Final

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

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3.2 Sediment and Water Quality

SEDIMENT AND WATER QUALITY SYNOPSIS

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

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

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

3.2.1 Introduction

The following sections provide an overview of sediment and water quality in the Study Area and describe the methods used to analyze potential impacts of the Proposed Action on these resources. Additional relevant information related to existing ecological characteristics of the Study Area, including bathymetry, currents, and water masses, is provided in Section 3.0.2 (Ecological Characterization of the Study Area) of the 2018 *Final Atlantic Fleet Training and Testing Environmental*

Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) (U.S. Department of the Navy, 2018) (hereinafter referred to as the 2018 Final EIS/OEIS), and a discussion of existing substrate and habitat characteristics is provided in Section 3.3 (Habitats).

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

3.2.2 Affected Environment

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

3.2.2.1 Sediment Quality

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

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

Table 3.2-1: Sediment Quality Summary

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

Table 3.2-1: Sediment Quality Summary (continued)

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

Table 3.2-1: Sediment Quality Summary (continued)

Region	*General Description*	*Sediment Quality Summary*
Southeast (continued)	• The continental margin of the South Atlantic Bight includes several prominent features, such as the Blake Plateau, which is a broad, terrace-like feature seaward of the southern Atlantic shelf off Georgia and South Carolina in water depths ranging from 500 to 1,100 m. • The continental margin also includes the Charleston Bump, Blake Ridge, and Blake Escarpment (Kaplan, 2011).	
Gulf of America	• States bordering the Gulf of America region include the west coast of Florida, Alabama, Mississippi, Louisiana, and Texas. • The region includes the Corpus Christi, New Orleans, Pensacola, Panama City, and Key West operating areas. Four locations in the Gulf of America region—Atchafalaya Bay, Atchafalaya River, Lake Borgne, and Pascagoula River—are new areas added for this Supplemental EIS/OEIS (see Table 2.1-1, Atlantic Fleet Training and Testing Study Area Summary Table). • The region includes more than 750 estuaries, bays, and sub-estuary systems associated with larger estuaries. • A broad range of sedimentary environments exists in the Gulf of America. The western and central portions of the region are dominated by sediment deposition from the Rio Grande and Mississippi River systems. • DeSoto Canyon, a submarine feature southwest of Pensacola, Florida, marks the transition between the Mississippi River-influenced sediment to the west (Alabama, Mississippi, Louisiana, and Texas) and the carbonate-dominated sediment to the east and south along western Florida. • Waves and tides, along with the effects of weather (e.g., hurricanes), are primary mechanisms that move sediments (Ward & Tunnell, 2017).	• The overall assessment for the region was that 54% of the area had a good rating, 17% had a fair rating, and 25% had a poor rating (U.S. Environmental Protection Agency, 2016). • The overall assessment for estuarine portions of the region was that 75% of the area had a good rating, 23% had a fair rating, and 2% had a poor rating (U.S. Environmental Protection Agency, 2016). • Contaminant concentrations in sediments generally decrease with distance from shore. • A study conducted by the National Oceanic and Atmospheric Administration (Cooksey et al., 2014) determined that sediments in offshore areas of Gulf of America were relatively uncontaminated as compared to typical near-shore sediments, with all of the Study Area having low levels of chemical contaminants relative to sediment quality guidelines. • Petroleum hydrocarbons in continental shelf and slope sediments are almost exclusively due to natural oil and gas seepage (Ward & Tunnell, 2017).

Table 3.2-1: Sediment Quality Summary (continued)

Region	*General Description*	*Sediment Quality Summary*
Caribbean	• The Caribbean region includes offshore areas south and southeast of the Florida Keys. • The majority of the Key West RC is located within this ecosystem. • Sediments in the Caribbean Region consist largely of (50 to 95%) a combination of carbonate sand, mud, and silt. • Sediment distribution in shallower areas (100 to 500 m) is influenced by tides and the Loop Current. • Sediments at intermediate depth and deeper (greater than 800 m) are influenced by the eastward-flowing Florida Current and low-energy, westward-flowing currents, respectively (Brooks & Holmes, 1990).	• Sediment quality in Puerto Rico was not assessed in the 2010 National Coastal Condition Assessment (U.S. Environmental Protection Agency, 2016). • However, the previous (2008) assessment (U.S. Environmental Protection Agency, 2012b) included island territories. Coastal sediments in Puerto Rico were rated 72% good, 2% fair, and 20% poor with 6% of data missing. • Elevated levels of organic carbon and sediment toxicity were found at several sites across the U.S. Virgin Islands (U.S. Environmental Protection Agency, 2012b).

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

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

3.2.2.2 Water Quality

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

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

Table 3.2-2: Water Quality Summary

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

Table 3.2-2: Water Quality Summary (continued)

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

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

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

3.2.2.2.1 Marine Debris and Water Quality

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

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

3.2.2.2.2 Increasing Atmospheric Carbon Dioxide Levels and Water Quality

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

3.2.3 Environmental Consequences

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

This section assesses the potential environmental impacts of the Proposed Action to sediment and water quality by considering the environmental fate (i.e., as it relates to the physical, chemical, and biological processes that determine the behavior of contaminants in sediments and water) and effects of four stressors associated with military readiness activities: (1) explosives and explosives byproducts, (2) metals,

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

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

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

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

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

3.2.3.1 Explosives and Explosives Byproducts

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

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

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

Background Information Summary

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

Table 3.2-4: Explosives and Explosives Byproducts Background Information Summary (continued)

Background Information Summary
magnitude lower than concentrations expected to be toxic to most species (i.e., provisional screening or benchmark levels). o These findings and conclusions are consistent with those of other studies conducted at Navy training ranges.

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

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

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

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

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

Munitions Constituents	*Freshwater WQC (µg/L)*		*Marine WQC (µg/L)*		*Combined WQC (µg/L)*		*RMUS Screening Value (µg/L)*
	Acute	*Chronic*	*Acute*	*Chronic*	*Acute*	*Chronic*	
Perchlorate	--	--	--	--	--	--	9,300

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

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

Table 3.2-6: Sediment Quality Benchmarks for Munitions Constituents

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

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

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

3.2.3.1.1 Impacts from Explosives and Explosives Byproducts under Alternative 1

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

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

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

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

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

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

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

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

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

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

3.2.3.1.2 Impacts from Explosives and Explosives Byproducts under Alternative 2

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

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

3.2.3.2 Metals

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

Table 3.2-7: Metals Background Information Summary

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

3.2.3.2.1 Impacts from Metals under Alternative 1

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

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

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

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

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

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

3.2.3.2.2 Impacts from Metals under Alternative 2

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

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

3.2.3.3 Chemicals Other Than Explosives

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

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

Background Information Summary
• Military readiness activities, such as those associated with the Proposed Action, would release a variety of chemicals other than explosives into the marine environment. • Chemicals other than explosives are associated with the following military expended materials: o solid-fuel propellants in missiles and rockets o Otto Fuel II torpedo propellant and combustion byproducts o chemicals associated with other non-explosive materials, including munitions. • Constituents commonly found in the energetics, propellant, and pyrotechnic elements of munitions may also leach from solid components of munitions and release into seawater. • Propellants used by rockets and missiles are typically completely consumed prior to impact of the water surface even if the munition fails to detonate upon impact. • Perchlorates, which make up a large percentage of rocket and missile propellants, are water soluble and any residuals that are not consumed dissolve and are dispersed in surface waters. • Aluminum powder is used as a fuel additive and ranges from 5 to 22% by weight of solid propellant. • Other explosives (e.g., octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine and hexahydro-1,3,5-trinitro-1,3,5-triazine) may be added, although they usually comprise less than 30% by weight of the propellant. • Otto Fuel II is used as a liquid propellant in torpedoes; it is consumed underwater, and any combustion products would enter the marine environment. • Exhaust byproducts of solid and liquid propellants include nitrous oxides, carbon monoxide, and carbon dioxide (Bennett et al., 1992). These byproducts occur naturally in the marine environment due, for example, to in situ production of carbon monoxide from photooxidation of dissolved organic matter in seawater. Distributions and concentrations reflect dispersion (such as exchange of carbon monoxide between seawater and the atmosphere), biochemical processes (such as oxidation of carbon monoxide by microorganisms), and rates of in situ production. Intermittent and dispersed inputs of exhaust byproducts associated with military readiness activities would result in negligible effects on water or sediment quality. • Target vessels used during sinking exercises are a potential source of polychlorinated biphenyls that may be present. However, USEPA considers the contaminant levels released during the sinking of a target to be within the standards of the Marine Protection, Research, and Sanctuaries Act (U.S. Environmental Protection Agency, 2014). • Fuel release procedures are governed by Federal Aviation Administration and Department of the Navy rules. Navy pilots are prohibited from dumping fuel below 6,000 feet, except in an emergency situation. Above 6,000 feet, the fuel would have enough time to completely vaporize and dissipate and therefore have a negligible effect on the ground below. Therefore, impacts from chemicals other than explosives associated with fuel release during aerial procedures are not analyzed further in this document. • The DoD uses chemical simulants for chemical and biological warfare agents for the purposes of testing equipment intended to detect their presence. Specific simulants are selected based on safety to humans and the environment, as well as the ability to trigger a response by sensors used in the detection equipment, such that exposure levels during testing activities would be well below concentrations associated with any adverse human health or environmental effects. Given the criteria for choosing simulants for use in testing activities, it is reasonable to conclude that simulants would have negligible

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

Background Information Summary
impact on sediment and water quality in the Study Area. Therefore, simulants are not analyzed further in this section.

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

3.2.3.3.1 Impacts from Chemicals Other Than Explosives under Alternative 1

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

Forty-three of the testing activities under Alternative 1 would result in releases of chemicals other than explosives to the marine environment (see Table B-2, Stressors by Testing Activity, in Appendix B, Activity Stressor Matrices). Of these, 23 testing activities would remain relatively unchanged from activities evaluated in the 2018 Final EIS/OEIS (i.e., same locations and numbers of exercises or same locations with fewer numbers of exercises). One activity—Intelligence, Surveillance, and Reconnaissance—was not evaluated in the 2018 Final EIS/OEIS. As shown in Table 2.2-3 through Table 2.2-6, the remaining 19 activities would have a greater number of exercises and/or exercises within a location that are different from those evaluated in the 2018 Final EIS/OEIS. Impacts from releases of chemicals other than explosives associated with those testing activities that are unchanged would be the same as discussed in the 2018 Final EIS/OEIS (Section 3.2.3.2, Chemicals Other Than Explosives). Therefore, the following focuses on those training and testing activities that are new, would have an increased number of exercises, or would occur at a different location(s) for the Proposed Action.

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

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

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

The types, amounts, and distributions of chemicals other than explosives released to the marine environment during military readiness activities under Alternative 1 would be similar to those associated with previous military readiness activities as analyzed in the 2018 Final EIS/OEIS. Assessments of releases of chemicals other than explosives associated with previous training activities in the Study Area (2018 Final EIS/OEIS; Section 3.2.3.2, Chemicals Other Than Explosives) concluded that for properly functioning munitions, impacts to sediment and water quality would be minimal for the following reasons: (1) the sizes of the offshore range complex areas in which expended materials would be distributed are large; (2) most propellant combustion byproducts are benign, while those of concern would be diluted to below detectable levels within a short time; (3) most propellants are consumed during normal operations; (4) most byproducts of Otto Fuel II combustion are non-toxic and naturally occurring chemicals, and most torpedoes are recovered after use, such that any fuel that is not consumed would be recovered along with the torpedo, limiting any direct exposure of sediments and water to Otto Fuel II; (5) the failure rate of munitions using propellants and other combustible materials is low; and (6) most of the constituents of concern are degradable via common biological, physical, and chemical processes. Thus, the analysis from the 2018 Final EIS/OEIS (Section 3.2.3.2, Chemicals Other Than Explosives) remains valid and impacts to sediment and water quality from releases of chemicals other than explosives during military readiness activities under Alternative 1 would also be minor. Impacts as a secondary stressor to other resources would be negligible. Differences between Alternative

1 and the No Action Alternative in impacts to sediment and water quality from releases of chemicals other than explosives would likely be undetectable.

3.2.3.3.2 Impacts from Chemicals Other Than Explosives under Alternative 2

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

3.2.3.4 Other Materials

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

Table 3.2-9: Other Materials Background Information Summary

Background Information Summary

• Military readiness activities, such as those associated with the Proposed Action, would release a variety of other materials to the marine environment.
• These materials potentially could include marine markers and flares, chaff, towed and stationary targets, biodegradable polymers, and miscellaneous components of other expended objects.
• These materials and components are either made mainly of non-reactive or slowly reactive materials, such as glass, carbon fibers, and plastics, or break down or decompose into non-toxic byproducts (e.g., rubber, steel, iron, and concrete).
• Most of these other materials would settle to the seafloor where they would be:
  ○ exposed to seawater
  ○ lodged in or covered by seafloor sediments
  ○ encrusted by oxidation products such as rust
  ○ slowly degraded by chemical decomposition
  ○ covered by marine organisms
• Plastic components of the other materials may float or descend to the bottom, depending upon their buoyancy, and/or break into smaller microplastic particles.

Table 3.2-9: Other Materials Background Information Summary (continued)

Background Information Summary
• Combustion of red phosphorus produces phosphorus oxides, which have a low toxicity to aquatic organisms. • Aluminum and iron canisters are expected to be covered by sediment over time, encrusted by chemical corrosion, and/or covered by marine organisms. • Flares are usually consumed during flight. Combustion products from flares include magnesium oxide, sodium carbonate, carbon dioxide, and water. • Chaff consists of small, thin glass fibers coated in aluminum that are light enough to remain in the air anywhere from 10 minutes to 10 hours (Farrell & Siciliano, 2004). • Once released, chaff fibers disperse, and the extent of dispersion depends on the altitude and location where it is released, prevailing winds, and meteorological conditions (Spargo, 2007; Spargo et al., 1999). • Chaff is generally resistant to chemical weathering and likely remains in the environment for long periods. The fibers are quickly dispersed by waves and currents. • Chemicals leached from the chaff would be diluted by surrounding seawater, reducing the potential for chemical concentrations to reach levels that can affect sediment quality or benthic habitats. • Sonobuoys typically contain both metal and nonmetal components and use lithium batteries. • During battery operation of the sonobuoy, the lithium reaction proceeds nearly to completion prior to battery termination, and only a small number of reactants remain when the battery life ends. These residual materials gradually dissolve and/or are diluted by currents. • After battery life expires (which takes no more than 8 hours), the sonobuoy scuttles itself and sinks to the bottom. • Biodegradable polymer, which includes bio-inspired slime, is a fibrous material comprising synthetic proteins. • Following deployment, biodegradable polymer loses tensile strength after a few hours and eventually sinks due to the slight net negative buoyancy. The protein fibers biodegrade and dissolve in the water column within weeks to a few months (see Section 3.0.3.3.5, Entanglement Stressors). • Some munitions and other military expended materials used for testing and training contain small amounts of plastic, such as that associated with chaff cartridge end caps and flare pads and pistons. The plastic residuals are not recovered after the munitions are expended.

3.2.3.4.1 Impacts from Other Materials under Alternative 1

Fifty-six of the training activities under Alternative 1 would result in releases of other materials to the marine environment (see Table B-1, Stressors by Training Activity, in Appendix B, Activity Stressor Matrices). As shown in Table 2.2-1, 36 of these activities would be largely unchanged or would occur at the same locations but with fewer annual numbers of exercises than those evaluated in the 2018 Final EIS/OEIS. Impacts from other materials associated with these activities would be the same as discussed in the 2018 Final EIS/OEIS (Section 3.2.3.4, Other Materials). Eleven of the new U.S. Coast Guard training activities (Table 2.2-2) that could result in releases of other materials, along with six other new activities were not addressed in the 2018 Final EIS/OEIS. The remaining activities would have an increased number of exercises or occur at a different location(s) under the Proposed Action.

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

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

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

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

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

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

3.2.3.4.2 Impacts from Other Materials under Alternative 2

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

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

3.2.3.5 Combined Impact of all Stressors under Alternative 1

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

3.2.3.6 Combined Impact of all Stressors under Alternative 2

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

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

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