# 3.7 Sea Turtles

# 3.7 SEA TURTLES

## 3.7.1 Affected Environment

For the purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the region of influence (ROI) for sea turtles is the Temporary Maritime Activities Area (TMAA). With the exception of Cape Cleare on Montague Island located over 12 nautical miles (nm) (22 kilometers [km]) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm (259 km) offshore. Given that the TMAA is more than 12 nm (22 km) from the closest point of land, it is therefore outside of United States (U.S.) territorial seas.

### 3.7.1.1 Existing Conditions

Sea turtles are long-lived reptiles that can be found throughout the world's tropical, subtropical, and temperate seas (Caribbean Conservation Corporation and Sea Turtle Survival League 2003). Sea turtles are highly adapted for life in the marine environment. Sea turtles possess powerful, modified forelimbs (or flippers) that enable them to swim continuously for extended periods of time (Wyneken 1997). Sea turtles are among the longest and deepest diving of the air-breathing marine vertebrates, spending as little as 3 to 6 percent of their time at the water's surface (Lutcavage and Lutz 1997). Sea turtles often travel thousands of miles between their nesting beaches and feeding grounds (Ernst et al. 1994, Meylan 1995). Sea turtles cannot withdraw their head or limbs into their shell, so growing to a large size as adults is important to avoid predation.

The distribution of sea turtles in ocean waters off the U.S. West Coast and the GOA is strongly affected by seasonal changes in water temperature. Cool water temperatures also prevent sea turtles from nesting on U.S. west coast beaches and may also inhibit reproductive activity by reducing the quality and availability of food resources in the area (Fuentes et al. 2000). In general, sea turtle sightings off the U.S. west coast south of the GOA peak during July through September and in abnormally warm water years such as in El Niño years. During El Niño years, changes in ocean currents bring warmer waters north, which can bring more sea turtles (and their preferred prey) to the west coast region (Washington to California) and as far north as Alaska (National Marine Fisheries Service [NMFS] 2003). There are no known sea turtle nesting areas in the Alaska region.

All sea turtles are listed as endangered or threatened under the Endangered Species Act (ESA). There are seven living species of sea turtles from two taxonomic families, the Cheloniidae (hard-shelled sea turtles; six species) and the Dermochelyidae (leatherback turtles; one species). Five species of sea turtles occur in the North Pacific: leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), green (*Chelonia mydas*), olive ridley (*Lepidochelys olivacea*), and hawksbill (*Eretmochelys imbricata*). However, only four species have been observed, albeit rarely, in Alaska waters between 1960 and 1998: the leatherback, loggerhead, green, and olive ridley (Hodge and Wing 2000).

Although members of the Cheloniidae family of sea turtles occur in the warm, subtropical areas of the Pacific such as southern California and Hawaii, the GOA is considered beyond their normal range of occurrence because of cold water temperatures. The ocean waters of the TMAA have an average sea surface temperature in summer in the upper 100 m (328 feet [ft]) of approximately 51.8 degrees Fahrenheit (°F) (11 degrees Celsius [°C]). Most hard-shell turtles seek optimal seawater temperatures near 65°F and are cold-stressed at seawater temperatures below 50°F (Mrosovsky 1980, Schwartz 1978). In contrast, leatherback sea turtles regularly occur in cold temperate waters of high latitudes (Bleakney 1965, Pritchard 1980, and Eckert et al. 1989). Individuals will often move into cooler temperate waters and sometimes cold northern waters during late summer and early fall (Keinath and Musick 1990, James et al. 2005).

After analyzing 363 records of sea turtles sighted along the Pacific coast of North America, Stinson (1984) concluded that the leatherback was the most common sea turtle in U.S. waters north of Mexico. In Alaska, 19 leatherback sea turtle occurrences were documented between 1960 and 2006, including two summer occurrences recorded near Cordova, Alaska, which is north of the TMAA (Hodge and Wing 2000, DoN 2006). Also recorded during that time frame were 9 green sea turtle occurrences, 2 olive ridley occurrences, and 2 loggerheads. Therefore, although sightings of sea turtles from the Chelonidae family have been documented in Alaska, most of these involve individuals that were either cold-stressed, likely to become cold-stressed, or already deceased (Hodge and Wing 2000, McAlpine et al. 2002). Thus, the TMAA is considered to be outside the normal range for sea turtle species of the Cheloniidae family and this family of sea turtles is not considered for further analysis in this EIS/OEIS.

The leatherback turtle, however, is distributed globally in tropical, subtropical, and temperate waters throughout the year and is the only species of sea turtle expected to occur in the TMAA and thus is considered further in this analysis.

The issues of concern for leatherback sea turtles include potential effects of sounds in the water, and impacts related to vessel movements, ordnance use, and possible entanglement or contact with expended materials that are not recovered. The analysis of effects addresses these issues by grouping effects based on activities with common components such as vessel movement, ordnance use, and expended materials.

**Species Accounts and Life History**

The leatherback sea turtle is listed under the ESA as endangered throughout its range. There is a recovery plan for this species. Critical habitat is designated for this species in waters near the U.S. Virgin Islands (44 FR 17710, March 23, 1979). Critical habitat has not been identified for this species along the U.S. Pacific coast, including the TMAA, largely because nesting is not known to occur and important foraging areas have not been identified (NMFS and USFWS 1998a).

The leatherback sea turtle is the most oceanic and has the widest range (71°N to 47°S) of the seven living species of sea turtles (Boulon et al. 1988, Pritchard and Trebbau 1984). Leatherback sea turtles have been documented in Alaska waters as far north as approximately 60º latitude (approximately 50 miles north of the northern edge of the TMAA) and as far west in the GOA as the Aleutian Islands (Eckert 1993) Although leatherback turtles are expected to be present within the TMAA, they are likely few in number given the TMAA is near the northern edge of the known extent of their Pacific range (Eckert 1993, DoN 2006). No numbers or density estimates are available for leatherback turtles in the TMAA, but given their distribution patterns based on water temperature elsewhere (Eckert 1993) the number of leatherback sea turtles in the GOA are likely very low. The analysis in this EIS/OEIS therefore assumes leatherback turtles may be encountered in the TMAA during the summer (April to October) although they will be extremely rare (very few in number).

The leatherback, which is the largest living sea turtle, has a unique carapace structure. The carapace lacks the outer layer of external plates or scales possessed by all other sea turtles. Instead, it is composed of a flexible layer of dermal bones underlying tough, oily connective tissue and smooth skin. The body of a leatherback is barrel-shaped, tapered to the rear, with seven longitudinal dorsal ridges; the body is almost completely black with variable spotting (McDonald and Dutton 1996). Carapace lengths in adult leatherbacks range from about 50 to 70 inches (in) (1.2 to 1.8 meters [m]), with an average around 57 in (1.4 m) and weighing between 450 and 1,575 pounds (lb) (200 to 700 kilograms [kg]) (NMFS and U.S. Fish and Wildlife Service [USFWS] 1998), although there is documentation suggesting this average may be greatly exceeded (Eckert and Luginbuhl 1988).

In contrast with other sea turtles, leatherback sea turtles have physiological traits that allow for the conservation of body heat which enable them to maintain body core temperatures well above the ambient water temperatures (Mrosovsky and Pritchard 1971, Greer et al. 1973, Neill and Stevens 1974, Goff and Stenson 1988, Paladino et al. 1990, Eckert 1993, Lutz and Musick 1996, DoN 2006). Shells, or carapaces, of adult leatherbacks are 4 cm (1.5 inches) thick on average, contributing to the leatherback's thermal tolerance that enables this species to forage in water temperatures far lower than the leatherback's core body temperature (Center for Biological Diversity et al. 2007). In an analysis of available sightings (Eckert 2002), researchers found that leatherback turtles with carapace lengths smaller than 100 cm (39 inches) were sighted only in waters 79°F or warmer, while adults were found in waters as cold as 32°F to 59°F off Newfoundland (Goff and Lien 1988). As a result, they are more capable of surviving for extended periods of time in cooler waters than the hard-shelled sea turtles (Bleakney 1965, Lazell 1980).

Historically, some of the world's largest nesting populations of leatherback turtles were found in the Pacific Ocean, although nesting on Pacific beaches under U.S. jurisdiction has always been rare (NMFS and USFWS 1998c). The northernmost nesting sites in the eastern Pacific Ocean are located in the Mexican states of Baja California Sur and Jalisco (Fritts et al. 1982). Post-nesting adults appear to migrate along bathymetric contours from 656 to 11,483 ft (200 to 3,500 m) (Morreale and Standora 1994), and most of the eastern Pacific nesting stocks migrate south (NMFS 2002). Other principal nesting sites in the Pacific Ocean indicate that gene flow between eastern and western Pacific nesting populations is restricted (Dutton et al. 1998, 1999, 2000a, 2000b).

Leatherbacks are highly pelagic and specialized for life at sea. Occasionally, sea turtles can end up on the shore if they are dead, sick, injured, or cold-stressed. These events, known as strandings, can be caused by either biological factors (e.g., predation and disease) or environmental factors (e.g., water temperature). In addition, leatherbacks approach coastal waters only during the reproductive season (EuroTurtle 2001). Male leatherbacks do not return to land after they hatch from their nests whereas mature females return to land only to lay eggs (Carr 1995, Spotila et al. 1997). Aside from this brief terrestrial period, which lasts approximately three months during egg incubation and hatching, leatherback turtles are rarely encountered out of the water. Sea turtles bask on the water surface to regulate their body temperatures, elude predators, avoid harmful mating encounters, possibly accelerate the development of their eggs, and destroy aquatic algae growth on their carapaces (Whittow and Balazs 1982, Spotila et al. 1997). Hatchling leatherbacks are pelagic, but nothing is known about their distribution during the first 4 years of life (Musick and Limpus 1997).

The leatherback is one of the deepest divers in the ocean, with dives as deep as 3,937 ft (1,200 m), although it spends most of its time feeding at a depth of less than 328 ft (100 m) (DoN 2006). Leatherback turtles primarily feed on gelatinous zooplankton such as cnidarians (jellyfish and siphonophores) and tunicates (salps and pyrosomas) (Bjorndal 1997, NMFS and USFWS 1998). The leatherback dives continually and spends short periods of time on the surface between dives (Eckert et al. 1986, Southwood et al. 1999). Typical dive durations averaged 6.9 to 14.5 minutes (min) per dive, with a maximum of 42 min (Eckert et al. 1996). Sea turtles typically remain submerged for several minutes to several hours depending upon their activity state (Standora et al. 1984, Renaud and Carpenter 1994). Long periods of submergence hamper detection and confound census efforts. Leatherbacks dive continually and spend short periods on the surface between dives (Eckert et al. 1986, Southwood et al. 1999). During migrations or long distance movements, leatherbacks maximize swimming efficiency by traveling within 15 ft (5 m) of the surface (Eckert 2002).

The world female leatherback turtle population is estimated at 35,860 (Spotila 2004). The western Pacific (west of the International Date Line) leatherback population was estimated to contain 2,700 to 4,500 nesting females (Dutton et al. 2007). A subset of these females, and an unknown number of males, forage off the U.S. west coast (Washington to California) each year from about May to November, when dense aggregations of jellyfish (leatherback prey) are present (Benson et al. 2007a, 2007b). Foraging abundance estimates are only available for nearshore waters off California, where the estimated minimum leatherback abundance has ranged from 12 to 379 individuals per year, based on aerial surveys.

**Natural and Induced Mortality**

The decline of sea turtles is believed primarily to be the result of exploitation by humans for the eggs and meat, commercial and recreational fishing with nets, longlines, trawls, seines, and hook-and-lines, loss or degradation of nesting habitat from coastal development, pollution and contaminants, marine debris, and watercraft strikes. Leatherbacks are seriously declining at all major Pacific basin nesting beaches, including those in Indonesia, Malaysia, and southwestern Mexico (NMFS and USFWS 1998).

A major factor in the decline of the leatherback turtle worldwide is commercial harvesting for meat and eggs. The crash of the Pacific leatherback turtle population, once the world's largest, is believed to be primarily the result of exploitation by humans for their eggs and meat. Enforcement of existing laws in remote areas is also a major problem.

It was estimated that worldwide, more than 50,000 leatherbacks were incidentally taken as pelagic longline bycatch in 2000 and that thousands die from longline gear interactions every year in the Pacific Ocean (Lewison et al. 2004). They have been known to ingest longline hooks used to catch tuna and swordfish (Davenport and Balazs 1991, Skillman and Balazs 1992, Grant 1994, Work and Balazs 2002).

Incidental capture of leatherbacks by the north Pacific high seas driftnet fleet, which targets squid and tuna, was also a source of mortality during the 1980s and early 1990s (Eckert 1993). In 2001, NMFS prohibited drift gillnet fishing in California and Oregon from August 15 to November 15 from Monterey, California to 45ºN latitude within 13 nm (24 km) of the coast. This ruling was necessary to avoid the likelihood that this fishery would jeopardize the continued existence of the leatherback turtle population in the Pacific as leatherbacks annually migrated through this area (NOAA 2001).

Environmental contamination from coastal runoff, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased underwater noise, and boat traffic can degrade marine habitats used by marine turtles. The development of marinas and docks in inshore waters can negatively impact nearshore habitats. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. An increase in the number of docks built may also increase boat and vessel traffic. Sea turtles swimming or feeding at or just beneath the surface of the water are particularly vulnerable to boat and vessel strikes, which can result in serious propeller injuries and death.

Marine debris is a continuing contaminant problem for marine turtles. Marine turtles living in the open ocean commonly ingest or become entangled in marine debris (e.g., tar balls, plastic bags, plastic pellets, balloons, and ghost fishing gear) as they feed along oceanographic fronts, where debris and their natural food items converge. This is especially problematic for sea turtles that spend all or significant portions of their life cycle in the open ocean (e.g., leatherbacks, juvenile loggerheads, and juvenile green turtles).

Investigation of clutch hatching success suggests that the leatherback turtle has lower hatching success levels than other sea turtles. Reasons for this condition are unknown. Excessive nest predation of eggs and new hatchlings by native and nonnative predators and degradation of foraging habitats are primary natural mortality factors. Predators of eggs and hatchlings include several species of mammals, birds, invertebrates, and fish. Eggs and hatchlings have high mortality rates, but as the survivors grow, natural mortality declines markedly.

**Sea Turtle Hearing**

Sea turtles do not have an external ear pinnae or eardrum. Instead, they have a cutaneous layer and underlying subcutaneous fatty layer that function as a tympanic membrane (TM). The subcutaneous fatty layer receives and transmits sounds to the middle ear and into the cavity of the inner ear (Ridgway et al. 1969). Sound also arrives by bone conduction through the skull. Sound arriving at the inner ear via the columella (homologous to the mammalian stapes or stirrup) is transduced by the bones of the middle ear. Sea turtle auditory sensitivity is not well studied, though a few preliminary investigations suggest that it is limited to low frequency bandwidths, such as the sounds of waves breaking on a beach. The role of underwater low-frequency hearing in sea turtles is unclear. It has been suggested that sea turtles may use acoustic signals from their environment as guideposts during migration and as a cue to identify their natal beaches (Lenhardt et al. 1983).

Lenhardt et al. (1983) applied audiofrequency vibrations at 250 hertz (Hz) and 500 Hz to the heads of loggerheads and Kemp's ridleys submerged in salt water to observe their behavior, measure the attenuation of the vibrations, and assess any neural-evoked response. These stimuli (250 Hz, 500 Hz) were chosen as representative of the lowest sensitivity area of marine turtle hearing (Wever 1978). At the maximum upper limit of the vibratory delivery system, the sea turtles exhibited abrupt movements, slight retraction of the head, and extension of the limbs in the process of swimming. Lenhardt et al. (1983) concluded that bone-conducted hearing appears to be a reception mechanism for at least some of the sea turtle species, with the skull and shell acting as receiving surfaces. Finally, sensitivity even within the optimal hearing range was low as threshold detection levels in water are relatively high at 160 to 200 decibels referenced to one micro Pascal at a distance of one meter (dB re 1 μPa-m), which is the standard reference measure for underwater sound energy in this regard; Lenhardt 1994).

Ridgway et al. (1969) used aerial and mechanical stimulation to measure the cochlea in three specimens of green turtle, and concluded that they have a useful hearing span of perhaps 60 to 1,000 Hz, but hear best from about 200 Hz up to 700 Hz, with their sensitivity falling off considerably below 200 Hz. The maximum sensitivity for one animal was at 300 Hz, and for another was at 400 Hz. At the 400 Hz frequency, the green turtle's hearing threshold was about 64 dB in air (approximately 126 dB in water). At 70 Hz, it was about 70 dB in air (approximately 132 dB in water). We may be able to extrapolate this data to pertain to all hard-shell sea turtles (i.e., the olive ridley, green, loggerhead, hawksbill, and Kemp's ridley turtles). No audiometric data are available for the leatherback turtle, but based on other sea turtle hearing capabilities, they probably also hear best in the low frequencies.

For exposures to impulsive sound, a recent study on the effects of air guns on sea turtle behavior also suggests that sea turtles are most likely to respond to low-frequency sounds (McCauley et al. 2000). Green and loggerhead sea turtles will avoid air-gun arrays at 2 km and at 1 km, with received levels of 166 dB re 1 μPa-m and 175 dB re 1 μPa, respectively (McCauley et al. 2000). The sea turtles' response was consistent: above a level of about 166 dB re 1 μPa, the sea turtles noticeably increased their swimming activity. Above 175 dB re 1 μPa, their behavior became more erratic, possibly indicating that they were agitated (McCauley et al. 2000).

Currently it is believed that the range of maximum sensitivity for sea turtles is 200 to 800 Hz, with an upper limit of about 2,000 Hz (Lenhardt 1994, Moein et al. 1994). Hearing below 80 Hz is less sensitive but still potentially usable to the animal. Green turtles are most sensitive to sounds between 200 and 700 Hz, with peak sensitivity at 300 to 400 Hz (Ridgway et al. 1997). They possess an overall hearing range of approximately 60 to 1,000 Hz (Ridgway et al. 1969). Juvenile loggerhead turtles hear sounds between 250 and 1,000 Hz and, therefore, often avoid low-frequency sounds (Bartol et al. 1999). Finally, sensitivity even within the optimal hearing range is apparently low—threshold detection levels in water are relatively high at 160 to 200 dB re 1 μPa-m (Lenhardt 1994). Given the lack of audiometric information for leatherback turtles, the potential for temporary threshold shifts among leatherback turtles must be classified as unknown but would likely follow those of other sea turtles. In terms of sound emission, nesting leatherback turtles produce sounds in the 300 to 500 Hz range (Mrosovsky 1972).

#### Mid-Frequency and High-Frequency Sound Sources

The lowest center frequency of any mid-frequency sonar proposed for use in ASW training (the AN/SQS-53) operates at 3,500 Hz. The best available information indicates that sea turtles hear in the range of 60 Hz to 2,000 Hz with best sensitivity between 200 to 800 Hz (Ridgway et al. 1969, Lenhardt 1994), which is well below the center operating frequency of any sonar proposed for use in the TMAA. Hearing sensitivity is low, even within the sea turtle's optimal hearing range, requiring received levels as high as 160 to 200 dB re 1 μPa for the sound to be heard (Lenhardt 1994). The nominal source level of the AN/SQS-53 sonar would attenuate below the upper end of this required received level within 175 meters of the ship. Because the remaining mid-frequency and high-frequency sources (Table 2-4 and 2-5, Section 2.5.2.1 Sonars Used in the TMAA) have lower source levels, are above the known hearing range of sea turtles, and because high levels of received sound are required for perception to occur, it is not likely that auditory impacts would occur from the use of mid-frequency and high-frequency sources during training in the TMAA.

Any potential role of long-range acoustical perception in sea turtles has not been studied. The concept of sound masking (the ability of one sound to make the ear incapable of perceiving another) is difficult, if not impossible, to apply to sea turtles. The best available science however, suggests that sea turtles cannot hear the mid- and high-frequency sound sources proposed for use in the TMAA.

### 3.7.1.2 Current Requirements and Practices

As summarized in Chapter 5, the comprehensive suite of protective measures and standard operating procedures (SOPs) implemented by the Navy to reduce impacts to marine mammals also serves to mitigate potential impacts on sea turtles. In particular, personnel and watchstander training, establishment of marine mammal exclusion zones for at-sea explosions, and pre- and post-exercise surveys all serve to reduce or eliminate potential impacts of Navy activities on sea turtles that may be present in the vicinity.

## 3.7.2 Environmental Consequences

As noted in Section 3.7.1, the ROI for sea turtles is the TMAA, which is more than 12 nm (22 km) from the closest point of land. As such, this section distinguishes between U.S. territorial seas (shoreline to 12 nm) and nonterritorial seas, (seaward of 12 nm) for the purposes of applying the appropriate regulations (National Environmental Policy Act [NEPA] or Executive Order [EO] 12114) to analyze potential environmental effects. Environmental effects in the open ocean beyond the U.S. territorial seas are analyzed in this EIS/OEIS pursuant to EO 12114.

### 3.7.2.1 Regulatory Framework

This EIS/OEIS analyzes potential effects to the leatherback turtle in the context of the ESA, NEPA, and EO 12114. For purposes of ESA compliance, effects of the action were analyzed to make the Navy's determination of effect for listed species (i.e., no effect or may affect). The definitions used in making the determination of effect under Section 7 of the ESA are based on the USFWS and NMFS *Endangered Species Consultation Handbook* (USFWS and NMFS 1998).

"No effect" is the appropriate conclusion when a listed species will not be affected, either because the species will not be present or because the project does not have any elements with the potential to affect the species. "No effect" does not include a small effect or an effect that is unlikely to occur.

If effects are insignificant (in size) or discountable (extremely unlikely), a “may affect” determination is appropriate. Insignificant effects relate to the magnitude or extent of the impact (that is, they must be small and would not rise to the level of a take of a species). Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur. These factors were also considered in determining the significance of effects under the NEPA and EO 12114.

#### 3.7.2.2 Approach to Analysis

**Assessment Methods and Data Used**

The Navy used a screening process to identify aspects of the Proposed Action that could act as stressors to sea turtles. Public and agency scoping comments, previous environmental analyses, previous agency consultations, laws, regulations, EOs, and resource-specific information were also evaluated. This process was used to focus the information presented and analyzed in the Affected Environment and Environmental Consequences sections (Sections 3.7.1 and 3.7.3) of this EIS/OEIS. Potential stressors to sea turtles include vessel movements (disturbance and collisions), aircraft overflights (disturbance), weapons firing and ordnance use (disturbance and strikes), explosions, and expended materials (ordnance-related materials, targets, and marine markers).

As discussed in Section 3.2, Expended Materials, and Section 3.3, Water Resources, potential pollutants in sediments, water, and air would be released into the environment as a result of the alternatives. The analyses presented in those sections indicate that any increases in pollutants resulting from Navy training in the TMAA would be negligible and localized, and impacts would not be significant. Based on these analyses, water quality changes would have negligible effects on sea turtles. Accordingly, the effects of water quality changes on sea turtles are not addressed further in this EIS/OEIS.

**Data Sources**

A systematic review of relevant literature and data was conducted of both published and unpublished sources. The following types of documents were used in the assessment: journals, books, periodicals, bulletins, Department of Defense (DoD) operations reports, theses, dissertations, endangered species recovery plans, species management plans, and other technical reports published by government agencies, private businesses, and consulting firms. The scientific literature was also consulted during the search for geographic location data (geographic coordinates) on the occurrence of sea turtles within the TMAA.

**Sea Turtle Density**

Given leatherback turtles have seldom been encountered in the GOA (19 documented occurrences in 47 years; Hodge and Wing 2000, DoN 2006), there is no data available and no density estimates for leatherback turtles in the TMAA. Extrapolation of numbers from temperate waters where numerical estimates have been made is not a valid approach given the cold waters of the GOA.

**Sound in the Water**

The acoustic abilities of marine species are important in communicating with others of their species, navigating, foraging, and avoiding predators. Human activities that affect their hearing could have adverse consequences for their survival and recovery. The approach to estimating the potential acoustic effects of Anti-Submarine Warfare (ASW) training activities in the TMAA on marine species uses methods that were developed for the Navy’s Hawaii Range Complex Final EIS/OEIS in cooperation with the National Oceanic and Atmospheric Administration (NOAA) (DoN 2008).

As discussed previously in Sea Turtle Hearing, effects on leatherback turtles are not likely from the use of mid-frequency or high-frequency sound sources given that all available information indicates the leatherback turtle hearing range is likely well below those frequencies. Acoustic masking of leatherback hearing should not occur as a result of the proposed use of the sources in those mid- and high-frequency ranges. Under ESA, use of sonar during training activities in the TMAA may effect leatherback turtles since it is possible that they may be exposed to sonar although not perceive it via hearing mechanisms.

Consideration of a physiological or stress response as a result of the proposed training activities must be discussed given the possible duration of the combined (exercise) activities (a maximum of 21 days). Although an individual training activity (such as an anti-submarine tracking exercise) may be hours in duration, the participants and activities are dispersed in the TMAA, the majority of sources are generally active only intermittently once or twice each minute, the sources have a small range of effect based on the hearing sensitivity of a sea turtle, and the sources are almost always moving rapidly (in relation to a sea turtle). Based on the discussion and citations provided in Section 3.7.1.1, leatherback turtles are not expected to be able to perceive the sounds from mid- and high-frequency sound sources and, given the likely short duration of any exposure to these sources, there should be no physiological or stress response as a result of their use in the TMAA.

Further discussion of potential effects from use of mid-frequency and high-frequency sound sources is not carried through in the analysis of the various alternatives for sea turtles.

#### At-Sea Explosions

Ordnance cannot be released and explosives cannot be detonated until the target area is determined to be clear. Training activities are halted immediately if cetaceans, pinnipeds, or sea turtles are observed in the target area. Training activities are delayed until the animal clears the target area. All observers are in continuous communication to be able to immediately halt training activities. The event can be delayed as necessary to ensure the target area is clear. If the area cannot be cleared, the operation is relocated or canceled. These practices lower the risk of harming leatherback turtles.

The lead time to set up and clear the impact area before an event using explosives takes place may be 30 minutes to several hours. There will, therefore, be a long period of area monitoring before any detonation or live-fire event begins.

Criteria and thresholds for estimating the impacts to leatherback turtles from a single at-sea explosion event were determined from information on marine species used for the environmental assessments for the two Navy ship-shock trials: the *Seawolf* Final EIS (DoN 1998) and the *Churchill* Final EIS (DoN 2001). During the analysis of the effects of explosions on marine mammals and sea turtles conducted by the Navy for the *Churchill* EIS, analysts compared the injury levels reported by these experiments to the injury levels that would be predicted using the modified-Goertner method and found them to be similar (DoN 2001, Goertner 1982). While the criteria and thresholds for injury and harassment summarized in Table 3.7-1 were developed based on data from marine mammals, extrapolation from human and marine mammal data to sea turtles may be inappropriate given the morphological differences between the auditory systems of mammals and turtles. However, they are also used for sea turtles because no other criteria exist.

The criteria for non-injurious harassment include acoustic annoyance and physical discomfort (Viada et al. 2007). Temporary threshold shift (TTS) is the criterion for acoustic annoyance; TTS is a temporary, recoverable, loss of hearing sensitivity (NMFS 2001, DoN 2001). There are two criteria for TTS: (1) 182 dB re 1 squared micropascal-second ($\mu Pa^2$-s) maximum Energy Flux Density Level (EL) level in any 1/3-octave band at frequencies greater than 100 Hz for sea turtles, and (2) 12 pounds per square inch (psi) peak pressure. Navy policy is to use a peak pressure level of 23 psi as a criterion for explosive charges less than 2,000 lb (900 kg) and a peak pressure level of 12 psi as a criterion for explosive charges larger than 2,000 lb. It was introduced to provide a safety zone for TTS when the explosive or the animal approaches the sea surface (for which case the explosive energy is reduced but the peak pressure is not). In addition to acoustic annoyance, non-injurious harassment may also include physical discomfort and tactile detection, particularly in areas around the eyes, mouth, external nares, and vent (Viada et al. 2007).

**Table 3.7-1: Summary of Criteria and Acoustic Thresholds for at-Sea Explosion Impacts to Sea Turtles**

| Impact to Marine Mammal | Criterion | Threshold |
|---|---|---|
| Level A harassment<br>Mortality | Onset of severe lung injury | Goertner Modified Positive Impulse indexed to 31 psi-ms |
| Injury | Tympanic membrane (TM) rupture<br>Onset of slight lung injury | 50 percent rate of rupture<br>205 dB re 1 µPa$^2$-s (Energy Flux Density)<br>Goertner Modified Positive Impulse Indexed to 13 psi-ms |
| Level B harassment<br>Noninjury | Temporary threshold shift (TTS) | 182 dB re 1 µPa$^2$-s maximum Energy Flux Density level in any 1/3-octave band at frequencies above 100 Hz for sea turtles |
| Dual criteria | Onset TTS | 23 psi peak pressure level (for small explosives) |

psi-ms = pounds per square inch-milliseconds, dB = decibel, µPa$^2$-s = squared micropascal-second, Hz = hertz

Two criteria are used for injury: onset of slight lung hemorrhage and 50 percent eardrum (TM) rupture. These criteria are considered indicative of the onset of injury. The threshold for onset of slight lung injury is calculated for a small animal (a dolphin calf weighing 27 lb [12 kg]), and is given in terms of the "Goertner modified positive impulse," indexed to 13 psi-millisecond (ms) (DoN 2001). This threshold is conservative since the positive impulse needed to cause injury is proportional to animal mass, and therefore, larger animals require a higher impulse to cause the onset of injury. The threshold for TM rupture corresponds to a 50 percent rate of rupture (i.e., 50 percent of animals exposed to the level are expected to suffer TM rupture); this is stated in terms of an EL value of 205 dB re 1 µPa$^2$-s. The criterion reflects the fact that TM rupture is not necessarily a serious or life-threatening injury, but is a useful index of possible injury that is well correlated with measures of permanent hearing impairment (e.g., Ketten 1998), and indicates a 30 percent incidence of permanent threshold shift [PTS] at the same threshold. Another slight injury that may result from at-sea explosions includes hemorrhage of the gastrointestinal tract. This is caused by excitation of radial oscillations of small gas bubbles normally present in the intestine. Hemorrhage of the gastrointestinal tract is not expected to be debilitating, and a sea turtle would be expected to recover on its own (Viada et al. 2007).

The criterion for mortality for marine mammals used in the *Churchill* Final EIS is "onset of severe lung injury." In the absence of analogous data for sea turtles, the criteria developed for marine mammals are also applied to sea turtles. This is conservative for marine mammals in that it corresponds to a 1 percent chance of mortal injury, and yet any animal experiencing onset severe lung injury is counted as a lethal exposure. The threshold is stated in terms of the Goertner (1982) modified positive impulse with value "indexed to 31 psi-ms." Since the Goertner approach depends on propagation, source/animal depths, and animal mass, the actual impulse value corresponding to the 31 psi-ms index is a complicated calculation. Again, to be conservative, the *Churchill* analysis used the mass of a dolphin calf (27 lb [12 kg]), so that the threshold index is 30.5 psi-ms. Gastrointestinal tract injuries are associated with lung hemorrhage and would be expected to include contusions with ulcerations throughout the tract, ultimately resulting in tract ruptures. Mortality is highly likely under these conditions (Viada et al. 2007). Lethal injuries may also result from shock waves with high peak pressure. These high peak pressure shock waves may result in concussive brain damage; cranial, skeletal, or shell fractures; hemorrhage; or massive inner ear trauma, leading either directly or indirectly to mortality (Viada et al. 2007).

#### Weapons Firing Disturbance

A gun fired from a vessel on the surface of the water propagates a blast wave away from the gun muzzle. As the blast wave hits the water, sound is carried into the water in proportion to the blast strike. Propagating energy is transmitted into the water in a finite region below the gun. The fraction of sound transmitted from air to water depends on the angle at which the sound approaches the air-water interface. The greater the angle, the less transmission of sound from air to water. This critical angle (about 13°, as measured from the vertical) can be calculated to determine the region of transmission in relation to a vessel and gun (DoN 2006). When the critical angle is exceeded, all of the acoustic energy is reflected from the air-water interface and does not enter the water column.

The largest proposed shell size for training activities is a 5-in shell. This will produce the greatest pressure of all ammunition used in the study area. All analysis was done using the 5-in shell as a source of produced and transmitted pressure, with the recognition that smaller ammunition sizes would have lesser impacts.

In June 2000, the Navy collected a series of pressure measurements during the firing of a 5-in gun. Average pressure measured approximately 200 dB with reference pressure of one micropascal (200 dB re 1 µPa) at the point of the air and water interface. Based on these values, down-range peak pressure levels were calculated to be less than 186 dB re 1 µPa at 100 m (DoN 2000), and down-range pressure levels decreased with increasing distance. The rapid dissipation of the sound pressure wave, the low potential for occurrence of leatherback turtles in the TMAA, and the protective measures implemented by the Navy (see Chapter 5 for details) to detect leatherback turtles in an area prior to implementing training activities would result in the gun muzzle blasts having no effect on leatherback turtles. This topic is not addressed further in the analyses of effects on sea turtles.

### 3.7.2.3 No Action Alternative

Under the No Action Alternative, baseline levels of activities would remain unchanged from current conditions. Leatherback turtles would have the potential to be affected by vessel movements, aircraft overflights, ordnance strikes, explosions, and expended materials.

#### Vessel Movements

Training activities within the study area involve maneuvers by various types of surface vessels and submarines (collectively referred to as vessels). Vessel movements have the potential to affect leatherback turtles by directly striking or disturbing individual animals. The probability of vessel and leatherback turtle interactions depends on factors such as the presence or absence and density of leatherback turtles; numbers, types, and speeds of vessels; duration and spatial extent of activities; and protective measures implemented by the Navy.

The number of Navy vessels participating in training under the No Action Alternative is 23, consisting of 4 military vessels and up to 19 contracted vessels and boats. Although Navy vessels are capable of much faster speeds, specific training activities will generally be at speeds in the range of 10 to 14 knots (kts) (18 to 26 kilometers per hour [km/h]). Training activities are widely dispersed throughout the TMAA, which encompasses 42,146 square nm ($nm^2$) (145,482 square km [$km^2$]) of surface and subsurface ocean.

#### Disturbance from Vessel Movement

The ability of sea turtles to detect approaching vessels via auditory or visual cues would be expected based on knowledge of their sensory biology (Bartol and Musick 2003, Ketten and Bartol 2006, Bartol and Ketten 2006, Levenson et al. 2004). Little information is available on how sea turtles respond to vessel approaches. Hazel et al. (2007) reported that greater vessel speeds increased the probability that sea turtles would fail to flee from an approaching vessel. Sea turtles fled frequently in encounters with a slow-moving (2.2 kts) (4.4 km/h) vessel, but infrequently in encounters with a moderate-moving (5.9 kts) (10.6 km/h) vessel, and only rarely in encounters with a fast-moving (10.3 kts) (18.5 km/h) vessel. It is difficult to differentiate whether a sea turtle reacts to a vessel due to the produced sound, the presence of the vessel itself, or a combination of both. As discussed previously in Sea Turtle Hearing, sea turtles have highest sensitivity to sounds between approximately 200 to 800 Hz, with an upper limit of 2,000 Hz (Ridgway et al. 1969, Lenhardt 1994, Bartol et al. 1999, Ketten and Bartol 2006). Although it is difficult to determine whether sea turtle response to vessel traffic is visual or auditory in nature, it is assumed sea turtles can hear approaching vessels given their hearing range.

Leatherback turtles exposed to the general disturbance associated with a passing Navy vessel could exhibit short-term behavioral responses. In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, vessel movement under the No Action Alternative may affect leatherback turtles.

#### Vessel Collisions

Vessel collisions or strikes have the potential to affect leatherback turtles in the TMAA. Sea turtles swimming or feeding at or just beneath the surface of the water are particularly vulnerable to a vessel strike. Sea turtles struck by vessels could be unharmed, injured, or killed. Collisions between vessels and leatherback turtles are possible, but have a low potential for occurrence. The probably extreme low density for leatherback turtles, low number of steaming hours over a large area (42,146 $nm^2$ [144,556 $km^2$]), and Navy standard lookouts meant to reduce the collision potential would combine to limit the likelihood of vessel-sea turtle collisions.

As noted above, there is little information available on how sea turtles respond to vessel approaches. Hazel et al. (2007) found that sea turtles reacted to approaching vessels in a variety of ways. Benthic sea turtles launched upwards at a shallow angle and began swimming. The majority of the sea turtles swam away from the vessel, while some swam along the vessel's track, and some crossed in front of the vessel's track before swimming away. Sea turtle reaction time was greatly dependent on the speed of the vessel; sea turtles were able to react faster to slower moving vessels than to faster moving vessels. Sea turtle reactions to vessels elicited short-term responses.

Human disturbance to wild animals, such as vessel movement, may elicit similar reactions to those caused by natural predators (Gill et al. 2001, Beale and Monaghan 2004). Behavioral responses may also be accompanied by a physiological response (Romero 2004), although this is very difficult to study in the wild. Immature Kemp's ridley turtles have shown physiological responses to the acute stress of capture and handling through increased levels of corticosterone (Gregory and Schmid 2001). In the short term, exposure to stressors results in changes in immediate behavior (Frid 2003). For sea turtles, this can include intense behavioral reactions such as biting and rapid flipper movement (Gregory and Schmid 2001). Repeated exposure to stressors, including human disturbance such as vessel disturbance and anthropogenic sound, can result in negative consequences to the health and viability of an individual or population. Chronic stress can result in decreased reproductive success (Lordi et al. 2000, Beale and Monaghan 2004), decreased energy budget (Frid 2003), displacement from habitat (Sutherland and Crockford 1993), and lower survival rates of offspring (Lordi et al. 2000). Although this study related to natural induced stressors, similar physiological changes may result from other types of stressors such as anthropogenic disturbance. At this time, it is unknown what the long-term implications of chronic stress may be on sea turtle species.

The Navy's SOPs include a number of measures that will help prevent a collision between a naval vessel and a leatherback turtle (see Chapter 5). Navy vessels use lookouts 24 hours a day, who serve to alert the bridge to any and all objects in the water, including sea turtles. Ships and surfaced submarines use caution and operate at safe speeds consistent with weather and sea state conditions. Ships and submarines will maneuver to avoid a collision with a sea turtle to the extent possible, with safety of the vessel paramount. The combination of the low initial probability of collision with a leatherback turtle and the procedures to avoid such an event makes it extremely unlikely a ship would collide with a leatherback turtle. In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, vessel strikes under the No Action Alternative may affect leatherback turtles.

#### Aircraft Overflights

Under the No Action Alternative, fixed-wing aircraft overflights associated with 300 sorties would occur above the TMAA. Most aircraft overflights would occur over the TMAA at elevations in excess of 15,000 ft (915 m). All aircraft overflights between the shore and 12 nm (22 km) from land would occur at altitudes at or above 15,000 ft (915 m). There would be 32 training events that may involve helicopter flights conducted over water.

Aircraft overflights produce noise, and some of this sonic energy would be transmitted into the water. Sea turtles could be exposed to noise associated with fixed-wing aircraft overflights and helicopter activities while at the surface or while submerged. In addition, low-flying aircraft passing overhead could create a visual shadow effect that could induce a reaction in sea turtles.

It is difficult to differentiate between reactions that sea turtles may experience to the presence of aircraft and reactions to sound. Based on information on their sensory biology as discussed in Sea Turtle Hearing (Ridgway et al. 1969, Lenhardt 1994, Bartol et al. 1999, Bartol and Musick 2003, Ketten and Bartol 2006), sound from low-flying aircraft could be heard by a sea turtle at or near the surface. Exposures to elevated noise levels that are associated with current activities are brief and infrequent, based on the transitory and dispersed nature of the overflights. Sound exposure levels are relatively low because sea turtles spend only 3 to 6 percent of the time at the sea surface and because most of the overflights would be above 15,000 ft. In addition, overflights do not generate underwater sound levels that result in harm to sea turtles (Eller and Cavanagh 2000, Laney and Cavanagh 2000). Hazel et al. (2007) suggested that green turtles rely more on visual cues than auditory cues when reacting to approaching water vessels. This suggests that sea turtles might not respond to aircraft overflights based on noise alone.

Leatherback turtles exposed to aircraft overflights that occur under the No Action Alternative may exhibit no response, or may exhibit behavioral reactions such as quick diving. Any behavioral avoidance reaction would be short-term and would not permanently displace animals or result in physical harm. Overflights are not expected to result in chronic stress because it is unlikely that individual animals would be repeatedly exposed to low-altitude overflights. In accordance with EO 12114, harm to leatherback turtles from aircraft overflights in nonterritorial seas would be possible but unlikely. In accordance with the ESA, aircraft overflights under the No Action Alternative may affect leatherback turtles.

#### At-Sea Explosions

Explosions that would occur in the No Action Alternative in the TMAA would result from training exercises that use explosive ordnance, including bombs (BOMBEX), high explosive (HE) rounds (Gunnery Exercise [GUNEX]) as identified in Table 2-8. At-sea explosions conducted under the No Action Alternative have the potential to adversely affect sea turtles in the study area by causing temporary behavioral effects, sub-lethal or lethal injuries, or direct mortality.

Missiles used in air to air training events at sea, although part of a live fire event, are designed to detonate in the air and do not constitute an at-sea explosion occurring in water as analyzed in this document.

However, the same factors that would limit other adverse effects to sea turtles would result in a low potential for impacts from explosions. These include the relatively low potential for sea turtles to occur in the study area, the limited number of training activities using explosive ordnance over a large area, and consistent implementation of Navy resource protection measures.

Under the No Action Alternative, approximately 48 live bombs may be used during a BOMBEX. During Surface-to-Surface (S-S) GUNEX, 30 5-in rounds and 10 76-millimeter (mm) rounds could be fired each year during training activities under the continuing activities of the No Action Alternative. Their use would occur in all areas of the TMAA.

An analysis of potential impacts from at-sea explosions using acoustic modeling could not be conducted for leatherback turtles, given there is no data regarding the abundance or distribution in the Pacific (NMFS and USFWS 1998c) and no known density or information available to derive an estimate for the number of leatherback turtles in the GOA or in the TMAA. In analyses undertaken for similar actions at other locations, modeling to predict potential impacts required that the zone of influence resulting from each explosion or detonation be multiplied by the sea turtle density to assess the potential for and number of impacts likely (see Sea Turtle Hearing Section and Section 3.7.2.2 for sea turtle-specific thresholds and Section 3.8, Marine Mammals, for a full description of the modeling and methods). Modeling efforts in these cases are completed as if no mitigation measures were in effect. The purpose of this is to model without consideration for reduction in the predicted impact numbers as a result of standard mitigations (regarding standard mitigations, see Current Requirements and Practices Section).

Given indications there are very low numbers of leatherback turtles present in the TMAA, mathematical modeling based on the density of sea turtles in the area (if available) would result in less than one predicted exposure annually (based on modeling of other species having magnitudes higher densities). However, there remains a possibility there could be an exposure of a leatherback to acoustic or pressure waves from at-sea explosions. Based on this possibility, under the No Action Alternative, the explosions and detonations that would take place in the TMAA may affect leatherback turtles. No sea turtle mortalities would be expected under this alternative.

In accordance with EO 12114, harm to leatherback turtles from explosive ordnance use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, use of explosive ordnance in the TMAA under the No Action Alternative may affect leatherback turtles.

**Expended Materials**

The Navy expends a variety of materials during training exercises. Under the No Action Alternative, 15,982 expendable items may be used. The types and quantities of materials expended and information regarding fate and transport of these materials within the marine environment are discussed in Section 3.2 (Expended Materials), and Section 3.3 (Water Resources). The analyses in these sections determined that most expended materials rapidly sink to the seafloor where they become encrusted by natural processes or are incorporated into the seafloor, with no substantial accumulations in any particular area and no significant negative effects to water quality or marine benthic communities. Given that materials expended during training do not remain at the surface and are generally used in areas where the water depth is beyond that of foraging sea turtles, it is unlikely expended materials would affect sea turtles.

Sea turtles of all sizes and species are known to ingest a wide variety of marine debris, which they might mistake for prey. Plastic bags and plastic sheeting are most commonly swallowed by sea turtles, but balloons, styrofoam beads, monofilament fishing line, and tar are also known to be ingested (National

Research Council [NRC] 1990). Most materials expended during Navy training are larger in size than the marine debris ingested by sea turtles. Marine debris can pass through the digestive tract and be voided naturally without causing harm, or it can cause sublethal or lethal effects (Balazs 1985). Sublethal effects include nutrient dilution, which occurs when nonnutritive debris displaces nutritious food in the gut, leading to slow growth or reduced reproductive success (McCauley and Bjorndal 1999).

Lutz (1997) found that hungry sea turtles will actively seek and consume marine debris if other food is not available. In most cases, this debris passed through the gut within a few days, but latex was found to take up to 4 months to clear the intestinal system. While ingestion of marine debris has been linked to sea turtle mortalities, sublethal effects are more common (NRC 1990, McCauley and Bjorndal 1999).

#### Ordnance-Related Materials

Ordnance-related materials include nonexplosive training rounds and shrapnel from explosive rounds. Under the No Action Alternative, 15,706 items of ordnance or related materials would be expended. The solid materials of high metal content quickly sink through the water column and into the seafloor in the TMAA where they would generally be beyond the reach of foraging leatherback turtles (although leatherbacks have been known to dive to a depth of 1,200 m [DoN 2006]).

Leatherbacks feed throughout all zones of the water column (Davenport 1988, Eckert et al. 1989, Grant and Ferrell 1993, Salmon et al. 2004, James et al. 2005). Prey is predominantly gelatinous zooplankton such as jellyfish and tunicates (Grant and Ferrell 1993, Bjorndal 1997, James and Herman 2001, Salmon et al. 2004), and as discussed in Species Accounts and Life History, they typically do not feed in the benthic environment. Therefore, although leatherbacks could reach ordnance-related materials resting on the bottom at depths up to 1,000 m, they are unlikely to ingest it.

Ingestion of expended ordnance is not expected to occur in the water column because ordnance quickly sinks. Leatherbacks would not be expected to ingest ordnance expended under the No Action Alternative because they do not typically feed in the benthic environment. In accordance with EO 12114, harm to leatherback turtles from expended materials in nonterritorial seas would not be likely to occur. In accordance with the ESA, ordnance-related materials under the No Action Alternative may affect leatherback turtles.

#### Nonexplosive Ordnance Use

Current Navy training activities in the TMAA include firing a variety of weapons that employ nonexplosive training rounds, including inert bombs, missiles, naval gun shells, cannon shells, and small-caliber ammunition. These materials are used in the open ocean beyond 12 nm (22 km) and represent potential stressors to sea turtles. Ordnance strikes have the potential to injure or kill sea turtles swimming or feeding at or just beneath the water surface.

Approximately 10,454 nonexplosive ordnance rounds would be used in the TMAA under the No Action Alternative. Given the few number of leatherback turtle likely in the TMAA, the large area encompassed by the training activities, and area clearance procedures, the potential for leatherback turtles to be struck by ordnance is very low.

In accordance with EO 12114, harm to leatherback turtles from nonexplosive ordnance use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, nonexplosive ordnance strikes under the No Action Alternative may affect leatherback turtles.

### Target-Related Materials

At-sea targets used in the TMAA could range from high-technology, remotely operated airborne and surface targets (such as airborne drones) to low-technology, floating, at-sea targets (such as inflatable targets) and airborne, towed banners. Many of the targets are designed to be recovered for reuse and are not destroyed during training. There are 252 target related items used under the No Action Alternative and all but eight of these would be recovered. The expendable targets used in the study area under this alternative are the Tactical Air Launched Decoy (TALD), BQM-74E, and Killer Tomato. When not recovered after use, these units are large and remain in large pieces when they sink to the bottom after use. Because of this characteristic, they present no ingestion hazard to sea turtles.

In addition to expendable target use, MK-58 marine markers or LUU-2B/B flares are used which produce chemical flames and surface smoke. They are used in training exercises to mark a surface position to simulate divers, vessels, and points of contact on the surface of the ocean. The smoke dissipates in the air and has little effect on the marine environment. The marker burns similar to a flare, producing a flame until all burn components have been used. While the light generated from the marker is bright enough to be seen up to 3 mi (4.8 km) away in ideal conditions, the light either reflects off the water's surface or enters the water and attenuates in brightness over depth. Because they spend only three to six percent of time on the sea surface, it would be extremely unlikely that leatherback turtles would be affected by the light from the marker.

In accordance with EO 12114, harm to leatherback turtles from target use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, use of target-related materials under the No Action Alternative may affect leatherback turtles.

### Chaff

As detailed in Section 3.2.1.1, chaff consists of aluminum-coated polymer fibers used as an electronic countermeasure designed to reflect radar waves and obscure aircraft, ships, and other equipment from radar tracking sources. Upon deployment, the chaff fibers are widely dispersed in the air and eventually land in the water and sink to the ocean floor. An extensive review of literature, combined with controlled experiments, revealed that chaff use poses little risk to the environment or animals (U.S. Air Force 1997, Naval Research Laboratory 1999, Arfsten et al. 2002, Farrell and Siciliano 2007). The materials in chaff are generally nontoxic except in quantities significantly larger than those any animal could reasonably be exposed to from normal usage. Particulate tests concluded that the concern about chaff fibers breaking down into respirable particle sizes is not a significant issue. Experiments have shown that animals should not suffer toxic or physical effects from chaff ingestion (U.S. Air Force 1997, Naval Research Laboratory 1999). It is likely that due to the small size of chaff, if ingested, it would pass through the digestive tract and be voided naturally without causing harm, sublethal, or lethal effects. Under the No Action Alternative, ingestion of chaff, although very unlikely, could occur but any effects are likely insignificant and discountable. In accordance with the ESA, use of chaff under the No Action Alternative may affect leatherback turtles.

### Entanglement

Entanglement in persistent marine debris threatens the survival of sea turtles in the eastern Pacific Ocean (NMFS and USFWS 1998a). Often, sea turtles that become entangled in debris or abandoned fishing gear cannot submerge to feed or surface to breathe. Those that do not starve or drown may lose a limb or attract predators with their struggling. Sea turtles can also become entangled in plastics and other buoyant and persistent synthetic debris discarded into the ocean (Balazs 1995, Carr 1987).

Although entanglement in military expended materials was not cited as a source of injury or mortality for any sea turtle in a large stranding database for Californian waters, there is a potential for sea turtles to become entangled in expended materials.

The greatest risk of entanglement occurs when expendable devices, primarily parachutes, are on or near the surface. Approximately 56 expendable devices employing parachutes are used annually under the No Action Alternative in the TMAA. Aircraft-launched sonobuoys, flares, and other expendable devices deploy nylon parachutes of varying sizes (e.g., the surface area is 1.5 square ft [$ft^2$] [0.1 square m {$m^2$}] to 3.5 $ft^2$ [0.3 $m^2$]). At water impact, the parachute lines and assembly is expended and sinks because all of the material is negatively buoyant. Other components of the expendable devices are metallic and will sink rapidly. Entanglement and the eventual drowning of a leatherback turtle in a parachute assembly would be unlikely because such an event would require the parachute to land directly on a leatherback turtle, or the leatherback turtle to swim into the parachute before it sinks.

The expended material accumulates on the ocean floor and is covered by sediments over time, reducing the potential for entanglement. If bottom currents are present, the canopy may billow and pose an entanglement threat to sea turtles with bottom-feeding habits. As described in Species Accounts and Life History, leatherback turtles have been recorded as diving to depths in excess of 1,200 m (3,937 ft) (DoN 2006) though spend the majority of time at depths less than 100m (328ft). With the general depth in the TMAA being over 1,000 m (3,281 ft), the probability of a leatherback turtle encountering a submerged parachute assembly is low, and the potential for accidental entanglement in the canopy or suspension lines is therefore discountable.

In accordance with EO 12114, harm to leatherback turtles from entanglement from military expended materials in nonterritorial seas would be possible but unlikely. In accordance with the ESA, entanglement from military expended materials under the No Action Alternative may affect leatherback turtles.

### 3.7.2.4 Alternative 1

Under Alternative 1, the level of activities in the TMAA would increase relative to the No Action Alternative. In addition to accommodating an increase in training activities currently conducted, Alternative 1 would also support an introduction of training activities to include training activities associated with ASW training.

#### Vessel Movements

Under Alternative 1, the number of vessels used in training events would increase from 23 under the No Action Alternative (current conditions) to 27 surface vessels plus 1 submarine; however, vessel movements would be widely dispersed throughout the area. This would be an increase of 17 percent over the No Action Alternative's current conditions.

#### Disturbance from Vessel Movement

The small increase in number of vessels over current conditions would not measurably increase potential effects to sea turtles. As described for the No Action Alternative, leatherback turtles exposed to the general disturbance associated with a passing Navy vessel could exhibit a short-term behavioral response such as fleeing. In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, vessel movements under Alternative 1 may affect leatherback turtles.

**Vessel Collisions**

The types of vessel strike impacts to sea turtles under Alternative 1 would be the same as those described for the No Action Alternative. The increase of four surface vessels and one submarine over current conditions would not measurably change effects on sea turtles relative to the No Action Alternative.

In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, vessel collisions under Alternative 1 may affect leatherback turtles.

**Aircraft Overflights**

Under Alternative 1, overflights associated with 300 sorties would occur above the TMAA annually. This would represent no change from No Action Alternative conditions. In addition there would be 59 training events that may involve helicopter flights conducted over water, an approximate 84 percent increase from the No Action Alternative. As with the other alternatives, most aircraft overflights would occur over the TMAA at elevations in excess of 15,000 ft (915 m). All fixed-wing aircraft overflights between the shore and 12 nm (22 km) from land would occur at altitudes at or above 15,000 ft (915 m).

Exposures to elevated noise levels associated with Alternative 1 would be brief and infrequent, based on the transitory, dispersed nature of the overflights. Sound exposure levels are relatively low because sea turtles spend only three to six percent of the time at the sea surface, and most of the overflights would be above 15,000 ft.

As described for aircraft overflights under the No Action Alternative, sea turtles could exhibit no response, or may exhibit behavioral reactions such as quick diving. Any behavioral avoidance reaction would be short-term and would not permanently displace animals or result in physical harm. Overflights are not expected to result in chronic stress because it is extremely unlikely that individual animals would be repeatedly exposed to low-altitude overflights.

In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, aircraft overflights under Alternative 1 may affect leatherback turtles.

**At-Sea Explosions**

Under Alternative 1, approximately 72 bomb explosions would occur each year during training activities in the TMAA, which is a 52% increase over the No Action Alternative. There would also be 42 5-in rounds and 14 76mm rounds fired during S-S GUNEX, which is a 167% increase over the No Action Alternative.

In addition, 40 SSQ-110A Improved Extended Echo Ranging (IEER) sonobuoys could be used for the first time in the TMAA under Alternative 1 in association with ASW training. These sonobuoys contain an explosive component and could be used in all areas of the TMAA. In the very rare event that a leatherback sea turtle was in the vicinity of an IEER sonobuoy, remained undetected, and loitered in the vicinity until the 4.4-lb charge was detonated, the leatherback turtle could be exposed to noise and the pressure wave from the detonation. Monitoring and resource protection undertaken prior to any detonation of an IEER would reduce the likelihood of sea turtles being exposed to such detonations. Protective measures that are used during training activities to identify sea turtle presences and suspend detonation activities if a sea turtle should be spotted would make these effects discountable.

An analysis of potential impacts from at-sea explosions under Alternative 1 using acoustic modeling could not conducted for leatherback turtles. There is no data regarding the abundance or distribution in the Pacific (NMFS and USFWS 1998c) and no known density or information available to derive an estimate for the number of leatherback turtles in the GOA or in the TMAA. In analyses undertaken for similar actions at other locations, modeling to predict potential impacts required that the zone of influence resulting from each explosion or detonation be multiplied by the sea turtle density to assess the potential for and number of impacts likely (see Sea Turtle Hearing Section and Section 3.7.2.2 for sea turtle-specific thresholds and Section 3.8, Marine Mammals, for a full description of the modeling and methods). The approach in prior modeling efforts were to model without consideration for reduction in the predicted impact numbers as a result of standard mitigations (regarding standard mitigations, see Current Requirements and Practices Section).

Given the low numbers of leatherback turtles likely present in the TMAA, modeling would likely result in a conclusion that there were no exposures in any event. However, without density information and modeling of potential impacts, there remains a possibility there could be an exposure of a leatherback to at-sea explosions. Based on this possibility, under Alternative 1, the explosions and detonations that would take place in the TMAA may affect leatherback turtles. No sea turtle mortalities would be expected under this alternative.

In accordance with EO 12114, harm to leatherback turtles from explosive ordnance use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, use of explosive ordnance in the TMAA under Alternative 1 may affect leatherback turtles.

## Expended Materials

### Ordnance-Related Materials

Under Alternative 1, a total of 19,101 items of ordnance or related materials would be expended. This is a 17 percent increase over current conditions. As described for the No Action Alternative, leatherback turtles would not be expected to be at risk from ingesting ordnance-related materials because they feed in the water column, not in the benthic environment. Because these materials sink rapidly and are encrusted on the seafloor, the potential to affect leatherbacks would be remote.

In accordance with EO 12114, harm to leatherback turtles from expended materials in nonterritorial seas would be possible but unlikely. In accordance with the ESA, ordnance-related materials under Alternative 1 may affect leatherback turtles.

### Nonexplosive Ordnance Use

Approximately 12,987 nonexplosive ordnance rounds would be used in the TMAA annually under Alternative 1. This is a 20 percent increase from current conditions and includes including inert bombs, missiles, naval gun shells, cannon shells, and small-caliber ammunition. Ordnance is used in all areas of the TMAA. Given the few number of leatherback turtles likely in the TMAA, the large area encompassed by the training activities, and area clearance procedures, the potential for leatherback turtles to be struck by ordnance is very low.

In accordance with EO 12114, harm to leatherback turtles from nonexplosive ordnance use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, nonexplosive ordnance strikes under the Alternative 1 may affect leatherback turtles.

### Target-Related Materials

At-sea targets used in the TMAA could range from high-technology, remotely operated airborne and surface targets (such as airborne drones) to low-technology, floating, at-sea targets (such as inflatable targets) and airborne, towed banners. Many of the targets are designed to be recovered for reuse and are not destroyed during training (i.e., Killer Tomato and BQM-74E). The expendable targets used in the study area under this alternative are the Tactical Air Launched Decoy (TALD), BQM-74E, and Killer Tomato. When not recovered after use, these units are large and remain in large pieces when they sink to the bottom after use. Because of this characteristic, they present no ingestion hazard to sea turtles. Under Alternative 1, there would be 322 target-related materials expended.

As discussed for the No Action Alternative, the smoke and flames produced by the marine markers or flares dissipate in the air, having little effect on the marine environment. While the light generated from the marker is bright enough to be seen up to 3 mi (4.8 km) away in ideal conditions, the light either reflects off the water's surface or enters the water and attenuates in brightness over depth.

In accordance with EO 12114, harm to leatherback turtles from target use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, use of target-related materials under Alternative 1 may affect leatherback turtles.

#### Chaff

As detailed in Section 3.2.1.1 chaff consists of aluminum-coated polymer fibers used as an electronic countermeasure designed to reflect radar waves and obscure aircraft, ships, and other equipment from radar tracking sources. Upon deployment, the chaff fibers are widely dispersed in the air and eventually land in the water and sink to the ocean floor. An extensive review of literature, combined with controlled experiments, revealed that chaff use poses little risk to the environment or animals (U.S. Air Force 1997, Naval Research Laboratory 1999, Arfsten et al. 2002, Farrell and Siciliano 2007). The materials in chaff are generally nontoxic except in quantities significantly larger than those any animal could reasonably be exposed to from normal usage. Particulate tests concluded that the concern about chaff fibers breaking down into respirable particle sizes is not a significant issue. Experiments have shown that animals should not suffer toxic or physical effects from chaff ingestion (U.S. Air Force 1997, Naval Research Laboratory 1999). It is likely that due to the small size of chaff, if ingested, it would pass through the digestive tract and be voided naturally without causing harm, sublethal, or lethal effects. Under Alternative 1, ingestion of chaff, although very unlikely, could occur but any effects are likely insignificant and discountable. In accordance with EO 12114, harm to leatherback turtles from use of chaff in nonterritorial seas would be unlikely. In accordance with the ESA, use of chaff under Alternative 1 may affect leatherback turtles.

#### Portable Undersea Tracking Range

The PUTR is a self-contained, portable, undersea tracking capability that employs modern technologies to support coordinated undersea warfare training for Forward Deployed Naval Forces (FDNF). PUTR will be available in two variants to support both shallow and deep water remote activities in keeping with Navy requirements to exercise and evaluate weapons systems and crews in the environments that replicate the potential combat area. The system will be capable of tracking submarines, surface ships, weapons, targets, and Unmanned Underwater Vehicles (UUVs) and distribute the data to a data processing and display system, either aboard ship, or at a shore site.

No area supporting a PUTR system has been identified. The transponders are not deployed on sensitive hard-bottom habitat, but rather on soft-bottom habitats. There would be direct impact to soft bottom habitat from the clump weight anchoring the transponder, however, this should have no impact on sea turtles. Cabling between the clump weight and the transponder is under tension and would not present an entanglement hazard to leatherback sea turtles. Upon completion of the exercise, the transponders are recovered, which eliminates any potential impacts associated with hazardous materials such as batteries and electronic components associated with the PUTR system. The clump weight is not recovered, and since it is composed of inert material, it is not a potential source of contaminants. Sediments stirred up by the clump weight anchor should only result in a temporary and localized turbidity. In accordance with EO

12114, harm to leatherback turtles from use of the PUTR in nonterritorial seas would be unlikely. In accordance with the ESA, use of the PUTR under Alternative 1 may affect leatherback turtles.

#### Entanglement

Under Alternative 1, use of parachuted expended devices (sonobuoys, flares, EMATT) would increase by 859 items as compared to the No Action Alternative. Changes in the use of targets and markers that are delivered using parachutes were provided under "Target-Related Materials." The greatest risk of entanglement occurs when expendable devices, primarily parachutes, are on or near the surface. Aircraft-launched sonobuoys, flares, and other expendable devices deploy nylon parachutes of varying sizes. At water impact, the parachute lines and assembly is expended and sinks because all of the material is negatively buoyant. Other components of the expendable devices are metallic and will sink rapidly. Entanglement and the eventual drowning of a leatherback turtle in a parachute assembly would be unlikely because such an event would require the parachute to land directly on a leatherback turtle, or the leatherback turtle to swim into the parachute before it sinks.

In accordance with EO 12114, harm to leatherback turtles from entanglement from military expended materials in nonterritorial seas would be possible but unlikely. In accordance with the ESA, entanglement from military expended materials under Alternative 1 may affect leatherback turtles.

### 3.7.2.5 Alternative 2

Implementation of Alternative 2 would include all elements of Alternative 1 (accommodating training activities currently conducted, increasing specific training activities to include the use of active sonar, and accommodating force structure changes). In addition, under Alternative 2 the following activities would occur:

- Conduct one additional separate summertime CSG exercise lasting up to 21 days within the ATA.
- Conduct a SINKEX in each summertime exercise (a maximum of two) in the TMAA.

Sea turtles would have the potential to be affected by vessel movements, aircraft overflights, sonar, weapons firing/nonexplosive ordnance use, explosive ordnance, and expended materials under Alternative 2.

#### Vessel Movements

Under Alternative 2, there may be up to 27 surface vessels and 1 submarine participating in training activities during two training periods. This alternative would increase by 17 percent the number of vessels relative to the No Action Alternative. Vessel movements would be widely dispersed throughout the TMAA.

#### Disturbance from Vessel Movement

The increase in the number of vessels would not measurably increase potential effects to sea turtles. Sea turtles exposed to the general disturbance associated with a passing Navy vessel could exhibit a short-term behavioral response such as fleeing. In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, vessel disturbance under Alternative 2 may affect leatherback turtles.

#### Vessel Collisions

The types of vessel strike effects to sea turtles under Alternative 2 would be the same as those described for the No Action Alternative. The 17 percent increase in the number of vessels associated with this alternative would not measurably change effects on sea turtles under Alternative 2 in comparison to the No Action Alternative.

In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, vessel disturbance under Alternative 2 may affect leatherback turtles.

#### Aircraft Overflights

Under Alternative 2, fixed-wing aircraft overflights associated with 600 sorties would occur above the TMAA annually. This would be a 100 percent increase over the number of overflights in the No Action Alternative. In addition there would be 120 training events that may involve helicopter flights conducted over water at various altitudes, an approximate 275 percent increase in these events from the No Action Alternative. As with the other alternatives, most aircraft overflights would occur over the TMAA at elevations in excess of 15,000 ft (915 m). All aircraft overflights between the shore and 12 nm (22 km) from land would occur at altitudes at or above 15,000 ft (915 m).

The increase in potential exposure to visual and noise disturbance that would be associated with the increase in sorties and helicopter flights would not measurably increase effects to sea turtles. Sea turtles could exhibit no response, or may change their behavior to avoid the disturbance. Any behavioral avoidance reaction would be short-term and would not permanently displace animals or result in physical harm. Overflights are not expected to result in chronic stress because it is extremely unlikely that individual animals would be exposed to low-altitude overflights during the short periods of takeoff and landing.

In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, aircraft overflights under Alternative 2 may affect leatherback turtles.

#### At-Sea Explosions

Under Alternative 2, approximately 144 live bombs may be dropped during BOMBEX and 84 5-in rounds and 28 76mm rounds could be fired during S-S GUNEX. In addition, 80 SSQ-110A explosive sonobuoys would be used during ASW Tracking Exercises (TRACKEXs) under Alternative 2. These events involving the use of at-sea explosions may occur in all areas of the TMAA. As mentioned previously, monitoring and resource protection undertaken prior to any detonation of an IEER would reduce the likelihood of sea turtles being exposed to such detonations. Protective measures that are used during training activities to identify sea turtle presence and suspend detonation activities if a sea turtle should be spotted would further minimize the potential for harm.

In addition to the events noted above, under Alternative 2 the potential to conduct a SINKEX training event during each of the two possible summer exercise periods is also proposed. During a SINKEX, a decommissioned vessel is towed to a deep-water location and sunk using a variety of ordnance containing high explosives that may include missiles, bombs, and gunfire. For each SINKEX, there may be up to 10 non-inert bombs and 400 explosive rounds of 5-inch gunfire used during the event. For modeling purposes it was assumed that approximately one third of the munitions used (one Maverick missile, three bombs, and 120 of the 5-inch rounds) would miss the target and explode in the water (for details, see Appendix D). SINKEX may also include the use of one MK-48 ADCAP torpedo, which can be used at the end of SINKEX if the target is still afloat.

Aspects of the SINKEX event that have potential effects on sea turtles (e.g., vessel movement, aircraft overflights, gunfire firing noise, munitions constituents) have been analyzed separately in previous sections. If a sea turtle remained in the immediate vicinity of the SINKEX and ordnance missed the target vessel, injury or mortality could occur. SINKEX under Alternative 2 is, however, not likely to result in impacts to leatherback turtles based on the low number of leatherback turtles likely to be in the TMAA, the assumption that they will not remain in the vicinity of the activities surrounding a SINKEX event, and area clearance procedures (See Section 5.1.7).

An analysis of potential impacts from at-sea explosions under Alternative 2 using acoustic modeling, could not conducted for leatherback turtles. There is no data available regarding the abundance or distribution in the Pacific (NMFS and USFWS 1998c) and no known density or information available to derive an estimate for the number of leatherback turtles in the GOA or in the TMAA. In analyses undertaken for similar actions at other locations, modeling to predict potential impacts required that the zone of influence resulting from each explosion or detonation be multiplied by the sea turtle density to assess the potential for and number of impacts likely (see Sea Turtle Hearing Section and Section 3.7.2.2 for sea turtle-specific thresholds and Section 3.8, Marine Mammals, for a full description of the modeling and methods).

Given the low numbers of leatherback turtles likely present in the TMAA, modeling would likely result in a conclusion that there were no exposures in any event. However, without density information and modeling of potential impacts, there remains a possibility there could be an exposure of a leatherback to at-sea explosions. Based on this assumption, under Alternative 2, the explosions and detonations that would take place in the study area are unlikely to affect leatherback turtles. No sea turtle mortalities would be expected under this alternative. The Navy is working with NMFS through the ESA Section 7 consultation process to address effects to sea turtles for the Preferred Alternative (Alternative 2). NMFS will determine, through issuance of a Biological Opinion, the effect to listed species that may result from implementation of the Proposed Action.

In accordance with EO 12114, harm to leatherback turtles from explosive ordnance use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, use of explosive ordnance in the TMAA under Alternative 2 may affect leatherback turtles.

## Expended Materials

### Ordnance-Related Materials

Approximately 39,036 items of ordnance or related materials would be used in the TMAA under Alternative 2; the majority of these are non-explosive rounds, this is a 60 percent increase over current conditions. As discussed for the No Action Alternative and Alternative 1, leatherback turtles would not be expected to be at risk under Alternative 2 from ingesting ordnance-related materials because they feed in the water column, not in the benthic environment. Because these materials sink rapidly and are encrusted on the seafloor, the potential to affect the leatherback would be discountable. In accordance with EO 12114, harm to leatherback turtles from expended materials in nonterritorial seas would be possible but unlikely. In accordance with the ESA, ordnance-related materials under Alternative 2 may affect leatherback turtles.

### Nonexplosive Ordnance Use

Approximately 25,922 nonexplosive ordnance rounds would be used in the TMAA under Alternative 2, an increase of 60 percent over the No Action Alternative. Ordnance could be used in all areas of the TMAA. Given the few number of leatherback turtles likely in the TMAA, the large area encompassed by the training activities, and area clearance procedures, the potential for leatherback turtles to be struck by ordnance is low.

In accordance with EO 12114, harm to leatherback turtles from nonexplosive ordnance use in nonterritorial seas would be possible but very unlikely. In accordance with the ESA, nonexplosive ordnance strikes under Alternative 2 may affect leatherback turtles.

#### Target-Related Materials

At-sea targets used in the TMAA could range from high-technology, remotely operated airborne and surface targets (such as airborne drones) to low-technology, floating, at-sea targets (such as inflatable targets) and airborne, towed banners. A total of 644 targets and target related materials would be used under Alternative 2, an increase of 160% over the No Action Alternative. Many of the targets are designed to be recovered for reuse and are not destroyed during training. The expendable targets used in the study area under this alternative are the Tactical Air Launched Decoy (TALD), BQM-74E, and Killer Tomato. When not recovered after use, these units are large and remain in large pieces when they sink to the bottom after use. Because of this characteristic, they present no ingestion hazard to sea turtles.

As discussed for the No Action Alternative, the smoke and flames produced by marine markers and flares dissipate in the air, having little effect on the marine environment. The light generated from the marker either reflects off the water's surface or enters the water and attenuates in brightness over depth.

In accordance with EO 12114, harm to leatherback turtles from target use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, use of target-related materials under Alternative 2 may affect leatherback turtles.

#### Chaff

As detailed in Section 3.2.1.1 chaff consists of aluminum-coated polymer fibers used as an electronic countermeasure designed to reflect radar waves and obscure aircraft, ships, and other equipment from radar tracking sources. Upon deployment, the chaff fibers are widely dispersed in the air and eventually land in the water and sink to the ocean floor. An extensive review of literature, combined with controlled experiments, revealed that chaff use poses little risk to the environment or animals (U.S. Air Force 1997, Naval Research Laboratory 1999, Arfsten et al. 2002, Farrell and Siciliano 2007). The materials in chaff are generally nontoxic except in quantities significantly larger than those any animal could reasonably be exposed to from normal usage. Particulate tests concluded that the concern about chaff fibers breaking down into respirable particle sizes is not a significant issue. Experiments have shown that animals should not suffer toxic or physical effects from chaff ingestion (U.S. Air Force 1997, Naval Research Laboratory 1999). It is likely that due to the small size of chaff, if ingested, it would pass through the digestive tract and be voided naturally without causing harm, sublethal, or lethal effects. Under Alternative 2, although the use of chaff may double as compared to the No Action Alternative, ingestion of chaff remains, although very unlikely, could occur but any effects are likely insignificant and discountable. In accordance with EO 12114, harm to leatherback turtles from use of chaff in nonterritorial seas would be unlikely. In accordance with the ESA, use of chaff under Alternative 2 may affect leatherback turtles.

#### Portable Undersea Tracking Range

Under Alternative 2, impacts from the PUTR would be the same as those described for Alternative 1. The use of the PUTR is not likely to have impact on sea turtles.

#### Entanglement

Under Alternative 2, the use of 1,847 expendable devices using parachutes is proposed. Changes in the use of targets, sonobuoys, and markers that are delivered using parachutes were provided under "Target-Related Materials." The greatest risk of entanglement occurs when expendable devices, primarily parachutes, are on or near the surface. Aircraft-launched sonobuoys, flares, and other expendable devices deploy nylon parachutes of varying sizes. At water impact, the parachute lines and assembly is expended and sinks because all of the material is negatively buoyant. Other components of the expendable devices are metallic and will sink rapidly. Entanglement and the eventual drowning of a leatherback turtle in a parachute assembly would be unlikely because such an event would require the parachute to land directly on a leatherback turtle, or the leatherback turtle to swim into the parachute before it sinks.

In accordance with EO 12114, harm to leatherback turtles from entanglement from military expended materials in nonterritorial seas would be possible but unlikely. In accordance with the ESA, entanglement from military expended materials under Alternative 2 may affect leatherback turtles.

### 3.7.3 Mitigation

Impacts to the leatherback turtle resulting from the alternatives proposed in this EIS/OEIS would be below thresholds that could adversely affect the continued presence of this species in the GOA or the TMAA. Furthermore, the Navy is working with NMFS through the ESA Section 7 consultation process to ensure that unavoidable significant effects to sea turtles do not result from implementation of the Proposed Action. The current requirements and practices described in Chapter 5 would continue to be implemented, and no further mitigation measures would be needed to protect leatherback turtles in the TMAA.

### 3.7.4 Summary of Effects

The presence of sea turtle species other than the leatherback turtle is restricted by cold water temperatures that would otherwise result in thermal shock to those species. There is no data available from which to derive the abundance, distribution, or density of leatherback turtles in the TMAA. The presumed low numbers of leatherback turtles based on temperature preference, limited number of stressors from Navy activities, and routine implementation by the Navy of protective measures combine to produce a low potential for effects to leatherback turtles under all the alternatives. Table 3.7-2 summarizes the effects of the No Action Alternative, Alternative 1, and Alternative 2 on leatherback turtles under both NEPA and EO 12114.

**Table 3.7-2: Summary of Effects by Alternative**

| Alternative | NEPA (U.S. Territorial Seas, 0 to 12 nm) | EO 12114 (Non-U.S. Territorial Seas, > 12 nm) |
|---|---|---|
| **No Action Alternative** | • Aircraft overflights would occur at altitudes at or above 15,000 ft (915 m) and have no effect on leatherback turtles. | • Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely.<br>• Potential for short-term behavioral responses to low level overflights.<br>• Extremely low probability of direct strikes from ordnance and low potential for ingestion of expended materials.<br>• Potential for exposure to at-sea explosions but occurrence is very unlikely.<br>• No long-term effects would occur.<br>• No Action Alternative may affect ESA-listed leatherback turtles. |

**Table 3.7-2: Summary of Effects by Alternative (Continued)**

| Alternative | NEPA (U.S. Territorial Seas, 0 to 12 nm) | EO 12114 (Non-U.S. Territorial Seas, > 12 nm) |
|---|---|---|
| **Alternative 1** | • Aircraft overflights would occur at altitudes at or above 15,000 ft (915 m) and have no effect on leatherback turtles. | • Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely.<br>• Potential for short-term behavioral responses to low level overflights.<br>• Extremely low probability of direct strikes from ordnance and low potential for ingestion of expended materials.<br>• Potential for exposure to at-sea explosions but occurrence is very unlikely.<br>• Because sonars used in the TMAA are above the known hearing range of sea turtles potential for exposure to mid-frequency and high-frequency sources is unlikely.<br>• No long-term effects would occur.<br>• Alternative 1 may affect ESA-listed leatherback turtles. |
| **Alternative 2 (Preferred Alternative)** | • Aircraft overflights would occur at altitudes at or above 15,000 ft (915 m) and have no effect on leatherback turtles. | • Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely.<br>• Potential for short-term behavioral responses to low level overflights.<br>• Extremely low probability of direct strikes from ordnance and low potential for ingestion of expended materials.<br>• Potential for exposure to at-sea explosions but occurrence is very unlikely.<br>• Because sonars used in the TMAA are above the known hearing range of sea turtles potential for exposure to mid-frequency and high-frequency sources is unlikely.<br>• No long-term effects would occur.<br>• Alternative 2 may affect ESA-listed leatherback turtles. |

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