3.8 Marine Invertebrates

Supplemental Environmental Impact Statement/

Overseas Environmental Impact Statement

Northwest Training and Testing

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3.8 Marine Invertebrates

3.8.1 Affected Environment

For purposes of this Supplemental Environmental Impact Statement (EIS)/Overseas EIS (OEIS), the region of influence for marine invertebrates remains the same as that identified in the 2015 Northwest Training and Testing (NWTT) Final EIS/OEIS. Following a review of recent literature since 2015, including government technical documents and reports, and online scientific journal databases managed by the Navy (e.g., MARLIN), the existing conditions of marine invertebrates in the Study Area, as listed in the 2015 NWTT Final EIS/OEIS, have not appreciably changed.

3.8.1.1 Taxonomic Groups

As described in the 2015 NWTT Final EIS/OEIS, all marine invertebrate taxonomic groups are represented in the Study Area (see Table 3.8-1), with the major taxonomic groups presented below in Invertebrate Hearing and Vocalization.

Following a review of recent literature, including government technical documents and reports and online scientific journal databases, the information presented on invertebrate hearing and vocalization, as described in the 2015 NWTT Final EIS/OEIS, has not appreciably changed. New research describes detection of particle motion in mechanical receptors on various invertebrate body parts (Roberts et al., 2016) and how acoustic sensory capabilities, if present, are apparently limited to detecting the local particle motion component of sound (Edmonds et al., 2016). As such, the information presented in the 2015 NWTT Final EIS/OEIS regarding invertebrate hearing and vocalization remains valid.

3.8.1.2 Sound Sensing and Production

Following a review of recent literature, including government technical documents and reports and online scientific journal databases, the information presented on invertebrate sound sensing and production, as described in the 2015 NWTT Final EIS/OEIS, has not appreciably changed. New information on particle motion detection by Roberts et al. (2016) reinforces the finding that mechanical receptors on some invertebrates are found on various body parts. In addition, these structures are connected to the central nervous system and can detect some movements or vibrations that are transmitted through substrate (Edmonds et al., 2016) (Roberts et al., 2016). As such, the information presented in the 2015 NWTT Final EIS/OEIS regarding invertebrate sound sensing and production remains valid.

3.8.1.3 General Threats

The general threats to marine invertebrates discussed in the 2015 NWTT Final EIS/OEIS included overexploitation and destructive fishing practices; habitat degradation from pollution and coastal development; disease; and invasive species, with compounding factors such as increasing temperature and decreasing pH of the ocean from pollution linked to global climate change. New information is regularly being published on the effects of global climate change and ocean acidification on various aspects of invertebrate life development such as larval development (McLaskey et al., 2016). However, the new research is generally in agreement with the information provided in the 2015 NWTT Final EIS/OEIS. As such, the information presented in the 2015 NWTT Final EIS/OEIS regarding general threats remains valid.

Table 3.8-1: Taxonomic Groups of Marine Invertebrates in the Study Area

Major Invertebrate Groups[1]		Presence in Study Area		
Common Name (Species Group)	**Description**	**Offshore**	**Inland Waters**	**Western Behm Canal, Alaska**
Foraminifera, radiolarians, ciliates (Phylum Foraminifera)	Benthic and pelagic single-celled organisms; shells typically made of calcium carbonate or silica.	Water column, seafloor	Water column, seafloor	Water column, seafloor
Sponges (Phylum Porifera)	Benthic animals; large species have calcium carbonate or silica structures embedded in cells to provide structural support.	Seafloor	Seafloor	Seafloor
Corals, hydroids, jellyfish (Phylum Cnidaria)	Benthic and pelagic animals with stinging cells.	Water column, seafloor	Water column, seafloor	Water column, seafloor
Flatworms (Phylum Platyhelminthes)	Mostly benthic; simplest form of marine worm with a flattened body.	Water column, seafloor	Water column, seafloor	Water column, seafloor
Ribbon worms (Phylum Nemertea)	Benthic marine worms with a long extension from the mouth (proboscis) from the mouth that helps capture food.	Water column, seafloor	Seafloor	Seafloor
Round worms (Phylum Nematoda)	Small benthic marine worms; many live in close association with other animals (typically as parasites).	Water column, seafloor	Water column, seafloor	Water column, seafloor
Segmented worms (Phylum Annelida)	Mostly benthic, highly mobile marine worms; many tube-dwelling species.	Seafloor	Seafloor	Seafloor
Bryozoans (Phylum Bryozoa)	Lace-like animals that exist as filter feeding colonies attached to the seafloor and other substrates.	Seafloor	Seafloor	Seafloor
Cephalopods, bivalves, sea snails, chitons (Phylum Molluska)	Mollusks are a diverse group of soft-bodied invertebrates with a specialized layer of tissue called a mantle. Mollusks such as squid are active swimmers and predators, while others such as sea snails are predators or grazers, and clams are filter feeders.	Water column, seafloor	Water column, seafloor	Water column, seafloor

Table 3.8-1: Taxonomic Groups of Marine Invertebrates in the Study Area (continued)

Major Invertebrate Groups[1]		Presence in Study Area		
Common Name (Species Group)	**Description**	**Offshore**	**Inland Waters**	**Western Behm Canal, Alaska**
Shrimp, crab, barnacles, copepods (Phylum Arthropoda - Crustacea)	Benthic or pelagic; some are immobile with an external skeleton; all feeding modes from predator to filter feeder.	Water column, seafloor	Water column, seafloor	Water column, seafloor
Sea stars, sea urchins, sea cucumbers (Phylum Echinodermata)	Benthic predators and filter feeders with tube feet.	Seafloor	Seafloor	Seafloor

[1] Major species groups (those with more than 1,000 species) are based on the World Register of Marine Species (Appeltans et al., 2010) and Catalogue of Life (Bisby et al., 2010)
Notes: Benthic = a bottom-dwelling organism; Pelagic = relating to, living, or occurring in the waters of the ocean.

3.8.1.4 Endangered Species Act-Listed Species

3.8.1.4.1 Offshore Area

No marine invertebrates listed as threatened or endangered under the Endangered Species Act (ESA) occur in the Offshore Area of the Study Area, as stated in the 2015 NWTT Final EIS/OEIS.

3.8.1.4.2 Inland Waters

As stated in the 2015 NWTT Final EIS/OEIS, no marine invertebrates listed as threatened or endangered under the ESA occur in the Inland Waters; but three species of concern, the Pinto abalone (*Haliotis kamtschatkana*), the Olympia oyster (*Ostreola conchaphila*), and the Newcomb's littorine snail (*Algamorda subrotundata*) do occur in the Inland Waters of the Study Area. Species of concern status does not carry any procedural or substantive protections under the ESA.

3.8.1.4.3 Western Behm Canal, Alaska

As stated in the 2015 NWTT Final EIS/OEIS, no marine invertebrates listed as threatened or endangered under the ESA occur in the Western Behm Canal; but three species of concern, the Pinto abalone (*Haliotis kamtschatkana*), the Olympia oyster (*Ostreola conchaphila*), and the Newcomb's littorine snail (*Algamorda subrotundata*) have potential to occur in the Western Behm Canal. Species of concern status does not carry any procedural or substantive protections under the ESA.

3.8.1.5 Federally Managed Species

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), which was reauthorized and amended by the Sustainable Fisheries Act (1996), requires eight regional fishery management councils to describe and identify Essential Fish Habitat (EFH) in their respective regions, to specify actions to conserve and enhance that EFH, and to minimize the adverse effects of fishing on EFH. Congress defined EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." This definition also covers federally-managed invertebrates such as squid and krill.

3.8.1.5.1 Offshore Area

Market squid (*Doryteuthis opalescens*) and krill (euphausiids) are the only federally managed coastal pelagic invertebrate species found in the Offshore Area of the Study Area, as described in the 2015 NWTT Final Essential Fish Habitat Assessment (U.S. Department of the Navy, 2015), hereinafter referred to as the 2015 NWTT Final EFH Assessment. A literature review found that the information on these species in the Study Area has not substantially changed from what is shown in the 2015 NWTT Final EFH Assessment. As such, the information presented in the 2015 NWTT Final EFH Assessment remains valid.

3.8.1.5.2 Inland Waters

Market squid (*Doryteuthis opalescens*) and krill (euphausiids) are the only federally managed coastal pelagic invertebrate species found in the Inland Waters of the Study Area, as described in the 2015 NWTT Final EFH Assessment (U.S. Department of the Navy, 2015). A literature review found that the information on this species in the Study Area has not substantially changed from what is shown in the 2015 NWTT Final EFH Assessment. As such, the information presented in the 2015 NWTT Final EFH Assessment remains valid.

3.8.1.5.3 Western Behm Canal, Alaska

As described in the 2015 NWTT Final EIS/OEIS, four species of scallops including *Patinopecten caurinus, Chlamys rubida, Chlamys hastata,* and *Crassadoma gigantean* are federally-managed in the Western Behm Canal portion of the Study Area. A literature review found that the information on this species in the Study Area has not substantially changed from what is shown in the 2015 NWTT Final EIS/OEIS. Siddon et al. (2017) describes a standardized method for determining the age of *Patinopecten caurinus* in Alaska that helps provide the foundation for sound fisheries management. As such, the information presented in the 2015 NWTT Final EIS/OEIS remains valid. The analysis of impacts on commercial and recreational fisheries is provided in Section 3.12 (Socioeconomic Resources and Environmental Justice).

3.8.2 Environmental Consequences

In the Proposed Action for this Supplemental, some modifications have been made to the quantity and type of acoustic stressors under the two action alternatives. Because of new activities being proposed, two new stressors would be introduced that could potentially affect marine species; high-energy lasers (as an Energy stressor), as detailed in Section 3.0.3.3.2.2 (High-Energy Lasers), and biodegradable polymer (as an Entanglement stressor), as detailed in Section 3.0.3.5.3 (Biodegradable Polymer).

The 2015 NWTT Final EIS/OEIS considered training and testing activities proposed to occur in the Study Area that may have the potential to impact marine invertebrates. The stressors applicable to marine invertebrates in the Study Area for this Supplemental include the two new stressors and the same stressors considered in the 2015 NWTT Final EIS/OEIS:

- **Acoustic** (sonar and other transducers, vessel noise, aircraft noise, weapons noise)
- **Explosives** (in-air explosions, in-water explosions)
- **Energy** (in-water electromagnetic devices, high-energy lasers)
- **Physical disturbance and strike** (vessels and in-water devices, military expended materials, seafloor devices)
- **Entanglement** (wires and cables, decelerators/parachutes, biodegradable polymer)
- **Ingestion** (military expended materials – munitions and military expended materials – other than munitions)
- **Secondary** (impacts on habitat and impacts on prey availability)

This section evaluates how and to what degree potential impacts on marine invertebrates from stressors described in Section 3.0 (Introduction) may have changed since the analysis presented in the 2015 NWTT Final EIS/OEIS was completed. Tables 2.5-1, 2.5-2, and 2.5-3 in Chapter 2 (Description of Proposed Action and Alternatives) list the proposed training and testing activities and include the number of times each activity would be conducted annually and the locations within the Study Area where the activity would typically occur under each alternative. The tables also present the same information for activities described in the 2015 NWTT Final EIS/OEIS so that the proposed levels of training and testing under this Supplemental can be easily compared.

The Navy conducted a review of federal and state regulations and standards relevant to marine invertebrates and reviewed scientific literature published since 2015 for new information on marine invertebrates that could inform the analysis presented in the 2015 NWTT Final EIS/OEIS. The analysis presented in this section also considers standard operating procedures (see Section 2.3.3, Standard Operating Procedures) and mitigation measures that the Navy would implement to avoid jellyfish aggregations (see Appendix K, Geographic Mitigation Assessment, for more details). Mitigation for ESA-listed marine invertebrates will be coordinated with the National Marine Fisheries Service through the ESA consultation process.

3.8.2.1 Acoustic Stressors

Little information is available on the potential impacts on marine invertebrates from exposure to sonar and other sound-producing activities. Most studies have focused on a few species (squid or crustaceans) and the consequences of exposures to broadband impulsive air guns typically used for seismic exploration, rather than on sonar or explosions. Because research on the consequences of marine invertebrate exposures to anthropogenic sounds is limited, qualitative analyses were conducted to determine the effects of the following acoustic stressors on marine invertebrates within the Study Area: non-impulsive sources (including sonar, vessel noise, aircraft overflights, and other active acoustic sources) and impulsive acoustic sources (including explosives and weapons firing).

While the number of training and testing activities would change under this supplement, the analysis presented in the 2015 NWTT Final EIS/OEIS, Section 3.8.3.1 (Acoustic Stressors) remains applicable. The changes in training and testing activities are not substantial and would not result in an overall change to existing environmental conditions or an increase in the level or intensity of acoustic stressors within the Study Area.

As stated in the 2015 analysis, marine invertebrates are generally not sensitive to most sounds that would result from the proposed activities. Given that the activities would also be conducted in the same areas as described in the 2015 analysis, the amount of sound (i.e., the number of activities producing those sounds) would not change the conclusions. The analysis below analyzes the impacts from all acoustic sources such as sonar and other transducers.

3.8.2.1.1 Impacts from Sonar and Other Transducers

3.8.2.1.1.1 Impacts from Sonar and Other Transducers Under Alternative 1

Impacts from Sonar and Other Transducers Under Alternative 1 for Training Activities

Under Alternative 1, there will be an overall decrease in the number of sonar hours used in the Study Area during training activities and a slight increase in other sources of acoustic stressors (aircraft and weapons noise) (Table 3.0-2) compared to the number analyzed in the 2015 NWTT Final EIS/OEIS. The activities would occur in the same locations and in a similar manner as were analyzed previously. Therefore, the analysis in the 2015 NWTT Final EIS/OEIS remains valid.

As described in the 2015 NWTT Final EIS/OEIS, invertebrates throughout the Study Area may be exposed to non-impulse sounds generated by low-, mid-, and high-frequency sonar and other acoustic sources, vessel noise, and aircraft noise. Acoustic impacts on marine invertebrates under Alternative 1 would be inconsequential because most marine invertebrates would not be close enough to intense sound sources to potentially experience impacts on sensory structures. Any marine invertebrate capable of sensing sound may alter its behavior and become disoriented due to masking of relevant environmental sounds if exposed to non-impulsive sound, although it is unknown if responses to non-impulsive sounds occur. Continuous noise, such as from vessels, may also contribute to masking of relevant environmental sounds. Because the distance over which most marine invertebrates are expected to detect any sounds is limited and vessels would be in transit, any sound exposures with the potential to cause masking or behavioral responses are anticipated to be of short duration. Furthermore, invertebrate species have their best sensitivity to sound below 1 kilohertz and would not be capable of detecting the majority of sonars and other acoustic sources used in the Study Area.

Non-impulsive sounds associated with training under Alternative 1 are not expected to impact the majority of marine invertebrates or cause more than a short-term behavioral disturbance (e.g., change in orientation or swim speeds) to those marine invertebrates capable of detecting nearby sound. No population-level impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected under Alternative 1.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of sonar and other transducers during training activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or Habitat Areas of Particular Concern (HAPCs) within the Study Area.

Impacts from Sonar and Other Transducers Under Alternative 1 for Testing Activities

Under Alternative 1, there will be an increase in both the number of sonar hours and other sources of acoustic stressors used in the Study Area during testing (Table 3.0-2) compared to the number analyzed in the 2015 NWTT Final EIS/OEIS. The activities would occur in the same locations and in a similar manner as were analyzed previously. Therefore, the analysis in the 2015 NWTT Final EIS/OEIS remains valid.

As described above, acoustic impacts on marine invertebrates would be inconsequential because most marine invertebrates would not be close enough to intense sound sources to potentially experience impacts on sensory structures. Non-impulsive sounds associated with testing under Alternative 1 are not expected to impact the majority of marine invertebrates or cause more than a short-term behavioral disturbance (e.g., change in orientation or swim speeds) to those marine invertebrates capable of detecting nearby sound. No population-level impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected under Alternative 1. Therefore, acoustic impacts on marine invertebrates under Alternative 1 would be inconsequential.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of sonar and other transducers during testing activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.1.1.2 Impacts from Sonar and Other Transducers Under Alternative 2

Impacts from Sonar and Other Transducers Under Alternative 2 for Training Activities

Under Alternative 2, the number of sonar hours and noise generated by other acoustic sources used during training activities (Table 3.0-2) would increase compared to the numbers analyzed in the 2015 NWTT Final EIS/OEIS and compared to Alternative 1. Under Alternative 2, increases in the number of sonar hours would have no appreciable change on the impact conclusions for acoustic stressors as summarized above under Alternative 1 and as presented in the 2015 NWTT Final EIS/OEIS. Therefore, acoustic impacts on marine invertebrates under Alternative 2 would be negligible.

As stated in the 2015 NWTT Final EIS/OEIS and discussed above for Alternative 1, invertebrates throughout the Study Area may be exposed to non-impulse sounds generated by the same sound sources under Alternative 2. Acoustic impacts on marine invertebrates under Alternative 2 would be inconsequential because most marine invertebrates would not be close enough to intense sound sources to potentially experience impacts on sensory structures. Any marine invertebrate capable of sensing sound may alter its behavior and become disoriented due to masking of relevant environmental sounds if exposed to non-impulsive sound, although it is unknown if responses to non-impulsive sounds occur. Continuous noise, such as from vessels, may also contribute to masking of relevant environmental sounds. Because the distance over which most marine invertebrates are expected to detect any sounds is limited and vessels would be in transit, any sound exposures with the potential to cause masking or behavioral responses would last only minutes. Furthermore, invertebrate species have their best sensitivity to sound below 1 kilohertz and would not be capable of detecting the majority of sonars and other acoustic sources used in the Study Area.

Non-impulsive sounds associated with training and testing under Alternative 2 are not expected to impact the majority of marine invertebrates or cause more than a short-term behavioral disturbance (e.g., change in orientation or swim speeds) to those marine invertebrates capable of detecting nearby sound. No population-level impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected under Alternative 2.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of sonar and other transducers during training activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Sonar and Other Transducers Under Alternative 2 for Testing Activities

Under Alternative 2, the number of sonar hours and noise generated by other acoustic sources used during testing activities (Table 3.0-2) would increase compared to the numbers analyzed in the 2015 NWTT Final EIS/OEIS and compared to Alternative 1. Under Alternative 2, increases in the number of sonar hours would have no appreciable change on the impact conclusions for acoustic stressors as summarized above under Alternative 1 and as presented in the 2015 NWTT Final EIS/OEIS. Therefore, acoustic impacts on marine invertebrates under Alternative 2 would be negligible.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of sonar and other transducers during testing activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.1.1.3 Impacts from Sonar and Other Transducers Under the No Action Alternative

Under the No Action Alternative, proposed training and testing activities would not occur. Acoustic stressors as listed above would not be introduced into the marine environment. Therefore, existing environmental conditions would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

Discontinuing the training and testing activities would result in fewer acoustic stressors within the marine environment where training and testing activities have historically been conducted. Therefore, discontinuing training and testing activities under the No Action Alternative would lessen the potential for impacts from acoustic stressors on individual invertebrates, but would not measurably improve the status of invertebrate populations or subpopulations.

3.8.2.2 Explosive Stressors

Explosives introduce loud, impulse, broadband sounds into the marine environment. Impulse sources are characterized by rapid pressure rise times and high peak pressures. Explosions produce high-pressure shock waves that could cause injury or physical disturbance due to rapid pressure changes. Impulse sounds are usually brief, but the associated rapid pressure changes can injure or startle marine invertebrates. While the number of training and testing activities would change under this supplement, the analysis presented in the 2015 NWTT Final EIS/OEIS, Section 3.8.3.1 (Acoustic Stressors), remains applicable. The changes in training and testing activities are not substantial and would not result in an overall change to existing environmental conditions or an increase in the level or intensity of explosive stressors within the Study Area.

As stated above and in the 2015 analysis, marine invertebrates are generally not sensitive to most sounds that would result from the proposed activities. Given that the activities would also be conducted in the same areas as described in the 2015 analysis, there would be no change to the conclusions.

Effects of explosions on marine invertebrates include physical disturbance, fragmentation, or mortality to sessile organisms and pelagic larvae. Energy from an explosion at the surface would dissipate below detectable levels before reaching the seafloor and would not injure or otherwise impact deep-water, benthic marine invertebrates. Additionally, the vast majority of explosions occur at distances greater than 3 nautical miles (NM) from shore, where water depths are greater than the depths where the majority of hard bottom associated invertebrates occur.

As discussed in Chapter 5 (Mitigation), the Navy will implement mitigation to avoid impacts from explosives on seafloor resources throughout the Study Area. For example, the Navy will not conduct explosive mine countermeasure and neutralization activities within a specified distance of live hard bottom, artificial reefs, and shipwrecks. The mitigation will consequently help to avoid potential impacts on invertebrates that inhabit these areas. In addition, procedural mitigations include the requirement to avoid jellyfish aggregations during the use of explosive torpedoes.

3.8.2.2.1 Impacts from Explosives

3.8.2.2.1.1 Impacts from Explosives Under Alternative 1

Impacts from Explosives under Alternative 1 for Training Activities

The quantity of explosives used during training activities under Alterative 1 would generally increase compared to levels presented in the 2015 NWTT Final EIS/OEIS (Table 3.0-7). The activities would occur in the same locations and in a similar manner as were analyzed previously, with underwater detonations typically occurring in waters greater than 200 ft. in depth and greater than 50 NM from shore, with the exception of mine countermeasure and neutralization testing proposed in the Offshore Area and existing mine warfare areas in Inland Waters (e.g., Crescent Harbor and Hood Canal Explosive Ordnance Disposal Training Ranges). Therefore, the impacts to marine invertebrates would be the same as those described in the 2015 NWTT Final EIS/OEIS. Both pelagic and benthic marine invertebrates could be impacted by explosive stressors. Explosions would likely kill or injure nearby marine invertebrates. The potential effects could include physical disturbance, fragmentation, or mortality to sessile organisms and pelagic larvae. Most explosions at the water surface would not injure benthic marine invertebrates because the explosive weights would be small compared to the water depth.

As stated in the 2015 NWTT Final EIS/OEIS, non-impulsive sounds from explosions associated with training and testing under Alternative 1 are not expected to impact the majority of marine invertebrates or cause more than a short-term behavioral disturbance (e.g., change in orientation or swim speeds) to those marine invertebrates capable of detecting nearby sound. Impacts to marine invertebrates from explosions would be inconsequential because most detonations would occur in deeper waters greater than 50 NM from shore in the offshore training area, and less than 1 percent would occur in Inland Waters. As water depth increases away from shore, benthic and pelagic invertebrates would be less likely to be impacted by detonations at or near the surface. Pelagic marine invertebrates are generally disturbed, rather than struck, as the water flows around the vessel or in-water device. Shockwaves created by explosions would impact invertebrates in a similar way, causing them to be disturbed rather than struck as water flows from around the explosion. In addition, detonations near the surface would release a portion of their explosive energy into the air, reducing the explosive impacts in the water. No population-level impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected under Alternative 1.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of explosives during training activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Explosives under Alternative 1 for Testing Activities

The quantity of explosives used during testing activities under Alterative 1 would generally increase (Table 3.0-7) compared to levels presented in the 2015 NWTT Final EIS/OEIS. The activities that use explosive munitions would occur in the same general locations and in a similar manner as previously analyzed in the 2015 NWTT Final EIS/OEIS, with one exception. A new mine countermeasure and neutralization testing activity would occur in the Offshore Area two times per year and would use explosives within the water column (see Chapter 2, Description of Proposed Action and Alternatives). This activity would occur closer to shore than other activities analyzed in the 2015 NWTT Final EIS/OEIS that involved the use of in-water explosives in the Offshore Area. Although this activity would occur closer to shore, it would typically occur in water depths greater than 100 feet. Therefore, the impacts to marine invertebrates would be the same as those described in the 2015 NWTT Final EIS/OEIS and would be inconsequential because most detonations would occur greater than 50 NM from shore. As water depth increases away from shore, benthic and pelagic invertebrates would be less likely to be impacted by detonations at or near the surface. Pelagic marine invertebrates are generally disturbed, rather than struck, as the water flows around the vessel or in-water device. Shockwaves created by explosions would impact invertebrates in a similar way, causing them to be disturbed rather than struck as water flows from around the explosion. In addition, detonations near the surface would release a portion of their explosive energy into the air, reducing the explosive impacts in the water. No population-level impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected under Alternative 1.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of explosives during testing activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.2.1.2 Impacts from Explosives Under Alternative 2

Impacts from Explosives under Alternative 2 for Training Activities

The quantity of explosives used during training activities under Alternative 2 would generally increase compared to levels presented above for Alternative 1 (Table 3.0-7) and levels presented in the 2015 NWTT Final EIS/OEIS. The activities would occur in the same locations and in a similar manner as were analyzed previously. Therefore, the impacts to marine vegetation would be the same. As stated in the 2015 NWTT Final EIS/OEIS and above for Alternative 1, both pelagic and benthic marine invertebrates could be impacted by explosive stressors during training activities under Alternative 2. However, impacts to marine invertebrates from underwater and surface explosions conducted for training activities would be inconsequential because most detonations would occur greater than 50 NM from shore in the offshore training area, and less than 1 percent would occur in Inland Waters. As water depth increases away from shore, benthic and pelagic invertebrates would be less likely to be impacted by detonations at or near the surface. Pelagic marine invertebrates are generally disturbed, rather than struck, as the water flows around the vessel or in-water device. Shockwaves created by explosions would impact invertebrates in a similar way, causing them to be disturbed rather than struck as water flows from around the explosion. In addition, detonations near the surface would release a portion of their explosive energy into the air, reducing the explosive impacts in the water. No population-level impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected under Alternative 2. No population-level impacts on the survival, growth, recruitment, or reproduction of marine invertebrate populations are expected under Alternative 2.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of explosives during training activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Explosives under Alternative 2 for Testing Activities

The quantity of explosives used during testing activities under Alterative 2 would generally be the same as Alternative 1 (Table 3.0-7), but would increase slightly compared to levels presented in the 2015 NWTT Final EIS/OEIS. The activities that use explosive munitions would occur in the same general locations and in a similar manner as previously analyzed in the 2015 NWTT Final EIS/OEIS, with one exception. A new mine countermeasure and neutralization testing activity would occur in the Offshore Area approximately two times per year and would use explosives within the water column (see Chapter 2, Description of Proposed Action and Alternatives). This activity would occur closer to shore than other activities analyzed in the 2015 NWTT Final EIS/OEIS that involved the use of in-water explosives in the Offshore Area. Although this activity would occur closer to shore, it would typically occur in water depths greater than 100 feet. Therefore, the impacts to marine invertebrates would be the same as those described above for Alternative 1.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of explosives during testing activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.2.1.3 Impacts from Explosives Under the No Action Alternative

Under the No Action Alternative, proposed training and testing activities would not occur. Explosive stressors as listed above would not be introduced into the marine environment. Therefore, existing environmental conditions would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

Discontinuing the training and testing activities would result in fewer explosive stressors within the marine environment where training and testing activities have historically been conducted. Therefore, discontinuing training and testing activities under the No Action Alternative would lessen the potential for impacts from explosive stressors on individual invertebrates, but would not measurably improve the status of invertebrate populations or subpopulations.

3.8.2.3 Energy Stressors

The energy stressors that may impact marine invertebrates include in-water electromagnetic devices and high-energy lasers. Only one new energy stressor (high-energy lasers) used in testing activities differs from the energy stressors that were previously analyzed in the 2015 NWTT Final EIS/OEIS. Use of low-energy lasers was analyzed and dismissed as an energy stressor in the 2015 NWTT Final EIS/OEIS in Section 3.0.5.3.2.2 (Lasers). However, at that time high-energy laser weapons were not part of the proposed action for the Study Area.

3.8.2.3.1 Impacts from In-Water Electromagnetic Devices

3.8.2.3.1.1 Impacts from In-Water Electromagnetic Devices Under Alternative 1

Impacts from In-Water Electromagnetic Devices Under Alternative 1 for Training Activities

Under Alternative 1, the number of proposed training activities involving the use of in-water electromagnetic devices would remain the same (Table 3.0-9) as those proposed in the 2015 NWTT Final EIS/OEIS. The activities would occur in the same locations and in a similar manner as were analyzed previously. Therefore, the impacts to marine invertebrates would be the same as those described above for Alternative 1 and presented in the 2015 NWTT Final EIS/OEIS. As stated in the 2015 NWTT Final EIS/OEIS, the impact of in-water electromagnetic devices on marine invertebrates would be inconsequential because (1) the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges; (2) the number of activities involving the stressor is low; (3) exposures would be localized, temporary, and would cease with the conclusion of the activity; and (4) even for susceptible invertebrates (e.g., some species of arthropods, mollusks, and echinoderms), the consequences of exposure are limited to temporary disruptions to navigation and orientation under Alternative 1.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of in-water electromagnetic devices during training activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from In-Water Electromagnetic Devices Under Alternative 1 for Testing Activities

No in-water electromagnetic devices are proposed for testing activities under Alternative 1.

3.8.2.3.2 Impacts from In-Water Electromagnetic Devices Under Alternative 2

Impacts from In-Water Electromagnetic Devices Under Alternative 2 for Training Activities

Under Alternative 2, the number of proposed training activities involving the use of in-water electromagnetic devices would remain the same as Alternative 1 (Table 3.0-9) and those proposed in the

2015 NWTT Final EIS/OEIS. The activities would occur in the same locations and in a similar manner as were analyzed previously. Therefore, the impacts to marine invertebrates would be the same as those described above for Alternative 1 and presented in the 2015 NWTT Final EIS/OEIS. As described above for Alternative 1, marine invertebrates may be exposed to in-water electromagnetic devices during training activities and only exposed to high-energy lasers during testing activities. The impact of these stressors on marine invertebrates under Alternative 2 would be inconsequential because (1) the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges; (2) the number of activities involving the stressor is low; (3) exposures would be localized, temporary, and would cease with the conclusion of the activity; and (4) even for susceptible invertebrates (e.g., some species of arthropods, mollusks, and echinoderms), the consequences of exposure are limited to temporary disruptions to navigation and orientation under Alternative 2.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of in-water electromagnetic devices during training activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

<u>Impacts from In-Water Electromagnetic Devices Under Alternative 2 for Testing Activities</u>

No in-water electromagnetic devices are proposed for testing activities under Alternative 2.

3.8.2.3.2.1 Impacts from In-Water Electromagnetic Devices Under the No Action Alternative

Under the No Action Alternative, proposed training and testing activities would not occur. Energy stressors as listed above would not be introduced into the marine environment. Therefore, existing environmental conditions would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

Discontinuing the training and testing activities would result in fewer energy stressors within the marine environment where training and testing activities have historically been conducted. Therefore, discontinuing training and testing activities under the No Action Alternative would lessen the potential for impacts from energy stressors on individual invertebrates, but would not measurably improve the status of invertebrate populations or subpopulations.

3.8.2.3.3 Impacts from High-Energy Lasers

High-Energy lasers were not proposed for use in the 2015 NWTT Final EIS/OEIS.

As discussed in Section 3.0.3.3.2.2 (High-Energy Lasers), high-energy laser weapons testing activities involve evaluating the effectiveness of a high-energy laser deployed from a surface ship or helicopter to create small but critical failures in potential targets from short ranges.

This section analyzes the potential impacts of high-energy lasers on marine invertebrates. The primary concern for high-energy weapons testing is the potential for a marine invertebrate to be struck by a high-energy laser beam at or near the water's surface, which could result in injury or death, resulting from traumatic burns from the beam.

Marine invertebrates could be exposed to a laser only if the beam missed the target. Should the laser strike the sea surface, individual invertebrates at or near the surface, such as jellyfish, floating eggs, and larvae could potentially be exposed. The potential for exposure to a high-energy laser beam decreases rapidly as water depth increases and with time of day, as many zooplankton species migrate away from the surface during the day. Most marine invertebrates are not susceptible to laser exposure because they occur beneath the sea surface.

3.8.2.3.3.1 Impacts from High-Energy Lasers Under Alternative 1

Impacts from High-Energy Lasers Under Alternative 1 for Training Activities

No high-energy lasers are proposed for training activities under Alternative 1.

Impacts from High-Energy Lasers Under Alternative 1 for Testing Activities

As discussed in Section 3.0.3.3.2.2 (High-Energy Lasers) and shown in Table 3.0-10, under Alternative 1 there would be up to 55 testing activities per year involving the use of high-energy lasers. One of those 55 activities is a test of a laser-based optical communication system, which was discussed in Section 3.0.3.3.2.2 and dismissed from further evaluation. The remaining 54 annual testing activities would involve the use of high-energy laser weapons in the Offshore portion of the Study Area. Invertebrates that do not occur at or near the sea surface would not be exposed due to the attenuation of laser energy with depth. Surface invertebrates such as squid, jellyfish, and zooplankton (which may include invertebrate larvae) exposed to high-energy lasers could be injured or killed, but the probability is low based on the relatively low number of events, very localized potential impact area of the laser beam, and the temporary duration of potential impact (seconds). Activities involving high-energy lasers are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level because of the relatively small number of individuals that could be impacted. The impact of high-energy lasers on marine invertebrates would be inconsequential because: (1) it is highly unlikely that a high-energy laser would miss its target; (2) it is highly unlikely that the laser would miss in such a way that the laser beam would strike a marine invertebrate; and (3) it is highly unlikely that the marine invertebrate would be at or near the surface, just as two equally unlikely events take place.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of high-energy lasers during testing activities, as described under Alternative 1, would have no effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.3.3.2 Impacts from High-Energy Lasers under Alternative 2

Impacts from High-Energy Lasers Under Alternative 2 for Training Activities

No high-energy lasers are proposed for training activities under Alternative 2.

Impacts from High-Energy Lasers Under Alternative 2 for Testing Activities

As shown in Table 3.0-10, a total of 54 testing activities involving the use of high-energy laser weapons are proposed to be conducted in the Offshore Area under Alternative 2, the same as under Alternative 1. As stated above, this represents a new activity not covered in the 2015 NWTT Final EIS/OEIS. Therefore, the impacts would be the same as described under Alternative 1.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of high-energy lasers during testing activities, as described under Alternative 2, would have no effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.3.3.3 Impacts from High-Energy Lasers Under the No Action Alternative

Under the No Action Alternative, proposed training and testing activities would not occur. Energy stressors, as listed above, would not be introduced into the marine environment. Therefore, existing environmental conditions would remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

Discontinuing the training and testing activities would result in fewer energy stressors within the marine environment where training and testing activities have historically been conducted. Therefore, discontinuing training and testing activities under the No Action Alternative would lessen the potential for impacts from energy stressors on individual invertebrates, but would not measurably improve the status of invertebrate populations or subpopulations.

3.8.2.4 Physical Disturbance and Strike

The physical disturbance and strike stressors that may impact marine invertebrates include (1) vessels and in-water devices, (2) military expended materials, and (3) seafloor devices. These stressors remain the same as analyzed in the 2015 NWTT Final EIS/OEIS.

3.8.2.4.1 Impacts from Vessels and In-Water Devices

3.8.2.4.1.1 Impacts from Vessels and In-Water Devices Under Alternative 1

Impacts from Vessels and In-Water Devices Under Alternative 1 for Training Activities

Under Alternative 1, the combined number of proposed training activities involving the movement of vessels and the use of in-water devices would increase (Table 3.0-12 and Table 3.0-13) compared to those proposed in the 2015 NWTT Final EIS/OEIS. Vessel movement would decrease slightly in the Offshore Area (from 1,156 to 1,144 annual activities) and in the Inland Waters (from 368 to 327), so there would still be a net decrease in the Study Area. The activities would occur in the same locations and in a similar manner as were analyzed previously. There is an overall increase in the use of in-water devices (Table 3.0-13), all of which are associated with small, slow-moving unmanned underwater vehicles. Because the increases are to activities in which the in-water devices are small and slow-moving, the impacts to marine invertebrates would be similar. The proposed increase of approximately 100 in-water devices would not change that conclusion. As stated in the 2015 NWTT Final EIS/OEIS, the impact of vessels and in-water devices on marine invertebrates would remain inconsequential because (1) the area exposed to the stressor amounts to a small portion of each vessel's and in-water device's footprint, and is extremely small relative to most marine invertebrates' ranges; (2) the frequency of activities involving the stressor is low such that few individuals could be exposed to more than one event; and (3) exposures would be localized, temporary, and would cease with the conclusion of the activity. Under Alternative 1, activities involving vessels and in-water devices are not expected to yield any behavioral changes or lasting impacts on the survival, growth, recruitment, or reproduction of invertebrate species at the population level.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of vessels and in-water devices during training activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Vessels and In-Water Devices Under Alternative 1 for Testing Activities

Under Alternative 1, the combined number of proposed testing activities involving the movement of vessels and the use of in-water devices (Table 3.0-12 and Table 3.0-13) would increase compared to those proposed in the 2015 NWTT Final EIS/OEIS. Vessel movement would increase in the Offshore Area (from 181 to 283 annual activities), and increases slightly in the Inland Waters (from 916 to 918) and Western Behm Canal (60 to 63).

There is also an overall increase in the use of in-water devices during testing activities in the Study Area (Table 3.0-13), all of which are associated with small, slow-moving, and unmanned underwater vehicles. The number of testing activities increases in the Offshore Areas (156 to 215), Inland Waters (576 to 664), and in the western Behm Canal (8 to 19). The proposed increase of in-water devices would not change the conclusion presented in the 2015 NWTT Final EIS/OEIS. The activities would occur in the same locations and in a similar manner as were analyzed previously. In spite of these increases, and as described in the 2015 NWTT Final EIS/OEIS, these vessel and in-water device activities remain unlikely to result in a strike to any marine invertebrate. The proposed increase of vessel and in-water device activities would not change that conclusion. As stated in the 2015 NWTT Final EIS/OEIS, the impact of vessels and in-water devices on marine invertebrates would remain inconsequential because (1) the area exposed to the stressor amounts to a small portion of each vessel's and in-water device's footprint, and is extremely small relative to most marine invertebrates' ranges; (2) the frequency of activities involving the stressor is low such that few individuals could be exposed to more than one event; and (3) exposures would be localized, temporary, and would cease with the conclusion of the activity. Under Alternative 1, activities involving vessels and in-water devices are not expected to yield any behavioral changes or lasting impacts on the survival, growth, recruitment, or reproduction of invertebrate species at the population level.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of vessels and in-water devices during testing activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.4.1.2 Impacts from Vessels and In-Water Devices Under Alternative 2

Impacts from Vessels and In-Water Devices Under Alternative 2 for Training Activities

Under Alternative 2, the combined number of proposed training activities involving the movement of vessels and the use of in-water devices would be slightly greater than Alternative 1 (Table 3.0-12 and Table 3.0-13) and greater than those proposed in the 2015 NWTT Final EIS/OEIS. Vessel movement would increase in the Study Area compared to Alternative 1 (1,471 for Alternative 1 compared to 1,658 for Alternative 2), and increases (1,524 to 1,658) compared to levels presented in the 2015 NWTT Final EIS/OEIS (Table 3.0-12).

There would also be a slight total increase in the use of in-water devices compared to Alternative 1 (600 for Alternative 1 compared to 620) and an increase from levels presented in the 2015 NWTT final EIS/OEIS (496 to 620) (Table 3.0-13). All of the increased in-water device activities are associated with small, slow-moving unmanned underwater vehicles. Because the increases are to activities in which the in-water devices are unlikely to have an impact to marine invertebrates (small, slow-moving in-water devices), the impacts to marine invertebrates would be similar. The proposed increase of in-water devices would not change that conclusion. The activities would occur in the same locations and in a similar manner as were analyzed previously. As stated in the 2015 NWTT Final EIS/OEIS, the impact of vessels and in-water devices on marine invertebrates would remain inconsequential because (1) the area exposed to the stressor amounts to a small portion of each vessel's and in-water device's footprint, and is extremely small relative to most marine invertebrates' ranges; (2) the frequency of activities involving the stressor is low such that few individuals could be exposed to more than one event; and (3) exposures would be localized, temporary, and would cease with the conclusion of the activity. Under Alternative 2, activities involving vessels and in-water devices are not expected to yield any behavioral changes or lasting impacts on the survival, growth, recruitment, or reproduction of invertebrate species at the population level.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of vessels and in-water devices during training activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Vessels and In-Water Devices Under Alternative 2 for Testing Activities

Under Alternative 2, the combined number of proposed testing activities involving the movement of vessels and the use of in-water devices would increase compared to Alternative 1 (Table 3.0-12 and Table 3.0-13) and those proposed in the 2015 NWTT Final EIS/OEIS. Vessel movement would increase slightly in the Offshore Area compared to Alternative 1 (from 283 to 295) and would increase compared to numbers presented in the 2015 NWTT Final EIS/OEIS (from 181 to 295). Vessel movements would increase in the Inland Waters compared to Alternative 1 (from 918 to 1,028) and would increase compared to numbers presented in the 2015 NWTT Final EIS/OEIS (from 916 to 1,028). Similarly, vessel movement would increase in the Western Behm Canal (from 63 to 77) compared to Alternative 1 and would increase from 60 to 77 compared to the 2015 NWTT Final EIS/OEIS, resulting in a net increase in the Study Area.

There would also be a slight increase in the use of in-water devices compared to Alternative 1 (898 for Alternative 1 compared to 932) and an increase from levels presented in the 2015 NWTT Final EIS/OEIS (740 to 932) (Table 3.0-13). The activities would occur in the same locations and in a similar manner as were analyzed previously. In spite of these increases, and as described in the 2015 NWTT Final EIS/OEIS, these vessel and in-water device activities remain unlikely to result in a strike to any marine invertebrate. The proposed increase of vessel and in-water device activities would not change that conclusion. As stated in the 2015 NWTT Final EIS/OEIS, the impact of vessels and in-water devices on marine invertebrates would remain inconsequential because (1) the area exposed to the stressor amounts to a small portion of each vessel's and in-water device's footprint, and is extremely small relative to most marine invertebrates' ranges; (2) the frequency of activities involving the stressor is low such that few individuals could be exposed to more than one event; and (3) exposures would be localized, temporary, and would cease with the conclusion of the activity. Under Alternative 2, activities involving vessels and in-water devices are not expected to yield any behavioral changes or lasting impacts on the survival, growth, recruitment, or reproduction of invertebrate species at the population level.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of vessels and in-water devices during testing activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.4.1.3 Impacts from Vessels and In-Water Devices Under the No Action Alternative

Under the No Action Alternative, proposed training and testing activities would not occur. Physical disturbance and strike stressors as listed above would not be introduced into the marine environment. Therefore, existing environmental conditions would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

Discontinuing the training and testing activities would result in fewer physical disturbance and strike stressors within the marine environment where training and testing activities have historically been conducted. Therefore, discontinuing training and testing activities under the No Action Alternative would lessen the potential for impacts from physical disturbance and strike stressors on individual invertebrates, but would not measurably improve the status of invertebrate populations or subpopulations.

3.8.2.4.2 Impacts from Military Expended Materials

Military expended materials include non-explosive practice munitions (Table 3.0-14), other military materials that are expended or recovered (Table 3.0-15), high explosives that may result in fragments (Table 3.0-16), and expended or recovered targets (Table 3.0-17).

3.8.2.4.2.1 Impacts from Military Expended Materials Under Alternative 1

Impacts from Military Expended Materials Under Alternative 1 for Training Activities

Under Alternative 1, the number of military materials that would be expended during training activities is generally consistent with the number proposed for use in the 2015 NWTT Final EIS/OEIS. When the amount of military expended materials from Tables 3.0-14 through 3.0-16 are combined, the number of items proposed to be expended under Alternative 1 decreases compared to ongoing activities. The activities that expend military materials would occur in the same locations and in a similar manner as were analyzed previously. Therefore, the impacts to marine invertebrates would be expected to be the same as stated in the 2015 NWTT Final EIS/OEIS and would be inconsequential for the same reasons described above for vessels and in-water devices.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of military expended material during training activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Military Expended Materials Under Alternative 1 for Testing Activities

Under Alternative 1, the number of military materials that would be expended during testing activities is generally consistent with the number proposed for use in the 2015 NWTT Final EIS/OEIS. When the amount of military expended materials from (Tables 3.0-14 through 3.0-16) are combined, the number of items proposed to be expended under Alternative 1 decreases slightly compared to ongoing activities. There are a few new activities, such as mine countermeasure and neutralization testing and kinetic energy weapon testing, that would generate military expended materials. Impacts to marine invertebrates would be expected to be the same as those described above and would be inconsequential for the same reasons described above for vessels and in-water devices.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of military expended material during testing activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.4.2.2 Impacts from Military Expended Materials Under Alternative 2

Impacts from Military Expended Materials Under Alternative 2 for Training Activities

Under Alternative 2, the number of military materials that would be expended during training activities is generally consistent with the number proposed for use in the 2015 NWTT Final EIS/OEIS. When the amount of military expended materials from Table 3.0-14, Table 3.0-15, and Table 3.0-16 are combined, the number of items proposed to be expended under Alternative 2 increases compared to both Alternative 1 and ongoing activities. The activities that expend military materials would occur in the same locations and in a similar manner as were analyzed previously. Therefore, the impacts to marine invertebrates would be expected to be the same. As stated in the 2015 NWTT Final EIS/OEIS, the impact of military expended materials on marine invertebrates would be inconsequential for the same reasons described above for vessels and in-water devices.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of military expended material during training activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Military Expended Materials Under Alternative 2 for Testing Activities

Under Alternative 2, the number of military materials that would be expended during testing activities is generally consistent with the number proposed for use in the 2015 NWTT Final EIS/OEIS. When the amount of military expended materials from Tables 3.0-14 through 3.0-16 are combined, the number of items proposed to be expended under Alternative 2 increases compared to Alternative 1 and ongoing activities. Although there are a few new activities such as mine countermeasure and neutralization testing and kinetic energy weapon testing that would generate military expended materials, impacts to marine invertebrates would be expected to be the same as those described above and would be inconsequential for the same reasons described above for vessels and in-water devices.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of military expended material during testing activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.4.2.3 Impacts from Military Expended Materials Under the No Action Alternative

Under the No Action Alternative, proposed training and testing activities would not occur. Physical disturbance and strike stressors as listed above would not be introduced into the marine environment. Therefore, existing environmental conditions would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

Discontinuing the training and testing activities would result in fewer physical disturbance and strike stressors within the marine environment where training and testing activities have historically been conducted. Therefore, discontinuing training and testing activities under the No Action Alternative would lessen the potential for impacts from physical disturbance and strike stressors on individual invertebrates, but would not measurably improve the status of invertebrate populations or subpopulations.

3.8.2.4.3 Impacts from Seafloor Devices

Several training and testing activities include the use of seafloor devices—items that may contact the ocean bottom temporarily. The activities and the specific seafloor devices are: (1) precision anchoring training, where anchors are lowered to the seafloor and recovered; (2) explosive ordnance disposal mine countermeasures training exercises, where some mine targets may be moored to the seafloor; (3) crawler unmanned underwater vehicle tests in which unmanned underwater vehicles "crawl" across the seafloor; and (4) various testing activities where small anchors are placed on the seafloor to hold instrumentation in place.

3.8.2.4.3.1 Impacts from Seafloor Devices Under Alternative 1

Impacts from Seafloor Devices Under Alternative 1 for Training Activities

Under Alternative 1, the number of training activities that include the use of seafloor devices would increase from 10 to 40 compared to ongoing activities, all of which would occur in the Inland Waters (Table 3.0-18) as part of the Precision Anchoring exercise. The activity is comprised of a vessel navigating to a precise, pre-determined location and releasing the ship's anchor to the bottom. The anchor is later recovered and the activity is complete. Because of the nature of the activity, the risk to marine invertebrates would be discountable because (1) the area exposed to the stressor amounts to a small portion of footprint which is extremely small relative to most marine invertebrates' ranges; (2) the frequency of activities involving the stressor is low such that few individuals could be exposed to more than one event; and (3) exposures would be localized, temporary, and would cease with the conclusion of the activity. Under Alternative 1, activities involving seafloor devices are not expected to yield any behavioral changes or lasting impacts on the survival, growth, recruitment, or reproduction of invertebrate species at the population level.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of seafloor devices during training activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Seafloor Devices Under Alternative 1 for Testing Activities

Under Alternative 1, the total number of testing activities that include the use of seafloor devices would increase (Table 3.0-18) compared to ongoing activities (from 809 to 878). The majority of the activities involve the temporary placement of mine shapes in Inland Waters. Because of the nature of the activity, marine invertebrates on the seafloor may be impacted by seafloor devices by physically removing, crushing the individual, and temporarily increasing the turbidity (sediment suspended in the water) of waters nearby. However, the impact of seafloor devices on marine invertebrates would be inconsequential for the same reasons described above for training activities.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of seafloor devices during testing activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.4.3.2 Impacts from Seafloor Devices Under Alternative 2

Impacts from Seafloor Devices Under Alternative 2 for Training Activities

Under Alternative 2, the number of training activities that include the use of seafloor devices would be the same as under Alternative 1 (Table 3.0-18) and would increase compared to ongoing activities (from 10 to 40). Because of the nature of the activity, marine invertebrates on the seafloor may be impacted by seafloor devices by physically removing, crushing the individual, and temporarily increasing the turbidity (sediment suspended in the water) of waters nearby. However, the impact of seafloor devices on marine invertebrates would be inconsequential for the same reasons described above for Alternative 1.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of seafloor devices during training activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Seafloor Devices Under Alternative 2 for Testing Activities

Under Alternative 2, the total number of testing activities that include the use of seafloor devices would increase compared to both Alternative 1 (878 to 935) (Table 3.0-18) and ongoing activities (809 to 953). The majority of the activities involve mine shapes. Because of the nature of the activity, marine invertebrates on the seafloor may be impacted by seafloor devices by physically removing, crushing the individual, and temporarily increasing the turbidity (sediment suspended in the water) of waters nearby.

However, the impact of seafloor devices on marine invertebrates would be inconsequential for the same reasons described above for Alternative 1.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of seafloor devices during testing activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.4.3.3 Impacts from Seafloor Devices Under the No Action Alternative

Under the No Action Alternative, proposed training and testing activities would not occur. Physical disturbance and strike stressors as listed above would not be introduced into the marine environment. Therefore, existing environmental conditions would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

Discontinuing the training and testing activities would result in fewer physical disturbance and strike stressors within the marine environment where training and testing activities have historically been conducted. Therefore, discontinuing training and testing activities under the No Action Alternative would lessen the potential for impacts from physical disturbance and strike stressors on individual invertebrates, but would not measurably improve the status of invertebrate populations or subpopulations.

3.8.2.5 Entanglement Stressors

The entanglement stressors that may impact marine invertebrates include (1) wires and cables, (2) decelerators/parachutes, and (3) biodegradable polymer. Biodegradable polymer is a new stressor not previously analyzed, but the other two stressors remain the same as analyzed in the 2015 NWTT Final EIS/OEIS.

3.8.2.5.1 Impacts from Wires and Cables

Wires and cables include fiber optic cables, guidance wires, and sonobuoy wires (Table 3.0-19).

3.8.2.5.1.1 Impacts from Wires and Cables Under Alternative 1

<u>Impacts from Wires and Cables Under Alternative 1 for Training Activities</u>

Under Alternative 1, the number of wires and cables that would be expended during training activities (Table 3.0-19) is generally consistent with the number proposed for use in the 2015 NWTT Final EIS/OEIS. No fiber optic cables are used in the NWTT Study Area under training, either in the previous analysis or this Supplemental. Two guidance wires are proposed to be expended in the Offshore Area under Alternative 1, none were proposed in the previous analysis and no guidance wires would be expended in Inland Waters. As shown in (Table 3.0-19), the expenditure of sonobuoy wires in the Offshore Area is proposed to increase slightly (from 8,928 to 9,338), and no sonobuoys are proposed to be used in the Inland Waters, where none were proposed previously. The activities that expend wires and cables would generally occur in the same locations and in a similar manner as were analyzed previously. Because the number and locations of these wires and cables is similar to those analyzed in the 2015 NWTT Final EIS/OEIS, the impacts to marine invertebrates would be expected to be the same. As stated in the 2015 NWTT Final EIS/OEIS, the impact of wires and cables on marine invertebrates would be inconsequential because: (1) the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges, (2) the activities are dispersed such that few individuals could conceivably be exposed to more than one activity, (3) exposures would be localized, and (4) marine invertebrates are not particularly susceptible to entanglement stressors as most would avoid entanglement and simply be temporarily disturbed. Activities involving fiber optic cables and guidance wires are not expected to yield any behavioral changes or lasting impacts on the survival, growth, recruitment, or reproduction of invertebrate species at individual or population levels.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of wires and cables during training activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Wires and Cables Under Alternative 1 for Testing Activities

Under Alternative 1, the total number of wires and cables that would be expended during testing activities is increased (Table 3.0-19) compared to the number proposed for use in the 2015 NWTT Final EIS/OEIS. Fiber optic cables used in the Offshore Area would increase (20 to 36), guidance wires used in both the Offshore Area and the Inland Waters would increase (92 to 152 in Offshore Areas and 155 to 230 in Inland Waters), and sonobuoy wires expended would also increase in Offshore Areas (1,000 to 4,001) and increase from 6 to 48 in Inland Waters. Even though the number of cable and wires would increase during testing activities, the locations are similar to those analyzed in the 2015 NWTT Final EIS/OEIS, and impacts to marine invertebrates would be expected to be the same. As stated in the 2015 NWTT Final EIS/OEIS, the impact of wires and cables on marine invertebrates would be inconsequential because: (1) the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges, (2) the activities are dispersed such that few individuals could conceivably be exposed to more than one activity, (3) exposures would be localized, and (4) marine invertebrates are not particularly susceptible to entanglement stressors as most would avoid entanglement and simply be temporarily disturbed. Activities involving fiber optic cables and guidance wires are not expected to yield any behavioral changes or lasting impacts on the survival, growth, recruitment, or reproduction of invertebrate species at individual or population levels.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of wires and cables during testing activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.5.1.2 Impacts from Wires and Cables Under Alternative 2

Impacts from Wires and Cables Under Alternative 2 for Training Activities

Under Alternative 2, the total number of wires and cables that would be expended during training activities (9,380) is generally consistent with the number proposed for use under Alternative 1 (9,340) (Table 3.0-19) and in the 2015 NWTT Final EIS/OEIS (8,928). No fiber optic cables are used in the Study Area under training, either in the previous analysis or this Supplemental. Two guidance wires are proposed to be expended in the Offshore Area under Alternative 2, none were proposed in the previous analysis. As shown in Table 3.0-19, the expenditure of sonobuoy wires in the Offshore Area is proposed to increase (from 9,338 to 9,378), and no sonobuoys are proposed to be used in the Inland Waters, where none were proposed previously. The activities that expend wires and cables would generally occur in the same locations and in a similar manner as were analyzed previously. Because the number and locations of these wires and cables is similar to those analyzed in the 2015 NWTT Final EIS/OEIS, the impacts to marine invertebrates would be expected to be the same. As stated in the 2015 NWTT Final EIS/OEIS, the impact of wires and cables on marine invertebrates would be inconsequential for the same reasons discussed above under Alternative 1.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of wires and cables during training activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Wires and Cables Under Alternative 2 for Testing Activities

Under Alternative 2, the total number of wires and cables that would be expended during testing activities increases compared to the number proposed for use under Alternative 1 (from 4,664 to 6,910) (Table 3.0-19) and in the 2015 NWTT Final EIS/OEIS (1,395 to 6,910). Fiber optic cables used in the Offshore Area and Inland Waters would be the same as Alternative 1 and increase compared to the 2015 NWTT Final EIS/OEIS. Guidance wires used in the Offshore Area would increase compared to Alternative 1 (from 152 to 192) and those proposed in the previous analysis (from 92 to 192). Guidance wires in Inland Waters would be the same as Alternative 1 (Table 3.0-19), but increase (from 155 to 230) compared to those proposed in the previous analysis. Sonobuoy wires expended in Offshore Areas would increase compared to Alternative 1 (from 4,001 to 6,207) and in the 2015 NWTT Final EIS/OEIS (from 1,000 to 6,207). Sonobuoy wires expended in Inland Waters would be the same as Alternative 1 (Table 3.0-19) and would increase from 6 to 48 compared to the 2015 NWTT Final EIS/OEIS. The activities that expend wires and cables would generally occur in the same locations and in a similar manner as were analyzed previously. As stated in the 2015 NWTT Final EIS/OEIS, the impact of wires and cables on marine invertebrates would be inconsequential for the same reasons discussed above under Alternative 1.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of fiber optic cables during testing activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.5.1.3 Impacts from Wires and Cables Under the No Action Alternative

Under the No Action Alternative, proposed training and testing activities would not occur. Entanglement stressors as listed above would not be introduced into the marine environment. Therefore, existing environmental conditions would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

Discontinuing the training and testing activities would result in fewer entanglement stressors within the marine environment where training and testing activities have historically been conducted. Therefore, discontinuing training and testing activities under the No Action Alternative would lessen the potential for impacts from entanglement stressors on individual invertebrates, but would not measurably improve the status of invertebrate populations or subpopulations.

3.8.2.5.2 Impacts from Decelerators/Parachutes

Decelerators/parachutes include small, medium, large, and extra-large decelerator parachutes (Table 3.0-20).

3.8.2.5.2.1 Impacts from Decelerators/Parachutes Under Alternative 1

Impacts from Decelerators/Parachutes Under Alternative 1 for Training Activities

Under Alternative 1, the total number of decelerators/parachutes that would be expended during training activities increases (9,097 to 9,456) compared to the number proposed for use in the 2015 NWTT Final EIS/OEIS. As shown in Table 3.0-20, the expenditure of small size decelerators/parachutes in the Offshore Area is proposed to increase (8,928 to 9,354), and no small decelerators/parachutes are proposed to be used in the Inland Waters, where none were proposed previously. The number of medium decelerators/parachutes in the Offshore Area decreases from 24 to 4, and the number of large decelerators/parachutes in the Offshore Area decreases from 145 to 98 (Table 3.0-20). The activities that expend decelerators/parachutes would generally occur in the same locations and in a similar manner as were analyzed previously. Because the number and locations of these decelerators/parachutes is similar to those analyzed in the 2015 NWTT Final EIS/OEIS, the impacts to marine invertebrates would be expected to be the same.

As stated in the 2015 NWTT Final EIS/OEIS, most marine invertebrates would never encounter a decelerator/parachute from training activities. The impact of decelerators/parachutes on marine invertebrates is not likely to cause injury or mortality to individuals, and impacts would be inconsequential for the same reasons described above for fiber optic cables and guidance wires. Activities involving decelerators/parachutes are not expected to yield any behavioral changes or lasting impacts on the survival, growth, recruitment, or reproduction of invertebrate species at individual or population levels.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of decelerators/parachutes during training activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Decelerators/Parachutes Under Alternative 1 for Testing Activities

Under Alternative 1, the total number of decelerators/parachutes that would be expended during testing activities is increased (1,181 to 1,887) compared to the number proposed for use in the 2015 NWTT Final EIS/OEIS. As shown in Table 3.0-20, the expenditure of small size decelerators/parachutes in the Offshore Area is proposed to increase (1,068 to 1,711), and in the Inland Waters to increase from 113 to 176. No other sizes of decelerators/parachutes are proposed during testing activities. The activities that expend decelerators/parachutes would generally occur in the same locations and in a similar manner as were analyzed previously. Even though the number of decelerators/parachutes would increase during testing activities, the locations are similar to those analyzed in the 2015 NWTT Final EIS/OEIS, and impacts to marine invertebrates would be expected to be the same. As stated in the 2015 NWTT Final EIS/OEIS, the impact of decelerators/parachutes on marine invertebrates would be inconsequential for the same reasons presented above for wires and cables.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of decelerators/parachutes during testing activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.5.2.2 Impacts from Decelerators/Parachutes Under Alternative 2

Impacts from Decelerators/Parachutes Under Alternative 2 for Training Activities

Under Alternative 2, the total number of decelerators/parachutes that would be expended during training activities increases compared to the number proposed for use under Alternative 1 (from 9,456 to 9,563) (Table 3.0-20) and in the 2015 NWTT Final EIS/OEIS (9,097 to 9,563). As shown in Table 3.0-20, the expenditure of small size decelerators/parachutes in the Offshore Area is proposed to increase (9,354 to 9,394), and no small decelerators/parachutes are proposed to be used in the Inland Waters, where none were proposed previously. The number of medium decelerators/parachutes in the Offshore Area increases from 4 to 24 compared to Alternative 1 and is the same as the 2015 NWTT Final EIS/OEIS. The number of large decelerators/parachutes in the Offshore Area increases from 98 to 145 (Table 3.0-20) compared to Alternative 1 and is the same as the 2015 NWTT Final EIS/OEIS. The activities that expend decelerators/parachutes would generally occur in the same locations and in a similar manner as were analyzed previously. Because the number and locations of these decelerators/parachutes is similar to those analyzed in the 2015 NWTT Final EIS/OEIS, the impacts to marine invertebrates would be expected to be the same. As stated in the 2015 NWTT Final EIS/OEIS, the impact of decelerators/parachutes on marine invertebrates would be inconsequential for the same reasons detailed above under Alternative 1.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of decelerators/parachutes during training activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Decelerators/Parachutes Under Alternative 2 for Testing Activities

Under Alternative 2, the total number of decelerators/parachutes that would be expended during testing activities increases compared to the number proposed for use under Alternative 1 (from 1,887 to 1,895) and in the 2015 NWTT Final EIS/OEIS (1,181 to 1,895). As shown in Table 3.0-20, the expenditure of small decelerators/parachutes would be the same in the Offshore Area compared to Alternative 1 and increase compared to the 2015 NWTT Final EIS/OEIS (from 1,068 to 1,711). The expenditure of small decelerators/parachutes in Inland Waters would increase compared to both Alternative 1 (176 to 184) and the previous analysis (113 to 184). The activities that expend decelerators/parachutes would generally occur in the same locations and in a similar manner as were analyzed previously. Even though the number of decelerators/parachutes would increase during testing activities, the locations are similar to those analyzed in the 2015 NWTT Final EIS/OEIS, and impacts to marine invertebrates would be expected to be the same. As stated in the 2015 NWTT Final EIS/OEIS, the impact of decelerators/parachutes on marine invertebrates would be inconsequential for the same reasons presented above for wires and cables.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of decelerators/parachutes during testing activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.5.2.3 Impacts from Decelerators/Parachutes Under the No Action Alternative

Under the No Action Alternative, proposed training and testing activities would not occur. Entanglement stressors as listed above would not be introduced into the marine environment. Therefore, existing environmental conditions would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

Discontinuing the training and testing activities would result in fewer entanglement stressors within the marine environment where training and testing activities have historically been conducted. Therefore, discontinuing training and testing activities under the No Action Alternative would lessen the potential for impacts from entanglement stressors on individual invertebrates, but would not measurably improve the status of invertebrate populations or subpopulations.

3.8.2.5.3 Impacts from Biodegradable Polymer

Biodegradable polymers were not proposed for use in the 2015 NWTT Final EIS/OEIS, and for this Supplemental would be used only during proposed testing activities, not during training activities. For a discussion of where biodegradable polymers are used and how many activities would occur under each alternative, see Section 3.0.3.5.3 (Biodegradable Polymer). The biodegradable polymers that the Navy uses are designed to temporarily interact with the propeller(s) of a target craft rendering it ineffective. A biodegradable polymer is a high molecular weight polymer that degrades to smaller compounds as a result of microorganisms and enzymes. The rate of biodegradation could vary from hours to years and the type of small molecules formed during degradation can range from complex to simple products, depending on whether the polymers are natural or synthetic (Karlsson & Albertsson, 1998). Based on the constituents of the biodegradable polymer the Navy proposes to use, it is anticipated that the material will break down into small pieces within a few days to weeks. This will break down further and dissolve into the water column within weeks to a few months. The final products which are all environmentally benign will be dispersed quickly to undetectable concentrations. Unlike other entanglement stressors, biodegradable polymers only retain their strength for a relatively short period of time, therefore the potential for entanglement by a marine invertebrate would be limited. Furthermore, the longer the biodegradable polymer remains in the water, the weaker it becomes making it more brittle and likely to break. A marine invertebrate would have to encounter the biodegradable polymer immediately after it was expended for it to be a potential entanglement risk. If a marine invertebrate were to encounter the polymer a few hours after it was expended, it is very likely that it would break easily and would no longer be an entanglement stressor.

3.8.2.5.3.1 Impacts from Biodegradable Polymer Under Alternative 1

<u>Impacts from Biodegradable Polymer Under Alternative 1 for Training Activities</u>

No biodegradable polymers are proposed to be used for training activities under Alternative 1.

<u>Impacts from Biodegradable Polymer Under Alternative 1 for Testing Activities</u>

As shown in Table 3.0-21, four testing activities involving the use of biodegradable polymers are proposed to only be conducted in the Inland Waters under Alternative 1. As detailed above and in the 2015 NWTT Final EIS/OEIS, marine invertebrates are not particularly susceptible to entanglement stressors, including biodegradable polymers and would likely only be temporarily disturbed. It is conceivable that relatively large pelagic invertebrates such as jellyfish would be temporarily entangled, although the probability is low due to the polymer design. The most likely effect would be temporary displacement as the material floats past an animal. Impacts on benthic species would not be expected. Activities involving biodegradable polymer would not yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at individual or population levels.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of biodegradable polymer during testing activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.5.3.2 Impacts from Biodegradable Polymer Under Alternative 2

<u>Impacts from Biodegradable Polymer Under Alternative 2 for Training Activities</u>

No biodegradable polymers are proposed to be used for training activities under Alternative 2.

Impacts from Biodegradable Polymer Under Alternative 2 for Testing Activities

As shown in Table 3.0-21, four testing activities involving the use of biodegradable polymers are proposed to be conducted in the Inland Waters under Alternative 2, the same number as Alternative 1. As detailed above and in the 2015 NWTT Final EIS/OEIS, marine invertebrates are not particularly susceptible to entanglement stressors, including biodegradable polymers and would likely only be temporarily disturbed. It is conceivable that relatively large pelagic invertebrates such as jellyfish would be temporarily entangled, although the probability is low due to the polymer design. The most likely effect would be temporary displacement as the material floats past an animal. Impacts on benthic species would not be expected. Therefore, as described above for Alternative 1, activities involving biodegradable polymer would not yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at individual or population levels.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of biodegradable polymer during testing activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.5.3.3 Impacts from Biodegradable Polymer Under the No Action Alternative

Under the No Action Alternative, proposed training and testing activities would not occur. Entanglement stressors as listed above would not be introduced into the marine environment. Therefore, existing environmental conditions would remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

Discontinuing the training and testing activities would result in fewer entanglement stressors within the marine environment where training and testing activities have historically been conducted. Therefore, discontinuing training and testing activities under the No Action Alternative would lessen the potential for impacts from entanglement stressors on individual invertebrates, but would not measurably improve the status of invertebrate populations or subpopulations.

3.8.2.6 Ingestion Stressors

The ingestions stressors that may impact marine invertebrates include military expended materials from munitions (non-explosive practice munitions and fragments from high-explosives) and military expended materials other than munitions (fragments from targets, chaff and flare components, and biodegradable polymers). Biodegradable polymer is a new source for existing entanglement and ingestion stressors not previously analyzed, but the other stressors remain the same as analyzed in the 2015 NWTT Final EIS/OEIS.

3.8.2.6.1 Impacts from Military Expended Materials – Munitions

Ingestion of intact military expended materials – munitions is not likely for most types of expended items because they are too large to be ingested by most marine invertebrates. Though ingestion of intact munitions or large fragments is conceivable in some circumstances (e.g., a relatively large invertebrate such as an octopus or lobster ingesting a small-caliber projectile), such a scenario is unlikely due to the animal’s ability to discriminate between food and non-food items. Indiscriminate deposit- and detritus-feeding invertebrates, such as some marine worms, could potentially ingest munitions fragments that have degraded to sediment size. In addition, metal particles in the water column may be taken up by suspension feeders (e.g., copepods, mussels) (Chiarelli & Roccheri, 2014; Griscom & Fisher, 2004). Although most metals do not technically dissolve in water, many react with water to form a soluble compound, and researchers often refer to these compounds as dissolved metals. Investigations of silver ingestion by marine invertebrates found that the metal is less toxic when dissolved in water (Brix et al., 2012), and an investigation of metals in a nearshore area heavily influenced by industrial activities found that concentrations were substantially greater in the sediment than in the water column (Bazzi, 2014). The results of these studies suggest that suspension-feeding invertebrates could be less susceptible to impacts than invertebrates that might consume metal particles directly from the sediment.

3.8.2.6.1.1 Impacts from Military Expended Materials – Munitions Under Alternative 1

Impacts from Military Expended Materials – Munitions Under Alternative 1 for Training Activities

Under Alternative 1, the number of military expended materials – munitions that would be used during training activities (Table 3.0-14 and Table 3.0-16) is generally consistent with the number proposed for use in the 2015 NWTT Final EIS/OEIS. When the amount of military expended materials from munitions are combined, the number of items proposed to be expended under Alternative 1 decreases compared to ongoing activities. The activities that expend military materials would occur in the same locations and in a similar manner as were analyzed previously. Therefore, the impacts to marine invertebrates would be expected to be the same. As stated in the 2015 NWTT Final EIS/OEIS, the impact of military expended materials – munitions on marine invertebrates would be inconsequential because most military expended materials and fragments of military expended materials are too large to be ingested by marine invertebrates. The potential for marine invertebrates to encounter fragments of ingestible size increases as the military expended materials degrade into smaller fragments. The fractions of military expended materials of ingestible size, or that become ingestible after degradation, may impact individual marine invertebrates, but are unlikely to impact populations.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of military expended materials – munitions of ingestible size associated with training activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Military Expended Materials – Munitions Under Alternative 1 for Testing Activities

Under Alternative 1, the number of military expended materials – munitions that would be used during testing activities (Table 3.0-14 and Table 3.0-16) is generally consistent with the number proposed for use in the 2015 NWTT Final EIS/OEIS. When the amount of military expended materials from munitions are combined, the number of items proposed to be expended under Alternative 1 increases compared to ongoing activities. The activities that expend military materials would occur in the same locations and in a similar manner as were analyzed previously. Therefore, the impacts to marine invertebrates would be expected to be the same. As stated in the 2015 NWTT Final EIS/OEIS, the impact of military expended materials – munitions on marine invertebrates would be inconsequential because most military expended materials and fragments of military expended materials are too large to be ingested by marine invertebrates. The potential for marine invertebrates to encounter fragments of ingestible size increases as the military expended materials degrade into smaller fragments. The fractions of military expended materials of ingestible size, or that become ingestible after degradation, may impact individual marine invertebrates, but are unlikely to impact populations.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of military expended materials – munitions of ingestible size associated with testing activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.6.1.2 Impacts from Military Expended Materials – Munitions Under Alternative 2

Impacts from Military Expended Materials – Munitions Under Alternative 2 for Training Activities

Under Alternative 2, the number of military expended materials – munitions that would be used during training activities (Table 3.0-14 and Table 3.0-16) is generally consistent with the number proposed for use in the 2015 NWTT Final EIS/OEIS. When the amount of military expended materials from munitions are combined, the number of items proposed to be expended under Alternative 2 increases compared to both Alternative 1 (Table 3.0-14 and Table 3.0-16) and ongoing activities. The activities that expend military materials would occur in the same locations and in a similar manner as were analyzed previously. Therefore, the impacts to marine invertebrates would be expected to be the same. As stated in the 2015 NWTT Final EIS/OEIS and above under Alternative 1, the impact of military expended materials – munitions on marine invertebrates would be inconsequential because most military expended materials and fragments of military expended materials are too large to be ingested by marine invertebrates. The potential for marine invertebrates to encounter fragments of ingestible size increases as the military expended materials degrade into smaller fragments. The fractions of military expended materials of ingestible size, or that become ingestible after degradation, may impact individual marine invertebrates, but are unlikely to impact populations.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of military expended materials – munitions of ingestible size associated with training activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Military Expended Materials – Munitions Under Alternative 2 for Testing Activities

Under Alternative 2, the number of military expended materials – munitions that would be used during testing activities (Table 3.0-14 and Table 3.0-16) is generally consistent with the number proposed for use in the 2015 NWTT Final EIS/OEIS. When the amount of military expended materials from munitions are combined, the number of items proposed to be expended under Alternative 2 increases compared to both Alternative 1 (Table 3.0-14 and Table 3.0-16) and ongoing activities. The activities that expend military materials would occur in the same locations and in a similar manner as were analyzed previously. Therefore, the impacts to marine invertebrates would be expected to be the same. As stated in the 2015 NWTT Final EIS/OEIS and above under Alternative 1, the impact of military expended materials – munitions on marine invertebrates would be inconsequential because most military expended materials and fragments of military expended materials are too large to be ingested by marine invertebrates. The potential for marine invertebrates to encounter fragments of ingestible size increases as the military expended materials degrade into smaller fragments. The fractions of military expended materials of ingestible size, or that become ingestible after degradation, may impact individual marine invertebrates, but are unlikely to impact populations.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of military expended materials – munitions of ingestible size associated with testing activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.6.1.3 Impacts from Military Expended Materials – Munitions Under the No Action Alternative

Under the No Action Alternative, proposed training and testing activities would not occur. Ingestion stressors as listed above would not be introduced into the marine environment. Therefore, existing environmental conditions would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

Discontinuing the training and testing activities would result in fewer ingestion stressors within the marine environment where training and testing activities have historically been conducted. Therefore, discontinuing training and testing activities under the No Action Alternative would lessen the potential for impacts from ingestion stressors on individual invertebrates, but would not measurably improve the status of invertebrate populations or subpopulations.

3.8.2.6.2 Impacts from Military Expended Materials – Other than Munitions

3.8.2.6.2.1 Impacts from Military Expended Materials – Other than Munitions Under Alternative 1

Impacts from Military Expended Materials – Other than Munitions Under Alternative 1 for Training Activities

Under Alternative 1, the number of military expended materials other than munitions that would be used during training activities (Table 3.0-17, Table 3.0-20, Table 3.0-21, and Table 3.0-22) is generally consistent with the number proposed for use in the 2015 NWTT Final EIS/OEIS. When the amount of military expended materials other than munitions (fragments from targets, chaff and flare components, and biodegradable polymers) are combined, the number of items proposed to be expended under Alternative 1 (Table 3.0-17, Table 3.0-20, Table 3.0-21, and Table 3.0-22) increases compared to ongoing activities. The activities that expend military materials would occur in the same locations and in a similar manner as were analyzed previously. Therefore, the impacts to marine invertebrates would be expected to be the same. As stated in the 2015 NWTT Final EIS/OEIS, the impact of military expended materials – other than munitions on marine invertebrates would be inconsequential because most military expended materials and fragments of military expended materials are too large to be ingested by marine invertebrates. The potential for marine invertebrates to encounter fragments of ingestible size increases as the military expended materials degrade into smaller fragments. The fractions of military expended materials of ingestible size, or that become ingestible after degradation, may impact individual marine invertebrates, but are unlikely to impact populations.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of military expended materials – other than munitions of ingestible size associated with training activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Military Expended Materials – Other than Munitions Under Alternative 1 for Testing Activities

Under Alternative 1, the number of military expended materials other than munitions that would be used during testing activities decreases (Table 3.0-17, Table 3.0-20, Table 3.0-21, and Table 3.0-22) compared to the number proposed for use in the 2015 NWTT Final EIS/OEIS. Other than the addition of biodegradable polymer, which would occur four times annually in the Inland Waters, the activities that expend military materials would occur in the same locations and in a similar manner as were analyzed previously. Based on the constituents of the biodegradable polymer the Navy proposes to use, it is anticipated that the material will breakdown into small pieces within a few days to weeks, eventually dissolving into the water column as environmentally benign products. Being benign, if ingested, the remnants of the biodegradable polymer would pose limited risk to marine invertebrates. Even though there would be a substantial increase in the number of military expended material – other than munitions and as stated in the 2015 NWTT Final EIS/OEIS, the impact on marine invertebrates would be inconsequential because most military expended materials and fragments of military expended materials are too large to be ingested by marine invertebrates. The potential for marine invertebrates to encounter fragments of ingestible size increases as the military expended materials degrade into smaller fragments. The fractions of military expended materials of ingestible size, or that become ingestible after degradation, may impact individual marine invertebrates, but are unlikely to impact populations.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of military expended materials – other than munitions of ingestible size associated with testing activities, as described under Alternative 1, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.6.2.2 Impacts from Military Expended Materials – Other than Munitions Under Alternative 2

Impacts from Military Expended Materials – Other than Munitions Under Alternative 2 for Training Activities

Under Alternative 2, the number of military expended materials other than munitions that would be used during training activities (Table 3.0-17, Table 3.0-20, Table 3.0-21, and Table 3.0-22) is generally consistent with the number proposed for use under Alternative 1 and in the 2015 NWTT Final EIS/OEIS. When the amount of military expended materials other than munitions (fragments from targets, chaff and flare components, and biodegradable polymers) are combined, the number of items proposed to be expended under Alternative 2 increases slightly compared to Alternative 1 (Table 3.0-17, Table 3.0-20, Table 3.0-21, and Table 3.0-22) and increases compared to ongoing activities. The activities that expend military materials would occur in the same locations and in a similar manner as were analyzed previously. Therefore, the impacts to marine invertebrates would be expected to be the same. As stated in the 2015 NWTT Final EIS/OEIS, the impact of military expended materials – other than munitions on marine invertebrates would be inconsequential because most military expended materials and fragments of military expended materials are too large to be ingested by marine invertebrates. The potential for marine invertebrates to encounter fragments of ingestible size increases as the military expended materials degrade into smaller fragments. The fractions of military expended materials of ingestible size, or that become ingestible after degradation, may impact individual marine invertebrates, but are unlikely to impact populations.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of military expended materials – other than munitions of ingestible size associated with training activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

Impacts from Military Expended Materials – Other than Munitions Under Alternative 2 for Testing Activities

Under Alternative 2, the number of military expended materials other than munitions that would be used during testing activities increases (Table 3.0-17, Table 3.0-20, Table 3.0-21, and Table 3.0-22) compared to the number proposed for use under Alternative 1 and decreases slightly from ongoing activities. Other than the addition of biodegradable polymer, which would occur four times annually in the Inland Waters, the activities that expend military materials would occur in the same locations and in a similar manner as were analyzed previously. Based on the constituents of the biodegradable polymer the Navy proposes to use, it is anticipated that the material will breakdown into small pieces within a few days to weeks, eventually dissolving into the water column as environmentally benign products. Being benign, if ingested, the remnants of the biodegradable polymer would pose limited risk to marine invertebrates. Even though there would be a substantial increase in the number of military expended material – other than munitions and as stated in the 2015 NWTT Final EIS/OEIS, the impact on marine invertebrates would be inconsequential because most military expended materials and fragments of military expended materials are too large to be ingested by marine invertebrates. The potential for marine invertebrates to encounter fragments of ingestible size increases as the military expended materials degrade into smaller fragments. The fractions of military expended materials of ingestible size, or that become ingestible after degradation, may impact individual marine invertebrates, but are unlikely to impact populations.

Pursuant to the EFH requirements of the MSA and implementing regulations, the use of military expended materials – other than munitions of ingestible size associated with testing activities, as described under Alternative 2, would have no adverse effect on sedentary invertebrate beds or reefs that constitute EFH or HAPCs within the Study Area.

3.8.2.6.2.3 Impacts from Military Expended Materials – Other than Munitions Under the No Action Alternative

Under the No Action Alternative, proposed training and testing activities would not occur. Ingestion stressors as listed above would not be introduced into the marine environment. Therefore, existing environmental conditions would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

Discontinuing the training and testing activities would result in fewer ingestion stressors within the marine environment where training and testing activities have historically been conducted. Therefore, discontinuing training and testing activities under the No Action Alternative would lessen the potential for impacts from ingestion stressors on individual invertebrates, but would not measurably improve the status of invertebrate populations or subpopulations.

3.8.2.7 Secondary Stressors

Potential impacts on marine invertebrates exposed to stressors could occur indirectly through sediments and water quality. Stressors from Navy training and testing activities could pose secondary or indirect impacts on marine invertebrates via habitat, sediment, or water quality. Components of these stressors that could pose indirect impacts include (1) explosives and explosives byproducts; (2) metals; (3) chemicals; and (4) other materials such as targets, chaff, and plastics.

While the number of training and testing activities would change under this supplement, the analysis presented in the 2015 NWTT Final EIS/OEIS, Section 3.8.3.6 (Secondary Stressors) remains valid.

As stated in the 2015 NWTT Final EIS/OEIS, indirect impacts of explosives and unexploded ordnance on marine invertebrates via water are likely to be inconsequential and not detectable for two reasons. First, most explosives and explosive degradation products have very low solubility in sea water. This means that dissolution occurs extremely slowly, and harmful concentrations of explosives and degradation are not likely to accumulate except within confined spaces. Second, a low concentration of byproducts, slowly delivered into the water column, is readily diluted to non-harmful concentrations. Filter feeders in the immediate vicinity of degrading explosives may be more susceptible to bioaccumulation of chemical byproducts. While marine invertebrates may be adversely impacted by the indirect effects of degrading explosives via water (Rosen & Lotufo, 2007; 2010), this is extremely unlikely in realistic scenarios.

Impacts on marine invertebrates, including zooplankton, eggs, and larvae, are likely only within a very small radius of the ordnance (1–6 feet [0.3–1.8 meters]). These impacts may continue as the ordnance degrades over months to decades. Because most ordnance is deployed as projectiles, multiple unexploded or low-order detonations would accumulate on spatial scales of 1–6 feet (0.3–1.8 meters); therefore, potential impacts are likely to remain local and widely separated. Given these conditions, the possibility of population-level impacts on marine invertebrates is inconsequential. However, if the sites of the depositions are the same over time, this could alter the benthic composition, affect bioaccumulation, and impact local invertebrate communities.

As stated in the 2015 NWTT Final EIS/OEIS, concentrations of metals in water are extremely unlikely to be high enough to cause injury or mortality to marine invertebrates; therefore, indirect impacts of metals via water are likely to be inconsequential and not detectable. Given these conditions, the possibility of population-level impacts on marine invertebrates is likely to be inconsequential and not detectable. In addition, concentrations of chemicals in sediment and water are not likely to cause injury or mortality to marine invertebrates; therefore, indirect impacts of chemicals via sediment and water are likely to be inconsequential and not detectable. Population-level impacts on marine invertebrates would be inconsequential and not detectable.

In addition, as stated in the 2015 NWTT Final EIS/OEIS, the only material that could impact marine invertebrates via sediment is plastics. Harmful chemicals in plastics interfere with metabolic and endocrine processes in many plants and animals (Derraik, 2002). Potentially harmful chemicals in plastics are not readily adsorbed to marine sediments; instead, marine invertebrates are most at risk via ingestion or bioaccumulation. Because plastics retain many of their chemical properties as they are physically degraded into microplastic particles (Singh & Sharma, 2008), the exposure risks to marine invertebrates are dispersed over time. Marine invertebrates could be indirectly impacted by chemicals from plastics but, absent bioaccumulation, these impacts would be limited to direct contact with the material. Because of these conditions, population-level impacts on marine invertebrates attributable to Navy-expended materials are likely to be inconsequential and not detectable.

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