
5 Mitigation

Supplemental Environmental Impact Statement/ Overseas Environmental Impact Statement

Northwest Training and Testing

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5 Mitigation

5.1 Introduction

This chapter describes the mitigation measures that the United States (U.S.) Department of the Navy (Navy) will implement to avoid or reduce potential impacts from the Northwest Training and Testing (NWTT) Supplemental Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) Proposed Action. This chapter has been updated in its entirety since Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the 2015 NWTT Final EIS/OEIS (U.S. Department of the Navy, 2015). As a cooperating agency for the Proposed Action, the U.S. Coast Guard will implement applicable mitigation measures developed by the Navy for the Proposed Action.

The Navy will also implement standard operating procedures specific to training and testing activities conducted under the Proposed Action. In many cases, standard operating procedures provide a benefit to environmental and cultural resources, some of which have high socioeconomic value in the Study Area. Standard operating procedures differ from mitigation measures because standard operating procedures are designed to provide for safety and mission success, whereas mitigation measures are designed specifically to avoid or reduce potential environmental impacts. An example of a standard operating procedure is that ships operated by or for the Navy have personnel assigned to stand watch at all times when underway. Watch personnel monitor their assigned sectors for any indication of danger to the ship and the 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. The Navy also avoids known navigation hazards that appear on navigational charts, such as submerged wrecks and obstructions. 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. The standard operating procedures to avoid collision hazards are designed for safety of the ship and the personnel on board. This is different from mitigation measures for vessel movement, which require vessels to maneuver to avoid marine mammals by specified distances to avoid or reduce the potential for physical disturbance and strike of marine mammals, as described in Section 5.3.4.1 (Vessel Movement). In this example, the benefit of the mitigation measure for vessel movement is additive to the benefit of the standard operating procedure for vessel safety. Standard operating procedures that apply to the Proposed Action and are generally consistent with those included in the 2015 NWTT Final EIS/OEIS are described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of that document. Standard operating procedures that apply to the Proposed Action and were not included in, or require a clarification from, the 2015 NWTT Final EIS/OEIS are discussed in Section 2.3.3 (Standard Operating Procedures) of this Final Supplemental EIS/OEIS.

In addition to the mitigation measures and standard operating procedures specific to the Proposed Action, the Navy has existing routine operating instructions (e.g., training manuals) and local installation instructions (e.g., Integrated Natural Resource Management Plans) that were developed to meet other safety and environmental compliance requirements or initiatives. For example, the Naval Air Training and Operating Procedures Standardization General Flight and Operating Instructions Manual (CNAF M-3710.7) contains naval air training procedures pertaining to safe operations of aircraft, which includes requirements to minimize the disturbance of wildlife. Aviation units are required to avoid noise-sensitive areas, such as breeding farms, resorts, beaches, national parks, national monuments, and national recreational areas when at altitudes less than 3,000 feet (ft.) above ground level except when in compliance with applicable Federal Aviation Administration or U.S. Navy-approved traffic patterns,

routes, or special use airspace (e.g., military operations areas). They are also required to avoid disturbing wild fowl in their natural habitats and to avoid firing directly at large fish, whales, or other wildlife. These requirements are in addition to mitigation measures developed for the Proposed Action. The Navy will continue complying with applicable operating instructions and local installation instructions within the Study Area, as appropriate.

5.1.1 Benefits of Mitigation

The Chapter 3 (Affected Environment and Environmental Consequences) environmental analyses indicate that certain acoustic, explosive, and physical disturbance and strike stressors have the potential to impact certain biological or cultural resources. The Navy developed mitigation measures for those stressors and would implement the mitigation for either action alternative. The Navy considered the benefits of mitigation in the environmental analyses for both Alternative 1 and Alternative 2 of the Proposed Action in this Final Supplemental EIS/OEIS. In addition to analyzing mitigation measures pursuant to the National Environmental Policy Act (NEPA), the Navy designed its mitigation measures to achieve one or more benefits, such as the following:

- Effect the least practicable adverse impact on marine mammal species or stocks and their habitat, and have a negligible impact on marine mammal species and stocks (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 (as required under the Magnuson-Stevens Fishery Conservation and Management Act); and
- Avoid adversely impacting shipwrecks (as required under the Abandoned Shipwreck Act and National Historic Preservation Act).

In addition to the benefits listed above, certain mitigation measures would also benefit other species in the Study Area, such as seabirds listed under the Migratory Bird Treaty Act. The Navy coordinated its mitigation with the appropriate regulatory agencies, including the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), and U.S. Fish and Wildlife Service (USFWS), through the consultation and permitting processes. The Navy Record of Decision will document all mitigation measures the Navy will implement under the Proposed Action. The NMFS Record of Decision, MMPA Regulations and Letters of Authorization, ESA Biological Opinion, and other applicable consultation documents will include the mitigation measures applicable to the resources for which the Navy has consulted. The suite of mitigation measures included in this Final Supplemental EIS/OEIS represents the maximum level of mitigation that is practical for the Navy to implement when balanced against impacts on safety, sustainability, and the ability to continue meeting mission requirements. Should the Navy require a change in how it implements mitigation based on national security concerns, evolving readiness requirements, or other factors (e.g., significant changes in the best available science), the Navy will engage the appropriate agencies and reevaluate its mitigation through adaptive management or the appropriate consultations. The Navy's adaptive management approach is discussed in Section 5.1.2.2.1.1 (Adaptive Management). This approach was coordinated with NMFS during the consultation and permitting processes and will be included in the MMPA Regulations and Letters of Authorization.

5.1.2 Compliance Initiatives

To disseminate its mitigation requirements to the appropriate personnel and meet other compliance requirements for the MMPA and ESA, the Navy will continue using the Protective Measures Assessment Protocol and its ongoing monitoring and reporting initiatives, as described in the sections below.

5.1.2.1 Protective Measures Assessment Protocol

To disseminate requirements to the personnel who are required to implement mitigation during training and testing activities, the Navy will continue inputting its mitigation measures into the Protective Measures Assessment Protocol and appropriate governing instructions. The Protective Measures Assessment Protocol is a software tool that serves as the Navy's comprehensive data source for at-sea mitigation. The software tool provides personnel with notification of the required mitigation measures and a visual display of the planned training or testing activity location overlaid with relevant environmental data (e.g., mapped locations of live hard bottom). Navy policy requires applicable personnel to access the Protective Measures Assessment Protocol during the event planning process. This helps ensure that personnel receive mitigation instructions prior to the start of training and testing activities and that mitigation is implemented appropriately.

5.1.2.2 Monitoring, Research, and Reporting Initiatives

Many of the Navy's monitoring programs, research programs, and reporting initiatives have been ongoing for more than a decade and will continue as a compliance requirement for the MMPA or ESA, or both. The Navy and NMFS use the information contained within monitoring, research, activity, and incident reports when evaluating the effectiveness and practicality of mitigation and determining if adaptive adjustments to mitigation may be appropriate. These reports also facilitate better understandings of the biological resources that inhabit the Study Area and the potential impacts of the Proposed Action on those resources.

5.1.2.2.1 Marine Species Research and Monitoring Programs

Through its marine species research and monitoring programs, the Navy is one of the nation's largest sponsors of scientific research on and monitoring of marine species. Detailed information on these programs is provided in Section 3.0.1.1.1 (Marine Species Monitoring and Research Programs). Navy research programs focus on investments in basic and applied research that increase fundamental knowledge and advance naval technological capabilities. Navy monitoring programs focus on the potential impacts of training and testing activities on biological resources. For example, the Navy Living Marine Resources Program is sponsoring an ongoing study on hearing and estimated acoustic impacts in three species of auk, which will help the Navy refine its assessment of potential impacts from training and testing activities on seabirds, including the marbled murrelet. The Navy has also sponsored several projects on seabird density and distribution to improve baseline knowledge about ESA-listed seabirds in the Study Area.

Other projects, such as those sponsored by the U.S. Navy's Marine Species Monitoring Program, primarily focus on marine mammals and sea turtles. Monitoring reports are available to the public on the U.S. Navy's Marine Species Monitoring webpage (<https://www.navy.marinespeciesmonitoring.us/>). The Navy will post future reports online as they become available. Specific details regarding the content of the reports will be coordinated with the appropriate agencies through the consultation and permitting processes. Additional information about the U.S. Navy's Marine Species Monitoring Program, including its adaptive management and strategic planning components, is provided in the sections below.

5.1.2.2.1.1 Adaptive Management

Adaptive management is an iterative process of decision-making that accounts for changes in the environment and scientific understanding over time through a system of monitoring and feedback. Within the natural resource management community, adaptive management involves ongoing, real-time learning and knowledge creation, both in a substantive sense and in terms of the adaptive process itself (Williams et al., 2009). Adaptive management focuses on learning and adapting, through partnerships of natural resource managers, scientists, and other stakeholders. Adaptive management helps managers maintain flexibility in their decisions and provides them the latitude to change direction to improve understanding of ecological systems and achieve management objectives. Taking action to improve progress toward desired outcomes is another function of adaptive management.

The Navy's adaptive management review process and reporting requirements serve as the basis for evaluating performance and compliance. The process involves technical review meetings and ongoing discussions between the Navy, NMFS, the Marine Mammal Commission, and other experts in the scientific community. An example of a revision to the compliance monitoring structure as a result of adaptive management is the development of the Strategic Planning Process, which is a planning tool for the selection and management of monitoring investments (U.S. Department of the Navy, 2013). Through adaptive management, the Strategic Planning Process has been incorporated into the Integrated Comprehensive Monitoring Program, which is described below.

5.1.2.2.1.2 Integrated Comprehensive Monitoring Program

The Navy developed an Integrated Comprehensive Monitoring Program to serve as the overarching framework for coordinating its marine species monitoring efforts and as a planning tool to focus its monitoring priorities pursuant to ESA and MMPA requirements (U.S. Department of the Navy, 2010). The purpose of the Integrated Comprehensive Monitoring Program is to coordinate monitoring efforts across regions and to allocate the most appropriate level and type of monitoring effort for each range complex based on a set of standardized objectives, regional expertise, and resource availability. The Integrated Comprehensive Monitoring Program does not identify specific field work or individual projects. It is designed to provide a flexible, scalable, and adaptable framework using adaptive management and the Strategic Planning Process to periodically assess progress and reevaluate objectives.

The Integrated Comprehensive Monitoring Program is evaluated through the adaptive management review process to (1) assess progress, (2) provide a matrix of goals and objectives, and (3) make recommendations for refinement and analysis of monitoring and mitigation techniques. This process includes conducting an annual adaptive management review meeting where the Navy and NMFS jointly consider the prior year's goals, project results, and related scientific advances to determine if monitoring plan modifications are warranted to address program goals more effectively. Modifications to the Integrated Comprehensive Monitoring Program that result from annual adaptive management review discussions are incorporated by an addendum or revision to the Integrated Comprehensive Monitoring Program as needed. The Integrated Comprehensive Monitoring Program will be routinely updated as the program evolves and progresses.

The Strategic Planning Process serves to guide the investment of resources to most efficiently address Integrated Comprehensive Monitoring Program objectives and intermediate scientific objectives. Navy-funded monitoring projects relating to the impact of Navy training and testing activities on protected

marine species are designed to accomplish one or more of the following top-level goals, as described in the Integrated Comprehensive Monitoring Program charter:

- Increase the understanding of the likely occurrence of marine mammals and ESA-listed marine species in the vicinity of the action (e.g., presence, abundance, distribution, density).
- Increase the understanding of the nature, scope, or context of the likely exposure of marine mammals and ESA-listed marine species to any of the potential stressors associated with the action (e.g., acoustics, explosives, physical disturbance and strike of military expended materials) through a better understanding of one or more of the following: (1) the nature of the action and its surrounding environment (e.g., sound-source characterization, propagation, ambient noise levels), (2) the affected species (e.g., life history, dive patterns), (3) the likely co-occurrence of marine mammals and ESA-listed marine species with the action (in whole or part), and (4) the likely biological or behavioral context of exposure to the stressor for the marine mammal and ESA-listed marine species (e.g., age class of exposed animals or known pupping, calving, or feeding areas).
- Increase the understanding of how individual marine mammals or ESA-listed marine species respond behaviorally or physiologically to the specific stressors associated with the action and in what context (e.g., at what distance or received level).
- Increase the understanding of how anticipated individual responses to individual stressors or anticipated combinations of stressors may impact either (1) the long-term fitness and survival of an individual, or (2) the population, species, or stock (e.g., through impacts on annual rates of recruitment or survival).
- Increase the understanding of the effectiveness of mitigation and monitoring.
- Improve the understanding and record of the manner in which the Navy complies with its Incidental Take Authorizations and Incidental Take Statements.
- Increase the probability of detecting marine mammals through improved technology or methods within mitigation zones to improve mitigation effectiveness and better achieve monitoring goals.

The Navy established a Scientific Advisory Group in 2011 with the initial task of evaluating current Navy monitoring approaches under the Integrated Comprehensive Monitoring Plan and existing MMPA Regulations and Letters of Authorization. The Scientific Advisory Group was also tasked with developing objective scientific recommendations that would form the basis for the Strategic Plan. While recommendations were fairly broad and not specifically prescriptive, the Scientific Advisory Group did provide specific programmatic recommendations that serve as guiding principles for the continued evolution of the Integrated Comprehensive Monitoring Program. Key recommendations included:

- Working within a conceptual framework of knowledge, from basic information on the occurrence of species within each range complex, to more specific matters of exposure, response, and consequences.
- Facilitating collaboration among researchers in each region, with the intent to develop a coherent and synergistic regional monitoring and research effort.
- Striving to move away from effort-based compliance metrics (e.g., completing a pre-determined amount of survey hours or days), with the intent to design and conduct monitoring projects according to scientific objectives rather than effort expended.

- Approaching the monitoring program holistically and selecting projects that offer the best opportunity to advance understanding of the issues, as opposed to establishing range-specific requirements.

5.1.2.2.1.3 Strategic Planning Process

The U.S. Navy's Marine Species Monitoring Program has evolved and improved as a result of adaptive management review and the Strategic Planning Process through changes that include:

- Recognizing the limitations of effort-based compliance metrics;
- Developing a strategic approach to monitoring based on recommendations from the Scientific Advisory Group;
- Shifting focus to projects based on scientific objectives that facilitate generation of statistically meaningful results upon which natural resources management decisions may be based;
- Focusing on priority species or areas of interest as well as best opportunities to address specific monitoring objectives to maximize return on investment; and
- Increasing transparency of the program and management standards, improving collaboration among participating researchers, and improving accessibility to monitoring data and results.

As a result of the changes outlined above due to the implementation of the Strategic Planning Process, the U.S. Navy's Marine Species Monitoring Program has undergone a transition. Intermediate scientific objectives now serve as the basis for developing and executing new monitoring projects across Navy training and testing areas in the Atlantic and Pacific Oceans. Implementation of the Strategic Planning Process involves coordination among fleets, system commands, Chief of Naval Operations Energy and Environmental Readiness Division, NMFS, and the Marine Mammal Commission with five primary steps:

- **Identify overarching intermediate scientific objectives.** Through the adaptive management process, the Navy coordinates with NMFS and the Marine Mammal Commission to review and revise the list of intermediate scientific objectives that guide development of individual monitoring projects. Examples include addressing information gaps in species occurrence and density, evaluating behavioral responses of marine mammals to Navy training and testing activities, and developing tools and techniques for passive acoustic monitoring.
- **Develop individual monitoring project concepts.** This step generally takes the form of soliciting input from the scientific community in terms of potential monitoring projects that address one or more of the intermediate scientific objectives. This can be accomplished through a variety of forums, including professional societies, regional scientific advisory groups, and contractor support.
- **Evaluate, prioritize, and select monitoring projects.** Navy technical experts and program managers review and evaluate monitoring project concepts and develop a prioritized ranking. The goal of this step is to establish a suite of monitoring projects that address a cross-section of intermediate scientific objectives spread over a variety of range complexes.
- **Execute and manage selected monitoring projects.** Individual projects are initiated through appropriate funding mechanisms and include clearly defined objectives and deliverables, such as data, reports, or publications.
- **Report and evaluate progress and results.** Progress on individual monitoring projects is updated through the U.S. Navy's Marine Species Monitoring Program webpage as well as annual monitoring reports submitted to NMFS. Both internal review and discussions with NMFS through the adaptive management process are used to evaluate progress toward addressing the

primary objectives of the Integrated Comprehensive Monitoring Program and serve to periodically recalibrate the focus of the monitoring program.

These steps serve three primary purposes: (1) to facilitate the Navy in developing specific projects addressing one or more intermediate scientific objectives; (2) to establish a more structured and collaborative framework for developing, evaluating, and selecting monitoring projects across areas where the Navy conducts training and testing activities; and (3) to maximize the opportunity for input and involvement across the research community, academia, and industry. This process is designed to integrate various elements, including

- Integrated Comprehensive Monitoring Program top-level goals,
- Scientific Advisory Group recommendations,
- Integration of regional scientific expert input,
- Ongoing adaptive management review dialog between NMFS and the Navy,
- Lessons learned from past and future monitoring of Navy training and testing, and
- Leveraging of research and lessons learned from other Navy-funded science programs.

The Strategic Planning Process will continue to shape the future of the U.S. Navy's Marine Species Monitoring Program and serve as the primary decision-making tool for guiding investments. Information on monitoring projects currently underway in the Atlantic and Pacific oceans, as well as results, reports, and publications, can be accessed through the U.S. Navy's Marine Species Monitoring Program webpage.

5.1.2.2.2 Training and Testing Activity Reports

The Navy developed a classified data repository known as the Sonar Positional Reporting System to maintain an internal record of underwater sound sources (e.g., active sonar) used during training and testing. The Sonar Positional Reporting System facilitates reporting pursuant to the Navy's MMPA Regulations and Letters of Authorization. Using data from the Sonar Positional Reporting System and other relevant sources, the Navy will continue to provide the USFWS and NMFS Office of Protected Resources with classified or unclassified (depending on the data) annual reports on the training and testing activities that use underwater sound sources. In its annual training and testing activity reports, the Navy will describe the level of training and testing conducted during the reporting period. Unclassified annual training and testing activity reports that have been submitted to NMFS can be found on the NMFS Office of Protected Resources and U.S. Navy's Marine Species Monitoring Program webpages.

5.1.2.2.3 Incident Reports

The Navy's mitigation measures and many of its standard operating procedures are designed to prevent incidents involving biological and cultural resources, such as aircraft strikes, vessel strikes, and impacts on submerged historic properties and seafloor resources. The Navy has been collecting data on such incidents (if they have occurred) for more than a decade and will continue doing so under the Proposed Action. To provide information on incidents involving biological or cultural resources, the Navy will submit reports to the appropriate management authorities as described below:

- **Bird Aircraft Strikes:** As described in Section 5.1.3 (Aircraft Safety) of the 2015 NWTT Final EIS/OEIS, bird strikes present an aviation safety risk for aircrews and aircraft. The Navy will report all aircraft strikes of birds per standard operating procedures.

- **Incidents Involving Marine Mammals, Sea Turtles, ESA-Listed Birds, and ESA-Listed Fish:** The Navy will notify the appropriate regulatory agency (e.g., NMFS, USFWS) immediately or as soon as operational security considerations allow if it observes the following that is (or may be) attributable to Navy activities: (1) a vessel strike of a marine mammal or sea turtle during training or testing; (2) a stranded, injured, or dead marine mammal or sea turtle during training or testing; or (3) an injured or dead marine mammal, sea turtle, or ESA-listed bird or fish species during post-explosive event monitoring. The Navy will provide relevant information pertaining to the incident (e.g., vessel speed). Additional details on these incident reporting requirements will be included in the Notification and Reporting Plan, which will be publicly available on the NMFS Office of Protected Resources webpage. The Navy will continue to provide the appropriate personnel with training on marine species incidents and their associated reporting requirements to aid the data collection and reporting processes (see Section 5.3.1, Environmental Awareness and Education). Information on marine mammal strandings is included in the *Marine Mammal Strandings Associated with U.S. Navy Sonar Activities* technical report (U.S. Department of the Navy, 2017c).
- **Cultural Resources:** In the event the Navy impacts a historic property, it will commence consultation with the appropriate Tribal Historic Preservation Officer, or State Historic Preservation Officer in accordance with 36 Code of Federal Regulations section 800.13(b)(3).

5.2 Mitigation Development Process

The Navy, in coordination with the appropriate regulatory agencies, developed its initial suite of mitigation measures for Phase I of environmental planning (2010–2015) and subsequently revised those mitigation measures for the 2015 NWTT Final EIS/OEIS in Phase II (2015–2020). For this Final Supplemental EIS/OEIS (which represents Phase III of environmental planning), the Navy worked collaboratively with the appropriate regulatory agencies to develop and refine its mitigation, which was finalized through the consultation and permitting processes. The mitigation development process involved reanalyzing existing mitigation measures implemented under the 2015 NWTT Final EIS/OEIS and analyzing new mitigation recommendations received from Navy and NMFS scientists, other governmental agencies, American Indian Tribes, the public, and non-governmental organizations during NEPA scoping, the 2019 NWTT Draft Supplemental EIS/OEIS public review, and the consultation and permitting processes. The Navy conducted a detailed review and assessment of each potential mitigation measure individually and then all potential mitigation measures collectively to determine if, as a whole, mitigation will effectively avoid or reduce potential impacts from the Proposed Action and will be practical to implement. The Navy operational community (i.e., leadership from the aviation, surface, subsurface, and special warfare communities; leadership from the research and acquisition community; and training and testing experts), environmental planners, and scientific experts provided input on the effectiveness and practicality of mitigation implementation. Navy Senior Leadership reviewed and approved all mitigation measures included in this Final Supplemental EIS/OEIS.

Mitigation measures that the Navy will implement under the Proposed Action are organized into two categories: procedural mitigation measures and mitigation areas. The sections below provide definitions of mitigation terminology, background information pertinent to the mitigation development process, and information about the mitigation effectiveness and practicality criteria. Section 5.5 (Measures Considered but Eliminated) and Appendix K (Geographic Mitigation Assessment) contain information on measures that did not meet the appropriate balance between being both effective as well as practical to implement, and therefore will not be implemented under the Proposed Action.

5.2.1 Procedural Mitigation Development

Procedural mitigation is mitigation that the Navy will implement whenever and wherever training or testing activities involving applicable acoustic, explosive, and physical disturbance and strike stressors take place within the Study Area. Procedural mitigation generally involves (1) the use of one or more trained Lookouts to observe for specific biological resources within a mitigation zone, (2) requirements for Lookouts to immediately communicate sightings of specific biological resources to the appropriate watch station for information dissemination, and (3) requirements for the watch station to implement mitigation until a pre-activity commencement or during-activity recommencement condition has been met.

Procedural mitigation primarily involves Lookouts observing for marine mammals and sea turtles. For some activities, Lookouts may also be required to observe for additional biological resources, such as ESA-listed seabirds, jellyfish aggregations, or floating vegetation. For example, the Navy implements procedural mitigation for several activities that have the potential to overlap the range of ESA-listed marbled murrelets or short-tailed albatross. In this chapter, the term “floating vegetation” refers specifically to floating concentrations of detached kelp paddies and *Sargassum*. Jellyfish aggregations and floating vegetation can be indicators of potential marine mammal or sea turtle presence because marine mammals and sea turtles have been known to seek shelter in, feed on, or feed among them. For example, young sea turtles have been known to hide from predators and eat the algae associated with floating concentrations of *Sargassum*. The Navy observes for additional biological resources prior to the initial start or during the conduct of certain activities to offer an additional layer of protection for marine mammals and sea turtles. While on watch, Lookouts employ visual search techniques, including a combination of naked-eye scanning and the use of hand-held binoculars or high-powered binoculars mounted on a ship deck, depending on the observation platform. After sunset and prior to sunrise, Lookouts and other Navy watch personnel employ night visual search techniques, which could include the use of night vision devices.

To consider the benefits of procedural mitigation to marine mammals and sea turtles within the MMPA and ESA impact estimates, the Navy conservatively factored mitigation effectiveness into its quantitative analysis process, as described in the technical report titled *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase III Training and Testing* (U.S. Department of the Navy, 2018). The Navy’s quantitative analysis assumes that Lookouts will not be 100 percent effective at detecting all individual marine mammals and sea turtles within the mitigation zones for each activity. This is due to the inherent limitations of observing marine species and because the likelihood of sighting individual animals is largely dependent on observation conditions (e.g., time of day, sea state, mitigation zone size, observation platform) and animal behavior (e.g., the amount of time an animal spends at the surface of the water). This is particularly true for sea turtles, small marine mammals, and marine mammals that display cryptic behaviors (e.g., surfacing to breathe with only a small portion of their body visible from the surface). Throughout Section 5.3 (Procedural Mitigation to be Implemented), discussions about the likelihood that a Lookout would observe a marine mammal or sea turtle pertain specifically to animals that are available to be observed (i.e., on, above, or just below the water’s surface). The benefits of procedural mitigation measures for species that were not included in the quantitative analysis process (e.g., birds, fish) are discussed qualitatively.

Data inputs for assessing and developing procedural mitigation included operational data described in Section 5.2.3 (Practicality of Implementation), the best available science discussed in Chapter 3 (Affected Environment and Environmental Consequences), published literature, data on marine

mammal and sea turtle impact ranges obtained through acoustic modeling, data on bird hearing, marine species monitoring and density data, and the most recent guidance from NMFS and the USFWS. Background information on the data that were used to develop the ranges to effect is provided in Section 3.4 (Marine Mammals), Section 3.5 (Sea Turtles), and Section 3.6 (Birds). Additional activity or stressor-specific details, such as the level of effect to which a procedural mitigation measure is expected to mitigate and if a measure has been modified from the 2015 NWTT Final EIS/OEIS, is provided throughout Section 5.3 (Procedural Mitigation to be Implemented).

5.2.1.1 Lookouts

Lookouts perform similar duties as the standard watch personnel described in Section 5.1.2 (Vessel Safety) of the 2015 NWTT Final EIS/OEIS, such as personnel on the bridge watch team and personnel stationed for man-overboard precautions. Lookouts are designated the responsibility of helping meet the Navy's mitigation requirements by visually observing mitigation zones. The number of Lookouts designated for each training or testing activity is dependent upon the number of personnel involved in the activity (i.e., manning restrictions) and the number and type of assets available (i.e., equipment and space restrictions).

Depending on the activity, a Lookout may be positioned on a ship (i.e., surface ships and surfaced submarines), on a small boat (e.g., a rigid-hull inflatable boat), in an aircraft, on a pier, or on shore. Certain platforms, such as aircraft and small boats, have manning or space restrictions; therefore, the Lookout on these platforms is typically an existing member of the aircraft or boat crew who is responsible for other essential tasks (e.g., a pilot or Naval Flight Officer who is also responsible for navigation). Some platforms are minimally manned and are therefore either physically unable to accommodate more than one Lookout or divert personnel from mission-essential tasks, including safe and secure operation of propulsion, weapons, and damage control systems that ensure safety of the ship and the personnel on board. The number of Lookouts specified for each activity in Section 5.3 (Procedural Mitigation to be Implemented) represents the maximum number of Lookouts that can be designated for those activities without requiring additional personnel or reassigning duties. The "maximum" number of Lookouts is equivalent to the required number of Lookouts; therefore, the Navy would not use fewer Lookouts than what is specified in each mitigation table. The Navy is unable to position Lookouts on unmanned surface vehicles, unmanned aerial systems, unmanned underwater vehicles, and submerged submarines, or have Lookouts observe during activities that use systems deployed from or towed by unmanned platforms, except in limited circumstances when escort vehicles are already participating in the activity.

When Lookouts are positioned in a fixed-wing aircraft or rotary-wing aircraft (i.e., helicopter), mission requirements determine the flight parameters (altitude, flight path, and speed) for that aircraft. For example, most fixed-wing aircraft sorties occur above 3,000 ft., while most rotary-wing sorties associated with mine countermeasure activities occur at altitudes as low as 75–100 ft. Similarly, when Lookouts are positioned on a vessel, mission requirements determine the operational parameters (course and speed) for that vessel.

The Navy's passive acoustic devices (e.g., remote acoustic sensors, expendable sonobuoys, passive acoustic sensors on submarines) can complement visual observations for marine mammals when passive acoustic assets are already participating in an activity. The passive acoustic devices can detect vocalizing marine mammals within the frequency bands already being monitored by Navy personnel. Marine mammal detections from passive acoustic devices can alert Lookouts to possible marine mammal presence in the vicinity. Lookouts can use the information from passive acoustic detections to

assist their visual observations of the mitigation zone. Based on the number and type of passive acoustic devices that are typically used, passive acoustic detections do not provide range or bearing to a detected animal in order to determine its location or confirm its presence in a mitigation zone. Therefore, it is not practical for the Navy to implement mitigation in response to passive acoustic detections alone (i.e., without a visual sighting of an animal within the mitigation zone). Additional information about passive acoustic devices is provided in Section 5.5.3 (Active and Passive Acoustic Monitoring Devices).

5.2.1.2 Mitigation Zones

Mitigation zones are areas at the surface of the water within which applicable training or testing activities will be ceased, powered down, or modified to protect specific biological resources from an auditory injury (permanent threshold shift [PTS]), non-auditory injury (from impulsive sources), or direct strike (e.g., vessel strike) to the maximum extent practicable. Mitigation zones are measured as the radius from a stressor. Implementation of procedural mitigation is most effective when mitigation zones are appropriately sized to be realistically observed during typical training and testing activity conditions.

The Navy customized its mitigation zone sizes and mitigation requirements for each applicable training and testing activity category or stressor. The Navy developed each mitigation zone to be the largest area that (1) Lookouts can reasonably be expected to observe during typical activity conditions (i.e., most environmentally protective); and (2) the Navy can commit to implementing mitigation without impacting safety, sustainability, or the ability to meet mission requirements. The Navy designed the mitigation zones for most acoustic and explosive stressors according to its source bins. As described in Section 3.0.3.1.1 (Sonar and Other Transducers), sonars and other transducers are grouped into classes that share an attribute, such as frequency range or purpose of use. Classes are further sorted by bins based on the frequency or bandwidth, source level, and when warranted, the application in which the source would be used. As described in Section 3.0.3.2.1.1 (Explosions in Water), explosives detonated in water are binned by net explosive weight. Mitigation does not pertain to stressors that do not have the potential to impact biological resources (e.g., *de minimis* acoustic and explosive sources that do not have the potential to impact marine mammals).

Discussions throughout Section 5.3 (Procedural Mitigation to be Implemented) about the level of effect that will likely be mitigated for marine mammals and sea turtles are based on a comparison of the mitigation zone size to the predicted impact ranges for the applicable source bins with the longest average ranges to PTS. These conservative discussions represent the worst-case scenario for each activity category or stressor. The mitigation zones will oftentimes cover all or a larger portion of the predicted average ranges to PTS for other comparatively smaller sources with shorter impact ranges (e.g., sonar sources used at a lower source level, explosives in a smaller bin). The discussions are primarily focused on how the mitigation zone sizes compare to the ranges to PTS; however, depending on the activity category or stressor, the mitigation zones are oftentimes large enough to also mitigate within a portion of the ranges to temporary threshold shift (TTS). TTS is a threshold shift that is recoverable. Background information on PTS, TTS, and marine mammal and sea turtle hearing groups is presented in the U.S. Department of the Navy (2017a) technical report titled *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III)*.

5.2.1.3 Procedural Mitigation Implementation

The Navy takes several courses of action in response to a sighting of an applicable biological resource in a mitigation zone. First, a Lookout will communicate the sighting to the appropriate watch station. Next,

the watch station will implement the prescribed mitigation, such as delaying the initial start of an activity, powering down sonar, ceasing an explosive detonation, or maneuvering a vessel. If floating vegetation is observed in the mitigation zone prior to the initial start of an activity, the activity will either be relocated to an area where floating vegetation is not observed in concentrations, or the initial start of the activity will be delayed until the mitigation zone is clear of floating vegetation concentrations. There are no requirements to cease activities if vegetation floats into the mitigation zone after activities commence. For sightings of marine mammals, sea turtles, and seabirds within a mitigation zone prior to the initial start of or during applicable activities, the Navy will continue mitigating until one of the five conditions listed below has been met. The conditions are designed to allow a sighted animal to leave the mitigation zone before the initial start of an activity or before an activity resumes.

- The animal is observed exiting the mitigation zone;
- The animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the stressor source;
- The mitigation zone has been clear from any additional sightings for a specific wait period;
- For mobile activities, the stressor source has transited or has been relocated a distance equal to double that of the mitigation zone size beyond the location of the last sighting; or
- For activities using hull-mounted sonar, the ship concludes that dolphins are deliberately closing in on the ship to ride the ship's bow wave and are therefore out of the main transmission axis of the sonar (and there are no other marine mammal sightings within the mitigation zone).

To supplement the implementation of procedural mitigation, the Navy has agreed to undertake reporting initiatives for certain activities or resources based on previous consultations with NMFS and the USFWS, as summarized in Section 5.1.2.2 (Monitoring, Research, and Reporting Initiatives) and detailed where applicable in Section 5.3 (Procedural Mitigation to be Implemented).

5.2.2 Mitigation Area Development

Mitigation areas are geographic locations within the Study Area where the Navy will implement mitigation measures to (1) avoid or reduce potential impacts on biological resources located on the seafloor or submerged cultural resources; (2) in combination with procedural mitigation, to effect the least practicable adverse impact on marine mammal species or stocks and their habitat; or (3) in combination with procedural mitigation, 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.

The Navy completed an extensive assessment of the NWTT Study Area to develop mitigation areas for the Proposed Action. The Navy reanalyzed existing mitigation areas implemented under the 2015 NWTT Final EIS/OEIS and assessed habitats suggested through comments received during NEPA scoping and on the 2019 NWTT Draft Supplemental EIS/OEIS, identified by NMFS or the USFWS during the consultation and permitting processes, and identified internally by the Navy. Biological effectiveness and operational assessments of mitigation areas the Navy developed for the Study Area are provided in Appendix K (Geographic Mitigation Assessment). The appendix includes background information and additional details for each of the areas considered. The Navy's mitigation areas are summarized in Section 5.4 (Mitigation Areas to be Implemented).

Mitigation areas are designed to help avoid or reduce potential impacts in key areas of importance. Therefore, mitigation benefits are discussed qualitatively in terms of the context of impact avoidance or reduction. The Navy considers a mitigation area to be effective if it meets the following criteria:

- **The mitigation area is a key area of biological or ecological importance or contains cultural resources:** The best available science suggests that the mitigation area contains submerged cultural resources (e.g., shipwrecks) or is particularly important to one or more species or resources for a biologically important life process (e.g., foraging, migration, reproduction) or ecological function (e.g., live hard bottom that provides critical ecosystem functions); and
- **The mitigation will result in an avoidance or reduction of impacts:** Implementing the mitigation will likely avoid or reduce potential impacts on (1) species, stocks, or populations of marine mammals based on data regarding their seasonality, density, and behavior; or (2) other biological or cultural resources based on their distribution and physical properties. Furthermore, implementing the mitigation will not shift or transfer adverse effects from one species to another (e.g., to a more vulnerable or sensitive species).

5.2.3 Practicality of Implementation

Mitigation measures are expected to have some degree of impact on the training and testing activities that implement them (e.g., modifying where and when activities occur, ceasing an activity in response to a sighting). The Navy is able to accept a certain level of impact on its military readiness activities because of the benefit that mitigation measures provide for avoiding or reducing potential impacts on environmental and cultural resources. The Navy's focus during mitigation assessment and development is that mitigation measures must meet the appropriate balance between being both effective as well as practical to implement. To evaluate practicality, the Navy operational community conducted an extensive and comprehensive assessment to determine how and to what degree potential mitigation measures would be compatible with planning, scheduling, and conducting training and testing activities under the Proposed Action in order to meet the Navy's Title 10 requirements.

5.2.3.1 Assessment Criteria

The purpose and need of the Proposed Action is to ensure that the Navy meets its mission to maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. The Navy is statutorily mandated to protect U.S. national security by being ready, at all times, to effectively prosecute war and defend the nation by conducting operations at sea, as outlined in Title 10 section 8062 of the United States Code. The Navy's mission is achieved in part by conducting training and testing within the Study Area in accordance with established military readiness requirements. Training requirements have been developed through many years of iteration and adaptation and are designed to ensure that Sailors achieve the levels of readiness needed to properly respond to the multitude of contingencies they may face during military missions and combat operations. Activities are planned and scheduled in accordance with the Optimized Fleet Response Plan, which details instructions on manning distribution, range scheduling, operational requirements, maintenance and modernization plans, quality of work and life for personnel, achieving training capabilities, and meeting strategic readiness objectives.

To achieve the highest skill proficiency and most accurate testing results possible, the Navy conducts activities in a variety of realistic tactical oceanographic and environmental conditions. Such conditions include variations in bathymetry, topography, surface fronts, and sea surface temperatures. Training activities must be as realistic as possible to provide the experiences and stressors necessary to successfully execute all required military missions and combat operations. Degraded training would

result in units being unqualified to conduct the range of military operations required by operational Commanders. The inability of such Commanders to meet national security objectives would result in not only the increased risk to life, but also the degradation of national security. Testing activities must be as realistic as possible for the Navy to conduct accurate acoustic research to validate acoustic models; conduct accurate engineering tests of acoustic sources, signal processing algorithms, and acoustic interactions; and to effectively test systems and platforms (and components of these systems and platforms) 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. Testing must be completed before full-scale production or delivery to the fleet to ensure functionality and accuracy in military mission and combat conditions.

As described in Chapter 2 (Description of Proposed Action and Alternatives), the Navy requires access to sea space and airspace throughout the Study Area within pierside locations, nearshore areas, and large-scale open ocean areas of the high seas. Each area plays a critical role in the Navy's ability to plan, schedule, and effectively execute military readiness activities. The locations where training and testing occur must be situated in a way that allows the Navy to complete its activities without physical or logistical obstructions. The Navy requires extensive sea space so that individual training and testing activities can occur at sufficient distances so they do not interfere with one another. Some training and testing activities require continuous access to large and unobstructed areas, consisting potentially of tens or thousands of square miles. This provides 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 military missions and combat operations. For example, some training exercises may require large areas of the littorals, open ocean, and nearshore areas for realistic and safe anti-submarine warfare training. The Navy also requires large areas of sea space because it trains in a manner to avoid observation by potential adversaries. Modern sensing technologies make training on a large scale without observation more difficult. A foreign military's continual observation of U.S. Navy 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. naval 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 military readiness.

The locations for training and testing activities are selected to maximize efficiency while supporting specific mission and safety requirements, deconflict sea space and airspace, and minimize the time personnel must spend away from home. Training and testing locations are typically selected based on their proximity to homeports, home bases, associated training ranges, testing facilities, air squadrons, and existing infrastructure to reduce travel time and associated costs. Activities involving the use of rotary-wing aircraft typically occur in proximity to shore or refueling stations due to fuel restrictions and safety requirements. Testing events are typically located near systems command support facilities, which provide critical infrastructure support and technical expertise necessary to conduct testing. Logistical support of range testing can only efficiently and effectively occur when the support is co-located with the testing activities. These same principles also apply to pierside and at-sea testing that must occur in proximity to naval harbors. Testing event site locations and associated field activities were originally established to support specific Navy mission testing needs using a selection process that included testing requirements, cost of living, availability of personnel, and low level of crowding from industry and development.

During its assessment to determine how and to what degree the implementation of mitigation would be compatible with meeting the purpose and need of the Proposed Action, the Navy considered a mitigation measure to be practical to implement if it met all criteria discussed below:

- **Implementing the mitigation is safe:** Mitigation measures must not increase safety risks to Navy personnel and equipment, or to the public. When assessing whether implementing a mitigation measure would be safe, the Navy factored in the potential for increased pilot fatigue; accelerated fatigue-life of aircraft; typical fuel restrictions of participating aircraft; locations of refueling stations; proximity to aircraft emergency landing fields, critical medical facilities, and search and rescue resources; space restrictions of the observation platforms; the ability to de-conflict platforms and activities to ensure that training and testing activities do not impact each other; and the ability to avoid interaction with non-Navy sea space and airspace uses, such as established commercial air traffic routes, commercial vessel shipping lanes, and areas used for energy exploration or alternative energy development. Other safety considerations included identifying if mitigation measures would reasonably allow Lookouts to safely and effectively maintain situational awareness while observing the mitigation zones during typical activity conditions, or if the mitigation would increase the safety risk for personnel. For example, the safety risk would increase if Lookouts were required to direct their attention away from essential mission requirements.
- **Implementing the mitigation is sustainable:** One of the primary factors that the Navy incorporates into the planning and scheduling of its training and testing activities is the amount and type of available resources, such as funding, personnel, and equipment. Mitigation measures must be sustainable over the life of the Proposed Action, meaning that they will not require the use of resources in excess of what is available. When assessing whether implementing a mitigation measure would be sustainable, the Navy considered if the measure would require excessive time on station or time away from homeport for Navy personnel, require the use of additional personnel (i.e., manpower) or equipment (e.g., adding a small boat to serve as an additional observation platform), or result in additional operational costs (e.g., increased fuel consumption, equipment maintenance, or acquisition of new equipment).
- **Implementing the mitigation allows the Navy to continue meeting its mission requirements:** The Navy considered if each individual measure and the iterative and cumulative impact of all potential measures would be within the Navy's legal authority to implement. The Navy also considered if mitigation would modify training or testing activities in a way that would prevent individual activities from meeting their mission objectives and if mitigation would prevent the Navy from meeting its national security requirements or statutorily-mandated Title 10 requirements, such as by:
 - Impacting training and testing realism or preventing ready access to ranges, operating areas, facilities, or range support structures (which would reduce realism and present sea space and airspace conflicts).
 - Impacting the ability for Sailors to train and become proficient in using sensors and weapon systems as would be required in areas analogous to where the military operates or causing an erosion of capabilities or reduction in perishable skills (which would result in a significant risk to personnel or equipment safety during military missions and combat operations).
 - Impacting the ability for units to meet their individual training and certification requirements (which would impact the ability to deploy with the required level of readiness necessary to accomplish any tasking by Combatant Commanders).

- Impacting the ability to certify forces to deploy to meet national security tasking (which would limit the flexibility of Combatant Commanders and warfighters to project power, engage in multi-national operations, and conduct the full range of naval warfighting capabilities in support of national security interests).
- Impacting the ability of researchers, program managers, and weapons system acquisition programs to conduct accurate acoustic research to meet research objectives, effectively test systems and platforms (and components of these systems and platforms) before full-scale production or delivery to the fleet, or complete shipboard maintenance, repairs, or pierside testing prior to at-sea operations (which would not allow the Navy to ensure safety, functionality, and accuracy in military mission and combat conditions per required acquisition milestones or on an as-needed basis to meet operational requirements).
- Requiring the Navy to provide advance notification of specific times and locations of Navy platforms, such as platforms using active sonar (which would present national security concerns).
- Reducing the Navy's ability to be ready, maintain deployment schedules, or respond to national emergencies or emerging national security challenges (which would present national security concerns).

5.2.3.2 Factors Affecting Practicality

Two of the factors that influenced whether procedural mitigation measures met the practicality criteria were the number of times mitigation measures would likely be implemented and the duration over which the activity would likely be ceased due to mitigation implementation. The number of times mitigation would likely be implemented is largely dependent on the size of the mitigation zone. As a mitigation zone size increases, the area of observation increases by an order of magnitude. This is because mitigation zones are measured as the radius (r) from a stressor but apply to circular area (A) around that stressor ($A = \pi * r^2$, where π is a constant that is approximately equal to 3.14). For example, a 100-yard (yd.) mitigation zone is equivalent to an area of 31,416 square yd. A 200 yd. mitigation zone is equivalent to an area of 125,664 square yd. Therefore, increasing a mitigation zone from 100 yd. to 200 yd. (i.e., doubling the mitigation zone radius) would quadruple the mitigation zone area (the area over which mitigation must be implemented). Similarly, increasing a mitigation zone from 1,000 yd. to 4,000 yd. (i.e., quadrupling the mitigation zone radius) would increase the mitigation zone area by a factor of 16. Increasing the area over which mitigation must be implemented consequently increases the number of times mitigation would likely be implemented during that activity.

The duration over which mitigation is implemented can differ considerably depending on the mitigation zone size, number of animal sightings, behavioral state of animals sighted (e.g., travelling at a fast pace on course to exit the mitigation zone, milling slowly in the center of the mitigation zone), and which pre-activity commencement or during-activity recommencement condition is met before the activity can commence or resume after each sighting. The duration of mitigation implementation typically equates to the amount of time the training or testing activity will be extended. The impact that extending the length of an activity has on safety, sustainability, and the Navy's ability to accomplish the activity's intended objectives varies by activity. This is one reason why the Navy tailors its mitigation zone sizes and mitigation requirements by activity category or stressor and the platforms involved.

As described in Section 5.2.1 (Procedural Mitigation Development), the Navy will mitigate for each applicable sighting and will continue mitigating until one of five conditions has been met. In some instances, such as if an animal dives underwater after a sighting, it may not be possible for a Lookout to

visually verify if the animal has exited the mitigation zone. The Navy cannot delay or cease activities indefinitely for the purpose of mitigation due to impacts on safety, sustainability, and the Navy's ability to continue meeting its mission requirements. To account for this, one of the pre-activity commencement and during-activity recommencement conditions is an established post-sighting wait period of 30 minutes (min.) or 10 min., based on the platforms involved. Wait periods are designed to allow animals the maximum amount of time practical to resurface (i.e., become available to be observed by a Lookout) before activities resume. When developing the length of its wait periods, the Navy factored in the assumption that mitigation may need to be implemented more than once. For example, an activity may need to be delayed or ceased for more than one 30 min. or 10 min. period.

The Navy assigns a 30 min. wait period to activities conducted from vessels and that involve aircraft that are not typically fuel constrained (e.g., maritime patrol aircraft). A 30 min. period covers the average dive times of most marine mammals and a portion of the dive times of sea turtles and deep-diving marine mammals (i.e., sperm whales, dwarf and pygmy sperm whales [Kogia whales], and beaked whales) (U.S. Department of the Navy, 2017b). The Navy determined that a 30 min. wait period is the maximum wait time that is practical to implement during activities involving vessels and aircraft that are not typically fuel constrained to allow the activities to continue meeting their intended objectives. Implementing a longer wait period (such as 45 min. or 60 min. to cover the average dive times of sea turtles and additional marine mammal species) would be impractical to implement. Activities are scheduled to occur at specific locations within specific timeframes based on range scheduling and for sea space deconfliction. Increasing the wait period, and consequently, the amount of time activities would need to be delayed or extended in order to accomplish their intended objectives, would impact activity realism or cause sea space conflicts in a way that could impact the Navy's ability to continue meeting its mission requirements. For example, delaying an explosive activity for multiple wait periods could result in personnel not being able to detonate an explosive before the participating platforms are required to depart the range due to range scheduling; therefore, the activity would not accomplish its intended objectives.

The Navy assigns a 10 min. wait period to activities involving aircraft that are typically fuel constrained (e.g., rotary-wing aircraft, fighter aircraft). A 10 min. period covers a portion, but not the average, dive times of marine mammals and sea turtles (U.S. Department of the Navy, 2017b). The Navy determined that a 10 min. wait period is the maximum wait time that is practical to implement during activities involving aircraft that are typically fuel constrained. Increasing the wait period, and consequently the amount of time the training or testing activity would need to be extended in order to accomplish its intended objective, would require aircraft to depart the activity area to refuel in order to safely complete the event. If the wait period was implemented multiple times, the aircraft would be required to depart the activity area to refuel multiple times. Refueling events would vary in duration, depending on the activity location and proximity to the nearest refueling station. Multiple refueling events would generally be expected to extend the length of the activity by two to five times or more. This would impact activity realism, could cause air space or sea space conflicts in a way that could impact the Navy's ability to continue meeting its mission requirements, would decrease the ability for Lookouts to safely and effectively maintain situational awareness of the activity area, and would increase safety risks due to increased pilot fatigue and accelerated fatigue-life of aircraft. For example, delaying an Anti-Submarine Warfare Tracking Exercise – Helicopter activity for multiple wait periods could result in personnel not being able to effectively search for, detect, classify, localize, and track a simulated threat submarine before the rotary-wing aircraft is required to depart the range due to range scheduling; therefore, the activity would not accomplish its intended objectives.

Factors that influenced whether a mitigation area measure met the practicality criteria included the historical use and projected future use of geographic locations for training and testing activities under the Proposed Action, and the relative importance of each location. The frequency that an area is used for training or testing does not necessarily equate to that area's level of importance for meeting an individual activity objective, or collectively, the Navy's mission requirements. While frequently used areas can be essential to one or more types of military readiness activities, some infrequently used areas are critical for a particular training exercise, testing mission, or research project.

5.3 Procedural Mitigation to be Implemented

The first procedural mitigation measure (Section 5.3.1, Environmental Awareness and Education) is designed to aid Lookouts and other personnel with observation, environmental compliance, and reporting responsibilities. The remaining procedural mitigation measures are organized by stressor type and training or testing activity category.

5.3.1 Environmental Awareness and Education

The Navy will continue to implement procedural mitigation to provide environmental awareness and education to the appropriate personnel to aid visual observation, environmental compliance, and reporting responsibilities, as outlined in Table 5.3-1.

Table 5.3-1: Environmental Awareness and Education

<i>Procedural Mitigation Description</i>
<u>Stressor or Activity</u> <ul style="list-style-type: none"> • All training and testing activities, as applicable
<u>Resource Protection Focus</u> <ul style="list-style-type: none"> • Marine mammals • Sea turtles • Birds
<u>Mitigation Requirements</u> <ul style="list-style-type: none"> • Appropriate personnel (including civilian personnel) involved in mitigation and training or testing activity reporting under the Proposed Action will complete one or more modules of the U.S. Navy Afloat Environmental Compliance Training Series, as identified in their career path training plan. Modules include: <ul style="list-style-type: none"> – Introduction to the U.S. Navy Afloat Environmental Compliance Training Series. The introductory module provides information on environmental laws (e.g., ESA, MMPA) and the corresponding responsibilities that are relevant to Navy training and testing activities. The material explains why environmental compliance is important in supporting the Navy's commitment to environmental stewardship. – Marine Species Awareness Training. All bridge watch personnel, Commanding Officers, Executive Officers, maritime patrol aircraft aircrews, anti-submarine warfare and mine warfare rotary-wing aircrews, Lookouts, and equivalent civilian personnel must successfully complete the Marine Species Awareness Training prior to standing watch or serving as a Lookout. The Marine Species Awareness Training provides information on sighting cues, visual observation tools and techniques, and sighting notification procedures. Navy biologists developed Marine Species Awareness Training to improve the effectiveness of visual observations for biological resources, focusing on marine mammals and sea turtles, and including floating vegetation, jellyfish aggregations, and flocks of seabirds. – U.S. Navy Protective Measures Assessment Protocol. This module provides the necessary instruction for accessing mitigation requirements during the event planning phase using the Protective Measures Assessment Protocol software tool. – U.S. Navy Sonar Positional Reporting System and Marine Mammal Incident Reporting. This module provides instruction on the procedures and activity reporting requirements for the Sonar Positional Reporting System and marine mammal incident reporting.

The Navy requires Lookouts and other personnel to complete their assigned environmental compliance responsibilities (e.g., mitigation, reporting requirements) before, during, and after training and testing activities. Marine Species Awareness Training was first developed in 2007 and has since undergone numerous updates to ensure that the content remains current, with the most recent product approved by NMFS and released by the Navy in 2014. In 2014, the Navy developed a series of educational training modules, known as the Afloat Environmental Compliance Training program, to ensure Navywide compliance with environmental requirements. The Afloat Environmental Compliance Training program, including the updated Marine Species Awareness Training, helps Navy personnel from the most junior Sailors to Commanding Officers gain a better understanding of their personal environmental compliance roles and responsibilities. Additional information on the Protective Measures Assessment Protocol is provided in Section 5.1.2.1 (Protective Measures Assessment Protocol), and additional information on training and testing activity and incident reports is provided in Section 5.1.2.2 (Monitoring, Research, and Reporting Initiatives).

From an operational perspective, the interactive web-based format of the U.S. Navy Afloat Environmental Compliance Training Series is ideal for providing engaging and educational content that is cost effective and convenient to access by personnel who oftentimes face rotating job assignments. The U.S. Navy Afloat Environmental Compliance Training Series has resulted in an improvement in the quality and accuracy of training and testing activity reports, incident reports, and Sonar Positional Reporting System reports submitted by Navy operators. Improved reporting quality indicates that the U.S. Navy Afloat Environmental Compliance Training Series is helping to facilitate Navywide environmental compliance as intended.

Lookouts and members of the operational community have demonstrated enhanced knowledge and understanding of the Navy's environmental compliance responsibilities since the development of the U.S. Navy Afloat Environmental Compliance Training Series. For example, it is likely that the implementation of the Marine Species Awareness Training starting in 2007, and the additional U.S. Navy Afloat Environmental Compliance Training Series modules starting in 2014, potentially helped contribute to a Navy-wide reduction in vessel strikes of marine mammals in areas where the Navy trains and tests. This indicates that the environmental awareness and education program is helping to improve the effectiveness of mitigation implementation. A more detailed analysis of vessel strikes is presented in Section 3.4.2.4 (Impacts from Physical Disturbance and Strike) of this Final Supplemental EIS/OEIS.

5.3.2 Acoustic Stressors

The Navy will implement procedural mitigation to avoid or reduce potential impacts on biological resources from the acoustic stressors or activities discussed in the sections below. In addition to procedural mitigation, the Navy will implement mitigation for acoustic stressors within mitigation areas, such as requirements to prohibit or limit certain activities in certain locations. Mitigation area requirements for acoustic stressors are detailed in Appendix K (Geographic Mitigation Assessment).

5.3.2.1 Active Sonar

The Navy will continue to implement procedural mitigation to avoid or reduce potential impacts on marine mammals and sea turtles from active sonar, as outlined in Table 5.3-2. In the 2015 NWTT Final EIS/OEIS, the Navy's active sonar mitigation zones were based on associated average ranges to PTS. When developing the mitigation for this Final Supplemental EIS/OEIS, the Navy analyzed the potential for increasing the sizes of these mitigation zones. The Navy determined that the current mitigation

zones for active sonar are the largest areas within which it is practical to implement mitigation; therefore, it will continue implementing these same mitigation zones under the Proposed Action.

The Navy is clarifying in the table that the mitigation zone for low-frequency active sonar sources at 200 dB will be the same as the mitigation implemented for hull-mounted mid-frequency active sonar; whereas low-frequency active sonar sources below 200 dB will implement the same mitigation zone as high-frequency active sonar and mid-frequency active sonar sources that are not hull-mounted. The Navy is also clarifying that it will require observation of the mitigation zone prior to the initial start of the activity to ensure the area is clear of applicable biological resources. The Navy has always verified that the mitigation zone is visually clear prior to conducting active sonar activities and is more clearly capturing this current practice in the mitigation measures for this activity. The Navy will follow the incident reporting procedures outlined in Section 5.1.2.2.3 (Incident Reports) if an incident is detected at any time during the event.

Table 5.3-2: Procedural Mitigation for Active Sonar

<i>Procedural Mitigation Description</i>
<p><u>Stressor or Activity</u></p> <ul style="list-style-type: none"> • Low-frequency active sonar, mid-frequency active sonar, high-frequency active sonar <ul style="list-style-type: none"> – For vessel-based active sonar activities, mitigation applies only to sources that are positively controlled and deployed from manned surface vessels (e.g., sonar sources towed from manned surface platforms). – For aircraft-based active sonar activities, mitigation applies only to sources that are positively controlled and deployed from manned aircraft that do not operate at high altitudes (e.g., rotary-wing aircraft). Mitigation does not apply to active sonar sources deployed from unmanned aerial systems or aircraft operating at high altitudes (e.g., maritime patrol aircraft).
<p><u>Resource Protection Focus</u></p> <ul style="list-style-type: none"> • Marine mammals • Sea turtles (only for sources < 2 kilohertz [kHz])
<p><u>Number of Lookouts and Observation Platform</u></p> <ul style="list-style-type: none"> • Hull-mounted sources: <ul style="list-style-type: none"> – 1 Lookout: Platforms with space or manning restrictions while underway (at the forward part of a small boat or ship) and platforms using active sonar while moored or at anchor (including pierside) – 2 Lookouts: Platforms without space or manning restrictions while underway (at the forward part of the ship) • Sources that are not hull-mounted: <ul style="list-style-type: none"> – 1 Lookout on the ship or aircraft conducting the activity
<p><u>Mitigation Requirements</u></p> <ul style="list-style-type: none"> • Mitigation zones: <ul style="list-style-type: none"> – 1,000 yd. power down, 500 yd. power down, and 200 yd. or 100 yd. shut down for low-frequency active sonar at 200 decibels (dB) and hull-mounted mid-frequency active sonar – 200 yd. or 100 yd. shut down for low-frequency active sonar < 200 dB, mid-frequency active sonar sources that are not hull-mounted, and high-frequency active sonar • Prior to the initial start of the activity (e.g., when maneuvering on station): <ul style="list-style-type: none"> – Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. – Observe the mitigation zone for marine mammals and sea turtles; if observed, relocate or delay the start of active sonar transmission.

Table 5.3-2: Procedural Mitigation for Active Sonar (continued)

<i>Procedural Mitigation Description</i>
<ul style="list-style-type: none"> • During the activity: <ul style="list-style-type: none"> – Low-frequency active sonar at 200 dB and hull-mounted mid-frequency active sonar: Observe the mitigation zone for marine mammals and sea turtles (for sources < 2 kHz); power down active sonar transmission by 6 dB if a marine mammal or sea turtle is observed within 1,000 yd. of the sonar source; power down an additional 4 dB (10 dB total) if a marine mammal or sea turtle is observed within 500 yd.; cease transmission if a cetacean or sea turtle is observed within 200 yd.; cease transmission if a pinniped in the NWTT Offshore Area or Western Behm Canal is observed within 200 yd.; cease transmission if a pinniped in NWTT Inland Waters is observed within 100 yd. (except if hauled out on, or in the water near, man-made structures and vessels). – Low-frequency active sonar < 200 dB, mid-frequency active sonar sources that are not hull-mounted, and high-frequency active sonar: Observe the mitigation zone for marine mammals and sea turtles (for sources < 2 kHz); cease transmission if a cetacean, sea turtle, or pinniped in the NWTT Offshore Area or Western Behm Canal is observed within 200 yd. of the sonar source; cease transmission if a pinniped in NWTT Inland Waters is observed within 100 yd. (except if hauled out on, or in the water near, man-made structures and vessels). • Commencement/recommencement conditions after a marine mammal or sea turtle sighting before or during the activity: <ul style="list-style-type: none"> – The Navy will allow a sighted marine mammal or sea turtle to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing or powering up active sonar transmission) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the sonar source; (3) the mitigation zone has been clear from any additional sightings for 10 min. for aircraft-deployed sonar sources or 30 min. for vessel-deployed sonar sources; (4) for mobile activities, the active sonar source has transited a distance equal to double that of the mitigation zone size beyond the location of the last sighting; or (5) for activities using hull-mounted sonar, the Lookout concludes that dolphins are deliberately closing in on the ship to ride the ship's bow wave, and are therefore out of the main transmission axis of the sonar (and there are no other marine mammal sightings within the mitigation zone).

The mitigation zone sizes and proximity to the observation platforms will result in a high likelihood that Lookouts will be able to detect marine mammals and sea turtles throughout the mitigation zones. Naval Sea Systems Command testing ranges and the designated pierside maintenance and testing locations in NWTT Inland Waters offer a controlled static environment, which increases the likelihood that any Southern Resident killer whales, gray whales, and other marine mammal species would be observed by Navy Lookouts prior to the start of an activity using active sonar. Observing for indicators of marine mammal and sea turtle presence will further help avoid or reduce potential impacts on these resources within the mitigation zones. Pinnipeds use Navy structures (e.g., submarines, security barriers) as haul-outs at several locations within NWTT Inland Waters, despite these areas being heavily trafficked for the past several decades. Because these animals are present in NWTT Inland Waters consistently throughout the year, the Navy would be unable to avoid them entirely unless they were physically removed from the water or haul-out locations. Efforts to remove or relocate pinnipeds away from Navy activities in NWTT Inland Waters would likely result in higher animal stress levels or behavioral disturbances and would present logistical constraints due to the number of animals that are typically present in these locations at any given time. For this reason, the Navy implements a smaller active sonar shut down mitigation zone for pinnipeds observed in NWTT Inland Waters than for other marine mammals and pinnipeds observed in the NWTT Offshore Area or Western Behm Canal.

Section 3.4.2.1.2 (Impacts from Sonar and Other Transducers) of this Final Supplemental EIS/OEIS provides a full analysis of the potential impacts of sonar on marine mammals and includes the impact ranges for various source bins. For low-frequency active sonar at 200 dB and hull-mounted mid-frequency active sonar, bin MF1 has the longest predicted ranges to PTS. For the highest source level in bin MF1, the 1,000 yd. and 500 yd. power down mitigation zones extend beyond the average ranges to PTS for marine mammals. The 200 yd. shut down mitigation zone extends beyond the average ranges to PTS for low-frequency cetaceans, mid-frequency cetaceans, otariids, and phocids, and into a portion of the average range to PTS for high-frequency cetaceans. The ranges to PTS for the 200 yd. shut down mitigation zone were calculated based on full power transmissions and do not consider that the impact ranges would be reduced if the 1,000 yd. and 500 yd. power down mitigation measures are implemented in response to a marine mammal sighting in those mitigation zones. If an animal is first sighted in the 1,000 yd. or 500 yd. power down mitigation zone, the source level reduction would shorten the ranges to PTS, and the 200 yd. shut down mitigation would then extend beyond the average ranges to PTS for all marine mammal hearing groups. The 100 yd. shut down mitigation zone applicable only to pinnipeds observed in NWTT Inland Waters extends beyond the average ranges to PTS for otariids and phocids.

For low-frequency active sonar below 200 dB, mid-frequency active sonar sources that are not hull-mounted, and high-frequency active sonar, bin HF4 has the longest predicted ranges to PTS. For the highest source level in bin HF4, the 200 yd. shut down mitigation zone extends beyond the average ranges to PTS for marine mammals. The 100 yd. shut down mitigation zone applicable only to pinnipeds observed in NWTT Inland Waters extends beyond the average ranges to PTS for otariids and phocids. In summary, the mitigation zones for active sonar will help avoid or reduce the potential for exposure to PTS for marine mammals.

The active sonar mitigation zones also extend into a portion of the average ranges to TTS for marine mammals; therefore, mitigation will help avoid or reduce the potential for some exposure to higher levels of TTS. Active sonar sources that fall within lower source bins or are used at lower source levels have shorter impact ranges than those discussed above; therefore, the mitigation zones will extend further beyond or into the average ranges to PTS and TTS for these sources. The analysis in Section 3.4.2.1.2 (Impacts from Sonar and Other Transducers) of this Final Supplemental EIS/OEIS indicates that pygmy and dwarf sperm whales (*Kogia* whales) are the only deep-diving marine mammal species that could potentially experience PTS impacts from active sonar in the Study Area. The 30 min. wait period for vessel-deployed sources will cover the average dive times of marine mammal species that could experience PTS from sonar in the mitigation zone, except for *Kogia* whales. The 10 min. wait period for aircraft-deployed sources will cover a portion, but not the average, dive times of marine mammals.

Section 3.5.2.1.2 (Impacts from Sonar and Other Transducers) provides a full analysis of the potential impacts of sonar on sea turtles. Due to sea turtle hearing capabilities, the mitigation only applies to sea turtles during the use of sources below 2 kHz. The range to auditory effects for most active sonar sources in sea turtle hearing range (e.g., LF4) is zero meters. Impact ranges are longer (i.e., up to tens of meters) for active sonars with higher source levels. The mitigation zones for active sonar extend beyond the ranges to PTS and TTS for sea turtles; therefore, mitigation will help avoid or reduce the potential for exposure to these effects for sea turtles.

The Navy currently uses, and will continue to use, computer simulation to augment training and testing whenever possible. As discussed in Section 1.4.1 (Why the Navy Trains), simulators and synthetic training are critical elements that provide early skill repetition and enhance teamwork; however, they

cannot replicate the complexity and stresses faced by Sailors during military missions and combat operations to which the Navy trains under the Proposed Action (e.g., anti-submarine warfare training using hull-mounted mid-frequency active sonar). As described previously, the mitigation zones developed for this Final Supplemental EIS/OEIS are based on the largest areas within which it is practical for the Navy to implement mitigation during training and testing within the Study Area. Training and testing with active sonar are essential to national security. Active sonar is the only reliable technology for detecting and tracking potential enemy diesel-electric submarines. For example, small diesel-electric submarines operate quietly and may hide in shallow coastal and littoral waters. The ability to effectively operate active sonar is a highly perishable skill that must be repeatedly practiced during realistic training. Naval forces must train in the same mode and manner in which they conduct military missions and combat operations. 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 or more 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 or reduce 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.

Increasing the mitigation zone sizes would result in a larger area over which active sonar would need to be powered down or shut down in response to a sighting, and therefore would likely increase the number of times that these mitigation measures would be implemented. This would extend the length of the activity, significantly diminish event realism, and prevent activities from meeting their intended objectives. It would also create fundamental differences between how active sonar would be used in training and how active sonar should be used during military missions and combat operations. For example, additional active sonar power downs or shut downs would prevent sonar operators from developing and maintaining awareness of the tactical picture during training events. Without realistic training in conditions analogous to military missions and combat operations, sonar operators cannot become proficient in effectively operating active sonar. Sonar operators, vessel crews, and aircrews would be expected to operate active sonar during military missions and combat operations in a manner inconsistent with how they were trained.

During integrated training, multiple vessels and aircraft may participate in an exercise using different warfare components simultaneously. Degrading the value of one training element results in a degradation of the training value of the other training elements. Degrading the value of training would cause a reduction in perishable skills and diminished operational capability, which would significantly impact military readiness. Each of these factors would ultimately impact the ability for units to meet their individual training and certification requirements and the Navy’s ability to certify forces to safely deploy to meet national security tasking. Diminishing proficiency or eroding active sonar capabilities would present a significant risk to personnel safety during military missions and combat operations and would impact the ability to deploy with the required level of readiness necessary to accomplish any tasking by Combatant Commanders.

Increasing the number of times that the Navy must power down or shut down active sonar transmissions during testing activities would result in similar consequences to activity realism. For

example, at-sea sonar testing activities are required in order to calibrate or document the functionality of sonar and torpedo systems while a ship or submarine is in an open ocean environment. Additional powering down or shutting down active sonar transmissions would prevent this activity from meeting its intended objective, such as verifying if the ship meets design acoustic specifications. These types of impacts would impede the ability of researchers, program managers, and weapons system acquisition programs to meet research objectives and testing requirements per required acquisition milestones or on an as-needed basis to meet operational requirements, and would impede shipboard maintenance, repairs, or pierside testing prior to at-sea operations.

For activities that involve aircraft (e.g., activities involving rotary-wing aircraft that use dipping sonar or sonobuoys to locate submarines or submarine targets), extending the length of the activity would require aircraft to depart the area to refuel. If multiple refueling events were required, the length of the activity would be extended by two to five times or more, which would decrease the ability for Lookouts to safely and effectively maintain situational awareness of the activity area and increase safety risks due to increased pilot fatigue and accelerated fatigue-life of aircraft. Extending the length of the activity would also result in additional operational costs due to increased fuel consumption. Increasing the mitigation zone sizes would not result in a substantial reduction of injurious impacts because, as described above, the mitigation zones extend beyond the average ranges to PTS for sea turtles and marine mammals.

In summary, the operational community determined that implementing procedural mitigation for active sonar beyond what is detailed in Table 5.3-2 would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements.

5.3.2.2 Weapons Firing Noise

The Navy will continue to implement procedural mitigation to avoid or reduce potential impacts on marine mammals, sea turtles, and seabirds from weapons firing noise, as outlined in Table 5.3-3. In the 2015 NWTT Final EIS/OEIS, the weapons firing noise mitigation zone was based on the associated average ranges to PTS. When developing the mitigation for this Final Supplemental EIS/OEIS, the Navy analyzed the potential for increasing the size of the mitigation zone. The Navy determined that the current mitigation zone is the largest area within which it is practical to implement mitigation for this activity; therefore, it will continue implementing the same mitigation zone size under the Proposed Action. The Navy is clarifying in the table that it will require observation of the mitigation zone prior to the initial start of the activity to ensure the area is clear of applicable biological resources. The Navy has always verified that the mitigation zone is visually clear prior to conducting weapons firing activities and is more clearly capturing this current practice in the mitigation measures for this activity. The Navy will follow the incident reporting procedures outlined in Section 5.1.2.2.3 (Incident Reports) if an incident is detected at any time during the event.

The small mitigation zone size and proximity to the observation platform will result in a high likelihood that Lookouts will be able to detect marine mammals, sea turtles, and seabirds throughout the mitigation zone. Section 3.6.2.1.5 (Impacts from Weapons Noise) provides a full analysis of the potential impacts of weapon noise on birds. Due to the difficulty of differentiating bird species, the Navy will implement mitigation for all seabird species for weapon noise during large-caliber weapons firing. Although there is a low likelihood that marbled murrelets and short-tailed albatross will occur in locations where the Navy conducts large-caliber gunnery activities, the mitigation will help the Navy further avoid or reduce potential impacts (e.g., startle response) on these ESA-listed bird species and other seabird species that occur offshore.

Table 5.3-3: Procedural Mitigation for Weapons Firing Noise

<i>Procedural Mitigation Description</i>
<u>Stressor or Activity</u> <ul style="list-style-type: none"> Weapons firing noise associated with large-caliber gunnery activities
<u>Resource Protection Focus</u> <ul style="list-style-type: none"> Marine mammals Sea turtles Seabirds (marbled murrelet and short-tailed albatross)
<u>Number of Lookouts and Observation Platform</u> <ul style="list-style-type: none"> 1 Lookout positioned on the ship conducting the firing <ul style="list-style-type: none"> Depending on the activity, the Lookout could be the same one described in Section 5.3.3.3 (Explosive Medium-Caliber and Large-Caliber Projectiles) or Section 5.3.4.3 (Small-, Medium-, and Large-Caliber Non-Explosive Practice Munitions)
<u>Mitigation Requirements</u> <ul style="list-style-type: none"> Mitigation zone: <ul style="list-style-type: none"> 30° on either side of the firing line out to 70 yd. from the muzzle of the weapon being fired Prior to the initial start of the activity: <ul style="list-style-type: none"> Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. Observe the mitigation zone for marine mammals, sea turtles, and seabirds; if observed, relocate or delay the start of weapons firing. During the activity: <ul style="list-style-type: none"> Observe the mitigation zone for marine mammals, sea turtles, and seabirds; if observed, cease weapons firing. Commencement/recommencement conditions after a marine mammal, sea turtle, or seabird sighting before or during the activity: <ul style="list-style-type: none"> The Navy will allow a sighted marine mammal, sea turtle, or seabird to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing weapons firing) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the firing ship; (3) the mitigation zone has been clear from any additional sightings for 30 min.; or (4) for mobile activities, the firing ship has transited a distance equal to double that of the mitigation zone size beyond the location of the last sighting.

Section 3.4.2.1.5 (Impacts from Weapon Noise) and Section 3.5.2.1.5 (Impacts from Weapon Noise) of this Final Supplemental EIS/OEIS provide an analysis of the potential impacts of weapon noise on marine mammals and sea turtles, respectively. As described in Section 3.0.5.3.1.3 (Weapons Firing, Launch, and Impact Noise) of the 2015 NWT Final EIS/OEIS, underwater sounds from large-caliber weapons firing activities would be strongest just below the surface and directly under the firing point. Any sound that enters the water only does so within a narrow cone below the firing point or path of the projectile. The mitigation zone extends beyond the distance to which marine mammals and sea turtles would likely experience PTS or TTS from weapons firing noise; therefore, mitigation will help avoid or reduce the potential for exposure to these impacts. Observing for indicators of marine mammal and sea turtle presence will further help avoid or reduce impacts on these resources within the mitigation zone.

As described previously, the mitigation zone developed for this Final Supplemental EIS/OEIS is based on the largest area within which it is practical for the Navy to implement mitigation for this activity. Increasing the mitigation zone would result in a larger area over which weapons firing would need to be ceased in response to a sighting, and therefore would likely increase the number of times weapons firing

would be ceased. However, increasing the mitigation zone size would not result in a substantial reduction of injurious impacts because the mitigation zone extends beyond the average ranges to PTS for sea turtles and marine mammals.

Large-caliber gunnery training activities may involve a single ship firing or may be conducted as part of a larger exercise involving multiple ships. Surface ship crews learn to track targets (e.g., with radar), engage targets, practice defensive marksmanship, and coordinate their efforts within the context of larger activities. Increasing the number of times that the Navy must cease weapons firing during training would decrease realism and impact the ability for Navy Sailors to train and become proficient in using large-caliber guns as required during military missions and combat operations. For example, additional ceasing of the activity would reduce the crew's ability to react to changes in the tactical situation or respond to an incoming threat, which could result in a delay to the ship's training schedule. When training is undertaken in the context of a coordinated exercise involving multiple ships, degrading the value of one of the training elements results in a degradation of the training value of the other training elements. These factors would ultimately impact the ability for units to meet their individual training and certification requirements, and the Navy's ability to certify forces to deploy to meet national security tasking.

In summary, the operational community determined that implementing procedural mitigation for weapons firing noise beyond what is detailed in Table 5.3-3 would be incompatible with the practicality assessment criteria for safety and mission requirements.

5.3.3 Explosive Stressors

The Navy will implement procedural mitigation to avoid or reduce potential impacts on biological resources from the explosives discussed in the sections below. Section 3.4.2.2 (Explosive Stressors), Section 3.5.2.2 (Explosive Stressors), and Section 3.6.2.2 (Explosive Stressors) provide a full analysis of the potential impacts of explosives on marine mammals, sea turtles, and birds, respectively, including predicted impact ranges. In addition to procedural mitigation, the Navy will implement mitigation for explosives within mitigation areas, such as requirements to prohibit or limit certain activities in certain locations (e.g., within a specified distance from shore). Mitigation area requirements for explosives are detailed in Appendix K (Geographic Mitigation Assessment).

5.3.3.1 Explosive Sonobuoys

The Navy will continue to implement procedural mitigation to avoid or reduce potential impacts on marine mammals and sea turtles from explosive sonobuoys, as outlined in Table 5.3-4. In the 2015 NWTT Final EIS/OEIS, explosive sonobuoys had two mitigation zone sizes based on net explosive weight and the associated average ranges to PTS. When developing mitigation for this Final Supplemental EIS/OEIS, the Navy analyzed the potential for increasing the size of these mitigation zones. The Navy identified an opportunity to increase the mitigation zone size by 250 yd. for sonobuoys using up to 2.5 lb. net explosive weight so that explosive sonobuoys will implement a 600 yd. mitigation zone, regardless of net explosive weight, to enhance protections to the maximum extent practicable. This increase is reflected in Table 5.3-4. The mitigation zone for explosive sonobuoys is now based on the largest area within which it is practical to implement mitigation.

Table 5.3-4: Procedural Mitigation for Explosive Sonobuoys

<i>Procedural Mitigation Description</i>
<u>Stressor or Activity</u> <ul style="list-style-type: none"> Explosive sonobuoys
<u>Resource Protection Focus</u> <ul style="list-style-type: none"> Marine mammals Sea turtles
<u>Number of Lookouts and Observation Platform</u> <ul style="list-style-type: none"> 1 Lookout positioned in an aircraft or on a small boat If additional platforms are participating in the activity, personnel positioned in those assets (e.g., safety observers, evaluators) will support observing the mitigation zone for applicable biological resources while performing their regular duties.
<u>Mitigation Requirements</u> <ul style="list-style-type: none"> Mitigation zone: <ul style="list-style-type: none"> 600 yd. around an explosive sonobuoy Prior to the initial start of the activity (e.g., during deployment of a sonobuoy field, which typically lasts 20–30 min.): <ul style="list-style-type: none"> Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. Conduct passive acoustic monitoring for marine mammals; use information from detections to assist visual observations. Visually observe the mitigation zone for marine mammals and sea turtles; if observed, relocate or delay the start of sonobuoy or source/receiver pair detonations. During the activity: <ul style="list-style-type: none"> Observe the mitigation zone for marine mammals and sea turtles; if observed, cease sonobuoy or source/receiver pair detonations. Commencement/recommencement conditions after a marine mammal or sea turtle sighting before or during the activity: <ul style="list-style-type: none"> The Navy will allow a sighted marine mammal or sea turtle to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing detonations) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the sonobuoy; or (3) the mitigation zone has been clear from any additional sightings for 10 min. when the activity involves aircraft that have fuel constraints, or 30 min. when the activity involves aircraft that are not typically fuel constrained. After completion of the activity (e.g., prior to maneuvering off station): <ul style="list-style-type: none"> When practical (e.g., when platforms are not constrained by fuel restrictions or mission-essential follow-on commitments), observe the vicinity of where detonations occurred; if any injured or dead marine mammals or ESA-listed species are observed, follow established incident reporting procedures. If additional platforms are supporting this activity (e.g., providing range clearance), these assets will assist in the visual observation of the area where detonations occurred.

The Navy is clarifying in the table that it will require observation of the mitigation zone prior to the initial start of the activity to ensure the area is clear of applicable biological resources. The Navy has always verified that the mitigation zone is visually clear prior to conducting explosive activities and is more clearly capturing this current practice in the mitigation measures for this activity. The Navy developed a new mitigation measure requiring the Lookout to observe the mitigation zone after completion of the activity. In accordance with the 2015 NWTT Final EIS/OEIS consultation requirements, the Navy currently conducts post-activity observations for some, but not all explosive activities. When developing mitigation for this Final Supplemental EIS/OEIS, the Navy determined that it could expand this

requirement to other explosive activities for enhanced consistency and to help determine if any resources were injured during explosive events, when practical. The Navy is adding a requirement that additional platforms already participating in the activity will support observing the mitigation zone before, during, and after the activity while performing their regular duties. There are typically multiple platforms in the vicinity of activities that use explosive sonobuoys (e.g., safety aircraft). When available, having additional personnel support observations of the mitigation zone will help increase the likelihood of detecting biological resources. The Navy will follow the incident reporting procedures outlined in Section 5.1.2.2.3 (Incident Reports) if an incident is detected at any time during the event, including during the post-activity observations.

Some activities that use explosive sonobuoys involve detonations of a single sonobuoy or sonobuoy pair, while other activities involve deployment of a field of sonobuoys that may be dispersed over a large distance. Lookouts will have a better likelihood of detecting marine mammals and sea turtles when observing the mitigation zone around a single sonobuoy, sonobuoy pair, or a smaller sonobuoy field than when observing a sonobuoy field dispersed over a large distance. When observing large sonobuoy fields, Lookouts will be more likely to detect large visual cues (e.g., whale blows or large pods of dolphins) than individual marine mammals, cryptic marine mammal species, and sea turtles. Observing for indicators of marine mammal and sea turtle presence will further help avoid or reduce potential impacts on these resources within the mitigation zones.

Bin E3 has the longest predicted impact ranges for explosive sonobuoys used in the Study Area (e.g., MK-61 SUS sonobuoys). For the largest explosive in bin E3, the mitigation zone extends beyond the ranges to 50 percent non-auditory injury and 50 percent mortality for sea turtles and marine mammals. The mitigation zone extends beyond the average ranges to PTS for sea turtles, mid-frequency cetaceans, and otariids, into a portion of the average ranges to PTS for high-frequency cetaceans, low-frequency cetaceans, and phocids. The mitigation zone also extends beyond or into a portion of the average ranges to TTS for sea turtles and marine mammals. Therefore, depending on the species, mitigation will help avoid or reduce all or a portion of the potential for exposure to mortality, non-auditory injury, PTS, and higher levels of TTS for the largest explosives in bin E3. Smaller explosives in bin E3 and explosives in smaller source bins (E1) have shorter predicted impact ranges; therefore, the mitigation zone will extend further beyond or cover a greater portion of the impact ranges for these explosives.

As described previously, the mitigation zone developed for this Final Supplemental EIS/OEIS is based on the largest area within which it is practical for the Navy to implement mitigation. It is not practical to increase the mitigation zone because observations within the margin of increase would be ineffective unless the Navy allocated additional platforms to observe for biological resources. This is particularly true when observations occur from a small boat or during observations of a large field of sonobuoys. The use of additional personnel and equipment (aircraft or small boats) would be unsustainable due to increased operational costs and an exceedance of the available manpower and resources for this activity. Adding aircraft to observe the mitigation zone could result in airspace conflicts with the event participants. This would either require the aircraft conducting the activity to modify their flight plans (which would reduce activity realism) or force the observing aircraft to position itself a safe distance away from the activity area (which would decrease observation effectiveness). Adding vessels to observe the mitigation zone would increase safety risks due to the presence of observation vessels within the vicinity of explosive sonobuoys or an explosive sonobuoy field.

Increasing the mitigation zone size would result in a larger area over which detonations would need to be ceased in response to a sighting, and therefore would likely increase the number of times

detonations would be ceased and would extend the length of the activity. These impacts would significantly diminish event realism in a way that would prevent the activity from meeting its intended objectives. For example, during Anti-Submarine Warfare Tracking Test—Maritime Patrol Aircraft (SUS) events, additional ceasing of the activity would not allow the Navy to effectively test sensors and systems that are used to detect and track submarines and ensure that systems perform to specifications and meet operational requirements. Such testing is required to ensure functionality and accuracy in military mission and combat conditions. Extending the length of the activity would require aircraft to depart the area to refuel. If multiple refueling events were required, the activity length would extend by two to five times or more, which would decrease the ability for Lookouts to safely and effectively maintain situational awareness of the activity area and increase safety risks due to increased pilot fatigue and accelerated fatigue-life of aircraft. Extending the length of the activity would also result in additional operational costs due to increased fuel consumption.

In summary, the operational community determined that implementing procedural mitigation for explosive sonobuoys beyond what is detailed in Table 5.3-4 would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements.

5.3.3.2 Explosive Torpedoes

The Navy will continue to implement procedural mitigation to avoid or reduce potential impacts on marine mammals and sea turtles from explosive torpedoes, as outlined in Table 5.3-5. In the 2015 NWTT Final EIS/OEIS, the explosive torpedo mitigation zone was based on net explosive weight and the associated average ranges to PTS. When developing the mitigation for this Final Supplemental EIS/OEIS, the Navy analyzed the potential for increasing the size of this mitigation zone. The Navy determined that the current mitigation zone is the largest area within which it is practical to implement mitigation for this activity; therefore, it will continue implementing this same mitigation zone under the Proposed Action.

The post-activity observations for explosive torpedoes are a continuation from the 2015 NWTT Final EIS/OEIS and will help the Navy determine if any resources were injured during the activity. The Navy will follow the incident reporting procedures outlined in Section 5.1.2.2.3 (Incident Reports) if an incident is detected at any time during the event, including during the post-activity observations. The Navy is clarifying in the table that it will require observation of the mitigation zone prior to the initial start of the activity to ensure the area is clear of applicable biological resources. The Navy has always verified that the mitigation zone is visually clear prior to conducting explosive activities and is more clearly capturing this current practice in the mitigation measures for this activity. The Navy is adding a requirement that additional platforms already participating in the activity will support observing the mitigation zone before, during, and after the activity while performing their regular duties. Typically, when aircraft are firing explosive torpedoes, there are additional observation aircraft, support vessels (e.g., range craft for torpedo retrieval), or other safety aircraft in the vicinity. When available, having additional personnel support observations of the mitigation zone will help increase the likelihood of detecting biological resources.

Table 5.3-5: Procedural Mitigation for Explosive Torpedoes

<i>Procedural Mitigation Description</i>
<u>Stressor or Activity</u> <ul style="list-style-type: none"> Explosive torpedoes
<u>Resource Protection Focus</u> <ul style="list-style-type: none"> Marine mammals Sea turtles
<u>Number of Lookouts and Observation Platform</u> <ul style="list-style-type: none"> 1 Lookout positioned in an aircraft If additional platforms are participating in the activity, personnel positioned in those assets (e.g., safety observers, evaluators) will support observing the mitigation zone for applicable biological resources while performing their regular duties.
<u>Mitigation Requirements</u> <ul style="list-style-type: none"> Mitigation zone: <ul style="list-style-type: none"> 2,100 yd. around the intended impact location Prior to the initial start of the activity (e.g., during deployment of the target): <ul style="list-style-type: none"> Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. Conduct passive acoustic monitoring for marine mammals; use information from detections to assist visual observations. Visually observe the mitigation zone for marine mammals, sea turtles, and jellyfish aggregations; if observed, relocate or delay the start of firing. During the activity: <ul style="list-style-type: none"> Observe the mitigation zone for marine mammals, sea turtles, and jellyfish aggregations; if observed, cease firing. Commencement/recommencement conditions after a marine mammal or sea turtle sighting before or during the activity: <ul style="list-style-type: none"> The Navy will allow a sighted marine mammal or sea turtle to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing firing) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the intended impact location; or (3) the mitigation zone has been clear from any additional sightings for 10 min. when the activity involves aircraft that have fuel constraints, or 30 min. when the activity involves aircraft that are not typically fuel constrained. After completion of the activity (e.g., prior to maneuvering off station): <ul style="list-style-type: none"> When practical (e.g., when platforms are not constrained by fuel restrictions or mission-essential follow-on commitments), observe the vicinity of where detonations occurred; if any injured or dead marine mammals or ESA-listed species are observed, follow established incident reporting procedures. If additional platforms are supporting this activity (e.g., providing range clearance), these assets will assist in the visual observation of the area where detonations occurred.

Explosive torpedo activities involve detonations at a target located down range of the firing platform. Due to the distance between the mitigation zone and the observation platform, Lookouts will have a better likelihood of detecting large visual cues (e.g., whale blows or large pods of dolphins) than individual marine mammals, cryptic marine mammal species, and sea turtles. Some species of sea turtles forage on jellyfish, and some of the locations where explosive torpedo activities could occur support high densities of jellyfish throughout parts of the year. Observing for indicators of marine mammal and sea turtle presence (including jellyfish aggregations) will further help avoid or reduce potential impacts on these resources within the mitigation zone. The post-activity observations for marine mammals and sea turtles will help the Navy determine if any resources were injured during the activity.

Bin E11 has the longest predicted impact ranges for explosive torpedoes used in the Study Area. For the largest explosive in bin E11, the mitigation zone extends beyond the ranges to 50 percent non-auditory injury and 50 percent mortality for sea turtles and marine mammals. The mitigation zone extends beyond the average ranges to PTS for sea turtles, mid-frequency cetaceans, and otariids, and into a portion of the average ranges to PTS for low-frequency cetaceans, high-frequency cetaceans, and phocids. The mitigation zone also extends into a portion of the average ranges to TTS for sea turtles and marine mammals. Therefore, depending on the species, mitigation will help avoid or reduce all or a portion of the potential for exposure to mortality, non-auditory injury, PTS, and higher levels of TTS for the largest explosives in bin E11. Explosive torpedoes in smaller source bins (e.g., E8) have shorter predicted impact ranges; therefore, the mitigation zone will extend further beyond or cover a greater portion of the impact ranges for these explosives.

As described previously, the mitigation zone developed for this Final Supplemental EIS/OEIS is based on the largest area within which it is practical for the Navy to implement mitigation. It is not practical to increase this mitigation zone because observations within the margin of increase would be ineffective unless the Navy allocated additional platforms to observe for biological resources. The use of additional personnel and observation platforms would be unsustainable due to increased operational costs and an exceedance of the available manpower and resources for this activity. Adding aircraft to observe the mitigation zone could result in airspace conflicts with the event participants. This would either require the aircraft participating in the activity to modify their flight plans (which would reduce activity realism) or force the observing aircraft to position itself a safe distance away from the activity area (which would decrease observation effectiveness). Adding vessels to observe the mitigation zone would increase safety risks due to the presence of observation vessels within the vicinity of explosive torpedoes.

Increasing the mitigation zone size would result in a larger area over which detonations would need to be ceased in response to a sighting, and therefore would likely increase the number of times detonations would be ceased and would extend the length of the activity. These impacts would significantly diminish event realism in a way that would prevent the activity from meeting its intended objectives. For example, the Navy conducts Torpedo (Explosive) Testing events to test the functionality of torpedoes and torpedo launch systems. These events often involve aircrews locating, approaching, and firing a torpedo on an artificial target. They require focused situational awareness of the activity area and continuous coordination between the participating platforms as required during military missions and combat operations. Extending the length of the activity would require aircraft to depart the area to refuel. If the firing aircraft departed the activity location to refuel, the aircrew would lose the ability to maintain situational awareness and effectively coordinate with other participating platforms. If multiple refueling events were required, the activity length would extend by two to five times or more, which would increase safety risks due to increased pilot fatigue and accelerated fatigue-life of aircraft. Therefore, an increase in mitigation would impede the Navy's ability to meet testing requirements per required acquisition milestones or on an as-needed basis to meet operational requirements. Extending the length of the activity would also result in additional operational costs due to increased fuel consumption.

In summary, the operational community determined that implementing procedural mitigation for explosive torpedoes beyond what is detailed in Table 5.3-5 would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements.

5.3.3.3 Explosive Medium-Caliber and Large-Caliber Projectiles

The Navy will continue to implement procedural mitigation to avoid or reduce potential impacts on marine mammals, sea turtles, and seabirds from explosive gunnery activities, as outlined in Table 5.3-6.

Table 5.3-6: Procedural Mitigation for Explosive Medium-Caliber and Large-Caliber Projectiles

<i>Procedural Mitigation Description</i>
<p><u>Stressor or Activity</u></p> <ul style="list-style-type: none"> Gunnery activities using explosive medium-caliber and large-caliber projectiles <ul style="list-style-type: none"> Mitigation applies to activities using a surface target
<p><u>Resource Protection Focus</u></p> <ul style="list-style-type: none"> Marine mammals Sea turtles Seabirds (marbled murrelet and short-tailed albatross)
<p><u>Number of Lookouts and Observation Platform</u></p> <ul style="list-style-type: none"> 1 Lookout on the vessel conducting the activity <ul style="list-style-type: none"> For activities using explosive large-caliber projectiles, depending on the activity, the Lookout could be the same as the one described in Section 5.3.2.2 (Weapons Firing Noise) If additional platforms are participating in the activity, personnel positioned in those assets (e.g., safety observers, evaluators) will support observing the mitigation zone for applicable biological resources while performing their regular duties.
<p><u>Mitigation Requirements</u></p> <ul style="list-style-type: none"> Mitigation zones: <ul style="list-style-type: none"> 200 yd. (for seabirds) or 600 yd. (for marine mammals and sea turtles) around the intended impact location for explosive medium-caliber projectiles 1,000 yd. (for marine mammals and sea turtles) around the intended impact location for explosive large-caliber projectiles Prior to the initial start of the activity (e.g., when maneuvering on station): <ul style="list-style-type: none"> Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. Observe the mitigation zone for marine mammals, sea turtles, and seabirds; if observed, relocate or delay the start of firing. During the activity: <ul style="list-style-type: none"> Observe the mitigation zone for marine mammals, sea turtles, and seabirds; if observed, cease firing. Commencement/recommencement conditions after a marine mammal, sea turtle, or seabird sighting before or during the activity: <ul style="list-style-type: none"> The Navy will allow a sighted marine mammal, sea turtle, or seabird to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing firing) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the intended impact location; (3) the mitigation zone has been clear from any additional sightings for 30 min. for vessel-based firing; or (4) for activities using mobile targets, the intended impact location has transited a distance equal to double that of the mitigation zone size beyond the location of the last sighting. After completion of the activity (e.g., prior to maneuvering off station): <ul style="list-style-type: none"> When practical (e.g., when platforms are not constrained by fuel restrictions or mission-essential follow-on commitments), observe the vicinity of where detonations occurred; if any injured or dead marine mammals or ESA-listed species are observed, follow established incident reporting procedures. If additional platforms are supporting this activity (e.g., providing range clearance), these assets will assist in the visual observation of the area where detonations occurred.

In the 2015 NWTT Final EIS/OEIS, explosive gunnery activity mitigation zones were based on guidance from the USFWS for seabirds and net explosive weight and the associated average ranges to PTS for marine mammals and sea turtles. When developing mitigation for this Final Supplemental EIS/OEIS, the Navy analyzed the potential for increasing the size of these mitigation zones. The Navy identified an opportunity to increase the marine mammal and sea turtle mitigation zone sizes by 400 yd. to enhance protections to the maximum extent practicable. These increases are reflected in Table 5.3-6. The marine mammal and sea turtle mitigation zones for explosive medium-caliber and large-caliber projectiles are now based on the largest areas within which it is practical to implement mitigation. The seabird mitigation zone remains consistent with USFWS guidance. The Navy is clarifying in the table that it will require observation of the mitigation zone prior to the initial start of the activity to ensure the area is clear of applicable biological resources. The Navy has always verified that the mitigation zone is visually clear prior to conducting explosive activities and is more clearly capturing this current practice in the mitigation measures for this activity.

The Navy developed a new mitigation measure requiring the Lookout to observe the mitigation zone after completion of the activity. In accordance with the 2015 NWTT Final EIS/OEIS consultation requirements, the Navy currently conducts post-activity observations for some, but not all explosive activities. When developing the mitigation for this Final Supplemental EIS/OEIS, the Navy determined that it could expand this requirement to other explosive activities for enhanced consistency and to help determine if any resources were injured during explosive events, when practical. The Navy is adding a requirement that additional platforms already participating in the activity will support observing the mitigation zone before, during, and after the activity while performing their regular duties. When available, having additional personnel support observations of the mitigation zone will help increase the likelihood of detecting biological resources. The Navy will follow the incident reporting procedures outlined in Section 5.1.2.2.3 (Incident Reports) if an incident is detected at any time during the event, including during the post-activity observations.

Large-caliber gunnery activities involve vessels firing projectiles at targets located up to 6 nautical miles (NM) down range. Medium-caliber gunnery activities in the Study Area involve vessels firing projectiles at targets located up to 4,000 yd. down range, although typically much closer. Lookouts will be more likely to detect large visual cues (e.g., whale blows, breaching whales) than individual marine mammals, cryptic marine mammal species and sea turtles when observing mitigation zones located at the furthest firing distances. The Navy will implement larger mitigation zones for large-caliber gunnery activities than for medium-caliber gunnery activities for marine mammals and sea turtles due to the nature of how the activities are conducted. During large-caliber gunnery activities, Lookouts typically have access to high-powered binoculars mounted on the ship deck. This will enable observation of the distant mitigation zone in combination with hand-held binoculars and naked-eye scanning. Observing for indicators of marine mammal and sea turtle presence will further help avoid or reduce potential impacts on these resources within the mitigation zones.

Due to the difficulty of differentiating bird species, the Navy will implement mitigation for all seabird species during explosive medium-caliber weapons firing. Although there is a low likelihood that marbled murrelets and short-tailed albatross will occur in locations where the Navy conducts medium-caliber gunnery activities, the mitigation will help the Navy further avoid or reduce potential impacts on these ESA-listed bird species, as well as other seabird species that could occur offshore. The Navy will not implement mitigation for seabirds during explosive large-caliber gunnery events because Lookouts

would not be effective at detecting seabirds from the distant firing location, even with the use of high-powered binoculars.

The mitigation applies only to activities using surface targets. Most airborne targets are recoverable aerial drones that are not intended to be hit by ordnance. Given the speed of the projectiles and mobile target, and the long ranges that projectiles typically travel, it is not possible to definitively predict or to effectively observe where the projectile fragments will fall. For gunnery activities using explosive medium-caliber and large-caliber projectiles, the potential military expended material fall zone can only be predicted within thousands of yards, which can be up to 6 NM from the firing location. These areas are too large to be effectively observed for marine mammals and sea turtles with the number of personnel and platforms available for this activity. The potential risk to marine mammals and sea turtles during events using airborne targets is limited to the animal being directly struck by falling military expended materials. There is no potential for direct impact from the explosives because the detonations occur in air. Based on the extremely low potential for projectile fragments to co-occur in space and time with a marine mammal or sea turtle at or near the surface of the water, the potential for a direct strike is negligible; therefore, mitigation for gunnery activities using airborne targets would not be effective at avoiding or reducing potential impacts.

Bin E5 (e.g., 5-in. projectiles) has the longest predicted impact ranges for explosive projectiles that apply to the 1,000 yd. mitigation zone. Bin E2 (e.g., 40-millimeter [mm] projectiles) has the longest predicted impact ranges for explosive projectiles that apply to the 600 yd. mitigation zone. The 1,000 yd. and 600 yd. mitigation zones extend beyond the respective ranges to 50 percent non-auditory injury and 50 percent mortality for sea turtles and marine mammals. The 1,000 yd. and 600 yd. mitigation zones extend beyond the respective average ranges to PTS for sea turtles, low-frequency cetaceans, mid-frequency cetaceans, otariids, and phocids, and into a portion of the average ranges to PTS for high-frequency cetaceans. The mitigation zones also extend beyond or into a portion of the average ranges to TTS for sea turtles and marine mammals. Therefore, depending on the species, mitigation will help avoid or reduce all or a portion of the potential for exposure to mortality, non-auditory injury, PTS, and higher levels of TTS for the largest explosives in bin E5 and bin E2. Explosives in smaller source bins (e.g., E1) have shorter predicted impact ranges; therefore, the mitigation zones will extend further beyond or cover a greater portion of the impact ranges for these explosives.

As described previously, the mitigation zones for marine mammals and sea turtles developed for this Final Supplemental EIS/OEIS are based on the largest areas within which it is practical for the Navy to implement mitigation. It is not practical to increase these mitigation zones because observations within the margin of increase would be unsafe and ineffective. One of the mission-essential safety protocols for explosive gunnery activities is a requirement for event participants (including the Lookout) to maintain focus on the activity area to ensure safety of Navy personnel and equipment, and the public. The typical activity areas for medium-caliber and large-caliber gunnery activities coincide with the applicable mitigation zones; therefore, the Lookout can safely and effectively observe the mitigation zones for biological resources while simultaneously maintaining focus on the activity area. However, if the mitigation zone sizes increased, the Lookout would need to redirect attention to observe beyond the activity area. This would not meet the safety criteria since personnel would be required to direct attention away from mission requirements. Alternatively, the Navy would need to add personnel to serve as additional Lookouts on the existing observation platforms or allocate additional platforms to the activity to observe for biological resources. These actions would not be safe or sustainable due to an exceedance of manpower, resource, and space restrictions for these activities. Similarly, positioning

platforms closer to the intended impact location would increase safety risks related to proximity to the detonation location and path of the explosive projectile.

Increasing the mitigation zone sizes would result in larger areas over which detonations would need to be ceased in response to a sighting, and therefore would likely increase the number of times firing would be ceased and would extend the length of the activity. These impacts would significantly diminish event realism in a way that would prevent activities from meeting their intended objectives. For example, the Navy must train its gun crews to coordinate with other participating platforms (e.g., small boats launching a target, other firing platforms), locate and engage surface targets (e.g., remote controlled high-speed targets), and practice precise defensive marksmanship to disable threats.

Depending on the type of target being used, additional stopping of the activity could result in the target needing to be recovered and relaunched, which would cause a significant loss of training time. These types of impacts would reduce the number of opportunities that gun crews have to fire on the target and cause significant delays to the training schedule. Therefore, an increase in mitigation would impede the ability for gun crews to train and become proficient in using their weapons as required during military missions and combat operations and would prevent units from meeting their individual training and certification requirements (which would prevent them from deploying with the required level of readiness necessary to accomplish their missions). Extending the length of the activity would also result in additional operational costs due to increased fuel consumption.

In summary, the operational community determined that implementing procedural mitigation for explosive medium-caliber and large-caliber projectiles beyond what is detailed in Table 5.3-6 would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements.

5.3.3.4 Explosive Missiles

The Navy will continue to implement procedural mitigation to avoid or reduce potential impacts on marine mammals and sea turtles from explosive missiles, as outlined in Table 5.3-7. In the 2015 NWTT Final EIS/OEIS, the explosive missile mitigation zone was based on charge size and associated average ranges to PTS. When developing the mitigation for this Final Supplemental EIS/OEIS, the Navy analyzed the potential for increasing the size of this mitigation zone. The Navy determined that the current mitigation zone for explosive missiles is the largest area within which it is practical to implement mitigation for this activity; therefore, it will continue implementing this same mitigation zone under the Proposed Action. The Navy is clarifying in the table that it will require observation of the mitigation zone prior to the initial start of the activity to ensure the area is clear of applicable biological resources. The Navy has always verified that the mitigation zone is visually clear prior to conducting explosive activities and is more clearly capturing this current practice in the mitigation measures for this activity. The Navy developed a new mitigation measure requiring the Lookout to observe the mitigation zone after completion of the activity. In accordance with the 2015 NWTT Final EIS/OEIS consultation requirements, the Navy currently conducts post-activity observations for some, but not all explosive activities. When developing the mitigation for this Final Supplemental EIS/OEIS, the Navy determined that it could expand this requirement to other explosive activities for enhanced consistency and to help determine if any resources were injured during explosive events, when practical. The Navy is adding a requirement that additional platforms already participating in the activity will support observing the mitigation zone before, during, and after the activity while performing their regular duties. Typically, when aircraft are firing explosive munitions there are additional observation aircraft, multiple aircraft firing munitions, or other safety aircraft in the vicinity. For example, during typical explosive missile exercises, two aircraft

circle the activity location. One aircraft clears the intended impact location while the other fires, and vice versa. A third aircraft is typically present for safety or proficiency inspections. When available, having additional personnel support observations of the mitigation zone will help increase the likelihood of detecting biological resources. The Navy will follow the incident reporting procedures outlined in Section 5.1.2.2.3 (Incident Reports) if an incident is detected at any time during the event, including during the post-activity observations.

Table 5.3-7: Procedural Mitigation for Explosive Missiles

<i>Procedural Mitigation Description</i>
<u>Stressor or Activity</u> <ul style="list-style-type: none"> Aircraft-deployed explosive missiles <ul style="list-style-type: none"> Mitigation applies to activities using a surface target
<u>Resource Protection Focus</u> <ul style="list-style-type: none"> Marine mammals Sea turtles
<u>Number of Lookouts and Observation Platform</u> <ul style="list-style-type: none"> 1 Lookout positioned in an aircraft If additional platforms are participating in the activity, personnel positioned in those assets (e.g., safety observers, evaluators) will support observing the mitigation zone for applicable biological resources while performing their regular duties.
<u>Mitigation Requirements</u> <ul style="list-style-type: none"> Mitigation zone: <ul style="list-style-type: none"> 2,000 yd. around the intended impact location Prior to the initial start of the activity (e.g., during a fly-over of the mitigation zone): <ul style="list-style-type: none"> Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. Observe the mitigation zone for marine mammals and sea turtles; if observed, relocate or delay the start of firing. During the activity: <ul style="list-style-type: none"> Observe the mitigation zone for marine mammals and sea turtles; if observed, cease firing. Commencement/recommencement conditions after a marine mammal or sea turtle sighting before or during the activity: <ul style="list-style-type: none"> The Navy will allow a sighted marine mammal or sea turtle to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing firing) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the intended impact location; or (3) the mitigation zone has been clear from any additional sightings for 10 min. when the activity involves aircraft that have fuel constraints, or 30 min. when the activity involves aircraft that are not typically fuel constrained. After completion of the activity (e.g., prior to maneuvering off station): <ul style="list-style-type: none"> When practical (e.g., when platforms are not constrained by fuel restrictions or mission-essential follow-on commitments), observe the vicinity of where detonations occurred; if any injured or dead marine mammals or ESA-listed species are observed, follow established incident reporting procedures. If additional platforms are supporting this activity (e.g., providing range clearance), these assets will assist in the visual observation of the area where detonations occurred.

Missile exercises conducted under the Proposed Action involve firing munitions at a target typically located up to 15 NM down range, and infrequently up to 75 NM down range. Due to the distance between the mitigation zone and the observation platform, the Lookout will have a better likelihood of detecting marine mammals and sea turtles during close-range observations and are less likely to detect

these resources once positioned at the firing location, particularly individual marine mammals, cryptic marine mammal species, and sea turtles. There is a chance that animals could enter the mitigation zone after the aircraft conducts its close-range mitigation zone observations and before firing begins (once the aircraft has transited to its firing position). Observing for indicators of marine mammal and sea turtle presence will further help avoid or reduce potential impacts on these resources within the mitigation zones.

The mitigation applies to aircraft-deployed missiles because aircraft can fly over the intended impact area prior to commencing firing. Mitigation would be ineffective for vessel-deployed missiles because of the inability for a Lookout to detect marine mammals or sea turtles from a vessel from the distant firing position. It would not be effective or practical to have a vessel conduct close-range observations of the mitigation zone prior to firing due to the length of time it would take to complete observations and transit back to the firing position, and the costs associated with increased fuel consumption.

The mitigation applies to activities using surface targets. Most airborne targets are recoverable aerial drones that are not intended to be hit by ordnance. For example, telemetry-configured anti-air missiles used in training are designed to detonate or simulate a detonation near a target, but not as a result of a direct strike on a target. Given the speed of missiles and mobile targets, the high altitudes involved, and the long ranges that missiles typically travel, it is not possible to definitively predict or to effectively observe where the missile fragments will fall. The potential expended material fall zone can only be predicted within tens of miles for long range events, which can be 75 NM from the firing location; and thousands of yards for short range events, which can occur 15 NM from the firing location. These areas are too large to be effectively observed for marine mammals and sea turtles with the number of personnel and platforms available for this activity. The potential risk to marine mammals and sea turtles during events using airborne targets is limited to the animal being directly struck by falling military expended materials. There is no potential for direct impact from explosives because the detonations occur in air. Based on the extremely low potential for military expended materials to co-occur in space and time with a marine mammal or sea turtle at or near the surface of the water, the potential for a direct strike is negligible; therefore, mitigation would not be effective at avoiding or reducing potential impacts.

Bin E10 (e.g., Harpoon missiles) has the longest predicted impact ranges for explosive missiles used in the Study Area. The 2,000 yd. mitigation zone extends beyond the ranges to 50 percent non-auditory injury and 50 percent mortality for sea turtles and marine mammals. The mitigation zone extends beyond the average ranges to PTS for sea turtles, low-frequency cetaceans, mid-frequency cetaceans, otariids, and phocids, and into a portion of the average range to PTS for high-frequency cetaceans. The mitigation zone also extends beyond or into a portion of the average ranges to TTS for sea turtles and marine mammals. Therefore, depending on the species, mitigation will help avoid or reduce all or a portion of the potential for exposure to mortality, non-auditory injury, PTS, and higher levels of TTS for the largest explosives in bin E10.

As described previously, the mitigation zone developed for this Final Supplemental EIS/OEIS is based on the largest area within which it is practical for the Navy to implement mitigation. It is not practical to increase the mitigation zone because observations within the margin of increase would be unsafe and ineffective unless the Navy allocated additional platforms to the activity to observe for biological resources. The use of additional personnel and equipment (e.g., aircraft) would be unsustainable due to increased operational costs and an exceedance of the available manpower and resources for this activity. Adding aircraft to observe the mitigation zone could result in airspace conflicts with the event

participants. This would either require the aircraft conducting the activity to modify their flight plans (which would reduce activity realism) or force the observing aircraft to position itself a safe distance away from the activity area (which would decrease observation effectiveness). Similarly, positioning platforms closer to the intended impact location (as would be required if mitigation applied to vessel-deployed missiles) would increase safety risks related to proximity to the detonation location and path of the explosive missile.

Increasing the mitigation zone size would result in larger areas over which firing would need to be ceased in response to a sighting, and therefore would likely increase the number of times detonations would be ceased and would extend the length of the activity. These impacts would significantly diminish event realism in a way that would prevent the activity from meeting its intended objectives. Explosive missile events require focused situational awareness of the activity area and continuous coordination between the participating platforms as required during military missions and combat operations. For activities using missiles in the larger net explosive weight category, the flyover distance between the mitigation zone and the firing location can extend upwards of 75 NM; therefore, even aircraft with larger fuel capacities would need to depart the activity area to refuel if the length of the activity was extended. If the firing aircraft departed the activity location to refuel, the aircrew would lose the ability to maintain situational awareness of the activity area and effectively coordinate with other participating platforms. If multiple refueling events were required, the activity length would extend by two to five times or more, which would increase safety risks due to increased pilot fatigue and accelerated fatigue-life of aircraft. These types of impacts would cause a significant loss of training or testing time, reduce the number of opportunities that aircrews have to fire on the target, and cause a significant delay to the training or testing schedule. Therefore, an increase in mitigation would impede the ability for aircrews to train and become proficient in using their weapons as required during military missions and combat operations, would prevent units from meeting their individual training and certification requirements (which would prevent them from deploying with the required level of readiness necessary to accomplish their missions), and would 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. Extending the length of the activity would also result in additional operational costs due to increased fuel consumption.

In summary, the operational community determined that implementing procedural mitigation for explosive missiles beyond what is detailed in Table 5.3-7 would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements.

5.3.3.5 Explosive Bombs

The Navy will continue to implement procedural mitigation to avoid or reduce potential impacts on marine mammals and sea turtles from explosive bombs, as outlined in Table 5.3-8.

Table 5.3-8: Procedural Mitigation for Explosive Bombs

<i>Procedural Mitigation Description</i>
<u>Stressor or Activity</u> <ul style="list-style-type: none"> • Explosive bombs
<u>Resource Protection Focus</u> <ul style="list-style-type: none"> • Marine mammals • Sea turtles
<u>Number of Lookouts and Observation Platform</u> <ul style="list-style-type: none"> • 1 Lookout positioned in the aircraft conducting the activity • If additional platforms are participating in the activity, personnel positioned in those assets (e.g., safety observers, evaluators) will support observing the mitigation zone for applicable biological resources while performing their regular duties.
<u>Mitigation Requirements</u> <ul style="list-style-type: none"> • Mitigation zone: <ul style="list-style-type: none"> – 2,500 yd. around the intended target • Prior to the initial start of the activity (e.g., when arriving on station): <ul style="list-style-type: none"> – Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. – Observe the mitigation zone for marine mammals and sea turtles; if observed, relocate or delay the start of bomb deployment. • During the activity (e.g., during target approach): <ul style="list-style-type: none"> – Observe the mitigation zone for marine mammals and sea turtles; if observed, cease bomb deployment. • Commencement/recommencement conditions after a marine mammal or sea turtle sighting before or during the activity: <ul style="list-style-type: none"> – The Navy will allow a sighted marine mammal or sea turtle to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing bomb deployment) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the intended target; (3) the mitigation zone has been clear from any additional sightings for 10 min.; or (4) for activities using mobile targets, the intended target has transited a distance equal to double that of the mitigation zone size beyond the location of the last sighting. • After completion of the activity (e.g., prior to maneuvering off station): <ul style="list-style-type: none"> – When practical (e.g., when platforms are not constrained by fuel restrictions or mission-essential follow-on commitments), observe the vicinity of where detonations occurred; if any injured or dead marine mammals or ESA-listed species are observed, follow established incident reporting procedures. – If additional platforms are supporting this activity (e.g., providing range clearance), these assets will assist in the visual observation of the area where detonations occurred.

In the 2015 NWTT Final EIS/OEIS, the explosive bombing mitigation zone was based on net explosive weight and the associated average ranges to PTS. When developing the mitigation for this Final Supplemental EIS/OEIS, the Navy analyzed the potential for increasing the size of this mitigation zone. The Navy determined that the current mitigation zone for explosive bombs is the largest area within which it is practical to implement mitigation for this activity; therefore, it will continue implementing this same mitigation zone under the Proposed Action. The Navy is clarifying in the table that it will require observation of the mitigation zone prior to the initial start of the activity to ensure the area is clear of applicable biological resources. The Navy has always verified that the mitigation zone is visually clear prior to conducting explosive activities and is more clearly capturing this current practice in the mitigation measures for this activity. The Navy developed a new mitigation measure requiring the Lookout to observe the mitigation zone after completion of this activity. In accordance with the

2015 NWTT Final EIS/OEIS consultation requirements, the Navy currently conducts post-activity observations for some, but not all explosive activities. When developing mitigation for this Final Supplemental EIS/OEIS, the Navy determined that it could expand this requirement to other explosive activities for enhanced consistency and to help determine if any resources were injured during explosive events, when practical. The Navy is adding a requirement that additional platforms already participating in the activity will support observing the mitigation zone before, during, and after the activity while performing their regular duties. Typically, when aircraft are firing explosive munitions there are additional observation aircraft, multiple aircraft firing munitions, or other safety aircraft in the vicinity. When available, having additional personnel support observations of the mitigation zone will help increase the likelihood of detecting biological resources. The Navy will follow the incident reporting procedures outlined in Section 5.1.2.2.3 (Incident Reports) if an incident is detected at any time during the event, including during the post-activity observations.

Bombing exercises involve an aircraft deploying munitions at a surface target located beneath the firing platform. During target approach, aircraft maintain a relatively steady altitude of approximately 1,500 ft. Lookouts, by necessity for safety and mission success, primarily focus their attention on the water surface surrounding the intended detonation location (i.e., the mitigation zone). Being positioned in an aircraft gives the Lookout a good vantage point for observing marine mammals and sea turtles throughout the mitigation zone. Observing for indicators of marine mammal and sea turtle presence will further help avoid or reduce potential impacts on these resources within the mitigation zone.

Bin E10 (e.g., 500 lb. bomb) has the longest predicted impact ranges for explosive bombs used in the Study Area. The 2,500 yd. mitigation zone extends beyond the ranges to 50 percent non-auditory injury and 50 percent mortality for sea turtles and marine mammals. The mitigation zone extends beyond the average ranges to PTS for sea turtles, low-frequency cetaceans, mid-frequency cetaceans, otariids, and phocids, and into a portion of the average range to PTS for high-frequency cetaceans. The mitigation zone also extends beyond or into a portion of the average ranges to TTS for sea turtles and marine mammals. Therefore, depending on the species, mitigation will help avoid or reduce all or a portion of the potential for exposure to mortality, non-auditory injury, PTS, and higher levels of TTS for the largest bombs in bin E10. Smaller bombs in bin E10 (e.g., 250 lb. bomb) have shorter predicted impact ranges; therefore, the mitigation zone will extend further beyond or cover a greater portion of the impact ranges for these explosives.

As described previously, the mitigation zone developed for this Final Supplemental EIS/OEIS is based on the largest area within which it is practical for the Navy to implement mitigation. It is not practical to increase this mitigation zone because observations within the margin of increase would be unsafe and ineffective unless the Navy allocated additional platforms to the activity to observe for biological resources. The use of additional personnel and aircraft would be unsustainable due to increased operational costs and an exceedance of the available manpower and resources for this activity. Adding aircraft to observe the mitigation zone could result in airspace conflicts with the event participants. This would either require the aircraft participating in the activity to modify their flight plans (which would reduce activity realism) or force the observing aircraft to position itself a safe distance away from the activity area (which would decrease observation effectiveness). Adding vessels to observe the mitigation zone would increase safety risks due to the presence of observation vessels within the vicinity of the intended explosive bomb detonation location.

Increasing the mitigation zone would result in a larger area over which explosive bomb deployment would need to be ceased in response to a sighting, and therefore would likely increase the number of

times explosive bombing activities would be ceased and would extend the length of the activity. These impacts would significantly diminish event realism in a way that would prevent the activity from meeting its intended objectives. For example, critical components of a Bombing Exercise Air-to-Surface training activity are the assembly, loading, delivery, and assessment of an explosive bomb. The activity requires focused situational awareness of the activity area and continuous coordination between multiple training components. The training exercise starts 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 loading 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. Extending the length of the activity would require aircraft to depart the area to refuel. If the firing aircraft departed the activity area to refuel, aircrew would lose the ability to maintain situational awareness of the activity area, effectively coordinate with other participating platforms, and complete all training components as required during military missions and combat operations. If multiple refueling events were required, the activity length would be extended by two to five times or more, which would cause a significant loss of training time and would increase safety risks due to increased pilot fatigue and accelerated fatigue-life of aircraft. This would reduce the number of opportunities that aircrews have to approach targets and deploy bombs, which would cause a significant delay to the training schedule. Therefore, an increase in mitigation would impede the ability for aircrews to train and become proficient in using their weapons. This would prevent units from meeting their individual training and certification requirements and deploying with the required level of readiness necessary to accomplish their missions. Extending the length of the activity would also result in additional operational costs due to increased fuel consumption.

In summary, the operational community determined that implementing procedural mitigation for explosive bombs beyond what is detailed in Table 5.3-8 would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements.

5.3.3.6 Explosive Mine Countermeasure and Neutralization Activities

The Navy developed new procedural mitigation to avoid or reduce potential impacts on marine mammals, sea turtles, seabirds, and fish from explosive mine countermeasure and neutralization activities, as outlined in Table 5.3-9. The mitigation applies to all explosive mine countermeasure and neutralization activities except those that involve the use of Navy divers, which are discussed in Section 5.3.3.7 (Explosive Mine Neutralization Activities Involving Navy Divers).

The types of charges used in these activities are positively controlled, which means the detonation is controlled by the personnel conducting the activity and is not authorized until the mitigation zone is clear at the time of detonation. Explosive Mine Countermeasure and Neutralization Testing activities will be scheduled to be conducted in daylight hours and detonations will not occur past sunset. Conducting explosive activities in the daytime in Beaufort sea state number 3 conditions or less (i.e., good visibility conditions) ensures safety of event participants while increasing the likelihood that marine mammals and sea turtles will be detected prior to and during the activity. By using the smallest practicable charge for each activity (e.g., using a smaller net explosive weight if the testing program objective can still be met), the Navy will be able to reduce potential impacts on marine mammals, sea turtles, ESA-listed fish, and marbled murrelets, while maintaining the ability to accomplish the required testing objectives.

Table 5.3-9: Procedural Mitigation for Explosive Mine Countermeasure and Neutralization Activities

<i>Procedural Mitigation Description</i>
<p><u>Stressor or Activity</u></p> <ul style="list-style-type: none"> Explosive mine countermeasure and neutralization activities
<p><u>Resource Protection Focus</u></p> <ul style="list-style-type: none"> Marine mammals Sea turtles Seabirds (marbled murrelet) Fish
<p><u>Number of Lookouts and Observation Platform</u></p> <ul style="list-style-type: none"> 1 Lookout positioned on a vessel or in an aircraft when implementing the smaller mitigation zone 2 Lookouts (one positioned in an aircraft and one on a small boat) when implementing the larger mitigation zone If additional platforms are participating in the activity, personnel positioned in those assets (e.g., safety observers, evaluators) will support observing the mitigation zone for applicable biological resources while performing their regular duties.
<p><u>Mitigation Requirements</u></p> <ul style="list-style-type: none"> Mitigation zones: <ul style="list-style-type: none"> 600 yd. around the detonation site for activities using ≤ 5 lb. net explosive weight 2,100 yd. around the detonation site for activities using > 5–60 lb. net explosive weight Prior to the initial start of the activity (e.g., when maneuvering on station; typically, 10 min. when the activity involves aircraft that have fuel constraints, or 30 min. when the activity involves aircraft that are not typically fuel constrained): <ul style="list-style-type: none"> Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. Observe the mitigation zone for marine mammals and sea turtles; if observed, relocate or delay the start of detonations. During the activity: <ul style="list-style-type: none"> Observe the mitigation zone for marine mammals and sea turtles; if observed, cease detonations. The Navy will use the smallest practicable charge size for each activity. The Navy will conduct activities in daylight hours only in Beaufort Sea state number 3 conditions or less. Commencement/recommencement conditions after a marine mammal or sea turtle sighting before or during the activity: <ul style="list-style-type: none"> The Navy will allow a sighted marine mammal or sea turtle to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing detonations) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to detonation site; or (3) the mitigation zone has been clear from any additional sightings for 10 min. when the activity involves aircraft that have fuel constraints, or 30 min. when the activity involves aircraft that are not typically fuel constrained. After completion of the activity (typically 10 min. when the activity involves aircraft that have fuel constraints, or 30 min. when the activity involves aircraft that are not typically fuel constrained): <ul style="list-style-type: none"> Observe the vicinity of where detonations occurred; if any injured or dead marine mammals or ESA-listed species are observed, follow established incident reporting procedures. If additional platforms are supporting this activity (e.g., providing range clearance), these assets will assist in the visual observation of the area where detonations occurred.

When developing the new mitigation for this Final Supplemental EIS/OEIS, the Navy analyzed a range of potential mitigation zone sizes for the type of explosives used during explosive mine countermeasure and neutralization activities under the Proposed Action. The Navy will adopt mitigation zones that are consistent with the ones used during comparable activities in other at-sea training and testing Study Areas. The mitigation zones for explosive mine countermeasure and neutralization activities are based on the largest areas within which it is practical for the Navy to implement mitigation during the types of activities conducted under the Proposed Action. When available, having additional personnel support observations of the mitigation zone will help increase the likelihood of detecting biological resources. The post-activity observations will help the Navy determine if any resources were injured during the activity. The Navy will follow the incident reporting procedures outlined in Section 5.1.2.2.3 (Incident Reports) if an incident is detected at any time during the event, including during the post-activity observations.

For the 600 yd. mitigation zone, the small observation area and proximity to the observation platform will result in a high likelihood that the Lookout will be able to detect marine mammals and sea turtles throughout the mitigation zone (regardless of the type of observation platform used). For the 2,100 yd. mitigation zone, the Lookout on a small boat will be more likely to detect large visual cues (e.g., whale blows or large pods of dolphins) or splashes of individual marine mammals than cryptic marine mammal species and sea turtles near the mitigation zone perimeter, while the Lookout positioned in an aircraft will help increase the chance that marine mammals and sea turtles will be detected throughout the mitigation zone. Observing for indicators of marine mammal and sea turtle presence will further help avoid or reduce potential impacts on these resources within the mitigation zones.

Bin E7 (e.g., 60 lb. mine) has the longest predicted impact ranges for explosives that apply to the 2,100 yd. mitigation zone. Bin E4 (e.g., 5 lb. net explosive weight charge) has the longest predicted impact ranges for explosives that apply to the 600 yd. mitigation zone. The 2,100 yd. and 600 yd. mitigation zones extend beyond the respective ranges to 50 percent non-auditory injury and 50 percent mortality for sea turtles and marine mammals. The 2,100 yd. mitigation zone extends beyond the respective average ranges to PTS for sea turtles, low-frequency cetaceans, mid-frequency cetaceans, otariids, and phocids, and into a portion of the average ranges to PTS for high-frequency cetaceans. The 600 yd. mitigation zone extends beyond the respective average ranges to PTS for sea turtles, mid-frequency cetaceans, and otariids, and into a portion of the average ranges to PTS for low-frequency cetaceans, high-frequency cetaceans, and phocids. The mitigation zones also extend into a portion of the average ranges to TTS for sea turtles and marine mammals. Therefore, depending on the species, mitigation will help avoid or reduce all or a portion of the potential for exposure to mortality, non-auditory injury, PTS, and higher levels of TTS for the largest explosives in bin E7 and bin E4. Smaller explosives within bin E7 and bin E4 have shorter predicted impact ranges; therefore, the mitigation zones will cover a greater portion of the impact ranges for these explosives.

As described previously, the mitigation zones developed for this Final Supplemental EIS/OEIS are based on the largest areas within which it is practical for the Navy to implement mitigation. It is not practical to increase these mitigation zones because observations within the margin of increase would be unsafe and ineffective unless the Navy allocated additional platforms to the activity to observe for biological resources. The use of additional personnel and equipment (e.g., small boats, aircraft) would be unsustainable due to increased operational costs and an exceedance of available manpower and resources for this activity. Adding aircraft to observe the mitigation zone could result in airspace conflicts with the event participants. This would either require the aircraft conducting the activity to

modify their flight plans (which would reduce activity realism) or force the observing aircraft to position itself a safe distance away from the activity area (which would decrease observation effectiveness). Adding vessels to observe the mitigation zone would increase safety risks due to the presence observation vessels within the vicinity of detonations.

Increasing the mitigation zone sizes would result in larger areas over which firing would need to be ceased in response to a sighting, and therefore would likely increase the number of times detonations would be ceased and would extend the length of the activity. These impacts would significantly diminish realism in a way that would prevent the activity from meeting its intended objectives. For example, Mine Countermeasure and Neutralization Testing events require focused situational awareness of the activity area and coordination of tactics between amphibious warfare ships, mine warfare ships, surface combatants, and rotary-wing aircraft crews to ensure systems can effectively neutralize threat mines and mine-like objects. During these events, personnel evaluate the system's ability to detect and destroy mines from an airborne mine countermeasures-capable rotary-wing aircraft in advance of delivery to the fleet for operational use. Extending the length of these activities would require aircraft to depart the activity area to refuel. If multiple refueling events were required, the length of the activity would be extended by two to five times or more. This would decrease the ability for Lookouts to safely and effectively maintain situational awareness of the activity area and would increase safety risks due to increased pilot fatigue and accelerated fatigue-life of aircraft.

These types of impacts would result in a significant loss of testing time (which would reduce the Navy's ability to validate whether mine neutralization systems perform as expected) and cause a significant delay to the testing schedule. Therefore, an increase in mitigation would 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. Extending the length of the activities would also result in additional operational costs due to increased fuel consumption.

In summary, the operational community determined that implementing procedural mitigation for explosive mine countermeasure and neutralization activities beyond what is detailed in Table 5.3-9 would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements.

5.3.3.7 Explosive Mine Neutralization Activities Involving Navy Divers

The Navy will continue to implement procedural mitigation to avoid or reduce potential impacts on marine mammals, seabirds, and fish from explosive mine neutralization activities involving Navy divers as outlined in Table 5.3-10. Navy divers participating in these activities may be explosive ordnance disposal personnel. Information specific to seasonal charge size requirements at the Hood Canal and Crescent Harbor Explosive Ordnance Detonation ranges developed to avoid or reduce potential impacts on fish, including migrating Chinook salmon, chum salmon, and bull trout, is presented in Section K.3.3 (Mitigation Areas for Marine Species in NWTT Inland Waters). In the 2015 NWTT Final EIS/OEIS, the marine mammal mitigation zone for explosive mine neutralization activities involving Navy divers was based on net explosive weight and the associated average ranges to PTS. The seabird mitigation zones were based on guidance from the USFWS. Mitigation does not apply to sea turtles or short-tailed albatross because they are not likely to occur at the locations where the Navy conducts explosive mine neutralization activities involving Navy divers in the Study Area.

When developing the mitigation for this Final Supplemental EIS/OEIS, the Navy analyzed the potential for increasing the size of the marine mammal mitigation zone. The Navy identified an opportunity to

increase the marine mammal mitigation zone by 100 yd. to enhance protections to the maximum extent practicable. This increase is reflected in Table 5.3-10. The marine mammal mitigation zone for explosive mine neutralization activities involving the use of Navy divers is now based on the largest area within which it is practical to implement mitigation for the charge sizes used under the Proposed Action. The seabird mitigation zones remain consistent with USFWS guidance. The post-activity observations are a continuation from the 2015 NWTT Final EIS/OEIS and will help the Navy determine if any resources were injured during the activity. The Navy will follow the incident reporting procedures outlined in Section 5.1.2.2.3 (Incident Reports) if an incident is detected at any time during the event, including during the post-activity observations. The Navy is clarifying in the table that it will require observation of the mitigation zone prior to the initial start of the activity to ensure the area is clear of applicable biological resources. The Navy has always verified that the mitigation zone is visually clear prior to conducting explosive activities and is more clearly capturing this current practice in the mitigation measures for this activity.

Table 5.3-10: Procedural Mitigation for Explosive Mine Neutralization Activities Involving Navy Divers

<i>Procedural Mitigation Description</i>
<u>Stressor or Activity</u> <ul style="list-style-type: none"> Explosive mine neutralization activities involving Navy divers
<u>Resource Protection Focus</u> <ul style="list-style-type: none"> Marine mammals Seabirds (marbled murrelet) Fish
<u>Number of Lookouts and Observation Platform</u> <ul style="list-style-type: none"> 2 Lookouts on one small boat for activities using < 0.1 lb. net explosive weight, one of which will be a Navy biologist 2 Lookouts on two small boats with one Lookout each, one of which will be a Navy biologist, for activities using > 0.5–2.5 lb. net explosive weight All divers placing the charges on mines will support the Lookouts while performing their regular duties and will report applicable sightings to the lead Lookout, the supporting small boat, or the Range Safety Officer. If additional platforms are participating in the activity, personnel positioned in those assets (e.g., safety observers, evaluators) will support observing the mitigation zone for applicable biological resources while performing their regular duties.
<u>Mitigation Requirements</u> <ul style="list-style-type: none"> Mitigation zones: <ul style="list-style-type: none"> 100 yd. (for seabirds) around the detonation site during activities using < 0.1 lb. net explosive weight 400 yd. (seabirds) or 500 yd. (marine mammals) around the detonation site during activities using > 0.5–2.5 lb. net explosive weight Prior to the initial start of the activity (starting 30 min. before the first planned detonation): <ul style="list-style-type: none"> Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. Observe the mitigation zone for marine mammals and seabirds; if observed, relocate or delay the start of detonations. Pre-event observations of the mitigation zones for seabirds will include naked eye scanning along transect lines no more than 50 meters (m) wide using vessel speeds between 5 and 10 knots. The Navy will ensure the area is clear of marine mammals for 30 min. prior to commencing a detonation. A Navy biologist will serve as the lead Lookout and will make the final determination that the mitigation zone is clear of any biological resource sightings prior to the commencement of a detonation. The Navy biologist will maintain radio communication with the unit conducting the event and the other Lookout.

Table 5.3-10: Procedural Mitigation for Explosive Mine Neutralization Activities Involving Navy Divers (continued)

<i>Procedural Mitigation Description</i>
<ul style="list-style-type: none"> • During the activity: <ul style="list-style-type: none"> – Observe the mitigation zone for marine mammals and seabirds; if observed, cease detonations. – To the maximum extent practicable depending on mission requirements, safety, and environmental conditions, boats will position themselves near the mid-point of the mitigation zone radius (but outside of the detonation plume and human safety zone), will position themselves on opposite sides of the detonation location (when two boats are used), and will travel in a circular pattern around the detonation location with one Lookout observing inward toward the detonation site and the other observing outward toward the perimeter of the mitigation zone. – The Navy will use only positively controlled charges (i.e., no time-delay fuses). – The Navy will use the smallest practicable charge size for each activity. – Activities will be conducted in Beaufort Sea state number 2 conditions or less and will not be conducted in low visibility conditions. • Commencement/recommencement conditions after a marine mammal or seabird sighting before or during the activity: <ul style="list-style-type: none"> – The Navy will allow a sighted marine mammal or seabird to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing detonations) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the detonation site; or (3) the mitigation zone has been clear from any additional sightings for 30 min. • After each detonation and the completion of an activity (for 30 min): <ul style="list-style-type: none"> – Observe the vicinity of where detonations occurred and immediately downstream of the detonation location; if any injured or dead marine mammals or ESA-listed species are observed, follow established incident reporting procedures. – If additional platforms are supporting this activity (e.g., providing range clearance), these assets will assist in the visual observation of the area where detonations occurred. – If any injured or dead seabirds or fish are observed, notify the appropriate Navy Region Environmental Director, Navy Pacific Fleet Environmental Office, and local base wildlife biologist and include information on the number of adults or juveniles and species, if possible. – The Navy will submit a mitigation summary report to the USFWS after the completion of each activity.

The charges used during explosive mine neutralization activities involving Navy divers in the Study Area are all positively controlled, which means that the detonation is controlled by the personnel conducting the activity and is not authorized until the area is clear at the time of detonation. This will allow Lookouts time to continuously observe the mitigation zone for biological resources right up to the point of detonation. By using the smallest practicable positive control charge for each activity (e.g., using 1.5 lb. net explosive weight in place of 2.5 lb. net explosive weight if the training objective can still be met), the Navy will be able to minimize potential impacts while maintaining the ability to accomplish the required training objectives. The pre-activity observations will typically entail a line transect survey (with each transect being no more than approximately 50 m wide) at speeds ranging between approximately 5–10 knots. The primary Lookouts for this activity will not include the boat drivers; however, the boat drivers will support the Lookouts while performing their regular duties. The small observation area and proximity to observation platforms will result in a high likelihood that Lookouts will be able to detect marine mammals throughout the mitigation zone. Observing for indicators of marine mammal presence will further help avoid or reduce impacts on these resources within the mitigation zone.

Due to the difficulty of differentiating bird species, the Navy will implement mitigation for all seabird species during this activity. Conducting activities in Beaufort sea state number 2 conditions or less (i.e., good visibility conditions) and having the Navy divers, boat drivers, and other personnel (typically four to five people per unit) support the Lookouts while performing their regular duties will increase the likelihood that marine mammals and seabirds will be detected prior to and during the activity.

Bin E3 has the longest predicted impact ranges for explosives used for these activities in the Study Area. The 500 yd. mitigation zone extends beyond the respective ranges to 50 percent non-auditory injury and 50 percent mortality for marine mammals. The mitigation zone extends beyond the average ranges to PTS for low-frequency cetaceans, mid-frequency cetaceans, and otariids, and into a portion of the average ranges to PTS for high-frequency cetaceans and phocids. The mitigation zone also extends beyond or into a portion of the average ranges to TTS for marine mammals. Therefore, depending on the species, mitigation will help avoid or reduce all or a portion of the potential for exposure to mortality, non-auditory injury, PTS, and higher levels of TTS for the largest explosives in bin E3. Smaller explosives within bin E3 have shorter predicted impact ranges; therefore, the mitigation zones will cover a greater portion of the impact ranges for these explosives.

As described previously, the marine mammal mitigation zone developed for this Final Supplemental EIS/OEIS is based on the largest area within which it is practical for the Navy to implement mitigation. It is not practical to increase the mitigation zone because observations within the margin of increase would be unsafe and ineffective unless the Navy allocated additional platforms to the activity to observe for biological resources. Because mine neutralization activities involve training Navy divers in the safe handling of explosive charges, one of the mission-essential safety protocols required of all event participants, including Lookouts, is to maintain focus on the activity area to ensure safety of personnel and equipment. The typical mine neutralization activity area coincides with the marine mammal mitigation zone size developed for this Final Supplemental EIS/OEIS; therefore, Lookouts can safely and effectively observe the mitigation zones for biological resources while simultaneously maintaining focus on the activity area. However, if the marine mammal mitigation zone size increased, Lookouts would need to redirect their attention beyond the activity area. This would not meet the safety criteria since personnel would be required to direct their attention away from mission requirements. Alternatively, the Navy would need to add personnel to serve as additional Lookouts on the existing observation platforms or allocate additional platforms to the activity to observe for biological resources. These actions would not be safe or sustainable due to an exceedance of manpower, resource, and space restrictions for these activities.

Increasing the mitigation zone sizes would result in larger areas over which detonations would need to be ceased in response to a sighting, and therefore would likely increase the number of times detonations would be ceased. This would extend the length of the activities and cause significant safety risks for Navy divers and loss of training time. Ceasing an activity (e.g., fuse initiation) with divers in the water would have safety implications for diver air consumption and bottom time. It would also impede the ability for Navy divers to complete the training exercise with the focused endurance as required during military missions and combat operations. These impacts would significantly diminish event realism in a way that would prevent activities from meeting their intended objectives. For example, the number of opportunities that divers would have to locate and neutralize mines would be reduced. Divers would then not be able to gain skill proficiency in precise identification and evaluation of a threat mine, safe handling of explosive material during charge placement, and effective charge detonation or fuse initiation. Mine neutralization activities involving the use of Navy divers only take place during

daylight hours for safety reasons; therefore, extending the length of the activity could delay the activity into the next day or next several days, which would significantly impact training schedules for all participating platforms. Therefore, an increase in mitigation would impede the ability for Navy divers to train and become proficient in mine neutralization and would prevent units from meeting their individual training and certification requirements (which would prevent them from deploying with the required level of readiness necessary to accomplish their missions).

In summary, the operational community determined that implementing procedural mitigation for explosive mine neutralization activities involving Navy divers beyond what is detailed in Table 5.3-10 would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements.

5.3.4 Physical Disturbance and Strike Stressors

The Navy will implement procedural mitigation to avoid or reduce potential impacts on biological resources from the physical disturbance and strike stressors or activities discussed in the sections below. Section 3.4.2.4 (Impacts from Physical Disturbance and Strike), Section 3.5.2.4 (Physical Disturbance and Strike Stressors), and Section 3.6.2.4 (Physical Disturbance and Strike Stressors) provide a full analysis of the potential impacts of physical disturbance and strikes on marine mammals, sea turtles, and birds, respectively. In addition to procedural mitigation, the Navy will implement mitigation for physical disturbance and strike within mitigation areas, such as requirements to prohibit or limit certain activities in certain locations (e.g., within a specified distance from shore). Mitigation area requirements for physical disturbance and strike stressors are detailed in Appendix K (Geographic Mitigation Assessment).

5.3.4.1 Vessel Movement

The Navy will continue to implement procedural mitigation to avoid or reduce the potential for vessel strikes of marine mammals and sea turtles, as outlined in Table 5.3-11. The procedural mitigation measures for vessel movement are a continuation from the 2015 NWTT Final EIS/OEIS based on the largest area within which it is practical for the Navy to implement mitigation and guidance from NMFS for vessel strike avoidance. The Navy is clarifying in the table that the mitigation zones for training activities will be the same as the mitigation zones for testing activities under the Proposed Action. Although the Navy is unable to position Lookouts on unmanned vessels, as a standard operating procedure, some vessels that operate autonomously have embedded sensors that aid in avoidance of large objects. The embedded sensors may help those unmanned vessels avoid vessel strikes of marine mammals.

As discussed in Section 5.3.1 (Environmental Awareness and Education), it is likely that the implementation of the Marine Species Awareness Training starting in 2007, and the additional U.S. Navy Afloat Environmental Compliance Training Series modules starting in 2014, potentially helped contribute to a Navy-wide reduction of vessel strikes of marine mammals across areas where the Navy trains and tests. The Navy is able to detect if a whale is struck due to the diligence of standard watch personnel and Lookouts stationed specifically to observe for marine mammals while a vessel is underway. In the unlikely event that a vessel strike of a marine mammal occurs, the Navy will notify the appropriate regulatory agency immediately or as soon as operational security considerations allow per the established incident reporting procedures described in Section 5.1.2.2.3 (Incident Reports). The Navy's incident reports include relevant information pertaining to the incident, including but not limited to vessel speed.

Table 5.3-11: Procedural Mitigation for Vessel Movement

<i>Procedural Mitigation Description</i>
<p><u>Stressor or Activity</u></p> <ul style="list-style-type: none"> • Vessel movement <ul style="list-style-type: none"> – The mitigation will not be applied if (1) the vessel's safety is threatened, (2) the vessel is restricted in its ability to maneuver (e.g., during launching and recovery of aircraft or landing craft, during towing activities, when mooring, during Transit Protection Program exercises or other events involving escort vessels), (3) the vessel is submerged or operated autonomously, or (4) when impractical based on mission requirements (e.g., during test body retrieval by range craft).
<p><u>Resource Protection Focus</u></p> <ul style="list-style-type: none"> • Marine mammals • Sea turtles
<p><u>Number of Lookouts and Observation Platform</u></p> <ul style="list-style-type: none"> • 1 Lookout on the vessel that is underway <p><u>Mitigation Requirements</u></p> <ul style="list-style-type: none"> • Mitigation zones: <ul style="list-style-type: none"> – 500 yd. around whales – 200 yd. (for surface ships) around other marine mammals (except bow-riding dolphins and pinnipeds hauled out man-made navigational structures, port structures, and vessels) – 100 yd. (for small boats, such as range craft) around other marine mammals (except bow-riding dolphins and pinnipeds hauled out man-made navigational structures, port structures, and vessels) – Within the vicinity of sea turtles • During the activity: <ul style="list-style-type: none"> – When underway, observe the mitigation zone for marine mammals and sea turtles; if observed, maneuver to maintain distance. • Additional requirements: <ul style="list-style-type: none"> – If a marine mammal or sea turtle vessel strike occurs, the Navy will follow the established incident reporting procedures.

The mitigation zones are smaller for marine mammal species such as pinnipeds to account for variations in mission requirements and activity locations (e.g., range craft operating in narrow channels where pinnipeds are consistently present in high densities). Similarly, a mitigation zone size is not specified for sea turtles to allow flexibility based on vessel type and mission requirements. The small mitigation zone sizes and proximity to the observation platform will result in a high likelihood that Lookouts will be able to detect marine mammals throughout the mitigation zones while vessels are underway. As discussed in Section K.3.3 (Mitigation Areas for Marine Species in NWTT Inland Waters), geographic mitigation for Small Boat Attack exercises, which involve high-speed Navy security force vessels, includes Navy biologists working with NMFS and Navy event planners to consider the likelihood of marine mammal presence as specific details of the event are planned (e.g., timing, location, duration), which will help the Navy further avoid or reduce potential impacts from vessel movements on marine mammals in NWTT Inland Waters.

As described in Section 5.1.2 (Vessel Safety) of the 2015 NWTT Final EIS/OEIS, Navy vessels are required to operate in accordance with applicable navigation rules. Applicable rules include the Inland Navigation Rules (33 Code of Federal Regulations 83) and International Regulations for Preventing Collisions at Sea (72 COLREGS), which were formalized in the Convention on the International Regulations for Preventing Collisions at Sea, 1972. These rules require that vessels proceed at a safe speed so proper and effective action can be taken to avoid collision and so vessels can be stopped within a distance appropriate to the prevailing circumstances and conditions. In addition to complying with navigation requirements, Navy

ships transit at speeds that are optimal for fuel conservation, to maintain ship 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.

Navy vessel operators need to train to proficiently operate vessels as they would during military missions and combat operations, 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. Implementing vessel speed restrictions would increase safety risks for Navy personnel and equipment and the public during the training event and would reduce skill proficiency in a way that would increase safety risks during military missions and combat operations. Furthermore, vessel speed restrictions would not allow the Navy to continue meeting its training requirements due to diminished realism of training exercises.

The Navy needs to test the full range of its vessel and system capabilities to ensure safety and functionality in conditions analogous to military missions and combat operations. For example, during non-explosive torpedo testing activities, the Navy must operate its vessels using speeds typical of military missions and combat operations to accurately test the functionality of its acoustic countermeasures and torpedo systems during firing. Vessel speed restrictions would not allow the Navy to continue meeting its testing program requirements due to diminished realism of testing events. Researchers, program managers, and weapons system acquisition programs would be unable to conduct accurate acoustic research to meet research objectives and effectively test vessels and vessel-deployed systems and platforms before full-scale production or delivery to the fleet. Such testing is required to ensure functionality and accuracy in military mission and combat conditions per required acquisition milestones or on an as-needed basis to meet operational requirements.

In summary, the operational community determined that implementing procedural mitigation for vessel movements beyond what is detailed in Table 5.3-11 would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements.

5.3.4.2 Towed In-Water Devices

The Navy will continue to implement procedural mitigation to avoid or reduce the potential for strike of marine mammals and sea turtles from towed in-water devices, as outlined in Table 5.3-12. Vessels involved in towing in-water devices will implement the mitigation described in Section 5.3.4.1 (Vessel Movement), in addition to the mitigation outlined in Table 5.3-12.

The mitigation zones for towed in-water devices are a continuation from the 2015 NWTT Final EIS/OEIS based on the largest area within which it is practical for the Navy to implement mitigation. The Navy is clarifying in the table that the mitigation zones for training and testing activities will be the same under the Proposed Action. The small mitigation zone sizes and proximity to the observation platform will result in a high likelihood that Lookouts will be able to detect marine mammals throughout the mitigation zones. The mitigation zone for marine mammals is smaller for in-water devices that are towed by small boats to account for variations in mission requirements and activity locations (e.g., range craft operating in narrow channels). Similarly, a mitigation zone size is not specified for sea turtles to allow flexibility based on towing platform type and mission requirements.

Table 5.3-12: Procedural Mitigation for Towed In-Water Devices

<i>Procedural Mitigation Description</i>
<p><u>Stressor or Activity</u></p> <ul style="list-style-type: none"> • Towed in-water devices <ul style="list-style-type: none"> – Mitigation applies to devices towed from a manned surface platform or manned aircraft, or when a manned support craft is already participating in an activity involving in-water devices being towed by unmanned platforms – The mitigation will not be applied if the safety of the towing platform or in-water device is threatened
<p><u>Resource Protection Focus</u></p> <ul style="list-style-type: none"> • Marine mammals • Sea turtles
<p><u>Number of Lookouts and Observation Platform</u></p> <ul style="list-style-type: none"> • 1 Lookout positioned on the towing platform or support craft
<p><u>Mitigation Requirements</u></p> <ul style="list-style-type: none"> • Mitigation zones: <ul style="list-style-type: none"> – 250 yd. (for in-water devices towed by aircraft or surface ships) around marine mammals (except bow-riding dolphins and pinnipeds hauled out on man-made navigational structures, port structures, and vessels) – 100 yd. (for in-water devices towed by small boats, such as range craft) around marine mammals (except bow-riding dolphins and pinnipeds hauled out on man-made navigational structures, port structures, and vessels). – Within the vicinity of sea turtles • During the activity (i.e., when towing an in-water device) <ul style="list-style-type: none"> – Observe the mitigation zone for marine mammals and sea turtles; if observed, maneuver to maintain distance.

Mission and safety requirements determine the operational parameters (e.g., course, speed) for in-water device towing platforms. Towed-in water devices must be towed at certain speeds and water depths for stability, which are controlled in part by the towing platform's speed and directional movements. Because these devices are towed and not self-propelled, they generally have limited maneuverability and are not able 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.

In summary, the operational community determined that implementing procedural mitigation for towed in-water devices beyond what is detailed in Table 5.3-12 would be incompatible with the practicality assessment criteria for safety.

5.3.4.3 Small-, Medium-, and Large-Caliber Non-Explosive Practice Munitions

The Navy will continue to implement procedural mitigation to avoid or reduce the potential for strike of marine mammals, sea turtles, and seabirds from small-, medium-, and large-caliber non-explosive practice munitions, as outlined in Table 5.3-13.

Table 5.3-13: Procedural Mitigation for Small-, Medium-, and Large-Caliber Non-Explosive Practice Munitions

<i>Procedural Mitigation Description</i>
<u>Stressor or Activity</u> <ul style="list-style-type: none"> Gunnery activities using small-, medium-, and large-caliber non-explosive practice munitions <ul style="list-style-type: none"> Mitigation applies to activities using a surface target
<u>Resource Protection Focus</u> <ul style="list-style-type: none"> Marine mammals Sea turtles Seabirds (marbled murrelet and short-tailed albatross)
<u>Number of Lookouts and Observation Platform</u> <ul style="list-style-type: none"> 1 Lookout positioned on the platform conducting the activity <ul style="list-style-type: none"> Depending on the activity, the Lookout could be the same as the one described in Section 5.3.2.2 (Weapons Firing Noise)
<u>Mitigation Requirements</u> <ul style="list-style-type: none"> Mitigation zone: <ul style="list-style-type: none"> 200 yd. around the intended impact location Prior to the initial start of the activity (e.g., when maneuvering on station): <ul style="list-style-type: none"> Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. Observe the mitigation zone for marine mammals and sea turtles (small-, medium-, and large-caliber activities) and seabirds (small- and medium-caliber activities); if observed, relocate or delay the start of firing. During the activity: <ul style="list-style-type: none"> Observe the mitigation zone for marine mammals and sea turtles (small-, medium-, and large-caliber activities) and seabirds (small- and medium-caliber activities); if observed, cease firing. Commencement/recommencement conditions after a marine mammal, sea turtle, or seabird sighting before or during the activity: <ul style="list-style-type: none"> The Navy will allow a sighted marine mammal, sea turtle, or seabird to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing firing) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the intended impact location; (3) the mitigation zone has been clear from any additional sightings for 10 min. for aircraft-based firing or 30 min. for vessel-based firing; or (4) for activities using a mobile target, the intended impact location has transited a distance equal to double that of the mitigation zone size beyond the location of the last sighting.

The mitigation zone is conservatively designed to be several times larger than the impact footprint for large-caliber non-explosive practice munitions, which are the largest projectiles used for these activities. Small-caliber and medium-caliber non-explosive practice munitions have smaller impact footprints than large-caliber non-explosive practice munitions; therefore, the mitigation zone will extend even further beyond the impact footprints for these smaller projectiles.

Large-caliber gunnery activities involve vessels firing projectiles at a target located up to 6 NM down range. Small- and medium-caliber gunnery activities involve vessels or aircraft firing projectiles at targets located up to 4,000 yd. down range, although typically much closer. Lookouts will have a better likelihood of detecting marine mammals and sea turtles when observing mitigation zones around targets located close to the firing platform. When observing activities that use a target located far from the firing platform, Lookouts will be more likely to detect large visual cues (e.g., whale blows or large pods of dolphins) than individual marine mammals, cryptic marine mammal species, and sea turtles.

Observing for indicators of marine mammal and sea turtle presence will further help avoid or reduce impacts on these resources within the mitigation zone. Positioning additional observers closer to the targets would increase safety risks because these platforms would be located in the vicinity of an intended impact location or in the path of a projectile.

Due to the difficulty of differentiating bird species, the Navy will implement mitigation for all seabird species during non-explosive small- and medium-caliber weapons firing. The mitigation will help the Navy further avoid or reduce potential impacts on ESA-listed marbled murrelets and short-tailed albatross and other seabird species that occur offshore. The Navy will not implement mitigation for seabirds during non-explosive large-caliber gunnery events because Lookouts would not be effective at detecting seabirds from the distant firing location, even with the use of high-powered binoculars.

5.3.4.4 Non-Explosive Missiles

The Navy will continue to implement procedural mitigation to avoid or reduce the potential for strike of marine mammals and sea turtles from non-explosive missiles, as outlined in Table 5.3-14. The mitigation zone for non-explosive missiles is conservatively designed to be several times larger than the impact footprint for the largest non-explosive missile used for these activities. Smaller non-explosive missiles have smaller impact footprints than the largest non-explosive missile used for these activities; therefore, the mitigation zone will extend even further beyond the impact footprints for these smaller projectiles. Mitigation applies to activities using non-explosive missiles fired from aircraft at targets that are typically located up to 15 NM down range, and infrequently up to 75 NM down range. There is a chance that animals could enter the mitigation zone after the aircraft conducts its close-range mitigation zone observations and before firing begins (once the aircraft has transited to its firing position). Due to the distance between the mitigation zone and the observation platform, Lookouts will have a better likelihood of detecting marine mammals and sea turtles during the close-range observations and are less likely to detect these resources once positioned at the firing location, particularly individual marine mammals, cryptic marine mammal species, and sea turtles. Observing for indicators of marine mammal and sea turtle presence will further help avoid or reduce potential impacts on these resources within the mitigation zone during the close-range observations. The mitigation only applies to aircraft-deployed missiles for the reasons discussed in Section 5.3.3.4 (Explosive Missiles). Positioning additional observers closer to the targets would increase safety risks because these platforms would be located in the vicinity of an intended impact location or in the path of a projectile.

Table 5.3-14: Procedural Mitigation for Non-Explosive Missiles

<i>Procedural Mitigation Description</i>
<u>Stressor or Activity</u> <ul style="list-style-type: none"> Aircraft-deployed non-explosive missiles <ul style="list-style-type: none"> Mitigation applies to activities using a surface target
<u>Resource Protection Focus</u> <ul style="list-style-type: none"> Marine mammals Sea turtles
<u>Number of Lookouts and Observation Platform</u> <ul style="list-style-type: none"> 1 Lookout positioned in an aircraft
<u>Mitigation Requirements</u> <ul style="list-style-type: none"> Mitigation zone: <ul style="list-style-type: none"> 900 yd. around the intended impact location Prior to the initial start of the activity (e.g., during a fly-over of the mitigation zone): <ul style="list-style-type: none"> Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. Observe the mitigation zone for marine mammals and sea turtles; if observed, relocate or delay the start of firing. During the activity: <ul style="list-style-type: none"> Observe the mitigation zone for marine mammals and sea turtles; if observed, cease firing. Commencement/recommencement conditions after a marine mammal or sea turtle sighting prior to or during the activity: <ul style="list-style-type: none"> The Navy will allow a sighted marine mammal or sea turtle to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing firing) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the intended impact location; or (3) the mitigation zone has been clear from any additional sightings for 10 min. when the activity involves aircraft that have fuel constraints, or 30 min. when the activity involves aircraft that are not typically fuel constrained.

5.3.4.5 Non-Explosive Bombs and Mine Shapes

The Navy will continue to implement procedural mitigation to avoid or reduce the potential for strike of marine mammals and sea turtles from non-explosive bombs and mine shapes, as outlined in Table 5.3-15. The mitigation zone for non-explosive bombs and mine shapes is conservatively designed to be several times larger than the impact footprint for the largest non-explosive bomb used for these activities. Smaller non-explosive bombs and mine shapes have smaller impact footprints than the largest non-explosive bomb used for these activities; therefore, the mitigation zone will extend even further beyond the impact footprints for these smaller military expended materials. Activities involving non-explosive bombing and mine laying involve aircraft deploying munitions or mine shapes from a relatively steady altitude of approximately 1,500 ft. at a surface target or in an intended minefield located beneath the aircraft. Due to the mitigation zone size, proximity to the observation platform, and the good vantage point from an aircraft, Lookouts will be able to observe the entire mitigation zone during approach of the target or intended minefield location. Observing for indicators of marine mammal and sea turtle presence will further help avoid or reduce impacts on these resources within the mitigation zone.

Table 5.3-15: Procedural Mitigation for Non-Explosive Bombs and Mine Shapes

<i>Procedural Mitigation Description</i>
<u>Stressor or Activity</u> <ul style="list-style-type: none"> • Non-explosive bombs • Non-explosive mine shapes during mine laying activities
<u>Resource Protection Focus</u> <ul style="list-style-type: none"> • Marine mammals • Sea turtles
<u>Number of Lookouts and Observation Platform</u> <ul style="list-style-type: none"> • 1 Lookout positioned in an aircraft
<u>Mitigation Requirements</u> <ul style="list-style-type: none"> • Mitigation zone: <ul style="list-style-type: none"> – 1,000 yd. around the intended target • Prior to the initial start of the activity (e.g., when arriving on station): <ul style="list-style-type: none"> – Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. – Observe the mitigation zone for marine mammals and sea turtles; if observed, relocate or delay the start of bomb deployment or mine laying. • During the activity (e.g., during approach of the target or intended minefield location): <ul style="list-style-type: none"> – Observe the mitigation zone for marine mammals and sea turtles; if observed, cease bomb deployment or mine laying. • Commencement/recommencement conditions after a marine mammal or sea turtle sighting prior to or during the activity: <ul style="list-style-type: none"> – The Navy will allow a sighted marine mammal or sea turtle to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing bomb deployment or mine laying) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the intended target or minefield location; (3) the mitigation zone has been clear from any additional sightings for 10 min.; or (4) for activities using mobile targets, the intended target has transited a distance equal to double that of the mitigation zone size beyond the location of the last sighting.

5.4 Mitigation Areas to be Implemented

As a result of the Navy's biological effectiveness and operational assessments, the Navy developed mitigation areas in the NWTT Offshore Area and NWTT Inland Waters, as summarized in the sections below. Additional details, including the complete biological effectiveness and operational assessments for each area, are provided in Appendix K (Geographic Mitigation Assessment).

5.4.1 Mitigation Areas for Seafloor Resources

The seafloor resource mitigation is a continuation from the 2015 NWTT Final EIS/OEIS. As outlined in Table 5.4-1, the Navy will implement mitigation to avoid or reduce potential impacts from explosives and physical disturbance and strike stressors on submerged cultural resources (i.e., shipwrecks), sensitive seafloor resources, and any biological resources that inhabit, shelter, rest, feed, or occur in the mitigation areas. Figure 5.4-1 shows the relevant seafloor resources and the Navy training or testing locations that overlap them. The Navy developed mitigation areas as either the anchor swing circle diameter or a 350 yd. radius around a seafloor resource, as indicated by the best available georeferenced data. Without this mitigation, explosives and physical disturbance and strike stressors could potentially impact these resources during certain training and testing activities in the Study Area.

The mitigation areas are particularly important to one or more resources for a biologically important ecological function (i.e., live hard bottom habitat and artificial reefs that provide critical ecosystem functions). Seafloor resources fulfill important ecosystem functions. Live hard bottom habitats and artificial structures (e.g., artificial reefs, shipwrecks) provide attachment substrate for aquatic vegetation and invertebrates, such as corals, seaweed, seagrass, macroalgae, and sponges. These habitats in turn support a community of organisms, such as fish, shrimp, crabs, barnacles, worms, and sea cucumbers. Dive sites occur throughout nearshore areas of the Study Area where there are shipwrecks and artificial reefs, making these resources highly valuable from a socioeconomic standpoint. Similarly, submerged aquatic vegetation attached to live hardbottom or artificial reefs provides important habitat for commercially and recreationally important fish species. Historic shipwrecks are classified as archaeological resources and are an important part of maritime history.

Table 5.4-1: Seafloor Resource Mitigation Areas in the NWTT Study Area

<i>Mitigation Area Description</i>
<u>Stressor or Activity</u> <ul style="list-style-type: none"> • Explosives • Physical disturbance and strikes
<u>Resource Protection Focus</u> <ul style="list-style-type: none"> • Live hard bottom • Artificial reefs • Shipwrecks
<u>Mitigation Requirements</u> <ul style="list-style-type: none"> • Seafloor Resource Mitigation Areas (year-round) <ul style="list-style-type: none"> – Within the anchor swing circle of live hard bottom, artificial reefs, and shipwrecks, the Navy will not conduct precision anchoring (except in designated areas). – Within a 350 yd. radius of live hard bottom, artificial reefs, and shipwrecks, the Navy will not conduct explosive mine countermeasure and neutralization activities or explosive mine neutralization activities involving Navy divers (except in designated locations), and the Navy will not place mine shapes, anchors, or mooring devices on the seafloor (except in designated areas).

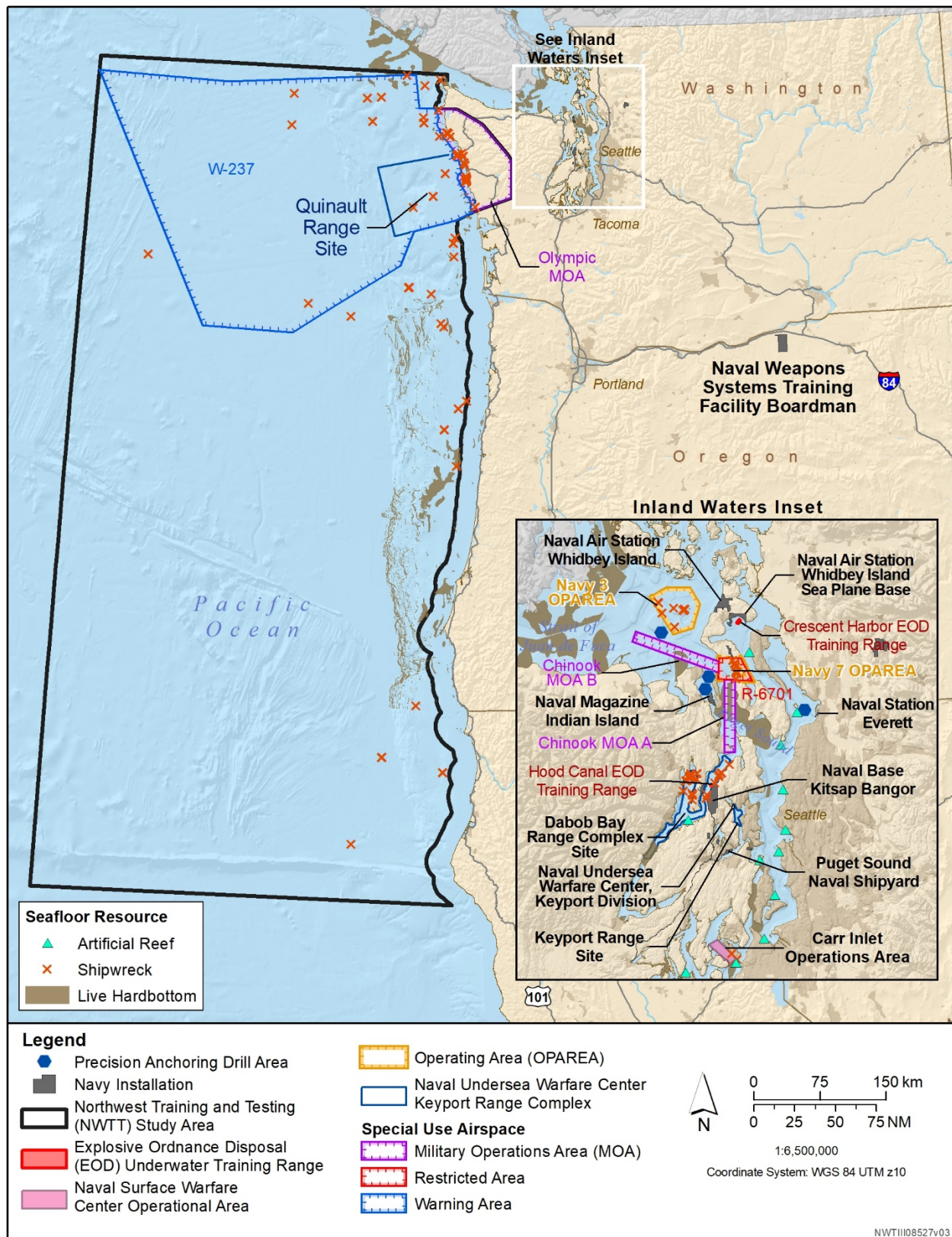


Figure 5.4-1: Seafloor Resource Mitigation Areas in the NWTT Study Area

5.4.2 Mitigation Areas for Marine Species in the Northwest Training and Testing Offshore Area

As described in Table 5.4-2 and shown in Figure 5.4-2, the Navy developed mitigation areas in the NWTT Offshore Area to avoid or reduce potential impacts on marine mammals, sea turtles, ESA-listed fish, and marbled murrelets. The Navy developed these mitigation areas to help avoid or reduce potential impacts from active sonar, explosives, and physical disturbance and strike in areas that the best available science suggests are particularly important to one or more of the following species for a biologically important life process (e.g., foraging, migration, reproduction):

- Humpback whale
- Gray whale
- Southern Resident killer whale
- Leatherback sea turtle
- Bull trout
- Steelhead
- Chinook salmon
- Coho salmon
- Chum salmon
- Sockeye salmon
- Green sturgeon
- Marbled murrelet

Implementing additional geographic mitigation in the NWTT Offshore Area beyond what is described in Table 5.4-2 would be impractical due to implications for safety, sustainability, and the Navy's ability to continue meeting its mission requirements for the reasons described in Appendix K (Geographic Mitigation Assessment).

Table 5.4-2: Marine Species Mitigation Areas in the NWTT Offshore Area

Mitigation Area Description
<p><u>Stressor or Activity</u></p> <ul style="list-style-type: none"> • Sonar (mitigation does not apply to active sonar sources used for safety of navigation) • Explosives • Physical disturbance and strikes
<p><u>Resource Protection Focus</u></p> <ul style="list-style-type: none"> • Marine mammals (humpback whale, gray whale, Southern Resident killer whale, harbor porpoise) • Sea turtles (leatherback sea turtle) • Seabirds (marbled murrelet) • Fish (bull trout, steelhead, Chinook salmon, coho salmon, chum salmon, sockeye salmon, green sturgeon)
<p><u>Mitigation Requirements¹</u></p> <ul style="list-style-type: none"> • Marine Species Coastal Mitigation Area (year-round or seasonal if specified) <ul style="list-style-type: none"> – Within 50 NM from shore in the Marine Species Coastal Mitigation Area: <ul style="list-style-type: none"> ▪ The Navy will not conduct explosive training activities. ▪ The Navy will not conduct explosive testing activities (except explosive Mine Countermeasure and Neutralization Testing). ▪ The Navy will not conduct non-explosive missile training activities. ▪ The Navy will issue annual seasonal awareness notification messages to alert ships and aircraft to the possible presence of increased concentrations of Southern Resident killer whales from December 1 to June 30, humpback whales from May 1 through December 31, and gray whales from May 1 to November 30. For safe navigation and to avoid interactions with large whales, the Navy will instruct vessels to remain vigilant to the presence of Southern Resident killer whales, humpback whales, and gray whales that may be vulnerable to vessel strikes or potential impacts from training and testing activities. Platforms will use the information from the awareness notification messages to assist their visual observation of applicable mitigation zones during training and testing activities and to aid in the implementation of procedural mitigation. – Within 20 NM from shore in the Marine Species Coastal Mitigation Area: <ul style="list-style-type: none"> ▪ The Navy will conduct a maximum combined total of 33 hours of surface ship hull-mounted MF1 mid-frequency active sonar during testing annually within 20 NM from shore in the Marine Species Coastal Mitigation Area, the Juan de Fuca Eddy Marine Species Mitigation Area, and the Olympic Coast National Marine Sanctuary Mitigation Area. ▪ To the maximum extent practical, the Navy will conduct explosive Mine Countermeasure and Neutralization Testing from July 1 through September 30 when operating within 20 NM from shore. ▪ From October 1 through June 30, the Navy will conduct a maximum of one explosive Mine Countermeasure and Neutralization Testing event, not to exceed the use of 20 explosives from bin E4 and 3 explosives from bin E7 annually, and not to exceed the use of 60 explosives from bin E4 and 9 explosives from bin E7 over 7 years. ▪ The Navy will not conduct non-explosive large-caliber gunnery training activities. ▪ The Navy will not conduct non-explosive bombing training activities. – Within 12 NM from shore in the Marine Species Coastal Mitigation Area: <ul style="list-style-type: none"> ▪ The Navy will not conduct Anti-Submarine Warfare Tracking Exercise – Helicopter, – Maritime Patrol Aircraft, – Ship, or – Submarine training activities (which involve the use of mid-frequency or high-frequency active sonar). ▪ The Navy will not conduct non-explosive Anti-Submarine Warfare Torpedo Exercise – Submarine training activities (which involve the use of mid-frequency or high-frequency active sonar). ▪ The Navy will conduct a maximum of one Unmanned Underwater Vehicle Training event within 12 NM from shore at the Quinault Range Site. Unmanned Underwater Vehicle Training events within 12 NM from shore at the Quinault Range Site will be cancelled or moved to another training location if Southern Resident killer whales are detected at the planned training location during the event planning process, or immediately prior to the event, as applicable. ▪ During explosive Mine Countermeasure and Neutralization Testing, the Navy will not use explosives in bin E7 closer than 6 NM from shore in the Quinault Range Site. ▪ The Navy will not conduct non-explosive small- and medium-caliber gunnery training activities.

Table 5.4-2: Marine Species Mitigation Areas in the NWTT Offshore Area (continued)

Mitigation Area Description
<ul style="list-style-type: none"> • Olympic Coast National Marine Sanctuary Mitigation Area (year-round) <ul style="list-style-type: none"> – Within the Olympic Coast National Marine Sanctuary Mitigation Area: <ul style="list-style-type: none"> ▪ The Navy will conduct a maximum of 32 hours of surface ship hull-mounted MF1 mid-frequency active sonar during training annually. ▪ The Navy will conduct a maximum combined total of 33 hours of surface ship hull-mounted MF1 mid-frequency active sonar during testing annually within 20 NM from shore in the Marine Species Coastal Mitigation Area, the Juan de Fuca Eddy Marine Species Mitigation Area, and the Olympic Coast National Marine Sanctuary Mitigation Area. ▪ The Navy will not conduct explosive Mine Countermeasure and Neutralization Testing activities. ▪ The Navy will not conduct non-explosive bombing training activities. • Juan de Fuca Eddy Marine Species Mitigation Area (year-round) <ul style="list-style-type: none"> – Within the Juan de Fuca Eddy Marine Species Mitigation Area: <ul style="list-style-type: none"> ▪ The Navy will conduct a maximum combined total of 33 hours of surface ship hull-mounted MF1 mid-frequency active sonar during testing annually within 20 NM from shore in the Marine Species Coastal Mitigation Area, the Juan de Fuca Eddy Marine Species Mitigation Area, and the Olympic Coast National Marine Sanctuary Mitigation Area. ▪ The Navy will not conduct explosive Mine Countermeasure and Neutralization Testing activities. • Stonewall and Heceta Bank Humpback Whale Mitigation Area (May 1–November 30) <ul style="list-style-type: none"> – Within the Stonewall and Heceta Bank Humpback Whale Mitigation Area from May 1 to November 30: <ul style="list-style-type: none"> ▪ The Navy will not use surface ship hull-mounted MF1 mid-frequency active sonar during training or testing. ▪ The Navy will not conduct explosive Mine Countermeasure and Neutralization Testing. • Point St. George Humpback Whale Mitigation Area (July 1–November 30) <ul style="list-style-type: none"> – Within the Point St. George Humpback Whale Mitigation Area from July 1 to November 30: <ul style="list-style-type: none"> ▪ The Navy will not use surface ship hull-mounted MF1 mid-frequency active sonar during training or testing. ▪ The Navy will not conduct explosive Mine Countermeasure and Neutralization Testing.

¹ Should national security present a requirement to conduct training or testing prohibited by the mitigation requirements specified in this table, naval units will obtain permission from the appropriate designated Command authority prior to commencement of the activity. The Navy will provide NMFS with advance notification and include relevant information about the event (e.g., sonar hours, explosives use, non-explosive practice munitions use) in its annual activity reports to NMFS.

5.4.3 Mitigation Areas for Marine Species in NWTT Inland Waters

As described in Table 5.4-3 and shown in Figure 5.4-2, the Navy developed mitigation areas in NWTT Inland Waters to avoid or reduce potential impacts on marine mammals, ESA-listed fish, and marbled murrelets. The Navy developed these mitigation areas to help avoid or reduce potential impacts from active sonar, explosives, and physical disturbance and strike in areas that the best available science suggests are particularly important to one or more of the following species for a biologically important life process (e.g., foraging, migration, reproduction):

- Gray whale
- Southern Resident killer whale
- Bull trout
- Puget Sound Chinook salmon
- Hood Canal summer-run chum salmon
- Green sturgeon
- Rockfish
- Marbled murrelet

Implementing additional geographic mitigation in NWTT Inland Waters beyond what is described in Table 5.4-3 would be impractical due to implications for safety, sustainability, and the Navy's ability to continue meeting its mission requirements for the reasons described in Appendix K (Geographic Mitigation Assessment).

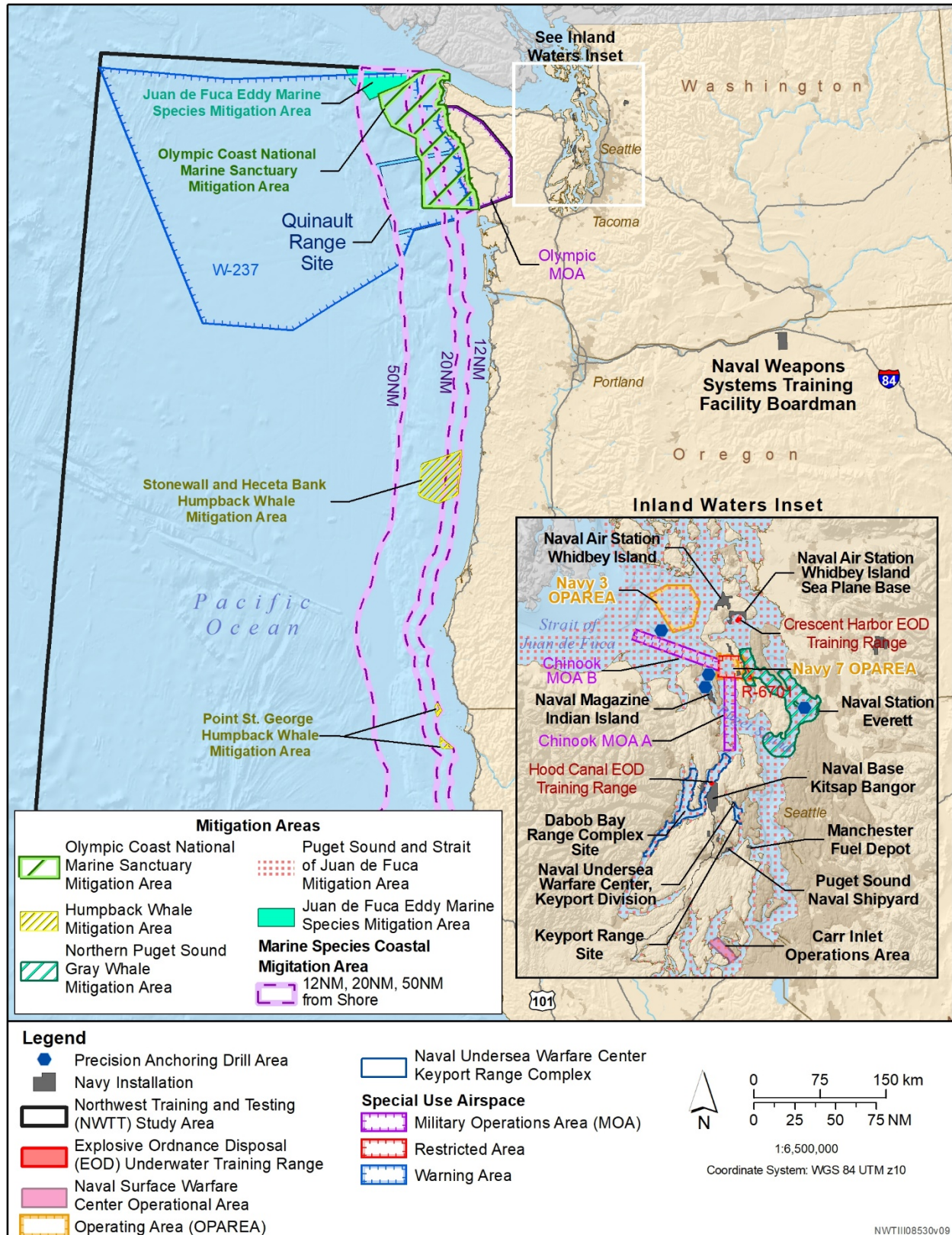
Table 5.4-3: Marine Species Mitigation Areas in NWTT Inland Waters

Mitigation Area Description
<p><u>Stressor or Activity</u></p> <ul style="list-style-type: none"> • Sonar (mitigation does not apply to active sonar sources used for safety of navigation) • Explosives • Physical disturbance and strikes
<p><u>Resource Protection Focus</u></p> <ul style="list-style-type: none"> • Marine mammals (gray whale, Southern Resident killer whale) • Seabirds (marbled murrelet) • Fish (bull trout, Puget Sound Chinook salmon, Hood Canal summer-run chum salmon, green sturgeon, rockfish)
<p><u>Mitigation Requirements¹</u></p> <ul style="list-style-type: none"> • Northern Puget Sound Gray Whale Mitigation Area (March 1–May 31) <ul style="list-style-type: none"> – Within the Northern Puget Sound Gray Whale Mitigation Area from March 1 to May 31: <ul style="list-style-type: none"> ▪ The Navy will not conduct Civilian Port Defense – Homeland Security Anti-Terrorism/Force Protection Exercises. • Puget Sound and Strait of Juan de Fuca Mitigation Area (year-round or seasonal if specified) <ul style="list-style-type: none"> – Within the Puget Sound and Strait of Juan de Fuca Mitigation Area: <ul style="list-style-type: none"> ▪ The Navy will not use low-frequency, mid-frequency, or high-frequency active sonar during training or testing within the Puget Sound and Strait of Juan de Fuca Mitigation Area, unless a required element necessitates that the activity be conducted in NWTT Inland Waters during (1) Unmanned Underwater Vehicle Training, (2) Civilian Port Defense – Homeland Security Anti-Terrorism/Force Protection Exercises, (3) activities conducted by Naval Sea Systems Command at designated locations, and (4) pierside sonar maintenance or testing at designated locations. ▪ The Navy will use the lowest active sonar source levels practical to successfully accomplish each event. ▪ Naval units will obtain permission from the appropriate designated Command authority prior to commencing pierside maintenance or testing with hull-mounted mid-frequency active sonar. ▪ The Navy will conduct a maximum of one Unmanned Underwater Vehicle Training activity annually at the NAVY 3 OPAREA, NAVY 7 OPAREA, and Manchester Fuel Depot (i.e., a maximum of one event at each location). ▪ The Navy will not use explosives during testing. ▪ The Navy will not use explosives during training except at the Hood Canal EOD Range and Crescent Harbor EOD Range during explosive mine neutralization activities involving the use of Navy divers. ▪ The Navy will not use explosives in bin E4 (>2.5–5 lb. net explosive weight) or above, and will instead use explosives in bin E0 (< 0.1 lb. net explosive weight) or bin E3 (> 0.5–2.5 lb. net explosive weight). ▪ During February, March, and April at the Hood Canal EOD Range, the Navy will not use explosives in bin E3 (> 0.5–2.5 lb. net explosive weight) and will instead use explosives in bin E0 (< 0.1 lb. net explosive weight). ▪ During August, September, and October at the Hood Canal EOD Range, the Navy will avoid using explosives in bin E3 (> 0.5–2.5 lb. net explosive weight) and will instead use explosives in bin E0 (< 0.1 lb. net explosive weight) to the maximum extent practical unless necessitated by mission requirements. ▪ At the Crescent Harbor EOD Range, the Navy will conduct explosive activities at least 1,000 m from the closest point of land. ▪ The Navy will not conduct non-explosive live fire events in the mitigation area (except firing blank weapons), including gunnery exercises, missile exercises, torpedo exercises, bombing exercises, and Kinetic Energy Weapon Testing.

Table 5.4-3: Marine Species Mitigation Areas in NWTT Inland Water (continued)

<i>Mitigation Area Description</i>
<ul style="list-style-type: none"> ▪ Navy event planners will coordinate with Navy biologists during the event planning process prior to conducting (1) Unmanned Underwater Vehicle Training at the NAVY 3 OPAREA, Manchester Fuel Depot, Crescent Harbor Explosive Ordnance Disposal Range, and NAVY 7 OPAREA (for Southern Resident killer whales); (2) Civilian Port Defense – Homeland Security Anti-Terrorism/Force Protection Exercises (for Southern Resident killer whales and gray whales); (3) explosive mine neutralization activities involving the use of Navy divers (for Southern Resident killer whales); and (4) Small Boat Attack Exercises, which involve firing blank small-caliber weapons (for Southern Resident killer whales and gray whales). Navy biologists will work with NMFS and will initiate communication with the appropriate marine mammal detection networks to determine the likelihood of applicable marine mammal species presence in the planned training location. Navy biologists will notify event planners of the likelihood of species presence. To the maximum extent practical, Navy planners will use this information when planning specific details of the event (e.g., timing, location, duration) to avoid planning activities in locations or seasons where species presence is expected. The Navy will ensure environmental awareness of event participants. Environmental awareness will help alert participating crews to the possible presence of applicable species in the training location. Lookouts will use the information to assist visual observation of applicable mitigation zones and to aid in the implementation of procedural mitigation. Unmanned Underwater Vehicle Training events at the NAVY 3 OPAREA, Manchester Fuel Depot, Crescent Harbor Explosive Ordnance Disposal Range, and NAVY 7 OPAREA will be cancelled or moved to another training location if the presence of Southern Resident killer whales is reported through available monitoring networks during the event planning process, or immediately prior to the event, as applicable. ▪ The Navy will issue annual seasonal awareness notification messages to alert ships and aircraft operating within the Puget Sound and Strait of Juan de Fuca Mitigation Area to the possible presence of concentrations of Southern Resident killer whales from July 1 to November 30 in the Puget Sound and Strait of Juan de Fuca, and concentrations of gray whales from March 1 to May 31 in the Strait of Juan de Fuca and northern Puget Sound. For safe navigation and to avoid interactions with large whales, the Navy will instruct vessels to remain vigilant to the presence of Southern Resident killer whales and gray whales that may be vulnerable to vessel strikes or potential impacts from training and testing activities. Platforms will use the information from the awareness notification messages to assist their visual observation of applicable mitigation zones during training and testing activities and to aid in the implementation of procedural mitigation.

¹ Should national security present a requirement to conduct training or testing prohibited by the mitigation requirements specified in this table, naval units will obtain permission from the appropriate designated Command authority prior to commencement of the activity. The Navy will provide NMFS with advance notification and include relevant information about the event (e.g., sonar hours, explosives use, non-explosive practice munitions use) in its annual activity reports to NMFS.



5.5 Measures Considered but Eliminated

As described in Section 5.2 (Mitigation Development Process), the Navy conducted a detailed review and assessment of each potential mitigation measure individually and then all potential mitigation measures collectively to determine if, as a whole, the mitigation will be effective at avoiding or reducing potential impacts and practical to implement. The assessment included consideration of mitigation recommendations received through scoping and public comments received on the 2019 NWTT Draft Supplemental EIS/OIS for this Proposed Action, during the ESA and MMPA consultation processes, and through public comments and consultations on past environmental compliance documents applicable to the Study Area. The operational community determined that implementing procedural mitigation beyond what is detailed in Section 5.3 (Procedural Mitigation to be Implemented) and Section 5.4 (Mitigation Areas to be Implemented) would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements. Information about why implementing additional mitigation measures for active sonar, explosives, active and passive acoustic monitoring devices, thermal detection systems, third-party observers, foreign navy mitigation, and reporting requirements would be impractical is provided in the sections below and in Appendix K (Geographic Mitigation Assessment).

When analyzing all potential mitigation measures collectively, the operational community determined that adopting certain mitigation measures, such as limiting active sonar to only be conducted beyond certain distances from shore, would result in the unacceptable limitation of the Navy's utilization of sea space and airspace required to effectively support training and testing of naval forces in the Study Area. Certain measures would restrict or prohibit Navy training and testing throughout most of the Study Area except in very narrow circumstances. For example, blanket limitations or restrictions on the level, number, or timing (seasonal or time of day) of training and testing activities within discrete or broad-scale areas of water (e.g., within NWTT Inland Waters or within a certain distance from shore in the NWTT Offshore Area), or other areas vital to mission requirements would prevent the Navy from accessing its ranges, operating areas, facilities, or range support structures necessary to meet the purpose and need of the Proposed Action. As described in Section 5.2.3 (Practicality of Implementation), the Navy requires extensive sea space so that individual training and testing activities can occur at sufficient distances such that these activities do not interfere with one another, and so that Navy units can train to communicate and operate in a coordinated fashion over tens or hundreds of square miles, as required during military missions and combat operations. The Navy also needs to maintain access to sea space with the unique, challenging, and diverse environmental and oceanographic features (e.g., bathymetry, topography, surface fronts, and variations in sea surface temperature) analogous to military mission and combat conditions to achieve the highest skill proficiency and most accurate testing results possible.

Threats to national security are constantly evolving. The Navy requires the ability to adapt training and testing to meet these emerging threats. Restricting access to broad-scale areas of water would impact the ability for Navy training and testing to evolve as threats evolve. Eliminating opportunities for the Navy to train and test in a myriad of at-sea conditions would put U.S. forces at a tactical disadvantage during military missions and combat operations. This would also present a risk to national security if potential adversaries were to be alerted to the environmental conditions within which the U.S. Navy is prohibited from training and testing. Restricting large areas of ocean or other smaller areas that are critical to Navy training and testing would make training and concealment much more difficult and would adversely impact the Navy's ability to perform its statutory mission.

5.5.1 Active Sonar

When assessing and developing mitigation, the Navy considered reducing active sonar training and testing hours, modifying active sonar sound sources, implementing time-of-day restrictions and restrictions during surface ducting conditions, replacing active sonar training and testing with synthetic activities (e.g., computer simulated training), and implementing active sonar ramp-up procedures. The Navy determined that it would be practical to implement certain restrictions on the use of active sonar in the Study Area, as detailed in Section 5.3.2.1 (Active Sonar) and Appendix K (Geographic Mitigation Assessment). As discussed in Chapter 2 (Description of Proposed Action and Alternatives), Section 5.2.3 (Practicality of Implementation), Appendix A (Navy Activities Descriptions), and Appendix K (Geographic Mitigation Assessment), training and testing activities are planned and scheduled based on numerous factors and data inputs, such as compliance with the Optimized Fleet Response Plan. Information on why training and testing with active sonar is essential to national security is presented in Section 5.3.2.1 (Active Sonar). The Navy uses active sonar during military readiness activities only when it is essential to training missions or testing program requirements since active sonar has the potential to alert opposing forces to the operating platform's presence. Passive sonar and other available sensors are used in concert with active sonar to the maximum extent practicable.

The Navy currently uses, and will continue to use, computer simulation to augment training and testing whenever possible. As discussed in Section 1.4.1 (Why the Navy Trains), simulators and synthetic training are critical elements that provide early skill repetition and enhance teamwork; however, they cannot replicate the complexity and stresses faced by Sailors during military missions and combat operations to which the Navy trains under the Proposed Action (e.g., anti-submarine warfare training using hull-mounted mid-frequency active sonar). Just as a pilot would not be ready to fly solo after simulator training, operational Commanders cannot allow military personnel to engage in military missions and combat operations based merely on simulator training. Similarly, in testing a system that is being developed, simulation can be used during the initial stages of development, but ultimately the system must be tested under conditions analogous to those faced during military missions and combat operations. Systems that have undergone maintenance need to be tested, and not simulated, to ensure that the system is operating correctly.

Sonar operators must train to effectively handle bottom bounce and sound passing through changing currents, eddies, and across changes in ocean temperature, pressure, salinity, depth, and in surface ducting conditions. Sonar systems must be tested in conditions analogous to where the Navy trains and operates to ensure functionality and accuracy in military mission and combat conditions. Although the majority of sonar use occurs during the day, the Navy has a nighttime training and testing requirement for some active sonar systems, and a requirement to test in a variety of locations and environmental conditions depending on the testing program objectives. Training and testing 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.

Submarines may hide in the higher ambient noise levels of shallow coastal waters and surface ducts. 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. Avoiding surface ducting conditions would be impractical because ocean conditions contributing to surface

ducting change frequently, and surface ducts can be of varying duration. Surface ducting can also lack uniformity and may or may not extend over a large geographic area, making it difficult to determine where to reduce power and for what periods. Submarines have long been known to take advantage of the phenomena associated with surface ducting to avoid being detected by sonar. When surface ducting occurs, active sonar becomes more useful near the surface but less useful at greater depths. 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 Navy to be able to train under these conditions when they occur. Training with active sonar in these conditions is a critical component of military 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. Reducing power, shutting down active sonar based on environmental conditions, or implementing other sonar modification techniques (e.g., sound shielding) as a 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 military missions and combat operations, such as during periods of low visibility.

The Navy explicitly designs its active sonar signals to provide optimum performance at detecting underwater objects (e.g., submarines) in a variety of acoustic environments. The Navy assessed the potential for implementing active sonar signal modification as mitigation. At this time, the science on the differences in potential impacts of up or down sweeps of the sonar signal (e.g., different behavioral reactions) is extremely limited and requires further development. For example, Kastelein et al. (2012) researched the behavioral responses of a single captive harbor porpoise to varying sonar signals. Although this very limited data set suggests up or down sweeps of the sonar signal may result in different reactions by harbor porpoises in certain circumstances, this science requires further development (e.g., to determine potential reactions by other individual harbor porpoises and other marine mammal species). If future studies indicate that modifying active sonar signals (i.e., up or down sweeps) could be an effective mitigation approach, then the Navy will investigate if and how the mitigation would affect the sonar's performance. As described throughout this chapter, mitigation must meet the appropriate balance between being effective and practical to implement.

Active sonar equipment power levels are set consistent with mission requirements. Active sonar ramp-up procedures are used during seismic surveys and some foreign navy sonar activities. Ramping up involves slowly increasing sound levels over a certain length of time until the optimal source level is reached. The intent of ramping up a sound source is to alert marine mammals with a low sound level to deter them from the area and avoid higher levels of sound exposure. The best available science does not suggest that ramp-up would be an effective mitigation tool for U.S. Navy active sonar training and testing activities under the Proposed Action. Wensveen et al. (2017) found that active sonar ramp-up was not an effective method for reducing impacts on humpback whales because most whales did not display strong behavioral avoidance to the sonar signals. The study suggested that sonar ramp-up could potentially be more effective for other more behaviorally responsive species but would likely also depend on the context of exposure. For example, ramp-up would be less effective if animals have a strong motivation not to move away from their current location, such as when foraging. Dunlop et al. (2016) and von Benda-Beckmann et al. (2014) found that implementing ramp-up as a mitigation may be effective for some activities in some situations. Additionally, von Benda-Beckmann et al. (2014) found that the main factors limiting ramp-up effectiveness for a typical anti-submarine warfare activity are a high source level, a moving sonar source, and long silences between consecutive sonar transmissions.

Based on the source levels, vessel speeds, and sonar transmission intervals that will be used during typical active sonar activities under the Proposed Action, the Navy has determined that ramp-up would be an ineffective mitigation measure for the active sonar activities analyzed in this Final Supplemental EIS/OEIS.

Implementing active sonar ramp-up procedures during training or testing under the Proposed Action would not be representative of military mission and combat conditions and would significantly impact training and testing realism. For example, during an anti-submarine warfare exercise using active sonar, ramp-ups have the potential to 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. Similarly, testing program requirements determine test parameters to accurately determine whether a system is meeting its operational and performance requirements; therefore, implementing ramp-up during testing activities would impede the Navy's ability to collect essential data for evaluation of a system's capabilities.

Reducing realism in training impedes the ability for Navy Sailors to train and become proficient in using active sonar, erodes capabilities, and reduces perishable skills. These impacts would result in a significant risk to personnel safety during military missions and combat operations and would prevent units from meeting their individual training and certification requirements. Therefore, implementing additional mitigation that would reduce training realism would ultimately prevent units from deploying with the required level of readiness necessary to accomplish their missions and impede the Navy's ability to certify forces to deploy to meet national security tasking. Reducing realism in testing would impact the ability of researchers, program managers, and weapons system acquisition programs to conduct accurate acoustic research and effectively test systems and platforms (and components of these systems and platforms) before full-scale production or delivery to the fleet. These tests are required to ensure functionality and accuracy in military mission and combat conditions per required acquisition milestones or on an as-needed basis to meet operational requirements.

5.5.2 Explosives

When assessing and developing mitigation, the Navy considered reducing the number and size of explosives and limiting the locations and time of day of explosive training and testing in the Study Area. The Navy determined that it would be practical to implement certain restrictions on the use of explosives in the Study Area, as detailed in Section 5.3.3 (Explosive Stressors) and Appendix K (Geographic Mitigation Assessment). As discussed in Chapter 2 (Description of Proposed Action and Alternatives), Section 5.2.3 (Practicality of Implementation), Appendix A (Navy Activities Descriptions), and Appendix K (Geographic Mitigation Assessment), the locations and timing of the training and testing activities that use explosives vary throughout the Study Area based on range scheduling, mission requirements, testing program requirements, and standard operating procedures for safety and mission success.

Activities that involve explosive ordnance are inherently different from those that involve non-explosive practice munitions. For example, critical components of an explosive Bombing Exercise Air-to-Surface include the assembly, loading, delivery, and assessment of the explosive bomb. The explosive bombing training exercise starts 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 practice munitions 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 number and size of explosives or diminishing activity realism by implementing time of day or geographic restrictions for additional explosive training activities would impede the ability for Navy Sailors to train and become proficient in using explosive weapons systems (which would result in a significant risk to personnel safety during military missions and combat operations), and would ultimately prevent units from meeting their individual training and certification requirements (which would prevent them from deploying with the required level of readiness necessary to accomplish their missions) and impede the Navy's ability to certify forces to deploy to meet national security tasking.

Similar to training, the Navy is required to test its explosives to quantify the compatibility of weapons with the platform from which they will be launched or released in military missions and combat operations. Such testing requires the use of the actual explosive ordnance that will be used during training exercises, military missions, and combat operations. Reducing the number and size of explosives or diminishing activity realism by implementing time of day or geographic restrictions for additional explosive testing events would impact the ability of researchers, program managers, and weapons system acquisition programs to effectively test systems and platforms (and components of these systems and platforms). Such testing must be conducted before full-scale production or delivery to the fleet to ensure functionality and accuracy in military mission and combat conditions per required acquisition milestones or on an as-needed basis to meet operational requirements. It would not be possible to illuminate mitigation zones during activities (such as during Kinetic Energy Weapon Testing) when conducted at night, due to either the size of the mitigation zone or the distance between the firing platform and the target or location.

5.5.3 Active and Passive Acoustic Monitoring Devices

When assessing and developing mitigation, the Navy considered using active and passive acoustic monitoring devices as procedural mitigation. 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 known as "HF/M3" to mitigate potential impacts. HF/M3 can only be towed at slow speeds and operates like a fish finder used by commercial and recreational fishermen. Installing the HF/M3 adjunct system on the tactical sonar ships used under the Proposed Action would have implications for safety and mission requirements due to impacts on speed and maneuverability. Furthermore, installing the system would significantly increase costs associated with designing, building, installing, maintaining, and manning the equipment. The Navy will not install the HF/M3 system or other adjunct marine mammal monitoring devices as mitigation under the Proposed Action. However, Navy assets with passive acoustic monitoring capabilities that are already participating in an activity will continue to monitor for marine mammals, as described in Section 5.2.1 (Procedural Mitigation Development) and Section 5.3 (Procedural Mitigation to be Implemented). Significant manpower and logistical constraints make constructing and maintaining additional passive acoustic monitoring systems for each training and testing activity under the Proposed Action impractical. For example, the Navy does not have available manpower or resources to allocate additional aircraft for the purpose of deploying, monitoring, and retrieving passive acoustic monitoring equipment during a bombing exercise. All platforms participating in explosive bombing exercises (e.g., firing aircraft, safety aircraft) must focus on situational awareness of the activity area and continuous

coordination between multiple training components for safety and mission success. Therefore, it is impractical for participating platforms to divert their attention to non-mission essential tasks, such as deploying sonobuoys and monitoring for acoustic detections during the event (e.g., setting up a computer station). Diverting platforms with passive acoustic monitoring capabilities to monitor training and testing events would impact their ability to meet their mission requirements and would reduce the service life of those systems.

The Navy is continuing to improve its capabilities to use range instrumentation to aid in the passive acoustic detection of marine mammals. For example, at the Southern California Offshore Range, the Pacific Missile Range Facility off Kauai, Hawaii, and the Atlantic Undersea Test and Evaluation Center in the Bahamas, the Navy can monitor instrumented ranges in real-time or through data recorded by hydrophones. The Navy has sponsored numerous studies that have produced meaningful results on marine mammal occurrence, distribution, and behavior on these ranges through the U.S. Navy's Marine Species Monitoring Program. For information on the U.S. Navy's Marine Species Monitoring Program, see Section 5.1.2.2.1 (Marine Species Research and Monitoring Programs).

Although the Navy's instrumented ranges are helping to facilitate a better understanding of the species that are present in those areas, instrumented ranges were not developed for the purpose of mitigation, and therefore do not have the capabilities to be used effectively for mitigation. To develop an estimated position for an individual marine mammal, the animal's vocalizations must be detected on at least three hydrophones. The vocalizations must be loud enough to provide the required signal to noise ratio on those hydrophones. The hydrophones must have the required bandwidth and dynamic range to capture that signal. Detection capabilities are generally degraded under noisy conditions (such as high sea state) that affect signal to noise ratio. The ability to detect and develop an estimated position for marine mammals on the Navy's instrumented ranges depends of numerous factors, such as behavioral state (e.g., only vocalizing animals can be detected), species (e.g., species vocalize at varying rates, call types, and source levels), animal location relative to the passive acoustic receivers (hydrophones), and location on the range. The Navy's hydrophones cannot track the real-time locations of individual animals with dispersed and directional vocalizations with the level of precision needed for effective mitigation. Even marine mammals that have been vocalizing for extended periods of time have been known to stop vocalizing for hours at a time, which would prevent the Navy from obtaining or maintaining an accurate estimate of that animal's location. In addition, the Navy does not currently have the capability to perform data processing for large baleen whales in real-time. Determining if an animal is located within a mitigation zone within the timeframes required for mitigation would be prohibited by the amount of time it takes to process the data.

If a vocalizing animal is detected on only one or two hydrophones, estimating its location is not possible, and the location of the animal would be assigned generally within the detection radius around each hydrophone. The detection radius of a hydrophone is typically much larger than the mitigation zone for the activities conducted on instrumented ranges. The Navy does not have a way to verify if that vocalizing animal is located within the mitigation zone or at a location down range. Mitigating for passive acoustic detections based on unknown animal locations would essentially increase the mitigation zone sizes for each activity to that of the hydrophone detection radius. Increasing the mitigation zone sizes beyond what is described for each activity is impractical for the reasons described throughout Section 5.3 (Procedural Mitigation to be Implemented).

In summary, although the Navy is continuing to improve its capabilities to use range instrumentation to aid in the passive acoustic detection of marine mammals, at this time it would not be effective or

practical for the Navy to monitor instrumented ranges for real-time mitigation or to construct additional instrumented ranges as a tool to aid in the implementation of mitigation.

5.5.4 Thermal Detection Systems and Unmanned Aerial Vehicles

When assessing and developing mitigation, the Navy considered using thermal detection systems and other technologies (e.g., autonomous platforms such as unmanned aerial vehicles, X-band radar) as procedural mitigation. The use of X-band radar instruments for marine mammal monitoring is a new field of study. A preliminary pilot experiment in the Mediterranean Sea indicated that X-band radar instruments, which allow for continuous observation of the sea surface within a certain range from the radar antenna, were able to detect bottlenose dolphins during optimal weather and sea state conditions (Mingozzi et al., 2020). Detections by radar were generally limited by conditions such as waves, which did not allow for the correct identification of small targets, and rain, which masked the radar signal reflection and reduced the ability to detect targets. The pilot experiment used a manual approach to observe for and validate radar detections; however, future technological developments could potentially allow for automated marine mammal observation using X-band radar (Mingozzi et al., 2020).

Thermal detection technology is designed to allow observers to detect the difference in temperature between a surfaced marine mammal (i.e., the body or blow of a whale) and the environment (i.e., the water and air). Thermal detection systems can be effective at detecting some types of marine mammals in a limited range of marine environmental conditions. Technologies are advancing but continue to be limited by their (1) reduced performance in certain environmental conditions, (2) ability to detect certain animal characteristics and behaviors, (3) low sensor resolution and narrow fields of view, and (4) high cost and low lifecycle (Boebel, 2017; Zitterbart et al., 2013). Current thermal detection systems have proven more effective at perceiving thermal anomalies as distance to the observer decreases (Zitterbart et al., 2020), and at detecting large whale blows than the bodies of small animals, particularly at a distance (Zitterbart et al., 2013). Zitterbart et al. (2020) found that certain cues, such as those caused by the displacement of relatively large amounts of water (e.g., whale breaches) were less affected by distance than other cues (e.g., whale blows) that showed a linear decay related to the effects of wind on thermal perceptibility. The study also found that the maximum thermal perceptibility distance ranged from < 1 to 10 kilometers, depending on factors such as cue type, species, and observation location.

The effectiveness of current technologies has not been demonstrated for small marine mammals. Thermal detection systems exhibit varying degrees of false positive detections (i.e., incorrect notifications) due in part to their low sensor resolution and reduced performance in certain environmental conditions. False positive detections may incorrectly identify other features (e.g., birds, waves, boats) as marine mammals. Zitterbart et al. (2013) reported a false positive rate approaching one incorrect notification per four minutes of observation. Zitterbart et al. (2020) reported maximum false positive rates of greater than 30 or 50 per hour, depending on observation location.

Thermal detection systems are generally thought to be most effective in detecting large, short-diving marine mammals in cold environments where there is a large temperature differential between an animal's temperature and the environment (Verfuss et al., 2018). Two studies that examined the effectiveness of thermal detection systems for marine mammal observations are Zitterbart et al. (2013), which tested a thermal detection system and automatic algorithm in polar waters between 34 and 50 degrees Fahrenheit, and a Navy-funded study in subtropical and tropical waters. Zitterbart et al. (2013) found that current technologies have limitations regarding temperature and survey conditions

(e.g., rain, fog, sea state, glare, ambient brightness), for which further effectiveness studies are required. The Office of Naval Research Marine Mammals and Biology program funded a project (2013–2018) to test the thermal limits of infrared-based automatic whale detection technology. That project focused on capturing whale spouts at two different locations featuring subtropical and tropical water temperatures, optimizing detector/classifier performance on the collected data, and testing system performance by comparing system detections with concurrent visual observations. Results indicated that thermal detection systems in subtropical and tropical waters can be a valuable addition to marine mammal surveys within a certain distance from the observation platform (e.g., during seismic surveys, vessel movements), but they have challenges associated with false positive detections of waves and birds (Boebel, 2017).

The Navy has also been investigating the use of thermal detection systems with automated marine mammal detection algorithms for future mitigation during training and testing, including on autonomous platforms. For example, the Defense Advanced Research Projects Agency funded six initial studies to test and evaluate infrared-based thermal detection technologies and algorithms to automatically detect marine mammals on an unmanned surface vehicle. Based on the outcome of these initial studies, the Navy is pursuing additional follow-on research efforts.

Thermal detection systems are currently used by some specialized U.S. Air Force aircraft for marine mammal mitigation. These systems are specifically designed for and integrated into Air Force aircraft and cannot be added to Navy aircraft. Only certain Navy aircraft have specialized infrared capabilities, and these capabilities are only for fine-scale targeting within a narrow field of view. The only thermal imagery sensors aboard Navy surface ships are associated with specific weapons systems, and these sensors are not available on all vessels. These sensors are typically used only in select training events, have a limited lifespan before requiring expensive replacement, and are not optimized for marine mammal observations within the Navy's mitigation zones. For example, as described in Section 5.3.3.3 (Explosive Medium-Caliber and Large-Caliber Projectiles), Lookouts are required to observe a 1,000 yd. mitigation zone around the intended impact location during explosive large-caliber gunnery activities. In addition to observing for marine mammals, one of the activity's mission-essential requirements is for event participants, including Lookouts, to maintain focus on the mitigation zone to ensure the safety of Navy personnel and equipment and the public. Lookouts would not be able to observe the 1,000 yd. mitigation zone using the Navy's thermal imagery sensors due to their narrow fields of view and technological design specific to fine-scale targeting. Such observations would be ineffective for marine mammals and would prevent Lookouts from effectively maintaining focus on the activity area and implementing mission-essential safety protocols.

The effectiveness of even the most advanced commercially available thermal detection systems with technological designs specific to marine mammal observations is highly dependent on environmental conditions, animal characteristics, and animal behaviors (Zitterbart et al., 2013). Considering the range of environmental conditions and diversity of marine mammal species found throughout the Study Area, the use of thermal detection systems would be less effective than the traditional techniques currently employed by the Navy, such as naked-eye scanning, hand-held binoculars, and high-powered binoculars mounted on a ship deck. Furthermore, high false positive rates of thermal detection systems could result in the Navy implementing mitigation for features incorrectly identified as marine mammals. Increasing the instances of mitigation implementation based on incorrectly identified features would have significant impacts on the ability for training and testing activities to accomplish their intended objectives, without providing any mitigation benefit to the species. In addition, thermal detection

systems are designed to detect marine mammals and do not have the capability to detect other resources for which the Navy is required to implement mitigation. Requiring Lookouts to use thermal detection systems would prevent them from detecting and mitigating for sea turtles and other biological resources (e.g., jellyfish aggregations).

Verfuss et al. (2018) determined that based on the science of current thermal detection system technologies, the combined performance of two or more observation methods would improve detection probability for real-time monitoring of marine mammals. Similarly, during a study conducted offshore Atlantic Canada, Smith et al. (2020) found that overall marine mammal detection rates increased when complementary methods (marine mammal observers, infrared cameras, and passive acoustic monitoring) were used. A combination of techniques balances the benefits and limitations of each method, particularly in conditions such as high sea state and low-visibility. As discussed in Section 5.3 (At-Sea Procedural Mitigation to be Implemented), the Navy's procedural mitigation measures include the maximum number of Lookouts the Navy can assign to each activity based on available manpower and resources, combined with the use of passive acoustic monitoring when those assets are already participating in an activity. It would be impractical to add personnel to serve as additional Lookouts for the sole purpose of thermal detection system use under the Proposed Action because the Navy does not have available manpower to add Lookouts to use thermal detection systems in tandem with existing Lookouts who are using traditional observation techniques.

In summary, thermal detection systems have not been sufficiently studied both in terms of their effectiveness within the environmental conditions found in the Study Area and their compatibility with Navy training and testing. The Navy plans to continue researching thermal detection systems to determine their effectiveness and compatibility with Navy applications. If the technology matures to the state where thermal detection is determined to be an effective mitigation tool during training and testing, the Navy will assess the practicality of using the technology during training and testing events and retrofitting its observation platforms with thermal detection devices. The assessment will include an evaluation of the budget and acquisition process (including costs associated with designing, building, installing, maintaining, and manning equipment that is expensive and has a relatively short lifecycle before key system components need replacing); logistical and physical considerations for device installment, repair, and replacement (e.g., conducting engineering studies to ensure there is no electronic or power interference with existing shipboard systems); manpower and resource considerations for training personnel to effectively operate the equipment; and considerations of potential security and classification issues. New system integration on Navy assets can entail up to 5–10 years of effort to account for acquisition, engineering studies, and development and execution of systems training. The Navy will provide information to NMFS about the status and findings of Navy-funded thermal detection studies and any associated practicality assessments at the annual adaptive management meetings. Information about the Navy's adaptive management program is included in Section 5.1.2.2.1.1 (Adaptive Management).

5.5.5 Third-Party Observers

When assessing and developing mitigation, the Navy considered using third-party observers during training and testing to aid in the implementation of procedural mitigation. The use of third-party observers to conduct pre- or post-activity biological resource observations would be an ineffective mitigation because marine mammals would likely move into or out of the activity area, and mitigation must be implemented at the time the activity is taking place.

There are significant manpower and logistical constraints that make using third-party observers for every training and testing activity under the Proposed Action impractical. Training and testing activities often occur simultaneously and in various regions throughout the Study Area, some of which last for days or weeks at a time. Having third-party observers embark on Navy vessels or aircraft would result in safety and security clearance issues. Training and testing event planning includes careful consideration of capacity limitations when placing personnel on participating aircraft and vessels. The Navy is unable to add third-party observers on a ship or substitute a Navy Lookout with a third-party observer without causing a berthing shortage or exceedance of other space limitations, or impacting the ability for Lookouts to complete their other mission-essential duties. The use of third-party observers also presents national security concerns due to the requirement to provide advance notification of specific times and locations of Navy platform movements and activities (e.g., vessels using active sonar).

Reliance on the availability of third-party personnel for mitigation would be impractical because training and testing activity timetables oftentimes cannot be precisely fixed and are instead based on the free-flow development of tactical situations. Waiting for third-party aircraft or vessels to complete surveys, refuel, or transit on station would extend the length of the activity in a way that would diminish realism and delay training and testing schedules. Hiring third-party civilian vessels or aircraft to observe Navy training and testing activities would also be unsustainable due to the significant associated costs. Because many training and testing activities take place offshore, the amount of time observers would spend on station would be limited due to aircraft fuel restrictions. Fuel restrictions and distance from shore would increase safety risks should mechanical problems arise. The presence of civilian aircraft or vessels in the vicinity of training and testing activities would present increased safety risks due to airspace conflicts and proximity to explosives.

5.5.6 Foreign Navy Mitigation

When assessing and developing mitigation, the Navy considered adopting the mitigation measures implemented by foreign navies. Mitigation measures are carefully developed for and assessed by each individual navy based on the potential impacts of their activities on the biological resources that live in their Study Areas, and the practicality of mitigation implementation based on their training mission and testing program requirements and the resources available for mitigation. The U.S. Navy's readiness considerations differ from those of foreign navies based on each navy's strategic reach, global mission, country-specific legal requirements, and geographic considerations. Most non-U.S. navies do not possess an integrated strike group and do not have integrated training requirements. The U.S. Navy's training is built around the integrated warfare concept and is based on the U.S. Navy's capabilities, the threats faced, the operating environment, and the overall mission. For this reason, not all measures developed for foreign navies would be effective at reducing impacts of U.S. Navy training or testing, or practical to implement by the U.S. Navy (and vice versa). For example, some navies implement active sonar ramp-up as mitigation for marine mammals; however, as described in Section 5.5.1 (Active Sonar), the U.S. Navy determined that active sonar ramp-up would be an ineffective mitigation measure for training and testing activities under the Proposed Action and would be impractical to implement because it would significantly impact training and testing realism.

The U.S. Navy will implement mitigation measures that have been determined to be effective at avoiding or reducing impacts from the Proposed Action and practical to implement by the U.S. Navy. Many of these measures are the same as, or comparable to, those implemented by foreign navies. For example, most navies implement some form of procedural mitigation to cease certain activities if a marine mammal is observed in a mitigation zone (Dolman et al., 2009). Some navies also implement

geographic mitigation to restrict activities within particularly important marine mammal breeding, feeding, or migration habitats. The U.S. Navy will implement several mitigation measures and environmental compliance initiatives that are not implemented by foreign navies. For example, as discussed in Section 5.1.2.2 (Monitoring, Research, and Reporting Initiatives), the U.S. Navy will continue to sponsor scientific monitoring and research and comply with stringent reporting requirements.

5.5.7 Reporting Requirements

When assessing and developing mitigation, the Navy considered increasing its reporting requirements, such as additional reporting of vessel speeds and marine species observations. As discussed in Section 5.1.2.2 (Monitoring, Research, and Reporting Initiatives), the Navy developed its 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 Navy's training and testing 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. In the unlikely event that a vessel strike of a marine mammal should occur, the Navy would provide NMFS with relevant information pertaining to the incident, including but not limited to vessel speed.

Additional reporting would be ineffective as mitigation because it would not result in modifications to training or testing activities or further avoidance or reductions of potential impacts. For example, additional reporting of vessel speed data would not result in modifications to vessel speeds (e.g., speed restrictions) or reduce the already low potential for vessel strikes of marine mammals for the reasons described in Section 5.3.4.1 (Vessel Movement). 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 Navy does not currently maintain a record management system to collect, archive, analyze, and report every marine species observation or all vessel speed data for every training and testing activity and all vessel movements. For example, the speed of Navy vessels can fluctuate an unlimited number of times during training and 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 participations with requirements to complete additional administrative reporting would distract them from preparing a ready force and 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 effectiveness of training or testing.

5.6 Mitigation Summary

Table 5.6-1 provides a general summary of the mitigation measures the Navy will implement under Alternative 1 or Alternative 2 of the Proposed Action. For detailed mitigation requirements, see Section 5.3 (Procedural Mitigation to be Implemented) and Appendix K (Geographic Mitigation Assessment).

Table 5.6-1: Summary of Mitigation Requirements

Stressor, Activity, or Mitigation Category	Procedural Mitigation Requirements Wherever Activities Occur in the Study Area		Mitigation Areas (MA) with Geographic Mitigation Requirements										Species Protection Focus			
	Number of Lookouts	Mitigation Zone Size or Other Requirements ¹	Seafloor Resource MA	Marine Species Coastal MA			Olympic Coast National Marine Sanctuary MA	Juan de Fuca Eddy Marine Species MA	Stonewall and Heceta Bank Humpback Whale MA (May–Nov)	Point St. George Humpback Whale MA (July–Nov)	Puget Sound and Strait of Juan de Fuca MA	Northern Puget Sound Gray Whale MA (March–May)	Marine mammals	Sea turtles	Seabirds	Fish
				50 NM	20 NM	12 NM										
Environmental Awareness and Education	• —	• Personnel take assigned Afloat Environmental Compliance Training modules	—	Seasonal Awareness Messages for whales	—	—	—	—	—	—	Seasonal Awareness Messages for whales	—	X	X	X	—
Active Sonar	1 or 2, depending on source	• 1,000 yd. power down, 500 yd. power down, and 200 yd. or 100 yd. shut down for LF at 200 decibels (dB) and HM MF • 200 yd. or 100 yd. shut down for LF < 200 dB, MF not HM, and HF	—	—	MF1 hours limit	No non-explosive torpedo training; No ASW Tracking Exercises	MF1 hours limit	MF1 hours limit	No MF1	No MF1	Limit UUV locations for SRKW density; Coordinate with marine mammal detection networks and NMFS prior to applicable activities	No Civilian Port Defense – Homeland Security Anti-Terrorism/ Force Protection Exercises	X	X	X	X
Weapons Firing Noise	1	• 30° on either side of the firing line out to 70 yd. from the muzzle of weapon being fired	—	No explosive gunnery	No non-explosive lg-cal gunnery	—	—	—	—	—	No gunnery (except blank sm-cal)	—	X	X	X	—
Explosive Sonobuoys	1	• 600 yd. shut down	—	No explosive sonobuoys	—	—	—	—	—	—	No explosive sonobuoys	—	X	X	X	X
Explosive Torpedoes	1	• 2,100 yd. shut down	—	No explosive torpedoes	—	—	—	—	—	—	No explosive torpedoes	—	X	X	X	X
Explosive Med-Cal and Lg-Cal Projectiles	1	• Med-cal: 200 yd. (seabirds) and 600 yd. (marine mammals, sea turtles) shut down; • Lg-cal: 1,000 yd. shut down (marine mammals, sea turtles)	—	No explosive gunnery	—	—	—	—	—	—	No explosive gunnery	—	X	X	X	X
Explosive Missiles	1	• 2,000 yd. shut down	—	No explosive missiles	—	—	—	—	—	—	No explosive missiles	—	X	X	X	X
Explosive Bombs	1	• 2,500 yd. shut down	—	No explosive bombs	—	—	—	—	—	—	No explosive bombs	—	X	X	X	X
Explosive Mine Countermeasure and Neutralization Activities	1 (≤ 5 lb. NEW), 2 (> 5–60 lb. NEW)	• 600 yd. shut down (≤ 5 lb. NEW) • 2,100 yd. shut down (> 5–60 lb. NEW) • Smallest practicable charge size	No explosive MCM testing	—	Seasonal explosive MCM Testing limit	—	No explosive MCM Testing	No explosive MCM Testing	No explosive MCM Testing	No explosive MCM Testing	No explosive MCM Testing	—	X	X	X	X

Table 5.6-1: Summary of Mitigation Requirements (continued)

Stressor, Activity, or Mitigation Category	Procedural Mitigation Requirements Wherever Activities Occur in the Study Area		Mitigation Areas (MA) with Geographic Mitigation Requirements										Species Protection Focus			
	Number of Lookouts	Mitigation Zone Size or Other Requirements ¹	Seafloor Resource MA	Marine Species Coastal MA			Olympic Coast National Marine Sanctuary MA	Juan de Fuca Eddy Marine Species MA	Stonewall and Heceta Bank Humpback Whale MA (May–Nov)	Point St. George Humpback Whale MA (July–Nov)	Puget Sound and Strait of Juan de Fuca MA	Northern Puget Sound Gray Whale MA (March–May)	Marine mammals	Sea turtles	Seabirds	Fish
				50 NM	20 NM	12 NM										
Explosive Mine Neutralization Activities Involving Navy Divers	2, including 1 Navy biologist	<ul style="list-style-type: none">• 100 yd. (< 0.1 lb. NEW) and 400 yd. (> 0.5–2.5 lb. NEW) shut down (seabirds),• 500 yd. (> 0.5–2.5 lb. NEW) shut down (marine mammals)• Smallest practicable charge size	No explosive mine training	—	—	—	—	—	—	—	Restricted to designated locations; Seasonal charge size or distance from shore requirements; Coordinate with marine mammal detection networks	—	X	—	X	X
Vessel Movement	1	<ul style="list-style-type: none">• 500 yd. (avoid whales)• 200 yd. (surface ships avoid other marine mammals)• 100 yd. (small boats avoid other marine mammals)• Avoid sea turtle vicinity	No precision anchoring; No anchor or mooring device placement	—	—	—	—	—	—	—	Coordinate with marine mammal detection networks and NMFS prior to Small Boat Attack Exercises	—	X	X	—	—
Towed In-Water Devices	1	<ul style="list-style-type: none">• 250 yd. avoidance for in-water devices towed by aircraft or surface ships (marine mammals)• 100 yd. avoidance for in-water devices towed by small boats (marine mammals)• Avoid sea turtle vicinity	—	—	—	—	—	—	—	—	—	—	X	X	—	—
Sm-, Med-, and Lg-Cal Non-Explosive Practice Munitions	1	<ul style="list-style-type: none">• 200 yd. shut down during sm-, med-, lg-cal events (marine mammals, sea turtles) and sm-, med-cal events (seabirds)	—	—	No non-explosive lg-cal gunnery	No non-explosive sm- and med-cal gunnery	—	—	—	—	No non-explosive gunnery (except blank sm-cal)	—	X	X	X	X
Non-Explosive Missiles	1	<ul style="list-style-type: none">• 900 yd. shut down	—	No non-explosive missiles	—	—	—	—	—	—	No non-explosive missiles	—	X	X	X	X
Non-Explosive Bombs and Mine Shapes	1	<ul style="list-style-type: none">• 1,000 yd. shut down	No mine shape placement	—	No non-explosive bombing	—	No non-explosive bombing	—	—	—	No non-explosive bombing	—	X	X	X	X

¹ The mitigation zones apply to marine mammals and sea turtles unless specified otherwise

Notes: — = No mitigation or mitigation is not applicable, X = Mitigation is applicable, ASW = anti-submarine warfare, HF = high-frequency, HM = hull-mounted, LF = low-frequency, Lg-cal = large-caliber, MA = Mitigation Area, MCM = Mine Countermeasure and Neutralization Testing, Med-cal = medium-caliber, MF = mid-frequency, NEW = net explosive weight, NM = nautical miles, Sm-cal = small-caliber, S-S = surface-to-surface, yd. = yard

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