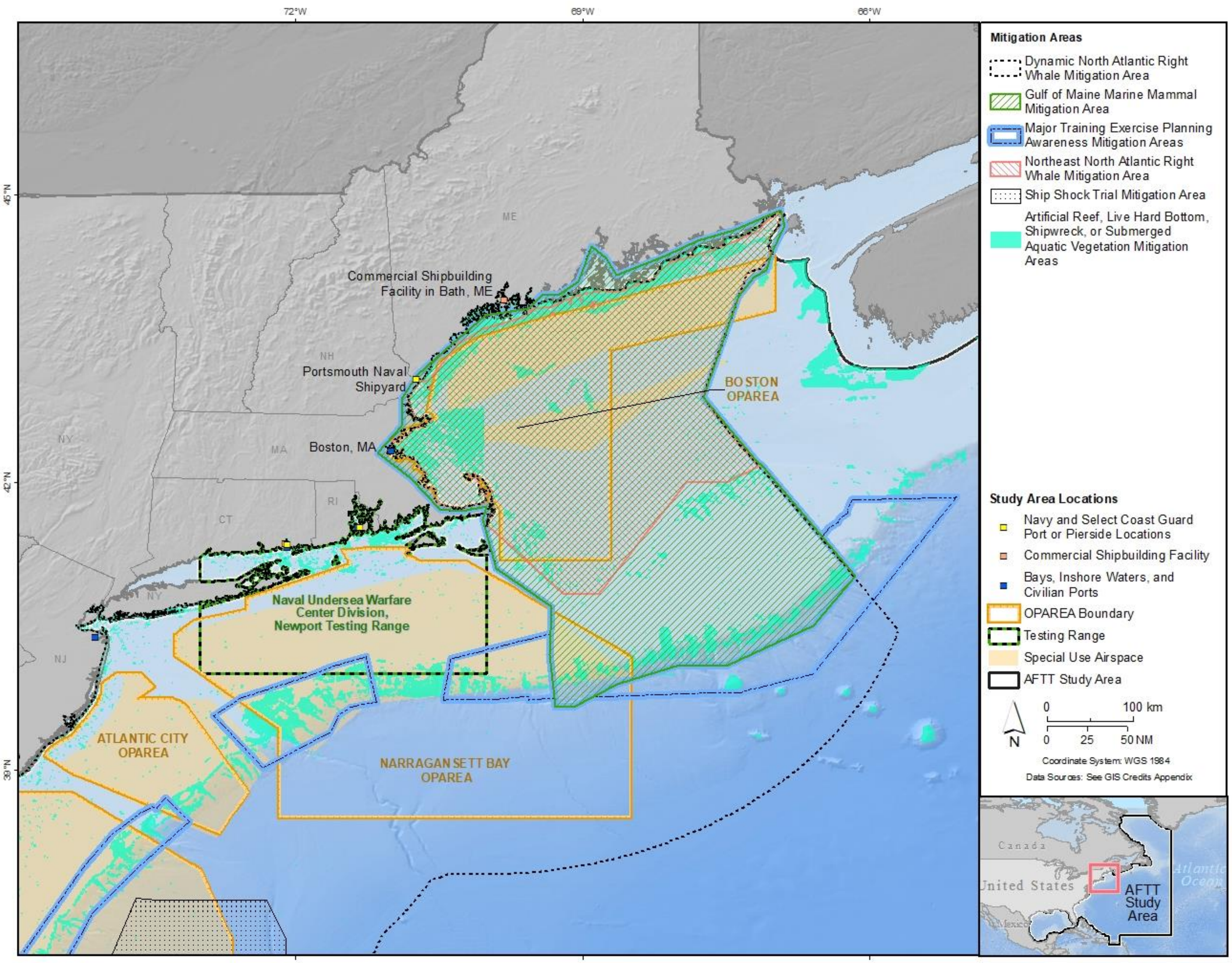
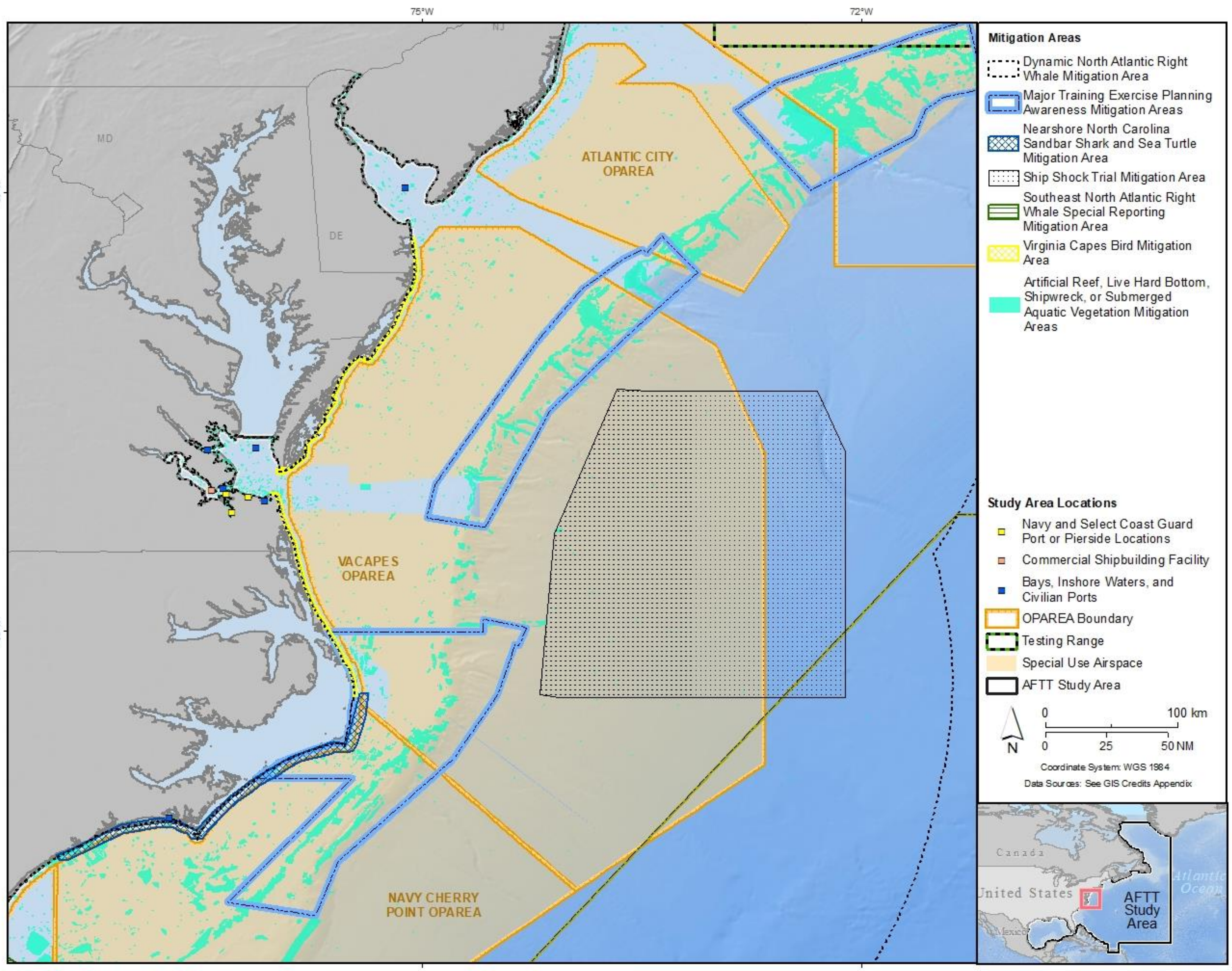


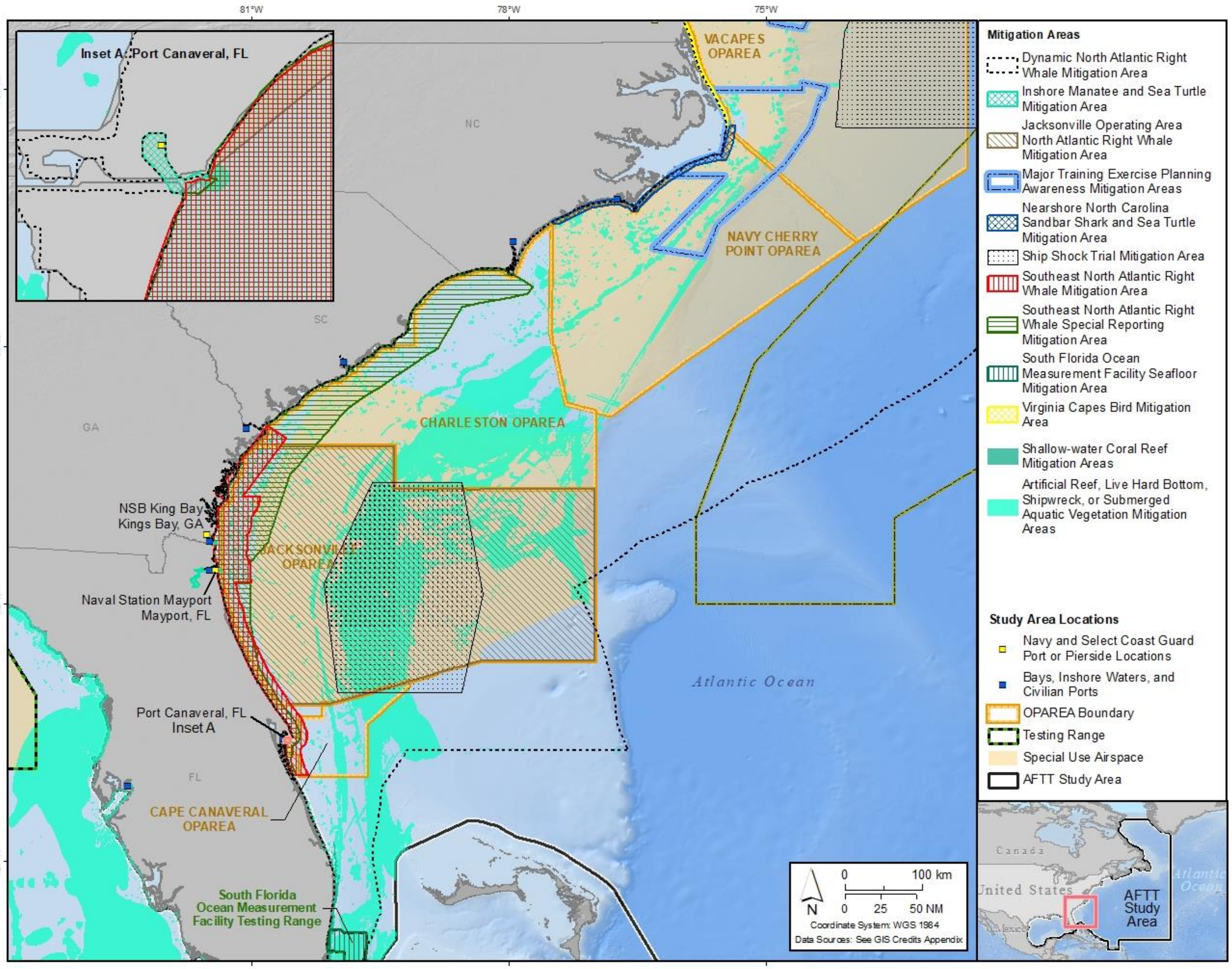
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 5.7-2: Mitigation Areas off the Northeastern United States



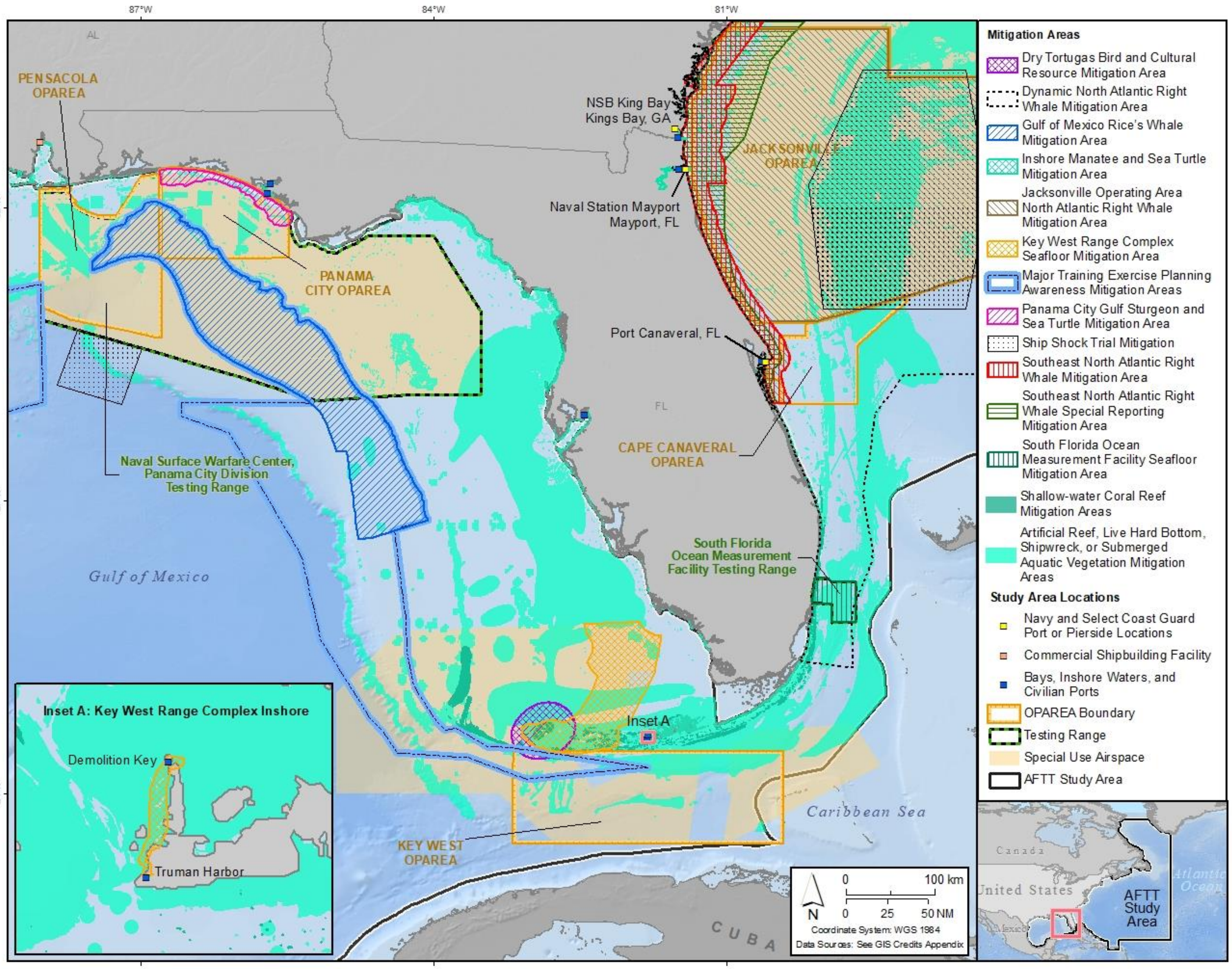
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 5.7-3: Mitigation Areas off the Mid-Atlantic United States



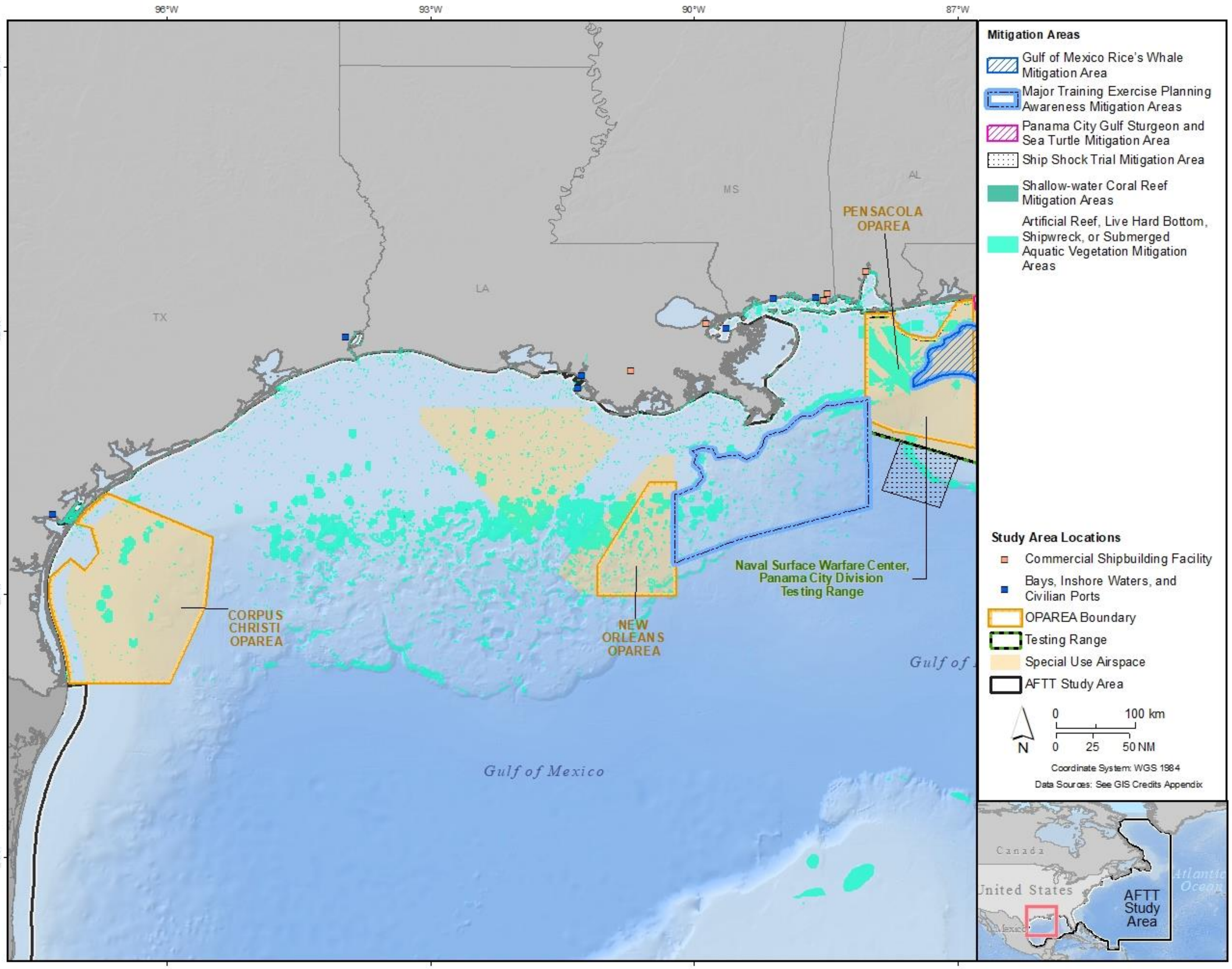
Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 5.7-4: Mitigation Areas off the Southeastern United States



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 5.7-5: Mitigation Areas off the Southeastern United States and in the Eastern Gulf of Mexico



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 5.7-6: Mitigation Areas in the Western Gulf of Mexico

Table 5.7-1: Stressors and Resources for Which Each Mitigation Area Was Developed

Mitigation Area	*Mitigation Type*				*Resources Benefiting from the Mitigation*						
	Acoustic	*Explosive*	*Physical Disturbance and Strike*	*Special Reporting*	*Vegetation*	*Habitats*	*Fishes*	*Marine Mammals*	*Reptiles*	*Birds and Bats*	*Cultural Resources*
Shallow-Water Coral Reef Mitigation Areas		X	X			X	X				
Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck Mitigation Areas		X	X		X	X	X				X
Key West Range Complex Seafloor Mitigation Area			X		X	X	X				
South Florida Ocean Measurement Facility Seafloor Mitigation Area			X		X	X	X				
Nearshore North Carolina Sandbar Shark and Sea Turtle Mitigation Area		X					X		X		
Panama City Gulf Sturgeon and Sea Turtle Mitigation Area		X					X		X		
Inshore Manatee and Sea Turtle Mitigation Areas	X		X					X	X		
Ship Shock Trial Mitigation Areas		X						X			
Major Training Exercise Planning Awareness Mitigation Areas	X							X			
Northeast North Atlantic Right Whale Mitigation Area	X	X	X	X				X			
Gulf of Maine Marine Mammal Mitigation Area	X			X				X			
Jacksonville Operating Area North Atlantic Right Whale Mitigation Area	X	X	X					X			
Southeast North Atlantic Right Whale Mitigation Area	X	X	X	X				X			
Southeast North Atlantic Right Whale Special Reporting Mitigation Area				X				X			
Dynamic North Atlantic Right Whale Mitigation Areas	X	X	X					X			
Gulf of Mexico Rice's Whale Mitigation Area	X	X		X				X			
Virginia Capes Bird Mitigation Area	X									X	
Dry Tortugas Bird and Cultural Resource Mitigation Area	X									X	X

Table 5.7-2: Mitigation Area Naming Convention Crosswalk

2018 Final EIS/OEIS Mitigation Area Name	*Draft Supplemental EIS/OEIS Mitigation Area Name*
Seafloor Resource Mitigation Areas	Shallow-Water Coral Reef Mitigation Areas
	Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck Mitigation Areas
Key West Range Complex	Key West Range Complex Seafloor Mitigation Area
South Florida Ocean Measurement Facility Testing Range	South Florida Ocean Measurement Facility Seafloor Mitigation Area
Navy Cherry Point Range Complex Nearshore Mitigation Area	Nearshore North Carolina Sandbar Shark and Sea Turtle Mitigation Area
Not applicable: categorized as procedural mitigation for line charge testing	Panama City Gulf Sturgeon and Sea Turtle Mitigation Area (Recategorized as geographic mitigation because the mitigation applies only to certain nearshore coastal areas and visual observations are not required)
Not applicable: categorized as procedural mitigation for active sonar	Inshore Manatee and Sea Turtle Mitigation Areas (Recategorized as geographic mitigation because the mitigation applies only to certain inshore and nearshore coastal areas, includes requirements beyond the standard visual observations, and is relevant to sea turtles and only one species of marine mammal)
Not applicable: categorized as procedural mitigation for ship shock trials	Ship Shock Trial Mitigation Areas (Recategorized as geographic mitigation because the mitigation applies to event location planning)
Gulf of Maine Planning Awareness Mitigation Area	Major Training Exercise Planning Awareness Mitigation Areas
Gulf of Mexico Planning Awareness Mitigation Areas	
Northeast Planning Awareness Mitigation Areas	
Southeast and Mid-Atlantic Planning Mitigation Awareness Areas	
Northeast North Atlantic Right Whale Mitigation Area	Northeast North Atlantic Right Whale Mitigation Area
Gulf of Maine Planning Awareness Mitigation Area	Gulf of Maine Marine Mammal Mitigation Area (Reorganized to split out mitigation applicable to Major Training Exercise Planning Awareness Mitigation Areas)
Jacksonville Operating Area	Jacksonville Operating Area North Atlantic Right Whale Mitigation Area
Southeast North Atlantic Right Whale Mitigation Area	Southeast North Atlantic Right Whale Mitigation Area
Southeast North Atlantic Right Whale Critical Habitat Special Reporting Area	Southeast North Atlantic Right Whale Special Reporting Mitigation Area
Not applicable: categorized as procedural mitigation for vessel movement	Dynamic North Atlantic Right Whale Mitigation Areas (Recategorized as geographic mitigation because the mitigation applies only to certain locations and seasons, which will fluctuate based on NMFS Dynamic Management Areas)
Bryde's Whale Mitigation Area	Gulf of Mexico Rice's Whale Mitigation Area (Renamed in this Supplemental EIS/OEIS to reflect the updated species name)
Not applicable: categorized as procedural mitigation for aircraft overflight noise	Virginia Capes Bird Mitigation Area (Recategorized as geographic mitigation because the mitigation applies only to certain nearshore coastal areas and visual observations are not required)
Not applicable: categorized as procedural mitigation for aircraft overflight noise	Dry Tortugas Bird and Cultural Resource Mitigation Area (Recategorized as geographic mitigation because the mitigation applies only to certain nearshore coastal areas and visual observations are not required)

5.7.1 Shallow-Water Coral Reef Mitigation Areas

Table 5.7-3 details geographic mitigation designed to avoid potential impacts from explosives and physical disturbance and strike stressors on shallow-water coral reefs, as well as their critical ecosystem functions and socioeconomic value. Mitigation will also help avoid potential impacts on organisms (e.g., invertebrates, fishes, sea turtles) that use shallow-water coral reefs for sheltering, resting, feeding, or other important life processes. Mitigation is a continuation from the 2018 Final EIS/OEIS. The overall effectiveness of the mitigation area would be correlated with the quality (e.g., accuracy) of the underlying mapping data, as discussed in the *Phase IV Atlantic Fleet Training and Testing SEIS/OEIS Supplement: Marine Habitat Database Technical Report* (U.S. Department of the Navy, 2024).

Table 5.7-3: Shallow-Water Coral Reef Mitigation Area Requirements

Category	***Mitigation Requirements***	***Mitigation Benefits***
Explosives	• The Action Proponents will not detonate any in-water explosives (including underwater explosives and explosives deployed against surface targets) within a horizontal distance of 350 yd from shallow-water coral reefs.	• The 350-yd mitigation area radius for in-water explosives was conservatively designed to be several times larger than the impact footprint (e.g., crater and expelled material radius) of the largest bottom-laid explosive used in the Study Area. As described in Appendix I (Military Expended Materials and Direct Strike Impact Analysis), that explosive is a 650-lb. NEW mine with an estimated impact footprint radius of 22.7 yd. The 350-yd mitigation area radius is 11 times larger than the maximum estimated explosive impact footprint radius, and is even more conservatively sized when compared to the impact footprints of smaller explosives. Therefore, the mitigation will prevent direct impacts (and some level of indirect impacts) from explosives on shallow-water coral reefs in the Study Area.
Physical disturbance and strike	• The Action Proponents will not set vessel anchors within the anchor swing circle radius from shallow-water coral reefs (except in designated anchorages). • The Action Proponents will not place non-explosive seafloor devices within a horizontal distance of 350 yd from shallow-water coral reefs (except as described in the bullet above for vessel anchors, and in Table 5.7-6 for the South Florida Ocean Measurement Facility Seafloor Mitigation Area). • The Action Proponents will not deploy non-explosive ordnance against surface targets (including aerial-deployed mines) within a horizontal distance of 350 yd from shallow-water coral reefs.	• The anchor swing circle mitigation will ensure that vessel anchors do not come into contact with shallow-water coral reefs when factoring in environmental conditions that could affect anchoring position, such as winds, currents, and water depth. • For ease of implementation, the 350-yd mitigation area radius for explosives was also adopted for seafloor devices and non-explosive ordnance deployed against surface targets. This mitigation area radius is even more conservative when compared to the small impact footprints of these non-explosive stressors. Therefore, the mitigation will prevent direct impacts (and some level of indirect impacts) from seafloor devices and non-explosive ordnance deployed against surface targets on shallow-water coral reefs.

5.7.2 Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck Mitigation Areas

Table 5.7-4 details geographic mitigation for explosives and physical disturbance and strike stressors near artificial reefs, live hard bottom, submerged aquatic vegetation (which is Essential Fish Habitat in the Study Area), and shipwrecks. For mitigation, the term "live hard bottom" is defined as substrate in the marine environment with a covering of biotic features (e.g., seaweed, sponges, hard corals). Mitigation will also help avoid potential impacts on organisms (e.g., invertebrates, fishes, sea turtles) that use these seafloor resources for sheltering, resting, feeding, or other important life processes. Mitigation is a continuation from the 2018 Final EIS/OEIS, except for new requirements pertaining to precisely placed non-explosive seafloor devices as described in Table 5.7-4 and Table 5.8-1. The overall effectiveness of the mitigation would be correlated with the quality (e.g., accuracy) of the underlying mapping data, as discussed in the *Phase IV Atlantic Fleet Training and Testing SEIS/OEIS Supplement: Marine Habitat Database Technical Report* (U.S. Department of the Navy, 2024).

Table 5.7-4: Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Explosives	• The Action Proponents will not detonate explosives on or near the seafloor (e.g., explosive bottom-laid or moored mines) within a horizontal distance of 350 yd from artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks, except in designated locations where these resources will be avoided to the maximum extent practical (e.g., Truman Harbor, Demolition Key).	• The 350-yd mitigation area radius will prevent direct impacts (and some level of indirect impacts) from explosives on artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks for the reasons described in Section 5.7.1 (Shallow-Water Coral Reef Mitigation Areas).
Physical disturbance and strike	• The Action Proponents will not set vessel anchors within the anchor swing circle radius from artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks (except in designated anchorages). • The Action Proponents will not place non-explosive seafloor devices (that are not precisely placed) within a horizontal distance of 350 yd from artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks (except as described in the bullet above for vessel anchors, the bullet below for precisely placed seafloor devices, and in Table 5.7-6 for the South Florida Ocean Measurement Facility). • The Action Proponents will not position precisely placed non-explosive seafloor devices directly on artificial reefs, live hard bottom, submerged aquatic vegetation, or shipwrecks. • The Action Proponents will avoid positioning precisely placed non-explosive seafloor devices near these resources by the largest distance that is practical to implement based on mission requirements.	• Mitigation ensures that vessel anchors do not come into contact with artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks, when factoring in environmental conditions that could affect anchoring position, such as winds, currents, and water depth. • For ease of implementation, the 350-yd mitigation area radius for explosives was also adopted for seafloor devices (that are not precisely placed), and is even more conservative when compared to the small impact footprints of non-explosive seafloor devices. • Mitigation specific to precisely placed seafloor devices was first developed and coordinated with NMFS for live hard bottom habitats during the 2022 Hawaii-Southern California Training and Testing Study Area's Essential Fish Habitat consultation reinitiation (U.S. Department of the Navy, 2022a). That mitigation is being included in this document, and applied to the whole mitigation area category of live hard bottom as well as artificial reefs, submerged aquatic vegetation, and shipwrecks, for consistency and practicality of implementation. Because precisely placed seafloor devices are deployed with a high degree of placement accuracy, the original intent of the mitigation (i.e., preventing direct physical strike and disturbance) will continue to be achieved. Therefore, the mitigation for seafloor devices that are either precisely placed or not precisely placed will collectively prevent direct impacts (and some level of indirect impacts) from seafloor devices on artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks.

5.7.3 Key West Range Complex Seafloor Mitigation Area

Table 5.7-5 details geographic mitigation related to the use of surface vessels in shallow areas of the Key West Range Complex. Mitigation is a continuation from the 2018 Final EIS/OEIS.

Table 5.7-5: Key West Range Complex Seafloor Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Physical disturbance and strike	• The Action Proponents will operate surface vessels in waters deep enough to avoid bottom scouring or prop dredging, with at least a 1-foot clearance between the deepest draft of the vessel (with the motor down) and the seafloor at mean low water.	• The mitigation area is bound by the 30-meter depth contour, consistent with the deepest potential seagrass depth within the Key West Range Complex. Seafloor resources outside of this water depth would be at no risk of prop dredging or bottom scouring based on the deepest drafts of the surface vessels used in the Study Area. • The mitigation will ensure that surface vessels and propellers do not contact the seafloor or seafloor resources. • The mitigation is designed to protect the critical ecosystem functions, socioeconomic value, and cultural importance of submerged aquatic vegetation and shallow soft bottom (which are Essential Fish Habitats in the Study Area), shallow-water coral reefs, artificial reefs, live hard bottom, and shipwrecks at their known locations in the Key West Range Complex. • The mitigation will also protect organisms (e.g., invertebrates, fishes, sea turtles) associated with these seafloor resources for sheltering, resting, feeding, or other important life processes.

5.7.4 South Florida Ocean Measurement Facility Seafloor Mitigation Area

Table 5.7-6 details geographic mitigation related to physical disturbance and strike stressors within the South Florida Ocean Measurement Facility. Mitigation is a continuation from the 2018 Final EIS/OEIS.

Table 5.7-6: South Florida Ocean Measurement Facility Seafloor Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Physical disturbance and strike	• The Action Proponents will operate surface vessels in waters deep enough to avoid bottom scouring or prop dredging, with at least a 1-foot clearance between the deepest draft of the vessel (with the motor down) and the seafloor at mean low water. • The Action Proponents will use a real-time geographic information system and global positioning system (along with remote-sensing verification) during deployment, installation, and recovery of anchors and mine-like objects and during deployment of bottom-crawling unmanned underwater vehicles in waters deeper than 10 feet to avoid shallow-water coral reefs and live hard bottom. • Surface vessels deploying seafloor devices will aim to hold a relatively fixed position over the intended mooring or deployment location using a dynamic positioning navigation system with global positioning system. • The Action Proponents will minimize surface vessel movement and drift (including anchor dragging) in accordance with mooring installation and deployment plans, and will conduct activities during sea and wind conditions that allow vessels to maintain position and speed control during deployment, installation, and recovery of seafloor devices. • The Action Proponents will not anchor surface vessels or moor over shallow-water coral reefs or live hard bottom. • The Action Proponents will use semi-permanent anchoring systems that are assisted with riser buoys over soft bottom habitats to avoid contact of mooring cables with shallow-water coral reefs and live hard bottom.	• The mitigation will ensure that surface vessels, propellers, and seafloor devices (e.g., anchors, anchoring systems, mine-like objects, bottom-crawling unmanned underwater vehicles) do not contact the seafloor or certain seafloor resources. • The mitigation is designed to protect the critical ecosystem functions, socioeconomic value, and cultural importance of submerged aquatic vegetation and shallow soft bottom (which are Essential Fish Habitats in the Study Area), shallow-water coral reefs, artificial reefs, and live hard bottom at their known locations. • The mitigation will also protect organisms (e.g., invertebrates, fishes, sea turtles) associated with these seafloor resources for sheltering, resting, feeding, or other important life processes.

5.7.5 Nearshore North Carolina Sandbar Shark and Sea Turtle Mitigation Area

Table 5.7-7 details geographic mitigation related to the use of explosives within 3.2 NM of an estuarine inlet and within 1.6 NM of the North Carolina shoreline in the Navy Cherry Point Range Complex. Mitigation is a continuation from the 2018 Final EIS/OEIS.

Table 5.7-7: Nearshore North Carolina Sandbar Shark and Sea Turtle Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Explosives	• From March 1 to September 30, the Action Proponents will not detonate explosive mines during mine neutralization events involving divers, and will avoid detonating all other types of in-water explosives (including underwater explosives and explosives deployed against surface targets) to the maximum extent practical.	• Mitigation is designed to avoid exposure of in-water explosives on ESA-listed green, Kemp's ridley, loggerhead, and leatherback sea turtles during transit to and from nesting beaches. Nesting season typically lasts in this area from April to September for green and loggerhead sea turtles, and from March to September for leatherback sea turtles. • Explosive mine neutralization events involving divers are the type of explosive event most likely to be conducted in these waters. Other in-water explosives events are unlikely in this location, but could potentially occur if necessitated by mission requirements. • The mitigation area completely encompasses the Habitat Area of Particular Concern for sandbar sharks along Cape Hatteras National Seashore, which provides important seasonal reproduction habitat from May 15 to September 15 (e.g., nursery and pupping grounds).

5.7.6 Panama City Gulf Sturgeon and Sea Turtle Mitigation Area

Table 5.7-8 details geographic mitigation related to explosive line charge testing, which is conducted in the surf zone. Naval Surface Warfare Center, Panama City Division Testing Range is currently the Navy's only location capable of supporting explosive line charge testing. For the purpose of representing this area on a map, the mitigation area extends from the shoreline out to the 30-meter depth contour within the Naval Surface Warfare Center, Panama City Division Testing Range. Mitigation is a continuation from the 2018 Final EIS/OEIS.

Table 5.7-8: Panama City Gulf Sturgeon and Sea Turtle Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Explosives	• From March 1 to September 30, the Action Proponents will not conduct line charge testing at night. • From October 1 to March 31, the Action Proponents will not conduct line charge testing (except within a designated location on Santa Rosa Island).	• Mitigation to not conduct line charge testing at night from March 1 to September 30 is designed to avoid exposure of ESA-listed green, Kemp's ridley, loggerhead, and leatherback sea turtles to explosives during the time of day when individuals are most likely to transit to and from nesting beaches. Nesting season typically lasts in this area from April to September for green, Kemp's ridley, and loggerhead sea turtles, and March to September for leatherbacks. • Mitigation to not conduct line charge testing (day or night) from October through March (except within a designated location on Santa Rosa Island) is designed to avoid exposure of ESA-listed Gulf sturgeon during seasonal migrations from the Gulf of Mexico winter and feeding grounds to the spring and summer natal (hatching) grounds in the Yellow, Choctawhatchee, and Apalachicola Rivers.

5.7.7 Inshore Manatee and Sea Turtle Mitigation Areas

Table 5.7-9 details geographic mitigation related to pierside use of active sonar at Naval Submarine Base Kings Bay and Port Canaveral, Florida, and vessel movements within inshore waters of Naval Submarine Base Kings Bay and Naval Station Mayport, Florida. Mitigation is a continuation from the 2018 Final EIS/OEIS, except the modifications described in Section 5.8 (Summary of New or Modified Mitigation Requirements).

Table 5.7-9: Inshore Manatee and Sea Turtle Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic	• Pierside at Naval Submarine Base Kings Bay, the Action Proponents will reduce mid-frequency active sonar transmissions by at least 36 dB from full power. • The Action Proponents will conduct pierside active sonar activities during daylight hours at Port Canaveral, Florida, and Naval Submarine Base Kings Bay. • The Action Proponents will notify the Port Authority prior to commencing pierside active sonar activities at Port Canaveral, Florida, and Naval Submarine Base Kings Bay. • The Action Proponents will post two Lookouts to conduct visual observations (who will follow applicable procedures described in Section 5.6, Visual Observations) during pierside active sonar activities at Port Canaveral, Florida, and Naval Submarine Base Kings Bay. After completion of pierside active sonar activities, Lookouts will observe for marine mammals and sea turtles for 30 minutes. • Pierside at Naval Submarine Base Kings Bay, the Lookout will communicate sightings of manatees and sea turtles (e.g., time, location, count, animal size, description of research tags if present, direction of travel) during or within 30 minutes after pierside active sonar activities to Port Operations. Port Operations will record, report, or communicate relevant sightings information as required by the Integrated Natural Resource Management Plan.	• Mitigation for active pierside sonar activities at Port Canaveral, Florida, and Naval Submarine Base Kings Bay are collectively designed to decrease potential impacts on manatees and sea turtles. • Mitigation to conduct pierside sonar activities during daylight hours at Port Canaveral, Florida, and Naval Submarine Base Kings Bay will help increase the likelihood that Lookouts will detect manatees and sea turtles. • Mitigation to implement a 36-dB reduction from full power for pierside mid-frequency active sonar transmissions at Naval Submarine Base Kings Bay, will reduce the level of sound exposure that would potentially be received by marine mammals (including manatees) and sea turtles, which would reduce the potential for injurious impacts at this location. • Mitigation for Lookouts to communicate information on sightings of manatees and sea turtles to Port Operations at Naval Submarine Base Kings Bay will assist sightings communication between platforms. Per the Integrated Natural Resource Management Plan at Naval Submarine Base Kings Bay the Port Authority communicates relevant sightings information to Action Proponent platforms operating in the vicinity, as well as any other record-keeping, reporting or communication procedures as required by the Integrated National Resource Management Plan.
Physical disturbance and strike	• When underway in the St. Johns River or in the turning basins, channels, and waterways adjacent to Naval Station Mayport, vessels will comply with federal, state, and local Manatee Protection Zones and reduce speed in accordance with established operational safety and security procedures. • When mooring pierside at Naval Submarine Base Kings Bay, submarines will ensure proper fendering techniques to remain off the quay wall.	• Mitigation for underway vessels to comply with federal, state, and local Manatee Protection Zones will decrease the potential for interactions between vessels and manatees in the St. Johns River and within the waters of and adjacent to Naval Station Mayport. • Mitigation for fendering techniques is designed to prevent submarines from injuring or confining a manatee against the quay wall.

5.7.8 Ship Shock Trial Mitigation Areas

Table 5.7-10 details geographic mitigation related to ship shock trials, which involve the use of explosives. Ship shock trials are conducted only within established ship shock trial boxes within the Gulf of Mexico and overlapping the Jacksonville and Virginia Capes OPAREAs. The boundaries of the mitigation areas match the boundaries of each ship shock trial box. Mitigation is a continuation from the 2018 Final EIS/OEIS, except for new mitigation related to the location of the northern Gulf of Mexico ship shock trial box as described in Table 5.7-10 and Table 5.8-1.

Table 5.7-10: Ship Shock Trial Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Explosives	• The Action Proponents will reposition the northern Gulf of Mexico ship shock trial box so it is situated outside of the Rice's whale core distribution area identified by NMFS in 2019 (84 *Federal Register* 15446) and updated in 2021 (86 *Federal Register* 47022). • The Action Proponents will not conduct ship shock trials within the portion of the ship shock trial box that overlaps the Jacksonville OPAREA from November 15 through April 15. • Pre-event planning for ship shock trials will include the selection of one primary and two secondary sites (within one of the ship shock trial boxes) where marine mammal abundance is expected to be the lowest during an event, with the primary and secondary locations located more than 2 NM from the western boundary of the Gulf Stream for events planned within the portion of the ship shock trial boxes that overlap the Virginia Capes or Jacksonville OPAREAs. • If the Action Proponents determine during pre-event visual observations that the primary site is environmentally unsuitable (e.g., continuous observations of marine mammals), it would evaluate the potential to move the event to one of the secondary sites in accordance with the event-specific mitigation and monitoring plan (see Table 5.6-2 for additional information).	• Prior to being repositioned, the northern Gulf of Mexico ship shock trial box overlapped the ESA-listed Bryde's whale core distribution area identified by NMFS in 2019 (84 *Federal Register* 15446) and updated in 2021 to distinguish Rice's whale as a subspecies distinct from Bryde's whale (86 *Federal Register* 47022). Preliminary Navy Acoustic Effects Model data indicated that Rice's whales would have potentially been exposed to auditory injury, temporary threshold shift, and behavioral impacts from explosives if events were to occur at that location. The Action Proponents determined it would be practical to reposition the ship shock trial box outside of the Rice's whale core distribution area, and into a new location that would avoid potential exposure of Rice's whales to injurious levels of sound. The repositioned ship shock trial box is now located off the Naval Surface Warfare Center, Panama City Division Testing Range's southern boundary. • Mitigation to not conduct ship shock trials in the Jacksonville OPAREA from November 15 through April 15 is designed to avoid potential injurious and behavioral impacts on North Atlantic right whales during calving season. • Mitigation to consider marine mammal abundance during pre-event planning, to prioritize locations that are more than 2 NM from the western boundary of the Gulf Stream (where marine mammals would be expected in greater concentrations for foraging and migration) when conducting ship shock trials in the boxes that overlap the Virginia Capes or Jacksonville OPAREAs, and to evaluate the environmental suitability of the selected site based on pre-event observations, are collectively designed to reduce the number of individual marine mammals exposed, as well as the level of impact that could potentially be received by each animal. • The benefits of the mitigation for Rice's whales, North Atlantic right whales, and other marine mammal species would be substantial because ship shock trials use the largest NEW of any explosive activity conducted under the Proposed Action.

5.7.9 Major Training Exercise Planning Awareness Mitigation Areas

Table 5.7-11 details geographic mitigation related to major training exercises (i.e., Composite Training Unit Exercises and Sustainment Exercises). Mitigation is a continuation from the 2018 Final EIS/OEIS.

Table 5.7-11: Major Training Exercise Planning Awareness Mitigation Area Requirements

Category	Mitigation Requirements	Mitigation Benefits
Acoustic	• **Northeast:** Within Major Training Exercise Planning Awareness Mitigation Areas located in the Northeast (i.e., the combined areas within the Gulf of Maine, over the continental shelves off Long Island, Rhode Island, Massachusetts, and Maine), the Action Proponents will not conduct any (or a portion of any) major training exercises. • **Mid-Atlantic:** Within Major Training Exercise Planning Awareness Mitigation Areas located in the Mid-Atlantic (i.e., the combined areas off Maryland, Delaware, and North Carolina), the Action Proponents will avoid conducting any (or a portion of any) major training exercises to the maximum extent practical, and will not conduct more than four (or a portion of more than four) major training exercises per year. • **Gulf of Mexico:** Within the combined areas located in the Gulf of Mexico, the Action Proponents will not conduct any (or a portion of any) major training exercises within Major Training Exercise Planning Awareness Mitigation Areas under Alternative 1, and not more than one (or a portion of more than one) under Alternative 2.	• Mitigation to prohibit or limit major training exercises within regional planning mitigation areas is collectively designed to reduce the number of marine mammal species, and individuals within each species, that are exposed to potential impacts from active sonar during major training exercises. The mitigation areas are situated among highly productive environments and persistent oceanographic features associated with upwellings, steep bathymetric contours, and canyons. The areas have high marine mammal densities, abundance, or concentrated use for feeding, reproduction, or migration. Mitigation benefits would be substantial because major training exercises are conducted on a larger scale and with more hours of active sonar use than other types of active sonar events. • Mitigation for the Northeast planning areas (including in the Gulf of Maine) is designed to prevent major training exercises from occurring within North Atlantic right whale foraging critical habitat, across the shelf break in the northeast, on Georges Bank, and in areas that contain underwater canyons (e.g., Hydrographer Canyon). These locations (including within a portion of the Northeast Canyons and Seamounts National Marine Monument) have been associated with high occurrences of marine mammal feeding, abundance, or mating for harbor porpoises and humpback, minke, sei, fin, and North Atlantic right whales. • Mitigation for the Mid-Atlantic planning areas is designed to limit the number of major training exercises that could occur within large swaths of shelf break that contain underwater canyons or other habitats (e.g., Norfolk Canyon, part of the Cape Hatteras Special Research Area) associated with high marine mammal diversity in this region, including blue, fin, minke, sei, sperm, beaked, dwarf sperm, pygmy sperm, and humpback whales, as well as Risso's dolphins and other delphinid species. The planning areas also overlap North Atlantic right whale migration habitats. • Mitigation for Gulf of Mexico planning areas is designed to prohibit (Alternative 1) or limit (Alternative 2) the number of major training exercises that could occur within feeding, migration, and reproduction habitat (e.g., Mississippi Canyon, DeSoto Canyon) for sperm and Rice's whales.

5.7.10 Northeast North Atlantic Right Whale Mitigation Area

Table 5.7-12 details geographic mitigation related to active sonar and explosives (and special reporting for their use), and physical disturbance and strike stressors off the northeastern United States. The mitigation area extent matches that of the North Atlantic right whale foraging critical habitat designated by NMFS in 2016 (81 *Federal Register* 4838). Mitigation is a continuation from the 2018 Final EIS/OEIS, with clarification that requirements pertain to in-water stressors (i.e., not activities with no potential marine mammal impacts, such as air-to-air activities). Mitigation is designed to protect individual North Atlantic right whales within their foraging critical habitat. Mitigation is expected to also protect individuals of other species whose biologically significant habitats overlap the mitigation area, including harbor porpoises and humpback, minke, sei, and fin whales.

Table 5.7-12: Northeast North Atlantic Right Whale Mitigation Area Requirements

Category	Mitigation Requirements	Mitigation Benefits
Acoustic	• The Action Proponents will minimize the use of low-frequency active sonar, mid-frequency active sonar, and high-frequency active sonar in the mitigation area to the maximum extent practical.	• Mitigation is designed to minimize exposure of North Atlantic right whales to sounds with potential for injury or behavioral impacts.
Explosives	• The Action Proponents will not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets) within the mitigation area. • The Action Proponents will not detonate explosive sonobuoys within 3 NM of the mitigation area.	• Mitigation is designed to prevent exposure of North Atlantic right whales to explosives with potential for injury, mortality, or behavioral impacts. • Mitigation to prohibit explosive sonobuoys within 3 NM is designed to further prevent exposure to large and dispersed explosive sonobuoy fields.
Physical disturbance and strike	• The Action Proponents will not use non-explosive bombs within the mitigation area. • During non-explosive torpedoes events within the mitigation area: – The Action Proponents will conduct activities during daylight hours in Beaufort sea state 3 or less. – In addition to Lookouts required as described in Section 5.6 (Visual Observations), the Action Proponents will post two Lookouts in an aircraft during dedicated aerial surveys, and one Lookout on the submarine participating in the event (when surfaced). Lookouts will begin conducting visual observations immediately prior to the start of an event. If floating vegetation or marine mammals are observed in the event vicinity, the event will not commence until the vicinity is clear or the event is relocated to an area where the vicinity is clear. Lookouts will continue to conduct visual observations during the event. If marine mammals are observed in the vicinity, the event will cease until one of the Mitigation Zone All-Clear Conditions has been met as described in Section 5.6 (Visual Observations). – During transits and normal firing, surface ships will maintain a speed of no more than 10 knots; during submarine target firing, surface ships will maintain speeds of no more than 18 knots; and during vessel target firing, surface ship speeds may exceed 18 knots for brief periods of time (e.g., 10 to 15 minutes). • For vessel transits within the mitigation area: – The Action Proponents will conduct a web query or e-mail inquiry to the North Atlantic Right Whale Sighting Advisory System to obtain the latest sightings data prior to transiting the mitigation area. The Action Proponents will provide Lookouts the sightings data prior to standing watch. Lookouts will use that data to help inform visual observations during vessel transits. – Surface ships will implement speed reductions after observing a North Atlantic right whale, if transiting within 5 NM of a sighting reported to the North Atlantic Right Whale Sighting Advisory System within the past week, and when transiting at night or during periods of reduced visibility.	• Mitigation to prohibit use of non-explosive bombs is designed to reduce the potential for North Atlantic right whales to be struck by non-explosive ordnance. • Mitigation to conduct non-explosive torpedo activities during daylight hours in Beaufort sea state 3 or less, and to post additional Lookouts from aircraft (and submarines, when surfaced), is designed to improve marine mammal sightability during visual observations. • Mitigation for vessels to obtain sightings information from the North Atlantic Right Whale Sighting Advisory System and implement speed reductions in certain circumstances is designed to reduce the potential for vessels to encounter North Atlantic right whales. The North Atlantic Right Whale Sighting Advisory System is a National Oceanographic and Atmospheric Administration Northeast Fisheries Science Center program that collects sightings information off the northeastern United States from aerial surveys, shipboard surveys, whale watching vessels, and opportunistic sources, such as the Coast Guard, commercial ships, fishing vessels, and the public.
Special reporting for the use of acoustics and explosives	• The Action Proponents will report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used in the mitigation area in their training and testing activity reports submitted to NMFS.	• Special reporting requirements are designed to aid the Action Proponents and NMFS in continuing to analyze potential impacts of training and testing in the mitigation area.

5.7.11 Gulf of Maine Marine Mammal Mitigation Area

Table 5.7-13 details geographic mitigation related to active sonar and special reporting for the use of active sonar and in-water explosives within the Gulf of Maine. Mitigation is a continuation from the 2018 Final EIS/OEIS.

Table 5.7-13: Gulf of Maine Marine Mammal Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic	• The Action Proponents will not use more than 200 hours of surface ship hull-mounted mid-frequency active sonar annually within the mitigation area.	• Mitigation is designed to reduce exposure of North Atlantic right whales to potentially injurious levels of sound from the type of active sonar with the highest source power used in the Study Area within foraging critical habitat designated by NMFS in 2016 (81 *Federal Register* 4838) and additional sea space southward over Georges Bank.
Special reporting for the use of acoustics and explosives	• The Action Proponents will report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used in the mitigation area in their training and testing activity reports submitted to NMFS.	• Special reporting requirements are designed to aid the Action Proponents and NMFS in continuing to analyze potential impacts of training and testing in the mitigation area.

5.7.12 Jacksonville Operating Area North Atlantic Right Whale Mitigation Area

Table 5.7-14 details geographic mitigation related to active sonar, explosives, and physical disturbance and strike stressors in the Jacksonville OPAREA. Mitigation is a continuation from the 2018 Final EIS/OEIS, with clarification that requirements pertain to in-water stressors (i.e., not activities with no potential marine mammal impacts, such as air-to-air activities).

Table 5.7-14: Jacksonville Operating Area North Atlantic Right Whale Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic Explosives Physical disturbance and strike	• From November 15 to April 15 within the mitigation area, prior to vessel transits or military readiness activities involving active sonar, in-water explosives (including underwater explosives and explosives deployed against surface targets), or non-explosive ordnance deployed against surface targets (including aerial-deployed mines), the Action Proponents will initiate communication with Fleet Area Control and Surveillance Facility, Jacksonville to obtain Early Warning System data. The facility will advise of all reported North Atlantic right whale sightings in the vicinity of planned vessel transits and military readiness activities. – Sightings data will be used when planning event details (e.g., timing, location, duration) to minimize interactions with North Atlantic right whales to the maximum extent practical. – The Action Proponents will provide Lookouts the sightings data prior to standing watch to help inform visual observations.	• The Early Warning System is described in Section 5.5 (Monitoring, Research, and Adaptive Management). Mitigation is designed to minimize potential North Atlantic right whale vessel interactions and exposure to stressors with the potential for mortality, injury, or behavioral disturbance within the portions of the reproduction (calving) critical habitat designated by NMFS in 2016 (81 *Federal Register* 4838) and important migration habitat that overlaps the Jacksonville OPAREA. • The benefits of the mitigation would be substantial because the Jacksonville OPAREA is an Action Proponent concentration area within the southeastern region.

5.7.13 Southeast North Atlantic Right Whale Mitigation Area

Table 5.7-15 details geographic mitigation related to active sonar and explosives (and special reporting for their use), and physical disturbance and strike stressors off the Southeastern United States. Mitigation is a continuation from the 2018 Final EIS/OEIS, with clarification that requirements pertain to the use of in-water stressors (i.e., not activities with no potential marine mammal impacts, such as air-to-air activities). The mitigation area is the largest area practical to implement within the North Atlantic right whale reproduction critical habitat designated by NMFS in 2016 (81 *Federal Register* 4838). Mitigation is designed to protect reproductive mothers, calves, and mother–calf pairs within the only known North Atlantic right whale calving habitat. Mitigation benefits would be substantial because the mitigation area encompasses the Georgia and northeastern Florida coastlines (where the highest seasonal concentrations occur) and coastal extent of the Jacksonville OPAREA (an Action Proponent concentration area).

Table 5.7-15: Southeast North Atlantic Right Whale Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic	• From November 15 to April 15 within the mitigation area, the Action Proponents will not use high-frequency active sonar; or low-frequency or mid-frequency active sonar except: – To the maximum extent practical, the Action Proponents will minimize use of (1) helicopter dipping sonar (a mid-frequency active sonar source) and (2) low-frequency or surface ship hull-mounted mid-frequency active sonar during navigation training or object detection.	• Mitigation is designed to minimize exposure to levels of sound that have the potential to cause injurious or behavioral impacts.
Explosives	• From November 15 to April 15 within the mitigation area, the Action Proponents will not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets).	• Mitigation is designed to prevent exposure to explosives with the potential for injury, mortality, or behavioral disturbance.
Physical disturbance and strike	• From November 15 to April 15 within the mitigation area, the Action Proponents will not deploy non-explosive ordnance against surface targets (including aerial-deployed mines). • From November 15 to April 15 within the mitigation area, surface ships will minimize north-south transits to the maximum extent practical, and will implement speed reductions after they observe a North Atlantic right whale, if they are within 5 NM of an Early Warning System sighting reported within the past 12 hours, and at night and in poor visibility.	• Mitigation is designed to prevent strikes by non-explosive ordnance, and to decrease the potential for vessel strikes (which could result in mortality or serious injury). North-south transit restrictions are designed to reduce the time ships spend in the highest seasonal occurrence areas to further decrease vessel strike risk.
Acoustic Explosives Physical disturbance and strike	• From November 15 to April 15 within the mitigation area, prior to vessel transits or military readiness activities involving active sonar, in-water explosives (including underwater explosives and explosives deployed against surface targets), or non-explosive ordnance deployed against surface targets (including aerial-deployed mines), the Action Proponents will initiate communication with Fleet Area Control and Surveillance Facility, Jacksonville to obtain Early Warning System sightings data. The facility will advise of all reported North Atlantic right whale sightings in the vicinity of planned vessel transits and military readiness activities. • The Action Proponents will provide Lookouts the sightings data prior to standing watch to help inform visual observations.	• The Early Warning System is described in Section 5.5 (Monitoring, Research, and Adaptive Management). Mitigation is designed to minimize potential vessel interactions and exposure to stressors with the potential for mortality, injury, or behavioral disturbance.
Special reporting for the use of acoustics and explosives	• The Action Proponents will report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used in the mitigation area from November 15 to April 15 in their training and testing activity reports submitted to NMFS.	• Special reporting requirements are designed to aid the Action Proponents and NMFS in continuing to analyze potential impacts of training and testing in the mitigation area.

5.7.14 Southeast North Atlantic Right Whale Special Reporting Mitigation Area

Table 5.7-16 details geographic mitigation related to special reporting requirements for the use of active sonar and explosives off the southeastern United States. Mitigation is a continuation from the 2018 Final EIS/OEIS.

Table 5.7-16: Southeast North Atlantic Right Whale Special Reporting Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Special reporting for the use of acoustics and explosives	• From November 15 to April 15, the Action Proponents will report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used within the mitigation area in their training and testing activity reports submitted to NMFS.	• The mitigation area extent aligns with the boundaries of the North Atlantic right whale critical habitat for reproduction designated by NMFS in 2016 (81 *Federal Register* 4838). • Special reporting requirements are designed to aid the Action Proponents and NMFS in continuing to analyze potential impacts of training and testing in the mitigation area.

5.7.15 Dynamic North Atlantic Right Whale Mitigation Areas

Table 5.7-17 details geographic mitigation related to active sonar, explosives and physical disturbance and strike stressors off the southeastern United States. Mitigation is a continuation from the 2018 Final EIS/OEIS, with clarification that requirements pertain to the use of in-water stressors (i.e., not activities with no potential marine mammal impacts, such as air-to-air activities).

Table 5.7-17: Dynamic North Atlantic Right Whale Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic Explosives Physical disturbance and strike	• The applicable dates and locations of this mitigation area will correspond with NMFS' Dynamic Management Areas, which fluctuate throughout the year based on the locations and timing of confirmed North Atlantic right whale detections. • The Action Proponents will provide North Atlantic right whale Dynamic Management Area information (e.g., location and dates) to applicable assets transiting and training or testing in the vicinity of the Dynamic Management Area. – The broadcast awareness notification messages will alert assets (and their Lookouts) to the possible presence of North Atlantic right whales in their vicinity. – Lookouts will use the information to help inform visual observations during military readiness activities that involve vessel movements, active sonar, in-water explosives (including underwater explosives and explosives deployed against surface targets), or non-explosive ordnance deployed against surface targets in the mitigation area.	• The mitigation area extent matches the boundary of the U.S. Exclusive Economic Zone on the East Coast, which is the full extent of where Dynamic Management Areas could potentially be established year-round. NMFS manages the Dynamic Management Areas program off the U.S. East Coast with the primary goal of reducing the likelihood of North Atlantic right whale vessel strikes from all mariners. • Mitigation is designed to minimize potential North Atlantic right whale vessel interactions and exposure to acoustic stressors, explosives, and physical disturbance and strike stressors that have the potential to cause mortality, injury, or behavioral disturbance.

5.7.16 Gulf of Mexico Rice's Whale Mitigation Area

Table 5.7-18 details geographic mitigation related to active sonar and explosives (and special reporting for their use) in the northeastern Gulf of Mexico. Mitigation is a continuation from the 2018 Final EIS/OEIS. The mitigation area extent aligns with this species' small and resident population area identified by NMFS in its 2016 status review (Rosel et al., 2016).

Table 5.7-18: Gulf of Mexico Rice's Whale Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic	• The Action Proponents will not use more than 200 hours of surface ship hull-mounted mid-frequency active sonar annually within the mitigation area.	• Mitigation is designed to reduce exposure of individuals within the small and resident population of Rice's whales to potentially injurious levels of sound by the type of active sonar with the highest source power used in the Study Area.
Explosives	• Except during mine warfare activities, the Action Proponents will not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets) within the mitigation area.	• Mitigation is designed to reduce exposure of individuals within the small and resident population of Rice's whales to explosives that have the potential to cause injury, mortality, or behavioral disturbance.
Special reporting for the use of acoustics and explosives	• The Action Proponents will report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used in the mitigation area in their training and testing activity reports submitted to NMFS.	• Special reporting requirements are designed to aid the Action Proponents and NMFS in continuing to analyze potential impacts of training and testing in the mitigation area.

5.7.17 Virginia Capes Bird Mitigation Area

Table 5.7-19 details geographic mitigation related to rotary-wing aircraft overflights in and adjacent to the Virginia Capes Range Complex. For the purpose of showing this area on a map, the mitigation area extent is a shoreline buffer around Fisherman Island and along the coast of the Virginia Capes Range Complex from Delaware to North Carolina. Mitigation is a continuation from the 2018 Final EIS/OEIS.

Table 5.7-19: Virginia Capes Bird Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic	• Rotary-wing aircraft will maintain at least a 3,000-foot altitude and a 1,000-yd horizontal distance from Fisherman Island National Wildlife Refuge when transiting between the Virginia Capes Range Complex and Norfolk Naval Station for at-sea training or testing. • After transiting from Norfolk Naval Station for at-sea training or testing, rotary-wing aircraft will maintain a distance of at least 1 NM from the beach when flying within the Virginia Capes Range Complex.	• One of the highest concentration areas for rotary-wing aircraft training is located adjacent to fleet concentration areas at Naval Station Norfolk in the lower Chesapeake Bay and off the coast of Virginia Beach, Virginia, within the Virginia Capes OPAREA. This area is located nearby important nesting habitat for the ESA-listed piping plover and other birds that breed along barrier islands from Delaware to North Carolina. • Mitigation is designed to help avoid potential disturbances to nesting birds within the Virginia Capes Range Complex and Fisherman Island National Wildlife Refuge.

5.7.18 Dry Tortugas Bird and Cultural Resource Mitigation Area

Table 5.7-20 details geographic mitigation related to aircraft activities near the Dry Tortugas, Florida. The mitigation area matches the boundary of the Dry Tortugas OPAREA. Mitigation is a continuation from the 2018 Final EIS/OEIS.

Table 5.7-20: Dry Tortugas Bird and Cultural Resource Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic	• The Action Proponents will not conduct air combat maneuver flights below a 5,000-foot altitude, or tactical maneuvers resulting in supersonic flights below a 20,000-foot altitude. • The Action Proponents will conduct aircraft activities in the airspace adjacent to Fort Jefferson in a manner that will avoid sonic booms to the maximum extent practical. This includes conducting training flights predisposed to supersonic conditions within designated airspace at least 30 NM from Fort Jefferson. • The Action Proponents will incorporate mitigation instructions into pre-flight planning guidance for applicable aircrew.	• Mitigation is designed to help preserve the structural integrity of Fort Jefferson, which is listed on the National Register of Historic Places. Fragile mortar in Fort Jefferson's brick masonry is susceptible to damage from sonic booms. • Mitigation will also help reduce potential disturbance from aircraft overflight noise on a nesting colony of roseate terns in the Dry Tortugas Islands.

5.8 SUMMARY OF NEW OR MODIFIED MITIGATION REQUIREMENTS

Table 5.8-1 summarizes new mitigation measures and substantive modifications to existing measures as compared to the 2018 Final EIS/OEIS.

Table 5.8-1: Summary of New or Modified Mitigation Requirements

Category	*New or Modified Mitigation Requirements for this Draft EIS/OEIS*
Visual Observations	
Lookout Teams	This Draft Supplemental EIS/OEIS includes a requirement for additional personnel on the platform conducting the event, or on additional participating platforms, to serve as part of the Lookout Team for all acoustic, explosive, and physical disturbance and strike stressor mitigation categories. In the 2018 Final EIS/OEIS, additional personnel were required to assist Lookouts for explosive events only. The Action Proponents have also been, in practice, implementing this for active sonar and non-explosive events, and are now formalizing their current practice as a mitigation requirement. Additionally, the *U.S. Navy Lookout Training Handbook* was updated in 2022 to include a more robust chapter on environmental compliance, mitigation, and marine species observation tools and techniques (NAVEDTRA 12968-E). These changes are collectively designed to improve the effectiveness of visual observations.
Broadband and Other Active Acoustic Sources	For this Draft Supplemental EIS/OEIS, a 200-yd shut down mitigation zone would apply to broadband and other active acoustic sources less than 200 dB, while the tiered 1,000-yd power down/500-yd power down/200-yd shut down mitigation zones would apply to those sources greater than or equal to 200 dB. This requirement is meant to encompass new acoustic sources (e.g., sources used for oceanographic and acoustic research) that use a range of frequencies. Broadband source mitigation zones were not specified in the 2018 Final EIS/OEIS.
Air Guns	For this Draft Supplemental EIS/OEIS, the air gun mitigation zone size has been increased from 150 yd to 200 yd for consistency with other active acoustic sources.
High-Altitude Aircraft	This Draft Supplemental EIS/OEIS clarifies that aircraft operating at high altitudes (e.g., Maritime Patrol Aircraft) are exempt from requirements to conduct visual observations. When operating at high altitudes, observations for marine mammals or sea turtles would not be effective.

Table 5.8-1: Summary of New or Modified Mitigation Requirements (continued)

Category	*New or Modified Mitigation Requirements for this Draft EIS/OEIS*
Vessel Movements	This Draft Supplemental EIS/OEIS clarifies that one or more Lookouts will be posted in accordance with the most recent navigation guidance, which is subject to change over time. The 2018 Final EIS/OEIS required one Lookout on underway vessels.
Unmanned Vehicles	This Draft Supplemental EIS/OEIS includes new visual observation requirements for applicable events that involve Unmanned Surface Vehicles and Unmanned Underwater Vehicles (and the sources they use, tow, or deploy) that are already being escorted and operated under positive control by a manned surface vessel. In the 2018 Final EIS/OEIS, visual observations were not required for unmanned vehicles or sources they used, towed, or deployed.
Research-Based Sub-Surface Explosives	This Draft Supplemental EIS/OEIS includes requirements for "research-based sub-surface explosives" to account for new explosive events with research applications (e.g., acoustic and oceanographic research) that would use 0.1 to 5-lb. NEW. These requirements are grouped within the explosive sonobuoy mitigation category because of their similarities between the charge sizes, detonation locations within the water column, and platforms that would be conducting visual observations.
Geographic Mitigation	
Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck Mitigation Areas	This Draft Supplemental EIS/OEIS includes new mitigation for precisely placed seafloor devices developed for live hard bottom habitats during the 2022 Hawaii-Southern California Training and Testing Study Area's Essential Fish Habitat consultation reinitiation (U.S. Department of the Navy, 2022a). For this Draft Supplemental EIS/OEIS, that mitigation is being applied to the whole mitigation area category of live hard bottom as well as artificial reefs, submerged aquatic vegetation, and shipwrecks, for consistency and practicality of implementation.
Inshore Manatee and Sea Turtle Mitigation Areas	This Draft Supplemental EIS/OEIS includes: • A reduction in the number of Lookouts required during pierside use of active sonar at Naval Submarine Base Kings Bay and Port Canaveral, Florida (from four to two) due to space restrictions. • Removal of the requirement for Lookouts to wear polarized sunglasses in the mitigation area. Instead, the use of polarized sunglasses will be encouraged for all Lookouts in this Supplemental EIS/OEIS regardless of location as described in Section 5.6 (Visual Observations). • Clarification that relevant sightings at Naval Submarine Base Kings Bay will be reported to Port Operations. The 2018 Final EIS/OEIS required sightings to be reported to Port Operations, the Georgia Department of Natural Resources sightings hotline, and the Base Natural Resources Manager. This language has been updated for consistency with the installation's Integrated Natural Resource Management Plan, which specifies the record-keeping and communication protocols that should be followed in response to relevant sightings. • Clarification of language regarding fendering techniques at Naval Submarine Base Kings Bay to state that submarines will ensure proper techniques to keep off the quay wall. The 2018 Final EIS/OEIS implied that Navy would use buoys to keep submarines 20 feet off the quay wall. This language has been updated to allow flexibility in equipment used (which could include but is not limited to buoys) and distance off the wall (which will vary based on the fendering technique and equipment used). • Removal of language regarding manatee propeller guards, manatee awareness education and signage, and communication protocols for manatee sightings at Naval Station Mayport, all of which are actions managed under the Integrated Natural Resource Management Plan.
Ship Shock Trial Mitigation Areas	For this Draft Supplemental EIS/OEIS, the Action Proponents repositioned the ship shock trial box outside of the Rice's whale core distribution area, and into a new location that would avoid potential exposure of Rice's whales to injurious levels of sound.

5.9 MITIGATION CONSIDERED BUT ELIMINATED

Mitigation measures that were considered but eliminated for not meeting the appropriate balance between being environmentally beneficial and practical to implement are described in Table 5.9-1.

Table 5.9-1: Mitigation Considered but Eliminated

Mitigation Considered	Not Sufficiently Beneficial	Impractical: Criterion 1: Safety	Impractical: Criterion 2: Sustainability	Impractical: Criterion 3: Mission	Assessment Summary
1. Mitigating for navigation sonar		X			Shutting down or powering down active sonar used for safety of navigation would present unacceptable safety risks to personnel and equipment.
2. Visual Observations for long-duration acoustic sources			X		Long-duration active sonar sources, such as low-level sources used by Office of Naval Research for acoustic and oceanographic research, are deployed in remote locations for long time spans (e.g., 1 year). Adding visual observers would require substantial additional resources (i.e., personnel and equipment) in excess of what is available, and associated increases in operational costs.
3. Visual observations for acoustic sources not under positive control	X				Visual observations for active sonar sources not under positive control would not be effective because these types of sources could not be powered down or shut down in response to a sighting after they are deployed.
4. Visual observations from high-altitude aircraft	X				Visual observations by Lookouts positioned in aircraft operating at high altitudes would not be effective due to the vertical distance between the mitigation zone and observation platform.
5. Visual observations from manned escort vessels for all use of unmanned platforms			X		Unmanned platforms are remotely controlled or designed to operate independently, oftentimes in remote locations or for long time spans. Adding escort vessels (when they are not already participating in an event) for the purpose of visual observations would require substantial additional resources (i.e., personnel and equipment) in excess of what is available, and an associated increase in operational costs.
6. Adding third-party marine species observers to conduct visual observations for additional event types		X	X	X	Adding third-party visual observers to observe additional event types (i.e., beyond ship shock trials) would require substantial additional resources in excess of what is available (i.e., berthing and space availability), and an associated increase in operational costs. The use of third-party observers presents security clearance issues, as well as national security concerns due to the requirement to provide advance notification of specific times and locations of platform movements and activities (e.g., vessels using active sonar). Events may occur simultaneously and in various locations throughout the Study Area, and some may last for a long period of time (e.g., weeks). Event timetables may be based on free-flow development of tactical situations and cannot be precisely fixed to accommodate arrival of third-party aircraft or vessels. Pre-event surveys to clear areas prior to an event begins would be ineffective for the purpose of real-time mitigation (e.g., the location of a moving animal in proximity to the mitigation zone would change, animals could move in or out of the event area after surveys have been completed). For offshore events, the length of time observers would spend on station would be limited due to aircraft fuel restrictions. Increased safety risks would be associated with offshore surveys and the presence of civilian aircraft or vessels in the vicinity of events (e.g., sea space conflicts, airspace conflicts, proximity to explosives).
7. Requiring active sonar mitigation for marine mammals swimming at the bow, alongside the vessel, or directly behind the vessel	X			X	Marine mammals (e.g., dolphins) intentionally bow-riding, swimming alongside to wake-ride, or pursuing underway vessels would be out of the main active sonar transmission axis. Furthermore, implementing mitigation for animals persistently located within an active sonar mitigation zone (due to their intentional pursuit of underway vessels) would have the same types of impacts on mission requirements as increasing mitigation zone size, which is described in row 15 of this table.

Table 5.9-1: Mitigation Considered but Eliminated (continued)

Mitigation Considered	Not Sufficiently Beneficial	Impractical: Criterion 1: Safety	Impractical: Criterion 2: Sustainability	Impractical: Criterion 3: Mission	Assessment Summary
8. Adding additional Lookouts or observation platforms		X	X	X	The number of required Lookouts and observation platforms is based on resource availability (e.g., crews, platforms, and equipment), safety considerations (i.e., space restrictions, sea space or airspace conflicts), and duty assignments (e.g., requiring additional personnel or reassigning duties). Adding vessels or aircraft to observe a mitigation zone would result in sea space or airspace conflicts with the event participants. For explosives, weapon firing, or ordnance deployment, this would increase safety risks due to the presence of additional vessels or aircraft within the vicinity of explosives, intended impact locations, or projectile paths. Sea space and airspace conflicts would either require participating platforms to modify their flight plans or vessel movement tracks (which would reduce event realism) or force the added observation platforms to position themselves a safe distance away from the activity area (which would not be effective). However, additional personnel on platforms conducting the events, or on additional participating platforms, will serve as part of the Lookout Team for all acoustic, explosive, and physical disturbance and strike stressor mitigation categories as described in Section 5.6 (Visual Observations).
9. Developing additional weapon firing mitigation zones	X				Weapon firing noise from weapon systems other than large caliber guns (which are deck-mounted on surface ships with a muzzle that extends over the water) would not expose marine mammals or sea turtles to potentially injurious levels of underwater sound.
10. Developing a mitigation zone for non-explosive vessel-deployed mines	X				Mitigation zones for non-explosive vessel-deployed mines is not warranted because of the extremely low potential for physical strike of a marine mammal or sea turtle from a mine deployed so close to the water surface (by vessels that are implementing vessel movement mitigation for marine mammals and sea turtles), or below the surface for submarine-deployed mines.
11. Developing mitigation zones around aerial targets	X				Mitigation zones for explosive and non-explosive weapon firing is not warranted for ordnance fired against air targets because there is no potential for direct impact because the detonations occur in air, and the potential for projectile fragments to co-occur in space and time with a marine mammal or sea turtle at or near the surface is extremely low.
12. Developing mitigation zones for surface-to-surface missiles and rockets	X		X	X	Mitigation zones apply to missiles and rockets deployed from aircraft because aircraft can fly over the intended impact area prior to commencing firing. Mitigation would not be effective for vessel-deployed missiles and rockets (without requiring additional observation platforms) because of the distance between the firing platform and target location. It would not be possible for vessels to conduct close-range observations due to the length of time (and associated operational costs and event delays) it would take to complete observations and then transit back to the firing position (typically around 15 or 75 NM each way, depending on the event).
13. Establishing a minimum pre-event or post-event observation duration for additional events			X	X	Some events have established minimum time requirements for observations prior to the initial start of an event or after completion of an event, while the time requirements for other events must remain more general to accommodate dynamic event schedules or other operational factors. Requiring minimum pre-event or post-event observation durations would have the same types of impacts on mission requirements as increasing the mitigation zone size as described in row 15 of this table.
14. Using developmental mitigation technologies for mitigation	X				As described in Section 5.5 (Monitoring, Research, and Adaptive Management), the Action Proponents plan to continue investing in research on and development of mitigation technologies, such as infrared, thermal detection, unmanned aerial vehicles, passive acoustic range instrumentation, and automated detection software or sensors. The development of any associated mitigation measures will be undertaken in coordination with NMFS through the adaptive management process.

Table 5.9-1: Mitigation Considered but Eliminated (continued)

Mitigation Considered	Not Sufficiently Beneficial	Impractical: Criterion 1: Safety	Impractical: Criterion 2: Sustainability	Impractical: Criterion 3: Mission	Assessment Summary
15. Increasing mitigation zone sizes, or extending the post-sighting wait periods beyond 10 or 30 minutes		X	X	X	Increasing mitigation zone sizes or post-sighting wait periods would potentially increase the number of instances and the total length of time activities would be ceased or delayed. This would significantly diminish realism in a way that would prevent activities from meeting intended objectives and decrease the ability to complete events as required and on time. This would have implications for fuel restrictions (e.g., need for aircraft to go off station to refuel), personnel fatigue, range scheduling (e.g., sea space and air space conflicts), and operational costs. Multiple refueling events could double (or more) event length, which would decrease the ability for Lookouts to safely and effectively maintain situational awareness of the event area. For events with multiple participants, degrading the training or testing value of one event element degrades the value of all other elements. For active sonar events, requiring additional or lengthier power downs or shutdowns would create fundamental differences in how active sonar would be used in training versus real-world missions. For example, additional power downs or shutdowns would prevent sonar operators from developing and maintaining awareness of the tactical picture. Without realistic training in conditions analogous to real-world missions, sonar operators cannot become proficient in effectively operating active sonar. Sonar operators, vessel crews, and aircrews would be expected to operate sonar during real-world missions in a manner inconsistent with how they were trained. Diminishing proficiency or eroding capabilities presents significant risk to personnel safety during real-world missions and impacts the ability to deploy with required levels of readiness necessary to accomplish tasking by Combatant Commanders or other national security tasking. For events involving explosives, weapon firing, or ordnance deployment, requiring additional or lengthier delays or shut downs would cause a significant loss of training or testing time, reduce the number of opportunities crews have to fire or deploy ordnance on a target, decrease realism, impede the ability for crews to train and become proficient in using weapons or systems, prevent development of the ability to react to changes in the tactical situation or respond to incoming threats, cause significant delays to training or testing schedules, prevent units from meeting individual training and certification requirements, prevent units from deploying with the level of readiness necessary to accomplish their missions, and impede the ability of program managers and weapons system acquisition programs to meet testing requirements per required acquisition milestones or on an as-needed basis to meet operational requirements. For SINKEX, events involving explosive sonobuoys deployed in a large field, explosive torpedo events, and medium- or large caliber gunnery events), visual observations within the margin of increased mitigation zone size would be unsafe and ineffective unless additional observation platforms were allocated. Mission-essential safety protocols require all event participants (including Lookouts) to maintain focus on the activity area for safety of the public, personnel, and equipment. Mitigation zone sizes are correlated with the activity area; therefore, an increase in mitigation zone size would not meet the safety criteria. For example, when air-to-surface medium-caliber gunnery events involve fighter aircraft descending on a target, or rotary-wing aircraft flying a racetrack pattern and descending on a target using a forward-tilted firing angle, maintaining focused attention on the activity area is paramount to aircraft safety. Vessel movement mitigation for marine mammals is based on guidance from NMFS and the USFWS. A mitigation zone size is not specified for sea turtles to allow flexibility based on vessel type and mission requirements (e.g., small boats operating in a narrow harbor). For towed in-water devices, mission and safety requirements determine the operational parameters (e.g., course) for towing platforms. Because these devices are towed and not self-propelled, they generally have limited maneuverability and are unable to make immediate course corrections. For example, a high degree of pilot skill is required when rotary-wing aircraft are deploying in-water devices, safely towing them at relatively low speeds and altitudes, and recovering them. The aircraft can safely alter course to shift the route of the towed device in response to a sighted marine mammal or sea turtle up to a certain extent (i.e., up to the size of the mitigation zone) while still maintaining the parameters needed for stable towing. However, the aircraft would be unable to further alter its course to more drastically course-correct the towed device without decreasing towing stability, which would have implications for safety of personnel and equipment.

Table 5.9-1: Mitigation Considered but Eliminated (continued)

Mitigation Considered	*Not Sufficiently Beneficial*	*Impractical*			*Assessment Summary*
		Criterion 1: Safety	*Criterion 2: Sustainability*	*Criterion 3: Mission*	
16. Implementing additional mandatory vessel speed restrictions beyond what is described in Section 5.7 (Geographic Mitigation), such as within Dynamic Management Zones, Slow Zones, and Seasonal Management Areas		X	X	X	As described in Section 5.6.2 (Mitigation Specific to Vessels, Vehicles, and Towed In-Water Devices), vessel movement mitigation involves maneuvering to maintain a specified distance from marine mammals and sea turtles, which may include reducing speed. As described in Section A.2.7 (Standard Operating Procedures), vessels used under the Proposed Action are required to operate in accordance with applicable navigation rules. In addition, vessels transit at speeds optimal for fuel conservation, to maintain schedules, and to meet mission requirements. Vessel captains use the totality of the circumstances to ensure the vessel is traveling at appropriate speeds in accordance with navigation rules. Depending on the circumstances, this may involve adjusting speeds during periods of reduced visibility or in certain locations (e.g., locations with other vessel traffic). NMFS implements various vessel speed management areas (e.g., Seasonal Management Areas, Slow Zones, Dynamic Management Areas) off the U.S. East Coast to reduce the likelihood of North Atlantic right whale vessel strikes. The vessel speed management areas overlap extensive areas of sea space that overlap or are located in proximity to OPAREAs, testing ranges, ports, and pierside locations that are instrumental to training and testing in the Study Area (e.g., Naval Station Norfolk, Naval Station Mayport). Under the regulations, the vessel speed management area speed restrictions are not mandatory for Federal agencies, such as the Action Proponents. Instead, the Action Proponents have developed vessel speed mitigation to protect North Atlantic right whale and manatees within geographic mitigation areas as described in Section 5.7.7 (Inshore Manatee and Sea Turtle Mitigation Areas), Section 5.7.10 (Northeast North Atlantic Right Whale Mitigation Area), and Section5.7.13 (Southeast North Atlantic Right Whale Mitigation Area). Additionally, vessels may reduce speeds to maneuver and maintain distance from sighted marine mammals anywhere in the Study Areas as described in Section 5.6.2 (Mitigation Specific to Vessels, Vehicles, and Towed In-Water Devices). Beyond these requirements, for training, additional vessel speed restrictions would be impractical to implement because vessel operators need to train to operate vessels safely and proficiently as they realistically would during real-world missions, including being able to react to changing tactical situations and evaluate system capabilities. For example, during training activities involving flight operations from an aircraft carrier, the vessel must maintain a certain wind speed over the deck to launch or recover aircraft. Depending on wind conditions, the aircraft carrier itself must travel at a certain speed to generate the wind required to launch or recover aircraft. Additionally, operating vessels at speeds that are not optimal for fuel conservation or mission requirements would be unsustainable due to increased time on station and operational costs. Seasonal vessel speed restrictions would result in vessels being unable to meet all of their requirements during their limited time available to be underway based on the complex logistical considerations involved with maintaining individual vessel and deployment schedules. For testing and research, the Action Proponents need to test the full range of their vessels and vessel-deployed system capabilities to ensure safety and functionality in conditions analogous to real-world missions, and before full-scale production or delivery to the fleet. For example, the Action Proponents conduct propulsion testing specifically to test the functionality of vessel propulsion systems, including maneuvering, full-power runs, and endurance runs. During this event, vessels must operate across the full spectrum of capable speeds to accomplish the primary testing objectives.
17. Additional geographic mitigation for active sonar in areas with certain bathymetric features				X	The Action Proponents select locations for certain active acoustic activities based on water depths that are ideal for acoustic propagation research, seafloor types, or bathymetric phenomena (e.g., Hudson Canyon) that are of particular interest for ocean acoustic research and realism of military readiness activities. Shifting events to alternative or sub-ideal locations to avoid certain bathymetric features (e.g., shelf breaks, underwater canyons) would preclude ready access to the environmental and oceanographic conditions needed to meet mission objectives.

Table 5.9-1: Mitigation Considered but Eliminated (continued)

Mitigation Considered	Not Sufficiently Beneficial	Impractical: Criterion 1: Safety	Impractical: Criterion 2: Sustainability	Impractical: Criterion 3: Mission	Assessment Summary
18. Additional restrictions on major training exercises		X		X	Major training exercises may require large areas of the littorals, open ocean, and nearshore areas for realistic and safe anti-submarine warfare training. Event locations may have to change during an exercise or during exercise planning based on assessments of unit performance or other conditions, such as weather and mechanical issues, which precludes the ability to develop additional restrictions on event location or timing.
19. Restricting training activities to certain established locations		X		X	Modern sensing technologies make training on a large scale without observation more difficult. A foreign military's continual observation of U.S. military training in predictable geographic areas and timeframes would enable foreign nations to gather intelligence and subsequently develop techniques, tactics, and procedures to potentially and effectively counter U.S. military operations. Other activities may be conducted on a smaller and more localized scale, with training or testing at discrete locations that are critical to certain aspects of readiness. Threats to national security are constantly evolving, and the Action Proponents require the ability to adapt training to meet these emerging threats. Restricting access to broad-scale areas of water would impact the ability for training to evolve as threats evolve. Eliminating opportunities to train in myriad at-sea conditions would put U.S. forces at a tactical disadvantage during real-world missions. This would also present a risk to national security if potential adversaries were to be alerted to the environmental conditions within which training has been prohibited.
20. Restrictions on explosives and non-explosive stressor use near additional types of seafloor resources				X	Implementing additional mitigation for other activities or types of seafloor resources would not allow the Action Proponents to continue meeting their mission requirements to successfully accomplish readiness objectives due to restrictions on ready access to a significant portion of the Study Area.
21. Prohibiting activities in areas with low historic use for training or testing				X	The frequency at which an area is used for training or testing does not necessarily equate to its level of importance for meeting an activity objective or collectively contributing to meeting mission requirements. Some infrequently used areas are critical for a particular event.
22. Additional seasonal restrictions for training and testing based on species occurrence or density		X	X	X	Training and testing schedules are based on national tasking, the Optimized Fleet Response Plan and other training plans, Department of Homeland Security strategic goals, evolving geopolitical world events, forecasting of future testing requirements, deployment schedules, maintenance schedules, acquisition schedules, and emerging requirements. The Action Proponents require flexibility in the timing of their use of active sonar and explosives in order to meet mission and deployment schedules. Vessels, aviation squadrons, and testing programs have a limited amount of time available for training and testing. Variables such as maintenance and weather must be accounted for when scheduling event locations and timing. Event locations may have to change during an event or during pre-event planning based on assessments of unit performance or other conditions, such as inclement weather (e.g., hurricanes) and mechanical issues. This precludes the ability to completely prohibit events from occurring seasonally within areas delineated by marine species occurrence or seasonal densities.
23. Restricting active sonar based on time of day or visibility (e.g., weather conditions)				X	Although the majority of active sonar use occurs during the day, the Action Proponents may have a nighttime training requirement for some systems. Training in both good visibility (e.g., daylight, favorable weather conditions) and low visibility (e.g., nighttime, inclement weather conditions) is vital because environmental differences between day and night and varying weather conditions affect sound propagation and the detection capabilities of sonar. Temperature layers that move up and down in the water column and ambient noise levels can vary significantly between night and day. This affects sound propagation and could affect how sonar systems function and are operated.

Table 5.9-1: Mitigation Considered but Eliminated (continued)

Mitigation Considered	*Not Sufficiently Beneficial*	*Impractical*			*Assessment Summary*
		Criterion 1: Safety	*Criterion 2: Sustainability*	*Criterion 3: Mission*	
24. Blanket geographic restrictions within certain regions or areas (e.g., distances from shore)		X	X	X	Blanket expansions on the scope or size of mitigation areas would encroach upon the primary water space where military readiness activities are scheduled to occur. The Action Proponents select locations for their events based on proximity to training ranges, available airspace, unobstructed sea space, aircraft emergency landing fields, target storage and deployment locations, systems command support facilities, and areas of historical use that provide critical known bathymetric features and consistency for comparative data collection. Requiring the Action Proponents to shift activities to alternative locations or farther offshore would have significant impacts on safety, sustainability, and the ability to meet mission requirements within limited available timeframes. For example, certain surface-to-surface and air-to-surface small, medium, and large caliber gunnery activities and missile and rocket activities, must be conducted in proximity to the target storage depot at Mayport, Florida, because the associated targets (e.g., remotely controlled jet ski targets) are limited by how far offshore they can safely be employed and controlled based on distance, weather, and sea state. Certain training activities, such as deployment certification exercises that involve integration with multiple warfare components, require large areas of the littorals and open ocean for realistic and safe training. Similarly, the testing community is required to install and test systems on platforms at the locations where those platforms are stationed. Testing associated with new construction ships must occur in locations close to the shipbuilder facilities for reasons associated with construction schedule, proximity to testing ranges and facilities, and safety. Additionally, the testing community has a need for rapid development to quickly resolve tactical deficiencies within locations supported by existing infrastructure and support facilities. Logistical support of range testing can only efficiently and effectively occur when the support is co-located with the testing activities. Some types of pierside and at-sea testing must occur in proximity to naval shipyards or contractor shipyards. Nearshore areas also serve as critical training and testing locations for certain explosive activities. For example, the explosive ordnance disposal training location off the coast of Virginia is vital due to its existing target setup, ideal bottom structure, and good bottom depth to safely train divers with explosives. Explosive ordnance disposal teams can be required to deploy with a 3-week notice, which presents a need to constantly train to maintain readiness for real-world missions. Relocating this activity to a location without these features would increase safety risks and diminish the effectiveness of training events.
25. Implementing active sonar ramp-up	X			X	Implementing active sonar ramp-up procedures during training or testing under the Proposed Action would not be representative of real-world missions and would significantly impact realism. For example, during an anti-submarine warfare exercise using active sonar, ramp-ups would alert opponents (e.g., target submarines) to the transmitting vessel's presence. This would defeat the purpose of the training by allowing the target submarine to detect the searching unit and take evasive measures, thereby denying the sonar operator the opportunity to learn how to locate the submarine. Additionally, based on the source levels, vessel speeds, and sonar transmission intervals that will be used during typical active sonar activities under the Proposed Action, ramp-up would likely be an ineffective mitigation measure for the active sonar activities conducted under the Proposed Action.

Table 5.9-1: Mitigation Considered but Eliminated (continued)

Mitigation Considered	*Not Sufficiently Beneficial*	*Impractical*			*Assessment Summary*
		Criterion 1: Safety	*Criterion 2: Sustainability*	*Criterion 3: Mission*	
26. Reducing annual active sonar hours, replacing active sonar with passive sonar, or modifying active sonar sources for training				X	Passive sonar and other available sensors are used in concert with active sonar to the maximum extent practical. Training with active sonar is essential to national security. Active sonar is the only reliable technology for detecting and tracking potential enemy diesel-electric submarines. Equipment power levels are set consistent with mission requirements. Active sonar signals are designed explicitly to provide optimum performance at detecting underwater objects (e.g., submarines) in a variety of acoustic environments. The ability to effectively operate active sonar is a highly perishable skill that must be repeatedly practiced during realistic training. The Action Proponents must train in the same mode and manner in which they conduct real-world missions. Anti-submarine warfare training typically involves the periodic use of active sonar to develop the "tactical picture," or an understanding of the battle space (e.g., area searched or unsearched, identifying false contacts, and understanding the water conditions). This can take from several hours to multiple days and typically occurs over vast areas with varying physical and oceanographic conditions (e.g., bathymetry, topography, surface fronts, and variations in sea surface temperature). Sonar operators train to avoid interference and sound-reducing clutter from varying ocean floor topographies and environmental conditions, practice coordinating their efforts with other sonar operators in a strike group, develop skill proficiency in detecting and tracking submarines and other threats, and practice the focused endurance vital to effectively working as a team in shifts around the clock until the conclusion of the event. The Action Proponents use active sonar only when it is essential to the mission. For example, as described in Section 2.4.2.1 (Training), for this Draft Supplemental EIS/OEIS, the Action Proponents are using a representative level of activity (rather than a maximum tempo of training activity in every year), which has reduced the amount of mid-frequency active sonar hours estimated to be necessary to meet training requirements relative to the 2018 Final EIS/OEIS.
27. Replacing active sonar training with synthetic activities (e.g., computer simulated training)				X	The Action Proponents currently use, and will continue to use, computer simulation to augment training whenever possible. Simulators and synthetic training are critical elements that provide early skill repetition and enhance teamwork; however, they cannot replicate the complexity and stresses faced during real-world missions to which the Action Proponents train under the Proposed Action (e.g., anti-submarine warfare training using surface ship hull-mounted mid-frequency active sonar). Just as a pilot would not be ready to fly solo after simulator training, operational Commanders cannot allow personnel to engage in real-world missions based merely on simulator training.
28. Restricting active sonar training during surface ducting conditions				X	Surface ducting occurs when water conditions, such as temperature layers and lack of wave action, result in little sound energy penetrating beyond a narrow layer near the surface of the water. Submarines have long been known to take advantage of the phenomena associated with surface ducting to avoid being detected by active sonar. Training with active sonar in these conditions is a critical component of readiness because sonar operators need to learn how sonar transmissions are altered due to surface ducting, how submarines may take advantage of them, and how to operate sonar effectively under these conditions. Avoiding military readiness activities during surface ducting conditions, reducing power, shutting down active sonar based on environmental conditions, or implementing other sonar modification techniques (e.g., sound shielding) for the purpose of mitigation would affect a Commander's ability to develop the tactical picture. It would also prevent sonar operators from training in conditions analogous to those faced during real-world missions, which is described in row 15 of this table. The ocean conditions contributing to surface ducting change frequently, and surface ducts lack uniformity, may or may not extend over a large geographic area and can be of varying duration, making it difficult to determine where to reduce power and for how long. As noted by the U.S. Supreme Court in *Winter v. Natural Resources Defense Council Inc.*, 555 U.S. 7 (2008), because surface ducting conditions occur relatively rarely and are unpredictable, it is especially important for the Action Proponents to be able to train under these conditions when they occur.

Table 5.9-1: Mitigation Considered but Eliminated (continued)

Mitigation Considered	Not Sufficiently Beneficial	Impractical: Criterion 1: Safety	Impractical: Criterion 2: Sustainability	Impractical: Criterion 3: Mission	Assessment Summary
29. Requiring use of active acoustic monitoring devices		X	X	X	During Surveillance Towed Array Sensor System low-frequency active sonar (which is not part of the Proposed Action), the Navy uses a specially designed adjunct high-frequency marine mammal monitoring active sonar, or “HF/M3.” HF/M3 can only be towed at slow speeds and operates like fish finders used by fishermen. Installing the HF/M3 adjunct system on tactical sonar ships used under the Proposed Action would have implications for safety and mission requirements due to impacts on speed and maneuverability, as well as excessive additional operating costs.
30. Requiring mitigation based on passive acoustic detections of marine mammals			X	X	When platforms with passive acoustic monitoring capabilities are already participating in an event, sonar technicians will alert Lookouts to passive acoustic detections of marine mammals as described in Section 5.6 (Visual Observations). Significant logistical constraints (e.g., personnel and equipment availability, operational costs) make diverting equipped platforms or constructing and maintaining new passive acoustic monitoring systems impractical. The fluidity and nature of military readiness activities (e.g., fast-paced and mobile readiness evolutions) make it impractical for passive acoustic devices to be used as precise real-time indicators of marine mammal location for mitigation (e.g., active sonar power downs or shutdowns, ceasing use of explosives) without an accompanying visual sighting. Implementing mitigation for animals located outside of the mitigation zone (which could occur due to imprecise localizations or relative movements of animals and the mitigation zone) would have the same types of effects on mission requirements as increasing the mitigation zone size, which is described in row 15 of this table.
31. Reducing explosive counts or NEW, or substituting with non-explosives				X	Activities that involve explosives are inherently different from those that involve non-explosive ordnance. For example, critical components of an explosive Bombing Exercise Air-to-Surface include the assembly, loading, delivery, and assessment of the explosive bomb. Explosive bombing training exercises start with ground personnel, who must practice the building and loading of explosive munitions. Training includes the safe handling of explosive material, configuring munitions to precise specifications, and the loading of munitions onto aircraft. Aircrew must then identify a target and safely deliver fused munitions, discern if the bomb was assembled correctly, and determine bomb damage assessments based on how and where the explosive detonated. An air-to-surface bombing exercise using non-explosive ordnance can train aircrews on valuable skills to locate and accurately deliver munitions on a target; however, it cannot effectively replicate the critical components of an explosive activity in terms of assembly, loading, delivery, and assessment of an explosive bomb. Reducing the counts or sizes of explosives would impede the ability for the Action Proponents to train and become proficient in using explosive weapon systems (which would result in a significant risk to personnel safety during real-world missions), and would ultimately prevent units from meeting individual training and certification requirements (which would prevent them from deploying with the required level of readiness necessary to accomplish missions) and impede the ability to certify forces to deploy to meet national security tasking. For testing, the Action Proponents need to test the full range of their platforms, weapon systems, and components to ensure safety and functionality in conditions analogous to real-world missions, and before full-scale production or delivery to the fleet.
32. Adopting mitigation implemented by foreign military units				X	Mitigation is carefully developed for and assessed by each individual unit based on their own assessment of mitigation benefits and practicality of implementation. Readiness considerations differ based on each nation’s strategic reach, global mission, country-specific legal requirements, and geographic considerations. The Action Proponents will implement mitigation that has been determined to be effective at avoiding impacts from the Proposed Action and practical to implement. Many of these measures are the same as, or comparable to, those implemented by foreign navies. For example, most navies implement some form of mitigation to cease certain activities if a marine mammal is visually observed in a mitigation zone (Dolman et al., 2009). Some navies also implement geographic mitigation. The Action Proponents will implement several mitigation measures and environmental compliance initiatives that are not implemented by foreign navies, such as providing extensive support for scientific monitoring and research and complying with stringent reporting requirements.

Table 5.9-1: Mitigation Considered but Eliminated (continued)

Mitigation Considered	Not Sufficiently Beneficial	Impractical			Assessment Summary
		Criterion 1: Safety	Criterion 2: Sustainability	Criterion 3: Mission	
33. Additional reporting requirements		X	X	X	The Action Proponents developed their reporting requirements in conjunction with NMFS to be consistent with mission requirements and balance the usefulness of the information to be collected with the practicality of collecting it. The Action Proponents' activity reports and incident reports are designed to verify implementation of mitigation; comply with current permits, authorizations, and consultation requirements; and improve future environmental analyses. Additional reporting would be ineffective as mitigation because it would not result in modifications to training activities or further avoidance or reductions of potential impacts. Lookouts are not trained to make species-specific identification and would not be able to provide detailed scientific data if more detailed marine species observation reports were to be required. Furthermore, the Action Proponents do not currently maintain a record management system to collect, archive, analyze, and report every marine species observation or all vessel speed data for every event and all vessel movements. For example, the speed of Action Proponent vessels can fluctuate an unlimited number of times during training or testing events. Developing and implementing a record management system of this magnitude would be unduly cost prohibitive and place a significant administrative burden on vessel operators and activity participants. Burdening operational Commanders, vessel operators, and event participants with requirements to complete additional administrative reporting would distract them from focusing on mission-essential tasks. Additional reporting requirements would draw event participants' attention away from the complex tactical tasks they are primarily obligated to perform, such as driving a warship or engaging in a gunnery event, which would adversely impact personnel safety, public health and safety, and the ability to meet mission objectives.
34. Developing mitigation outside the Action Proponent's legal authority				X	The Action Proponents did not develop mitigation outside their legal authority to implement. For example, the Action Proponents do not have legal authority to develop Marine Protected Areas to restrict commercial or recreational fishing, which is a recommendation received through public comments on previous EIS/OEISs.
35. Restrictions on pierside sonar at additional locations				X	Mitigation to implement source level reductions for pierside mid-frequency active sonar activities at additional locations (e.g., at Port Canaveral, Florida) would not be practical to implement due to the type of submarines and sonar systems used during those events.

References

Barlow, J. (2015). Inferring trackline detection probabilities, g(0), for cetaceans from apparent densities in different survey conditions. *Marine Mammal Science 31* (3): 923–943. DOI:10.1111/mms.12205

Dolman, S. J., C. R. Weir, and M. Jasny. (2009). Comparative review of marine mammal guidance implemented during naval exercises. *Marine Pollution Bulletin 58* 465–477.

Jefferson, T. A., M. A. Webber, and R. L. Pitman. (2015). *Marine Mammals of the World: A Comprehensive Guide to Their Identification* (2nd ed.). Cambridge, MA: Academic Press.

Marine Mammal Commission. (2023). *Survey of Federally Funded Marine Mammal Research: FY 2022 Results Summary*. Retrieved November 24, 2023, from https://www.mmc.gov/grants-and-research-survey/survey-of-federally-funded-research/fy-2022-results-summary/.

National Marine Fisheries Service. (2014). Endangered and Threatened Species: Critical Habitat for the Northwest Atlantic Ocean Loggerhead Sea Turtle Distinct Population Segment (DPS) and Determination Regarding Critical Habitat for the North Pacific Ocean Loggerhead DPS; Final Rule. *Federal Register 79* (132): 39856–39912.

National Marine Fisheries Service. (2023). Taking and Importing Marine Mammals; Taking Marine Mammals Incidental to the U.S. Navy Training Activities in the Gulf of Alaska Study Area. *Federal Register 88* (2): 604-697.

Oedekoven, C. and L. Thomas. (2022). *Effectiveness of Navy lookout teams in detecting marine mammals*. Centre for Research into Ecological and Environmental Modelling. Report number CREEM-24289-1.

Rosel, P. E., P. Corkeron, L. Engleby, D. Epperson, K. D. Mullin, M. S. Soldevilla, and B. L. Taylor. (2016). *Status Review of Byrde's Whales (Balaenopter edeni) in the Gulf of Mexico Under the Endangered Species Act* (NOAA Technical Memorandum NMFS-SEFSC-692). Lafayette, LA: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center.

U.S. Department of the Navy. (2021). *Surface Ship Navigation Department Organization and Regulations Manual*. Washington, DC: U.S. Department of the Navy.

U.S. Department of the Navy. (2022a). *Essential Fish Habitat Reinitiation for Submarine Mine Training Around Maui*. Pearl Harbor, HI: U.S. Department of the Navy.

U.S. Department of the Navy. (2022b). *Marine Species Monitoring for the U.S. Navy's Atlantic Fleet Training and Testing (AFTT)—2021 Annual Report*. Norfolk, VA: U.S. Fleet Forces Command.

U.S. Department of the Navy. (2023). *U.S. Pacific Fleet Memorandum to NMFS 13NOV2023*. Joint Base Pearl Harbor-Hickam, HI: Office of Protected Services PR1 and PR5.

U.S. Department of the Navy. (2024a). *Phase IV Atlantic Fleet Training and Testing: Marine Habitat Database Technical Report*.

U.S. Department of the Navy. (2024b). *U.S. Navy Marine Species Density Database Phase IV for the Hawaii-California Training and Testing Study Area. Technical Report.* Pearl Harbor, HI: U.S. Pacific Fleet, Environmental Readiness Division,.

Williams, B. K., R. C. Szaro, and C. D. Shapiro. (2009). *Adaptive Management: The U.S. Department of the Interior Technical Guide*. Washington, DC: U.S. Department of the Interior.

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6 REGULATORY CONSIDERATIONS

In accordance with Council on Environmental Quality regulations for implementing the National Environmental Policy Act (NEPA), federal agencies shall, to the fullest extent possible, integrate the requirements of NEPA with other planning and environmental review procedures required by law or by agency practice so that all such procedures run concurrently rather than consecutively. This chapter summarizes environmental compliance for the Proposed Action and consistency with other federal, state, and local plans, policies; the relationship between short-term impacts and the maintenance and enhancement of long-term productivity in the affected environment; irreversible and irretrievable commitments of resources; and energy requirement and efficiency initiatives; and climate change.

6.1 Consistency with Regulatory Considerations

Implementation of the Proposed Action for this Atlantic Fleet Training and Testing (AFTT) Supplemental Environmental Impact Statement (EIS)/Overseas EIS (OEIS) would comply with applicable federal, state, and local laws, regulations, and executive orders. The Action Proponents are consulting with and will continue to consult with regulatory agencies, as appropriate, during the NEPA process and prior to implementation of the Proposed Action to ensure that requirements are met. Table 6.1-1 summarizes the environmental compliance requirements assessed in this Supplemental EIS/OEIS. Documentation of consultation and coordination with regulatory agencies is provided in Appendix L (Agency Correspondence).

Table 6.1-1: Summary of Environmental Compliance for the Proposed Action

Laws, Executive Orders, International Standards, and Guidance	***Status of Compliance***
Laws	
Abandoned Shipwreck Act (43 United States Code [U.S.C.] section 2101 et seq.)	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (hereinafter referred to as the 2018 Final EIS/OEIS), and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
Act to Prevent Pollution from Ships (33 U.S.C. section 1901 et seq.)	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
Antiquities Act (54 U.S.C. section 320301 et seq.)	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
Bald and Golden Eagle Protection Act (16 U.S.C. section 668 et seq.)	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.

Table 6.1-1: Summary of Environmental Compliance for the Proposed Action (continued)

Laws, Executive Orders, International Standards, and Guidance	*Status of Compliance*
Clean Air Act (42 U.S.C. section 7401 et seq.) Clean Air Act General Conformity Rule (40 Code of Federal Regulations [CFR] section 93[B]) State Implementation Plan	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS with two exceptions. First, the South Coast Air Quality Management District v. Environmental Protection Agency decision of 2018 changed the requirements for maintenance areas under the revoked 1997 8-hour ozone standard, requiring these maintenance areas to continue to meet requirements of the standard, even though the standard has been revoked and superseded. Second, the approach to greenhouse gas analysis has evolved as a result of recent executive orders and guidance. See Section 3.1 (Air Quality) for the assessment.
Coastal Zone Management Act (16 U.S.C. section 1451 et seq.)	The Action Proponents will comply with the coastal zone federal consistency requirements for those states/territories whose coastal uses or resources may be affected by the Proposed Action (as discussed in Section 6.1.1, Coastal Zone Management Act Compliance). There are 18 states (Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas) and two U.S. territories (Puerto Rico and the U.S. Virgin Islands) whose coastal zones are located within the Study Area.
Clean Water Act (33 U.S.C. section 1251 et seq.)	In November 2019, the U.S. Environmental Protection Agency and Department of Defense Uniform National Discharge Standards for Vessels of the Armed Forces were updated (40 CFR Part 1700). The Action Proponents will continue to work with the U.S. Environmental Protection Agency regarding Uniform National Discharge Standards and will continue to implement and comply with these requirements as outlined in 40 CFR Part 1700. Regarding other requirements of the Clean Water Act, the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
Endangered Species Act (16 U.S.C. section 1531 et seq.)	This Supplemental EIS/OEIS analyzes potential effects to species listed under the Endangered Species Act, which is administered by both the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (NMFS). The Action Proponents have prepared a Biological Assessment that was submitted to NMFS and an informal consultation package that was submitted to U.S. Fish and Wildlife Service as part of the ongoing consultation under section 7 of the Endangered Species Act.
Historic Sites Act (54 U.S.C. section 320101 et seq.)	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. section 1801 et seq.)	The Action Proponents are preparing an Essential Fish Habitat Assessment. The Proposed Action may adversely affect Essential Fish Habitat and managed species. The Action Proponents will submit the Essential Fish Habitat Assessment to NMFS to consult on affected species and their habitats (as discussed in Section 6.1.4, Magnuson-Stevens Fishery Conservation and Management Act).

Table 6.1-1: Summary of Environmental Compliance for the Proposed Action (continued)

Laws, Executive Orders, International Standards, and Guidance	*Status of Compliance*
Marine Mammal Protection Act (16 U.S.C. section 1361 et seq.)	This Supplemental EIS/OEIS updates the analysis and is the basis for a request for a 7-year Letter of Authorization from NMFS. This is a change from the 2018 Final EIS/OEIS per the 2018 National Defense Authorization Act, as the NMFS permitting period has been changed from 5- to 7-year permits, to cover the Action Proponents' proposed activities for the 2025–2032 timeframe. The Action Proponents have prepared a Letter of Authorization that was submitted to NMFS as part of the ongoing consultation under the Marine Mammal Protection Act.
Migratory Bird Treaty Act (16 U.S.C. section 703 et seq.)	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
National Fishing Enhancement Act (33 U.S.C. section 2101 et seq.)	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
National Historic Preservation Act (54 U.S.C. section 300101 et seq.)	The Proposed Action is not anticipated to affect known cultural resources within the Study Area. Accordingly, in the event that the Action Proponents inadvertently impact a submerged prehistoric site or historic resource, consultation would be conducted with the appropriate State Historic Preservation Officer(s).
National Marine Sanctuaries Act (16 U.S.C. section 1431 et seq.)	Five National Marine Sanctuaries managed by the National Oceanic and Atmospheric Administration Office of National Marine Sanctuaries lie within the Study Area. One proposed National Marine Sanctuary is located within the Study Area. These are discussed further in Section 6.1.3 (National Marine Sanctuaries).
Resource Conservation and Recovery Act (42 U.S.C. section 6901 et seq.)/Military Munitions Rule (40 CFR Part 266 Subpart M)	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
Rivers and Harbors Act (33 U.S.C. section 401 et seq.)	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
Submerged Lands Act (43 U.S.C. section 1301 et seq.)	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
Sunken Military Craft Act (10 U.S.C. section 113 et seq.)	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
R.M.S. Titanic Maritime Memorial Preservation Act (16 U.S.C. section 450rr et seq.)	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.

Table 6.1-1: Summary of Environmental Compliance for the Proposed Action (continued)

Laws, Executive Orders, International Standards, and Guidance	***Status of Compliance***
Executive Orders (EOs)	
EO 11990, *Protection of Wetlands*	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
EO 12962, *Recreational Fisheries*, as amended by EO 13474	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
EO 13089, *Coral Reef Protection*	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
EO 13112, *Invasive Species,* as amended by EO 13751	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
EO 13158, *Marine Protected Areas*	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
EO 13175, *Consultation and Coordination with Indian Tribal Governments*	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements. In January 2018, the U.S. Congress passed the Thomasina E. Jordan Indian Tribes of Virginia Federal Recognition Act, granting federal recognition to the Chickahominy, the Eastern Chickahominy, the Upper Mattaponi, the Rappahannock, the Monacan, and the Nansemond tribes in Virginia. However, the Proposed Action would not affect these newly recognized tribes and government-to-government consultation is not required.
EO 13840, *Ocean Policy to Advance the Economic, Security, and Environmental Interests of the United States*	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.
EO 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*	This EO was signed on January 20, 2021. The Proposed Action is consistent with this EO's goals to empower workers and communities, promote and protect public health and the environment, and conserve national treasures and monuments.

Table 6.1-1: Summary of Environmental Compliance for the Proposed Action (continued)

Laws, Executive Orders, International Standards, and Guidance	*Status of Compliance*
EO 14008, *Tackling the Climate Crisis at Home and Abroad*, as amended by EO 14082	This EO was signed on January 27, 2021. The Proposed Action is consistent with this EO's goal to taking a government-wide approach to tackling the climate crisis.
EO 14057, *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability*	This EO was signed on December 8, 2021. The Action Proponents have completed a Climate Action Plan in accordance with this EO.
EO 14096, *Revitalizing Our Nation's Commitment to Environmental Justice for All*	This EO was signed on April 21, 2023. This Supplemental EIS/OEIS fulfills the legal requirements of this EO by addressing environmental justice concerns to ensure an equitable and sustainable environment for all.
International Standards	
International Convention for the Prevention of Pollution from Ships as implemented in Act to Prevent Pollution from Ships (33 U.S.C. sections 1901 et seq.)	As applicable to the Proposed Action, these legal requirements have not changed since the 2018 Final EIS/OEIS, and the Action Proponents have verified that the updated proposed activities and stressor quantities do not change its compliance with these requirements.

Notes: CFR = Code of Federal Regulations; EIS = Environmental Impact Statement; EO = Executive Order; NMFS = National Marine Fisheries Service; OEIS = Overseas Environmental Impact Statement; U.S. = United States; U.S.C. = United States Code

6.1.1 Coastal Zone Management Act Compliance

Section 6.1.1 of the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (hereinafter referred to as the 2018 Final EIS/OEIS) describes the Coastal Zone Management Act of 1972 (16 United States Code [U.S.C.] section 1451 et seq.). This description and the definitions in the 2018 Final EIS/OEIS have not changed.

In accordance with the Coastal Zone Management Act, the Action Proponents have reviewed the enforceable policies of each state's federally approved Coastal Zone Management Plan relevant to the Study Area. There are 18 states and two U.S. territories whose coastal zones are located within the Study Area. The Action Proponents determined that no activities are proposed within or in proximity to the coastal zones of Puerto Rico and the U.S. Virgin Islands, and therefore no activities would cause reasonably foreseeable effects on coastal uses or resources against which to analyze enforceable policies. As such, the Action Proponents were not required to submit a negative determination pursuant to 15 Code of Federal Regulations (CFR) section 930.35. Activities are proposed within or in proximity to the coastal zones for the remaining 18 states that may have reasonably foreseeable effects on coastal uses or resources and are therefore subject to consistency requirements. Based on an evaluation of the effects of the Proposed Action discussed in this Supplemental EIS/OEIS and the enforceable policies of each state's Coastal Zone Management Plan, and pursuant to 15 CFR section 930.39, the Action Proponents will submit a consistency determination or negative determination to each of the 18 states.

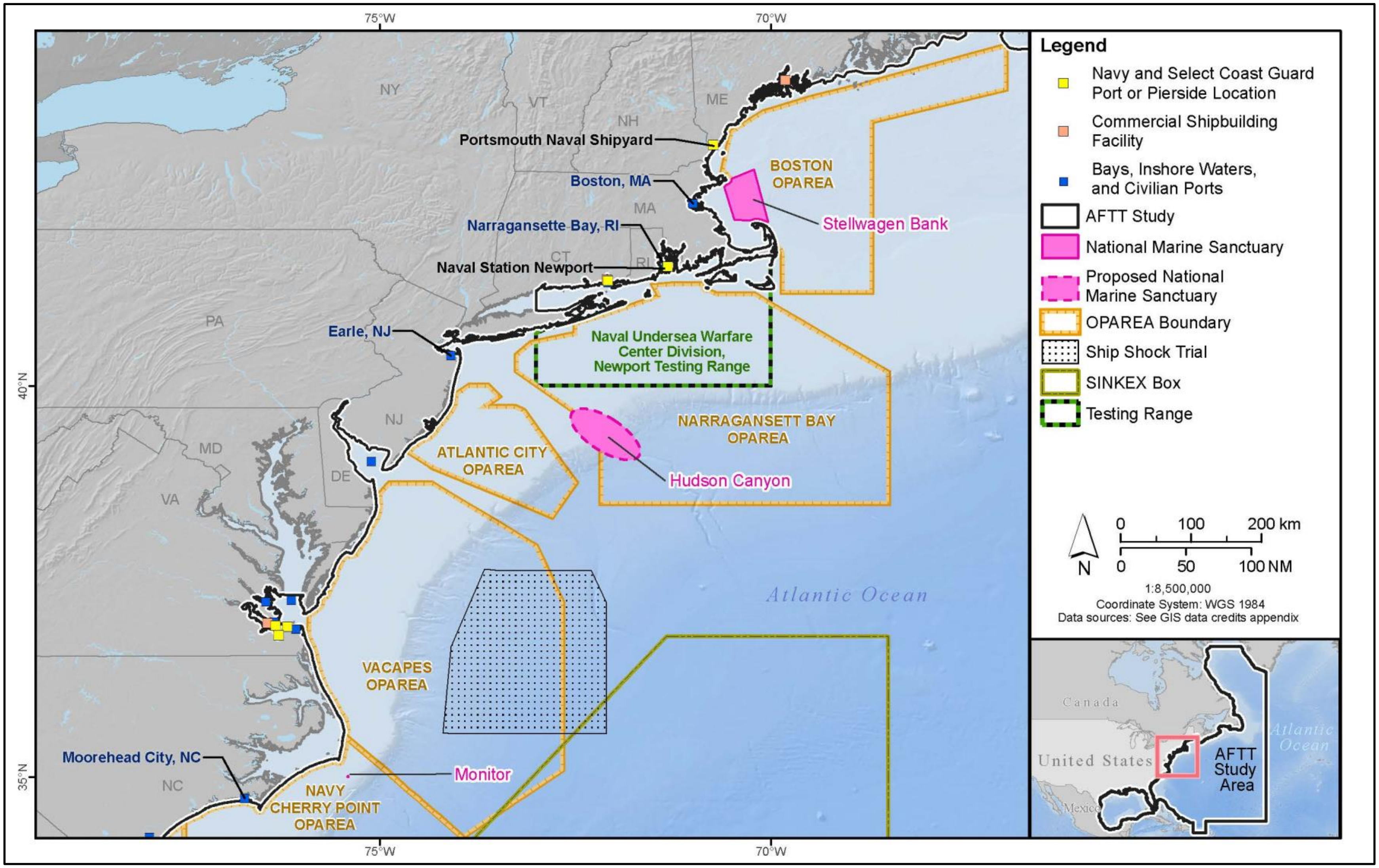
6.1.2 Marine Protected Areas

Section 6.1.2 of the 2018 Final EIS/OEIS discussed marine protected areas that were part of the National System of Marine Protected Areas that overlapped with the Study Area (U.S. Department of the Navy, 2018). Since the publication of the 2018 Final EIS/OEIS, the National Marine Protected Areas Center has updated their definitions and classification system for marine protected areas to mirror that of the International Union for Conservation of Nature. More information on marine protected areas, as well as an online mapper, can be found at the National Marine Protected Areas Center website (National Marine Protected Areas Center, 2023). The Northeast Canyons and Seamounts Marine National Monument is located within the Study Area off the coast of southern New England.

All resources of the marine protected areas located within the Study Area have been incorporated into the analyses in Section 3.1 (Air Quality), Section 3.2 (Sediment and Water Quality), Section 3.3 (Habitats), Section 3.4 (Vegetation), Section 3.5 (Invertebrates), Section 3.6 (Fishes), Section 3.7 (Marine Mammals), Section 3.8 (Reptiles), and Section 3.9 (Birds and Bats). In accordance with Executive Order 13158, *Marine Protected Areas*, the Action Proponents have considered the potential impacts of its proposed activities under the Preferred Alternative (Alternative 1) to the national system of protected areas that contain marine waters within the Study Area, factoring in Action Proponents' standard operating procedures (see Appendix A, Activity Descriptions) and mitigation (see Chapter 5, Mitigation) when applicable to the stressor and resource.

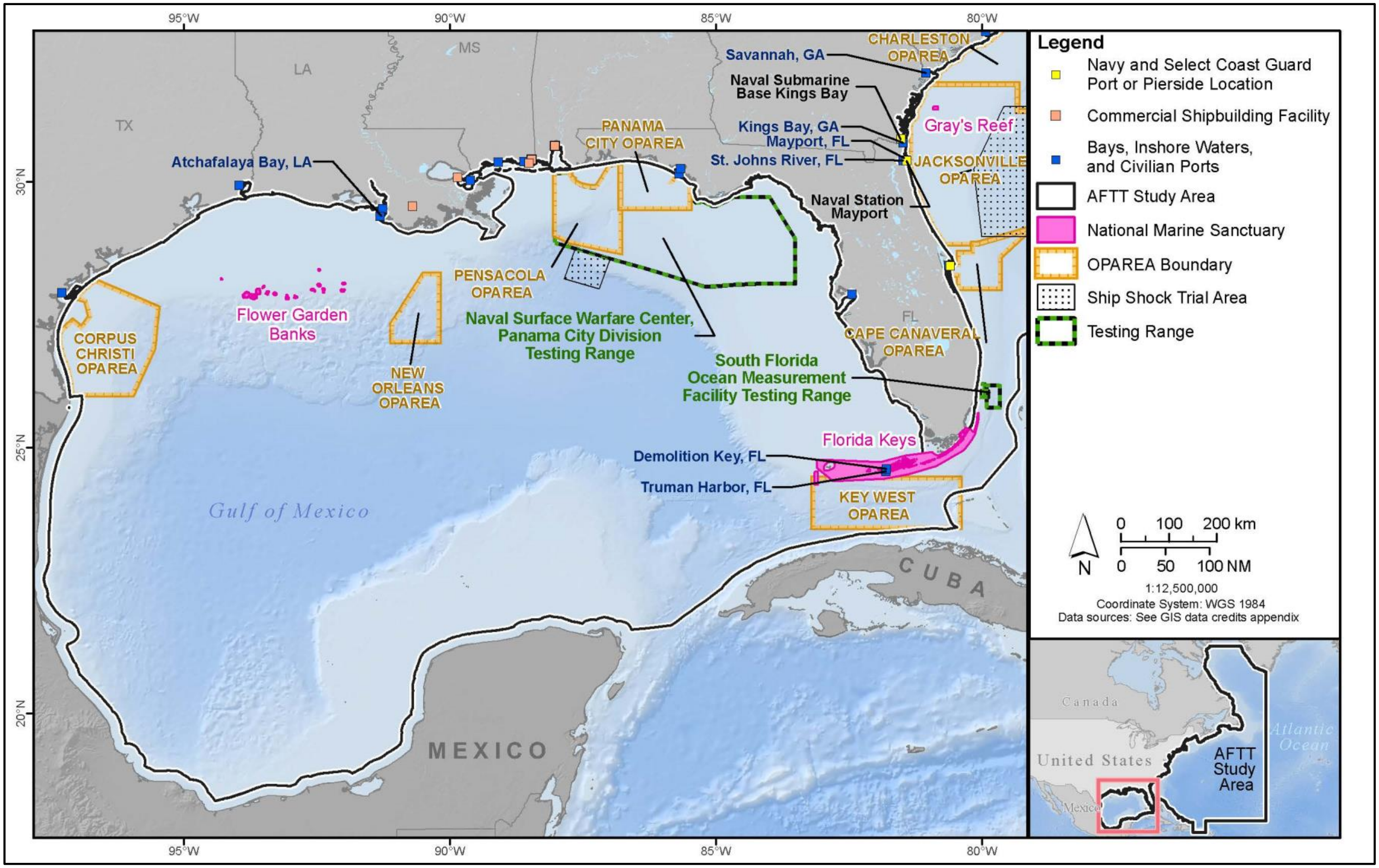
6.1.3 National Marine Sanctuaries

Within the Study Area, there are five designated National Marine Sanctuaries and one proposed National Marine Sanctuary. The National Marine Sanctuaries within the Study Area are mapped in Figure 6.1-1 and Figure 6.1-2. In association with the 2018 Final EIS/OEIS the Action Proponents consulted under section 304(d) of the National Marine Sanctuaries Act with three of the then five designated sanctuaries. As part of that consultation a Sanctuary Resource Statement was submitted that addressed the potential for the proposed activities to injure sanctuary resources. Based on the analysis within the Sanctuary Resource Statement, it was determined that only those activities with acoustic and explosive stressors had the potential to destroy, cause the loss of, or injure (or affect in the case of Stellwagen Bank) sanctuary resources. At the conclusion of the consultation, the Office of National Marine Sanctuaries indicated that consultation reinitiation would be required if the following conditions occurred: (1) if the action is modified such that it is likely to destroy, cause the loss of, or injure a sanctuary resource or quality in a manner greater than was considered in a previous consultation under section 304(d) of the National Marine Sanctuaries Act; (2) if the action is likely to destroy, cause the loss of, or injure a sanctuary resource or quality not considered in a previous consultation under 304(d); or (3) if a new action is proposed that is likely to destroy, cause the loss of, or injure' a sanctuary resource. Where appropriate, the Action Proponents have prepared a Sanctuary Resources Statement describing its proposed actions and potential effects on sanctuary resources, which will be submitted to the Office of National Marine Sanctuaries to initiate National Marine Sanctuaries Act section 304(d) consultation. A description of each National Marine Sanctuary in the Study Area is included in Table 6.1-2.



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

Figure 6.1-1: Location of National Marine Sanctuaries within the Northeast and Mid-Atlantic Portion of the Study Area



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

Figure 6.1-2: Location of National Marine Sanctuaries within the Southeast Atlantic and Gulf of Mexico Portion of the Study Area

Table 6.1-2: National Marine Sanctuaries in the Study Area

National Marine Sanctuary	Sanctuary Details	Sanctuary Resource Statement
Stellwagen Bank National Marine Sanctuary	Details of the Stellwagen Bank National Marine Sanctuary are discussed in the 2018 Final EIS/OEIS, and the dimensions, species, and descriptions of the area have not changed. The offshore portion of the Study Area encompasses the Stellwagen Bank National Marine Sanctuary (see Figure 6.1-1). Activities that the Action Proponents may conduct and those that they are not planning to conduct within the Sanctuary are also discussed in the 2018 Final EIS/OEIS. The Action Proponents implement mitigation measures based on visual observations as applicable to a given activity anywhere in the Study Area as described in Chapter 5 (Mitigation). Four geographic mitigation areas overlap the Sanctuary, the Gulf of Maine Marine Mammal Mitigation Area, the Northeast North Atlantic Right Whale Mitigation Area, the Artificial Reef, Live Hard Bottom, Shipwreck, or Submerged Aquatic Vegetation Mitigation Areas, and the Major Training Exercise Planning Awareness Mitigation Area. All mitigation specific to these areas can be found in Chapter 5. All activity and geographic mitigations would be followed as applicable when conducted within a sanctuary boundary, which would result in a benefit to Stellwagen Bank National Marine Sanctuary resources. The Stellwagen Bank National Marine Sanctuary recently updated its management plan and associated Environmental Assessment; however, military activities are not mentioned within these recent documents. Therefore, the information regarding the military activities in the 2010 management plan is still relevant (National Oceanic and Atmospheric Administration, 2010; Office of National Marine Sanctuaries, 2023). The Action Proponents reviewed the proposed activities that could occur within and in the vicinity of the Sanctuary to determine if military readiness activities have the potential to result in adverse impacts on sanctuary resources or qualities, and if reinitiation is required. Based on this analysis and to ensure compliance with the National Marine Sanctuary Program regulations and the interagency consultation requirements of National Marine Sanctuaries Act section 304(d), the Action Proponents and NMFS plan to submit a new joint Sanctuary Resource Statement for Stellwagen Bank National Marine Sanctuary.	Yes

Table 6.1 2: National Marine Sanctuaries in the Study Area (continued)

National Marine Sanctuary	*Sanctuary Details*	*Sanctuary Resource Statement*
Monitor National Marine Sanctuary	Details of the Monitor National Marine Sanctuary are discussed in the 2018 Final EIS/OEIS, and the dimensions, species, and descriptions of the area have not changed. The offshore portion of the Study Area encompasses the Monitor National Marine Sanctuary (see Figure 6.1-1). Activities that the Action Proponents may conduct and those that they are not planning to conduct within the Sanctuary are also discussed in the 2018 Final EIS/OEIS. The Action Proponents implement mitigation measures based on visual observations as applicable to a given activity anywhere in the Study Area as described in Chapter 5 (Mitigation). All activity mitigations would be followed as applicable when conducted within a sanctuary boundary, which would result in a benefit to Monitor National Marine Sanctuary resources. The regulations and management plan for the Monitor National Marine Sanctuary have not been updated since the 2018 Final EIS/OEIS. The Action Proponents reviewed the proposed activities that could occur within and in the vicinity of the Sanctuary to determine the potential impacts from military readiness activities to sanctuary resources or qualities. Based on this analysis it was determined that the proposed activities do not meet the conditions for reinitiation, and would not destroy, cause the loss of, or injure sanctuary resources as defined in the interagency consultation requirements of National Marine Sanctuaries Act section 304(d). Therefore, the Action Proponents and NMFS do not plan to submit a joint Sanctuary Resource Statement for Monitor National Marine Sanctuary.	No

Table 6.1 2: National Marine Sanctuaries in the Study Area (continued)

National Marine Sanctuary	Sanctuary Details	Sanctuary Resource Statement
Gray's Reef National Marine Sanctuary	Details of the Gray's Reef National Marine Sanctuary are discussed in the 2018 Final EIS/OEIS, and the dimensions, species, and descriptions of the area have not changed. The offshore portion of the Study Area encompasses the Gray's Reef National Marine Sanctuary (see Figure 6.1-2). Activities that the Action Proponents may conduct and those that they are not planning to conduct within the Sanctuary are also discussed in the 2018 Final EIS/OEIS. The Action Proponents implement mitigation measures based on visual observations as applicable to a given activity anywhere in the Study Area as described in Chapter 5 (Mitigation). Three geographic mitigation areas overlap the Sanctuary, the Southeast North Atlantic Right Whale Special Reporting Mitigation Area, the Jacksonville Operating Area North Atlantic Right Whale Mitigation Area, and the Artificial Reef, Live Hard Bottom, Shipwreck, or Submerged Aquatic Vegetation Mitigation Areas. All mitigation specific to these areas can be found in Chapter 5. All activity mitigations would be followed as applicable when conducted within a sanctuary boundary, which would result in a benefit to Gray's Reef National Marine Sanctuary resources. The regulations and management plan for the Gray's Reef National Marine Sanctuary have not been updated since the 2018 Final EIS/OEIS. The Action Proponents reviewed the proposed activities that could occur within and in the vicinity of the Sanctuary to determine if military readiness activities have the potential to destroy, cause the loss of, or injure sanctuary resources or qualities and if reinitiation is required. Based on this analysis and to ensure compliance with the National Marine Sanctuary Program regulations and the interagency consultation requirements of National Marine Sanctuaries Act section 304(d), the Action Proponents and NMFS plan to submit a new joint Sanctuary Resource Statement for Gray's Reef National Marine Sanctuary.	Yes

Table 6.1 2: National Marine Sanctuaries in the Study Area (continued)

National Marine Sanctuary	Sanctuary Details	Sanctuary Resource Statement
Florida Keys National Marine Sanctuary	Details of the Florida Keys National Marine Sanctuary are discussed in the 2018 Final EIS/OEIS, and the dimensions, species, and descriptions of the area have not changed. An expansion to the Sanctuary boundaries was proposed in 2019 (Office of National Marine Sanctuaries, 2019). The offshore portion of the Study Area encompasses the Florida Keys National Marine Sanctuary, including the proposed expansion (see Figure 6.1-2). Activities that the Action Proponents may conduct and those that they are not planning to conduct within the Sanctuary are discussed in the 2018 Final EIS/OEIS. The Action Proponents implement mitigation measures based on visual observations as applicable to a given activity anywhere in the Study Area as described in Chapter 5 (Mitigation). Five geographic mitigation areas overlap the Sanctuary, the Key West Range Complex Seafloor Mitigation Area, the Dry Tortugas Bird and Cultural Resource Mitigation Area, the Major Training Exercise Planning Awareness Mitigation Area, the Shallow water Coral Reef Mitigation Area, and the Artificial Reef, Live Hard Bottom, Shipwreck, or Submerged Aquatic Vegetation Mitigation Areas. All mitigation specific to these areas can be found in Chapter 5. All activity mitigations would be followed as applicable when conducted within a sanctuary boundary, which would result in a benefit to Florida Keys National Marine Sanctuary resources. The regulations and management plan for the Florida Keys National Marine Sanctuary have not been updated since the 2018 Final EIS/OEIS. However, the Sanctuary is in the process of updating its existing management plan and associated Environmental Impact Statement (Office of National Marine Sanctuaries, 2019). These updated documents will continue to take into account military readiness activities occurring within and in the vicinity of the Sanctuary as previous plans and environmental documents have. The Action Proponents reviewed the proposed activities that could occur within and in the vicinity of the Sanctuary (including the proposed boundary expansion) to determine if military readiness activities have the potential to destroy, cause the loss of, or injure sanctuary resources or qualities and if reinitiation is required. Based on this analysis and to ensure compliance with the National Marine Sanctuary Program regulations and the interagency consultation requirements of National Marine Sanctuaries Act section 304(d), the Action Proponents and NMFS plan to submit a new joint Sanctuary Resource Statement for the Florida Keys National Marine Sanctuary.	Yes

Table 6.1 2: National Marine Sanctuaries in the Study Area (continued)

National Marine Sanctuary	***Sanctuary Details***	***Sanctuary Resource Statement***
Flower Garden Banks National Marine Sanctuary	On January 19, 2021, the National Oceanic and Atmospheric Administration issued the final rule for expansion of Flower Garden Banks National Marine Sanctuary (15 CFR 922.120 et seq.). The expansion protects 14 additional reefs and banks, slightly adjusts the boundaries of the sanctuary's original three banks, and expands the sanctuary from 56 square miles to a total of 160 square miles. The final rule applies existing sanctuary regulations to all of the new areas, providing protection to limit the impact of activities related to fishing with bottom-tending gear, ship anchoring, oil and gas exploration and production, and salvage on sensitive biological resources (National Oceanic and Atmospheric Administration, 2023). The offshore portion of the Study Area encompasses the Flower Garden Banks National Marine Sanctuary (Figure 6.1-2). The Action Proponents implement mitigation measures based on visual observations as applicable to a given activity anywhere in the Study Area as described in Chapter 5 (Mitigation). One group of geographic mitigation areas overlap the Sanctuary, the Artificial Reef, Live Hard Bottom, Shipwreck, or Submerged Aquatic Vegetation Mitigation Areas. All mitigation specific to these areas can be found in Chapter 5. All activity and geographic mitigations would be followed as applicable when conducted within a sanctuary boundary, which would result in a benefit to Flower Garden Banks National Marine Sanctuary resources. The regulations and management plan for the Flower Garden Banks National Marine Sanctuary have not been updated since the 2018 Final EIS/OEIS. The Final Environmental Impact Statement developed to support the boundary expansion states that the regulations applicable to military readiness activities also apply to the expanded portions of the Sanctuary and are not changed from when the Sanctuary was originally designated. The Action Proponents reviewed the proposed activities that could occur within and in the vicinity of the Sanctuary to determine if military readiness activities have the potential to destroy, cause the loss of, or injure sanctuary resources or qualities. Based on this analysis it was determined that the proposed activities do not meet the conditions for reinitiation and would not destroy, cause the loss of, or injure sanctuary resources as defined in the interagency consultation requirements of National Marine Sanctuaries Act section 304(d). Therefore, the Action Proponents and NMFS do not plan to submit a joint Sanctuary Resource Statement to Flower Garden Banks National Marine Sanctuary.	No

Table 6.1 2: National Marine Sanctuaries in the Study Area (continued)

National Marine Sanctuary	***Sanctuary Details***	***Sanctuary Resource Statement***
Proposed Hudson Canyon National Marine Sanctuary	The Office of National Marine Sanctuaries is in the process of designating the Hudson Canyon National Marine Sanctuary off the coast of New York and New Jersey (see Figure 6.1-1). Hudson Canyon is the largest submarine canyon along the U.S. Atlantic coast and is one of the largest in the world. Beginning approximately 100 miles southeast of New York City, the canyon extends about 350 miles seaward, reaches depths of 2 to 2.5 miles, and is up to 7.5 miles wide. Hudson Canyon's grand scale and diverse structure—steep slopes, firm outcrops, diverse sediments, flux of nutrients, and areas of upwelling—make it an ecological hotspot for a vast array of marine wildlife. Hudson Canyon provides habitat for a range of protected and sensitive species, including sperm whales, sea turtles, and deep-sea corals. The area's rich biodiversity is integral to the regional economy, underpinning commercial and recreational fisheries, recreational diving, whale watching, and birding. There are also several shipwrecks in the proposed area. The primary goals of the proposed national marine sanctuary designation are to (1) support conservation of the area's marine wildlife, habitats, and maritime cultural resources, (2) work closely with Indigenous tribes and nations to identify and raise awareness of Indigenous connections to the area, (3) highlight and promote sustainable uses of the area, (4) expand ocean science and monitoring in, and education and awareness of the area, and (5) provide a platform for collaborative and diverse partnerships that support effective and inclusive long-term management of the area (Office of National Marine Sanctuaries, 2024). The Action Proponents will coordinate with the Office of National Marine Sanctuaries to ensure that proposed activities are considered as part of the regulations and environmental analysis, as appropriate. The Action Proponents will review the proposed activities that could occur within and in the vicinity of the proposed sanctuary boundaries and will consult under National Marine Sanctuaries Act section 304(d), as necessary.	Yes

Notes: EIS = Environmental Impact Statement; NMFS = National Marine Fisheries Service; OEIS = Overseas Environmental Impact Statement

6.1.4 Magnuson-Stevens Fishery Conservation and Management Act

The Proposed Action may adversely affect Essential Fish Habitat and managed species within the Study Area. The Action Proponents are preparing an Essential Fish Habitat Assessment for this Supplemental EIS/OEIS and will submit it to NMFS.

The Action Proponents will continue to coordinate with NMFS to ensure that the best available data is considered for continued compliance with the Magnuson-Stevens Fishery Conservation and Management Act. This consultation is ongoing, and the results will be documented in the Final SEIS/OEIS and Record of Decision.

6.2 Relationship Between Short-Term Use of the Environment and Maintenance and Enhancement of Long-Term Productivity

In accordance with Council on Environmental Quality regulations, this Supplemental EIS/OEIS analyzes the relationship between the short-term impacts on the environment and the effects those impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. This analysis has not changed since the analysis conducted in the 2018 Final EIS/OEIS. See Section 6.2 (Relationship Between Short-Term Use of the Environment and Maintenance and Enhancement of Long-Term Productivity) of the 2018 Final EIS/OEIS for more information.

6.3 Irreversible or Irretrievable Commitment of Resources

NEPA requires that environmental analysis include identification of “any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented” (42 U.S.C. section 4332). This analysis has not changed since it was conducted in the 2018 Final EIS/OEIS and the Action Proponents’ activities have been ongoing and continuous since then. See Section 6.3 (Irreversible or Irretrievable Commitment of Resources) of the 2018 Final EIS/OEIS for more information (U.S. Department of the Navy, 2018).

6.4 Energy Requirements and Efficiency Initiatives

The federal government is the largest single energy consumer in the United States. In fiscal year 2017, the Department of Defense (DoD) consumed approximately 76 percent of the total energy used by the federal government (Congressional Research Service, 2019). In fiscal year 2020, the DoD used approximately 77.6 million barrels of liquid fuel for operational energy to power ships, aircraft, combat vehicles, and contingency bases. The Navy and Marine Corps consume approximately 36 percent of the total DoD share (28.3 million barrels in fiscal year 2020) (U.S. Department of Defense, 2021). In 2023, the DoD published a new Operational Energy Strategy to update the 2016 strategy and transform the way energy is consumed in military operations; the strategy sets the overall direction for operational energy security (U.S. Department of Defense, 2023). The 2023 strategy shifts focus toward four lines of effort and focus areas: (1) Energy Demand Reduction; (2) Energy Substitution and Diversification; (3) Supply Chain Resilience; and (4) Enterprise-Wide Energy Visibility (U.S. Department of Defense, 2023).

The Proposed Action would not result in a significant change in energy use from that described in the 2018 Final EIS/OEIS. Military readiness activities within the Study Area would result in an increase in energy demand over the No Action Alternative. The increased energy demand would arise from an increase in fuel consumption, mainly from aircraft and vessels participating in training and testing. The alternatives could result in a net cumulative reduction in the global energy (fuel) supply.

Energy requirements would be subject to any established energy efficiency practices. Per DoD policy, the use of energy sources has been minimized wherever possible without compromising safety, training, or testing activities. No additional efficiency measures related to direct energy consumption by the proposed activities are identified. In accordance with the Operational Energy Strategy, the DoD's energy vision is to prioritize energy demand reduction and seek to adopt more efficient and clean energy technologies that reduce logistics requirements in contested environments (U.S. Department of Defense, 2023).

The Action Proponents are committed to improving energy security and environmental stewardship by reducing its reliance on fossil fuels. The Navy is actively developing and participating in energy, environmental, and climate change initiatives that will help conserve the world's resources for future generations. The U.S. Department of the Navy Climate Action 2030 report (U.S. Department of the Navy, 2022) identifies actions the Navy and Marine Corps are taking to implement Executive Order 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis* (executed January 20, 2021) and EO 14008, *Tackling the Climate Crisis at Home and Abroad* (executed January 27, 2021). The two performance goals set in the report are (1) Build Climate Resilience – Ensure that our forces, systems, and facilities can continue to operate effectively and achieve the mission in the face of changing climate conditions, and worsening climate impacts; and (2) Reduce Climate Threat – The Department must reduce its greenhouse gas emissions and draw greenhouse gases out of the atmosphere, stabilize ecosystems, and achieve, as an enterprise, the nation's commitment to net-zero emissions by 2050 (U.S. Department of the Navy, 2022). To meet these performance goals, the Navy has begun creating plans and initiatives to meet the following specific targets of Executive Order 14057, *Catalyzing Clean Energy Industries and Jobs* (executed December 8, 2021):

- achieving a 65 percent reduction in scopes 1 and 2 greenhouse gas emissions department-wide by 2030 (measured from a 2008 baseline)
- achieving 100 percent carbon pollution-free electricity by 2030, at least half of which will be locally supplied clean energy to meet 24/7 demand
- acquiring 100 percent zero-emission vehicles by 2035, including 100 percent zero-emission light-duty vehicle acquisitions by 2027
- achieving a 50 percent reduction in emissions from buildings by 2032
- annually diverting at least 50 percent of non-hazardous solid waste from landfills, including food and compostable materials, and construction and demolition waste and debris by 2025 (U.S. Department of the Navy, 2022)

6.5 Climate Change

Both action alternatives would generate greenhouse gas emissions, and in combination with past and future worldwide sources of greenhouse gas emissions, would contribute incrementally to the global warming that produces the adverse effects of climate change. The Navy takes proactive measures to reduce greenhouse gas emissions by decreasing the use of fossil fuels and increasing the use of alternative energy sources in accordance with the goals set by executive orders, the Energy Policy Acts of 2005 and 2020, and Navy and DoD policies. The Department of the Navy Climate Action Plan details the Navy's goals to meet the requirements of Executive Orders 14008 and 14057, as discussed above. Following these directives, the Action Proponents will continue to optimize its force through hybridization, electrification, alternative lower-carbon fuels, and advanced propulsion solutions for both existing and future tactical platforms in all domains: sea, air, and ground. The Action Proponents will ensure that energy performance is formally evaluated and optimized for every weapons system in the acquisitions process.

The Navy is committed to climate stewardship and will continue to consider climate change in its planning and operations under the action alternatives. For example, the DoD conducts research on potential impacts from climate change and develops measures for installations to adapt to these threats (Strategic Environmental Research and Development Program, 2023).

References

Congressional Research Service. (2019). *Department of Defense Energy Management: Background and Issues for Congress*. Washington, DC: Congressional Research Service.

National Marine Protected Areas Center. (2023). *The MPA Inventory*. Retrieved March 14, 2023, from https://marineprotectedareas.noaa.gov/dataanalysis/mpainventory/.

National Oceanic and Atmospheric Administration. (2010). *Stellwagen Bank National Marine Sanctuary Final Management Plan and Environmental Assessment*. Silver Spring, MD: National Oceanic and Atmospheric Administration, National Ocean Service.

National Oceanic and Atmospheric Administration. (2023). *Sanctuary Expansion: Flower Garden Banks National Marine Sanctuary*. Retrieved September 19, 2023, from https://flowergarden.noaa.gov/management/sanctuaryexpansion.html.

Office of National Marine Sanctuaries. (2019). *Draft Environmental Impact Statement for Florida Keys National Marine Sanctuary: A Restoration Blueprint*. Silver Spring, MD: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries.

Office of National Marine Sanctuaries. (2023). *Stellwagen Bank National Marine Sanctuary Final Management Plan and Environmental Assessment*. Silver Spring, MD: National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries.

Office of National Marine Sanctuaries. (2024). *Proposed Designation of Hudson Canyon National Marine Sanctuary*. Retrieved March 7, 2024, from https://sanctuaries.noaa.gov/hudson-canyon/.

Strategic Environmental Research and Development Program. (2023). *Focus Areas*. Retrieved May 21, 2024, from https://serdp-estcp.mil/focusareas/landing.

U.S. Department of Defense. (2021). *Fiscal Year 2020 Operational Energy Annual Report*. Washington, DC: U.S. Department of Defense, Office of the Under Secretary of Defense for Acquisition and Sustainment.

U.S. Department of Defense. (2023). *Department of Defense Operational Energy Strategy*. Washington, DC: U.S. Department of Defense.

U.S. Department of the Navy. (2018). *Atlantic Fleet Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement*. Norfolk, VA: Naval Facilities Engineering Command Atlantic.

U.S. Department of the Navy. (2022). *Department of the Navy Climate Action 2030*. Washington, DC: Office of the Assistant Secretary of the Navy for Energy, Installations, and Environment.