TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

There are no figures in this section.

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3.6 SEABIRDS

SEABIRDS SYNOPSIS

The United States Department of the Navy considered all potential stressors and the following have been analyzed for birds:

- Acoustic (tactical acoustic sonar and other acoustic devices, explosions, pile driving, swimmer defense airguns, vessel noise, and aircraft noise)
- Energy (electromagnetic)
- Physical disturbance and strikes (aircraft, vessels and in-water devices, and military expended materials)
- Ingestion (munitions and military expended materials other than munitions)

Preferred Alternative

- Per the Endangered Species Act (ESA), acoustic sources may affect but are not likely to adversely affect ESA-listed seabirds. Acoustic sources would not affect critical habitat.
- Per the ESA, energy sources may affect but are not likely to adversely affect ESA-listed seabirds. Energy sources would not affect critical habitat.
- Per the ESA, physical disturbance and strike sources may affect but are not likely to adversely affect ESA-listed seabirds. Physical disturbance and strike sources would not affect critical habitat.
- Per the ESA, ingestion sources may affect but are not likely to adversely affect ESA-listed seabirds. Ingestion sources would not affect critical habitat.

3.6.1 INTRODUCTION

This chapter provides the analysis of potential impacts on seabirds that are found in the Hawaii-Southern California Training and Testing (HSTT) Study Area (Study Area). This section provides an introduction to the species and taxonomic groups that occur in the Study Area. Section 3.6.2 provides detailed information on the baseline affected environment. The complete analysis and summary of potential impacts of the proposed action on seabirds are found in Sections 3.6.3 and 3.6.4 through 3.6.6, respectively.

Seabirds are found throughout the HSTT Study Area. This section introduces the Endangered Species Act (ESA)–listed species, the major taxonomic groups of seabirds that occur in the Study Area, species protected under the Migratory Bird Treaty Act, and United States (U.S.) Fish and Wildlife Service Birds of Conservation Concern, and a general description of major species groups of seabirds in the Study Area.

3.6.1.1 Endangered Species Act Species

Five seabird species that occur in the Study Area are listed under the ESA as endangered or threatened species. The status, presence, and nesting occurrence of ESA-listed seabirds in the Study Area are listed in Table 3.6-1. These species will be further discussed in detailed species profiles (Section 3.6.1.3 U.S. Fish and Wildlife Service Birds of Conservation Concern).

Table 3.6-1: Endangered Species Act Listed Seabird Species Found in the Study Area

Species Name and Regulatory Status[1]			Presence in Study Area[2]		
Common Name	**Scientific Name**	**Endangered Species Act- Listing**	**Open Ocean Area**	**Large Marine Ecosystem**	**Bays, Estuaries, and Rivers**
California least tern	*Sterna antillarum browni*	Endangered	None	California Current (nesting)	San Diego Bay
Hawaiian petrel	*Pterodroma sandwichensis*	Endangered	North Pacific Subtropical Gyre	Insular Pacific-Hawaiian (nesting)	None
Short-tailed albatross	*Phoebastria albatrus*	Endangered	North Pacific Subtropical Gyre	California Current, Insular Pacific-Hawaiian	None
Marbled murrelet	*Brachyramphus marmoratus*	Threatened	None	California Current	None
Newell's shearwater	*Puffinus auricularis newelli*	Threatened	North Pacific Subtropical Gyre	Insular Pacific-Hawaiian (nesting)	None

[1]ESA listing status.
[2]Presence in the Study Area indicates open ocean areas (North Pacific Subtropical Gyre) and coastal waters of large marine ecosystems (California Current, Insular Pacific-Hawaiian) in which the species are found. Nesting in the Study Area is indicated in parentheses.

3.6.1.2 Major Bird Groups

There are three major taxonomic groups of seabirds represented in the Study Area (Table 3.6-2). These seabirds may be found in air, at the water's surface, or in the water column of the Study Area. The vertical distribution descriptions provided in Table 3.6-2 are meant to provide a representative description of the taxonomic group; however, due to variations in species behavior, may not apply to all species within each group. Distribution in the water column is indicative of a species that is known to dive under the surface of the water (for example, during foraging). More detailed species descriptions, including diving behavior, are provided in Sections 3.6.2.10 (Order Procellariiformes), 3.6.2.11 (Order Pelecaniformes) through 3.6.2.12 (Orders Charadriiformes).

All three major groups of seabirds in the Study Area occur either in open-ocean areas (North Pacific Subtropical Gyre and North Pacific Transition Zone) or coastal waters of large marine ecosystems (California Current and Insular Pacific-Hawaiian) or coastal bays or estuaries (San Diego Bay) (see map of the Study Area in Figure 3.0-2).

3.6.1.3 Migratory Bird Treaty Act Species

A variety of seabird species would be encountered in the Study Area including those listed under the Migratory Bird Treaty Act (United States Fish and Wildlife Service 2010b). The Migratory Bird Treaty Act established federal responsibilities for protecting nearly all migratory species of seabirds, eggs, and nests. Bird migration is defined as the periodic seasonal movement of seabirds from one geographic region to another, typically coinciding with available food supplies or breeding seasons. Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 Code of Federal Regulations [C.F.R.] Part 21), the U.S. Fish and Wildlife Service has promulgated a rule that permits the incidental take of migratory seabirds under certain circumstances (see Section 3.0.1 [Regulatory Framework]). Of the 1,007 species protected under the Migratory Bird Treaty Act, 105 species occur in the Study Area. These species are not analyzed individually, but rather are grouped based on taxonomic or behavioral similarities based on the stressor that is being analyzed. Conclusions of potential impacts on species protected under the Migratory Bird Treaty Act are presented at the conclusion of each stressor subsection as well as in Section 3.6.5 (Summary of Potential Impacts [Combined Impacts of All Stressors] on Seabirds).

Table 3.6-2: Descriptions and Examples of Major Taxonomic Groups within the Study Area

Major Bird Groups[1]		Vertical Distribution in the Study Area		
Common Name (Taxonomic Group)	**Description**	**Open Ocean Areas[2]**	**Large Marine Ecosystem[2]**	**Bays, Estuaries, and Rivers**
Albatrosses, petrels, shearwaters, and storm-petrels (order Procellariiformes)	Group of largely pelagic seabirds, fly nearly continuously when at sea, soar low over the water surface to find prey, some species dive below the surface.	Airborne, surface, water column	Airborne, surface, water column	Airborne, surface, water column
Tropicbirds, boobies, pelicans, cormorants, and frigatebirds (order Pelecaniformes)	Diverse group of large, fish-eating seabirds with four toes joined by webbing, often occur in large flocks near high concentrations of bait fish.	Airborne, surface, water column	Airborne, surface, water column	Airborne, surface, water column
Phalaropes, gulls, noddies, terns, skua, jaegers, and alcids (order Charadriiformes)	Diverse group of small to medium sized shorebirds, seabirds and allies inhabiting coastal, nearshore, and open-ocean waters	Airborne, surface, water column	Airborne, surface, water column	Airborne, surface, water column

[1] Major taxonomic groups based on American Ornithologists' Union (American Ornithologists' Union 1998), Sibley (Sibley 2000).
[2] Presence in the Study Area includes open ocean areas (North Pacific Subtropical Gyre and North Pacific Transition Zone) and coastal waters of two Large Marine Ecosystems (California Current and Insular Pacific-Hawaiian).

3.6.1.4 United States Fish and Wildlife Service Birds of Conservation Concern

Birds of Conservation Concern are species, subspecies, and populations of migratory and nonmigratory birds that the U.S. Fish and Wildlife Service has determined to be the highest priority for conservation actions (U.S. Fish and Wildlife Service 2008). The purpose of the Birds of Conservation Concern list is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions needed to conserve these species. Of the 105 species that occur within the Study Area, 13 are considered Birds of Conservation Concern (Table 3.6-3). These species are not analyzed individually, but rather are grouped by taxonomic or behavioral similarities based on the stressor that is being analyzed.

Table 3.6-3: Migratory Bird Treaty Act Species and Birds of Conservation Concern within the Study Area

Family/Subfamily	Common Name	Scientific Name	Birds of Conservation Concern
Order PROCELLARIIFORMES			
Family DIOMEDEIDAE			
	Laysan albatross	*Phoebastria immutabilis*	X
	Black-footed albatross	*Phoebastria nigripes*	X
	Short-tailed albatross	*Phoebastria albatrus*	
Family PROCELLARIIDAE			
	Northern fulmar	*Fulmarus glacialis*	
	Kermadec petrel	*Pterodroma neglecta*	
	Murphy's petrel	*Pterodroma ultima*	
	Mottled petrel	*Pterodroma inexpectata*	
	Juan Fernandez petrel	*Pterodroma externa*	
	Hawaiian petrel	*Pterodroma sandwichensis*	
	White-necked petrel	*Pterodroma cervicalis*	
	Bonin petrel	*Pterodroma hypoleuca*	
	Black-winged petrel	*Pterodroma nigripennis*	
	Cook's petrel	*Pterodroma cookii*	
	Stejneger's petrel	*Pterodroma longirostris*	
	Phoenix petrel	*Pterodroma alba*	
	Tahiti petrel	*Pseudobulweria rostrata*	
	Bulwer's petrel	*Bulweria bulwerii*	
	Streaked shearwater	*Calonectris leucomelas*	
	Pink-footed shearwater	*Puffinus creatopus*	X
	Flesh-footed shearwater	*Puffinus carneipes*	
	Wedge-tailed shearwater	*Puffinus pacificus*	
	Buller's shearwater	*Puffinus bulleri*	
	Sooty shearwater	*Puffinus griseus*	
	Short-tailed shearwater	*Puffinus tenuirostris*	
	Christmas shearwater	*Puffinus nativitatis*	X
	Townsend's shearwater	*Puffinus auricularis*	
	Black-vented shearwater	*Puffinus opisthomelas*	X
Family HYDROBATIDAE			
	Wilson's storm-petrel	*Oceanites oceanicus*	
	Fork-tailed storm-petrel	*Oceanodroma furcata*	
	Leach's storm-petrel	*Oceanodroma leucorhoa*	
	Ashy storm-petrel	*Oceanodroma homochroa*	X
	Band-rumped storm-petrel	*Oceanodroma castro*	X
	Wedge-rumped storm-petrel	*Oceanodroma tethys*	
	Matsudaira's storm-petrel	*Oceanodroma matsudairae*	
	Black storm-petrel	*Oceanodroma melania*	
	Tristram's storm-petrel	*Oceanodroma tristrami*	X
	Least storm-petrel	*Oceanodroma microsoma*	

Table 3.6-3: Migratory Bird Treaty Act Species and Birds of Conservation Concern within the Study Area (continued)

Family/Subfamily	Common Name	Scientific Name	Birds of Conservation Concern
Order PELECANIFORMES			
Family PHAETHONTIDAE			
	Red-billed tropicbird	*Phaethon aethereus*	
	Red-tailed tropicbird	*Phaethon rubricauda*	
	White-tailed tropicbird	*Phaethon lepturus*	
Family SULIDAE			
	Masked booby	*Sula dactylatra*	
	Blue-footed booby	*Sula nebouxii*	
	Brown booby	*Sula leucogaster*	
	Red-footed booby	*Sula sula*	
Family PELECANIDAE			
	American white pelican	*Pelecanus erythrorhynchos*	
	California brown pelican	*Pelecanus occidentalis californicus*	
Family PHALACROCORACIDAE			
	Brandt's cormorant	*Phalacrocorax penicillatus*	
	Double-crested cormorant	*Phalacrocorax auritus*	
	Pelagic cormorant	*Phalacrocorax pelagicus*	
Family FREGATIDAE			
	Magnificent frigatebird	*Fregata magnificens*	
	Great frigatebird	*Fregata minor*	
Order CHARADRIIFORMES			
Family LARIDAE			
Subfamily LARINAE	Laughing gull	*Larus atricilla*	
	Franklin's gull	*Larus pipixcan*	
	Little gull	*Larus minutes*	
	Black-headed gull	*Larus ridibundus*	
	Bonaparte's gull	*Larus philadelphia*	
	Heermann's gull	*Larus heermanni*	
	Mew gull	*Larus canus*	
	Ring-billed gull	*Larus delawarensis*	
	California gull	*Larus californicus*	
	Herring gull	*Larus argentatus*	
Subfamily LARINAE	Thayer's gull	*Larus thayeri*	
	Slaty-backed gull	*Larus schistisagus*	
	Yellow-footed gull	*Larus livens*	
	Western gull	*Larus occidentalis*	
	Glaucous-winged gull	*Larus glaucescens*	
	Glaucous gull	*Larus hyperboreus*	
	Sabine's gull	*Xema sabini*	
	Black-legged kittiwake	*Rissa tridactyla*	
Subfamily STERNINAE	Blue noddy	*Procelsterna cerulea*	X
	Black noddy	*Anous minutus*	
	Brown noddy	*Anous stolidus*	

Table 3.6-3: Migratory Bird Treaty Act Species and Birds of Conservation Concern within the Study Area (continued)

Family/Subfamily	Common Name	Scientific Name	Birds of Conservation Concern
Subfamily STERNINAE	White tern	*Gygis alba*	
	Sooty tern	*Onychoprion fuscatus*	
	Gray-backed tern	*Onychoprion lunatus*	
	Little tern	*Sternula albifrons*	
	California Least tern	*Sternula antillarum browni*	
	Caspian tern	*Hydroprogne caspia*	
	Black tern	*Chlidonias niger*	
	Common tern	*Sterna hirundo*	
	Arctic tern	*Sterna paradisaea*	
	Forster's tern	*Sterna forsteri*	
	Black-naped tern	*Sterna sumatrana*	
	Royal tern	*Thalasseus maximus*	
	Great Crested tern	*Thalasseus bergii*	
	Elegant tern	*Thalasseus elegans*	
	Gull-billed tern	*Sterna nilotica*	X
Subfamily RYNCHOPINAE	Black skimmer	*Rynchops niger*	X
Family STERCORARIIDAE			
	South polar skua	*Stercorarius maccormicki*	
	Pomarine jaeger	*Stercorarius pomarinus*	
	Parasitic jaeger	*Stercorarius parasiticus*	
	Long-tailed jaeger	*Stercorarius longicaudus*	
Family ALCIDAE			
	Common murre	*Uria aalge*	
	Thick-billed murre	*Uria lomvia*	
	Pigeon guillemot	*Cepphus columba*	
	Long-billed murrelet	*Brachyramphus perdix*	
	Marbled murrelet	*Brachyramphus marmoratus*	
	Xantus's murrelet	*Synthliboramphus hypoleucus*	X
	Craveri's murrelet	*Synthliboramphus craveri*	
	Ancient murrelet	*Synthliboramphus antiquus*	
	Cassin's auklet	*Ptychoramphus aleuticus*	X
	Parakeet auklet	*Aethia psittacula*	
	Rhinoceros auklet	*Cerorhinca monocerata*	
	Horned puffin	*Fratercula corniculata*	
	Tufted puffin	*Fratercula cirrhata*	

3.6.2 AFFECTED ENVIRONMENT

Seabirds are a diverse group that are adapted to living in marine environments (Enticott and Tipling 1997) and use coastal (nearshore) waters, offshore waters (continental shelf), or open ocean areas (Harrison 1983). There are many biological, physical, and behavioral adaptations that are different for seabirds than for terrestrial birds. Seabirds typically live longer, breed later in life, and produce fewer young than other bird species (Onley and Scofield 2007). The feeding habits of seabirds are related to their individual physical characteristics, such as body mass, bill shape, and wing area (Hertel and

Ballance 1999; Spear and Ainley 1998). Some seabirds look for food (forage) on the sea surface, whereas others dive to variable depths to obtain prey (Burger 2001). Many seabirds spend most of their lives at sea and come to land only to breed, nest, and occasionally rest (Schreiber and Chovan 1986). Most species nest in groups (colonies) on the ground of coastal areas or oceanic islands, where breeding colonies number from a few individuals to thousands.

The Hawaiian Islands are important habitat for seabirds in the North Pacific Subtropical Gyre. The shoreline, estuarine, and open ocean environments support a variety and large population of seabird species by providing important nesting and feeding habitats. The Hawaiian Islands are in the warm North Pacific water mass (U.S. Fish and Wildlife Service 2005b). Despite low levels of localized production, recent research estimates that 15 million seabirds inhabit the Hawaiian Islands; 22 species of seabirds regularly nest in the Hawaiian Islands, and many more pass through during migration to and from their breeding grounds elsewhere in the Pacific (Birding Hawaii 2004).

The entire world populations of Hawaiian petrels and Newell's shearwaters and more than 95 percent of the world's Laysan and black-footed albatrosses nest in the northwest Hawaiian Islands. Most of the world's ashy storm-petrels, western gulls, and Brandt's cormorants nest along the west coast of the United States (U.S. Fish and Wildlife Service 2005b). In addition to breeding seabirds, millions of seabirds from more than 100 different species migrate to or through the Study Area. For example, an estimated abundance of 5.5 to 6 million seabirds off California are thought to occur based on at-sea surveys (U.S. Fish and Wildlife Service 2005b). Surveys around the Hawaiian Islands found 40 different species of seabirds, half of which were local breeders and the remainder were migrant species.

The Southern California Bight, within the California Current Large Marine Ecosystem, is important for both breeding and migratory bird species. More than 195 species of birds use coastal or offshore aquatic habitats in the Southern California Bight—the area of the Pacific Ocean lying between Point Conception on the Santa Barbara County coast to a point south of the U.S.-Mexico border (Anderson et al. 2007; Bearzi et al. 2009; Hunt and Butler 1980).

The following sections contain profiles for ESA-listed and ESA-candidate species and species groups that occur in the Study Area. The emphasis on species-specific information is placed on the ESA-protected species list because any threats or potential impacts on those species are subject to consultation with regulatory agencies. Additional information on the biology, life history, and conservation of seabird species, including species-specific profiles, can be found on the following organizations' websites: U.S. Fish and Wildlife Service Endangered Species Program (2010a), Birdlife International (2010), and the International Union for Conservation of Nature and Natural Resources (2010). Sections 3.6.3.5 to 3.6.3.9 describe the taxonomic groups of ESA-listed seabird species in the Study Area.

3.6.2.1 Group Size

A variety of group sizes and diversity may be encountered throughout the Study Area, ranging from solitary migration of an individual seabird to large concentrations of mixed-species flocks. Depending on season, location, and time of day, the number of seabirds observed (group size) will vary and will likely fluctuate from year to year. During spring and fall periods, diurnal and nocturnal migrants would likely occur in large groups as they migrate over open water. Most seabird species nest in groups (colonies) on the ground of coastal areas or oceanic islands, where breeding colonies number from a few individuals to thousands. This breeding strategy is believed to have evolved in response to the limited availability of relatively predator-free nesting habitats and distance to foraging sites from breeding grounds (Siegel-Causey and Kharitonov 1990). Outside of the breeding season, most Proceliid (birds within the Order

Procelliiformes) seabirds are solitary, though they may join mixed-species flocks while foraging and can be associated with whales and dolphins (Onley and Scofield 2007) or areas where prey density is high (U.S. Fish and Wildlife Service 2005c). During the breeding season, these seabirds usually form large nesting colonies. Similarly, Pelecaniform (birds within the Order Pelecaniformes) breeding, whether on the ground or in trees, is typically colonial. Foraging occurs either singly or in small groups. Foraging seabirds of the order Charadriiformes can range from singles or pairs (murrelets) (International Union for the Conservation of Nature 2010f; U.S. Fish and Wildlife Service 2005b) and can extend upward into larger groups (terns) where juveniles accompany adults to post-breeding foraging areas, where the water is calm and the food supply is good. There are post-season dispersal sites, where adults and fledglings congregate (U.S. Fish and Wildlife Service 2006). Large groups are occasionally observed foraging at great distances from colonies, including at inland water sources (Atwood and Minsky 1983).

3.6.2.2 Diving Information

Most of the seabird species found with the Study Area will dive, skim, or grasp prey at the water's surface or within the upper portion (1 to 2 m [3.3 to 6.6 ft.]) of the water column (Sibley 2007). Foraging strategies are species specific such as plunge-diving or pursuit diving. Plunge-diving, as utilized by terns and pelicans, is a foraging strategy in which the bird hovers over the water and dives into the water to pursue fish. Diving behavior in terns is limited to plunge-diving during foraging (U.S. Fish and Wildlife Service 1985) and in general, tern species do not usually dive deeper than 3 ft. (0.9 m). Pursuit divers, a common foraging strategy of seabirds of the Family Alcidae, usually float on the water and dive under to pursue fish and other prey. They most commonly eat fish, squid, and crustaceans (Burger 2004).

Petrels forage both night and day; they capture prey by resting on the water surface and dipping their bill and by aerial pursuit of flying fish (International Union for the Conservation of Nature 2010d). Hawaiian petrels eat mostly squid (50-75 percent of their diet), fish, and crustaceans (International Union for the Conservation of Nature 2010d).

More specific diving information in regard to taxonomic groups is provided in Sections 3.6.2.10 (Order Procellariiformes), 3.6.2.11 (Order Pelecaniformes) through 3.6.2.12 (Orders Charadriiformes).

3.6.2.3 Bird Hearing

The majority of the published literature on bird hearing focuses on terrestrial birds and their ability to hear in air as there is a paucity of data regarding underwater hearing abilities (Melvin and Parrish 1999). A review of 32 terrestrial and marine species indicates that birds generally have greatest hearing sensitivity between 1 and 4 kilohertz (kHz) (see Beason 2004). Very few can hear below 20 hertz (Hz), most have an upper frequency hearing limit of 10 kHz, and none exhibit hearing at frequencies higher than 20 kHz (Dooling et al. 2000). Thiessen (1958) reported the lower hearing threshold for the ring-billed gull (*Larus delawarensis*) of 2 kHz. Starlings (*Sturnus vulgais*) and house sparrows (*Passer domesticus*) have reported hearing ranges of 0.2-18 kHz (Brand and Kellogg, 1939) while the hearing range of pigeons (*Columba livia*) is 0.1 to 10 kHz (Necker, 1983). Hearing capabilities have been studied for only a few seabirds (Beason 2004; Beuter et al. 1986; Thiessen 1958; Wever et al. 1969); these studies show that seabird hearing ranges and sensitivity are consistent with what is known about bird hearing in general.

There is little published literature on the hearing abilities of birds underwater. In fact, there are no measurements of the underwater hearing of any diving birds (Therrien et al. 2011). There are some studies of bird behavior underwater when exposed to sounds, from which some hearing abilities of birds underwater could be inferred. Common murres (*Uria aalge*) were deterred from gillnets by acoustic pingers emitting 1.5 kHz pings at 120 decibels (dB) referenced (re) to 1 micro-Pascal (µPa); however, there was no significant reduction in rhinoceros auklet (*Cerorhinca monocerata*) bycatch in the same nets (Melvin et al. 1999).

3.6.2.4 General Threats

Threats to seabird populations in the Study Area include human-caused stressors such as incidental mortality from interactions with commercial and recreational fishing gear, predation by introduced species, disturbance and degradation of nesting areas by humans and domesticated animals, noise pollution from construction and other human activities, nocturnal collisions with power lines and artificial lights, collisions with aircraft, and pollution, such as that from oil spills and plastic debris (Anderson et al. 2007; Burkett et al. 2003; California Department of Fish and Game 2010; Carter and Kuletz 1995; Carter et al. 2005; Clavero et al. 2009; International Union for Conservation of Nature and Natural Resources 2010; North American Bird Conservation Initiative 2010; Piatt and Naslund 1995; U.S. Fish and Wildlife Service 2005b, 2008a, 2010a). Disease, volcanic eruptions, storms, and harmful algal blooms are also threats to seabirds (Anderson et al. 2007; Jessup et al. 2009; North American Bird Conservation Initiative 2010; U.S. Fish and Wildlife Service 2005b). In addition, seabird distribution, abundance, breeding, and other behaviors are affected by cyclical environmental events, such as the El Niño Southern Oscillation and Pacific Decadal Oscillation in the Pacific Ocean (Vandenbosch 2000).

In the long term, climate change could be the largest threat to seabirds (North American Bird Conservation Initiative 2010). Climate change effects include changes in air and sea temperatures, precipitation, the frequency and intensity of storms, pH level of sea water, and sea level. These changes could affect overall marine productivity, which could affect the food resources, distribution, and reproductive success of seabirds (Aebischer et al. 1990; Congdon et al. 2007). The projection for global sea levels rise from 2090-2099 is up to 1 ft. (0.3 m) relative to 1980-1999 levels (Church and White 2006; Solomon et al. 2007). As a result, seabird nesting colonies that occur along sections of coastlines undergoing sea level rise may experience a loss of nesting habitat (Congdon et al. 2007; Gilman and Ellison 2009; Gilman et al. 2008; Hitipeuw et al. 2007; Mullane and Suzuki 1997).

3.6.2.5 California Least Tern (*Sternula antillarum browni*)

3.6.2.5.1 Status and Management

The California least tern (*Sternula antillarum browni*) was federally listed as endangered in 1970 and is listed as endangered by the state of California (California Department of Fish and Game 2010). In 2006, the U.S. Fish and Wildlife Service completed the most recent 5-year status review for the species and recommended that the California least tern be downlisted to threatened under the ESA. The population increased from 600 pairs in 1973 to approximately 7,100 pairs in 2005, and least tern nesting sites have nearly doubled since the species was first listed (U.S. Fish and Wildlife Service 2006). In 2007, an estimated 6,744 to 6,989 California least tern breeding pairs established nests at 48 locations in California (Marschalek 2008); however, the species' population increase does not meet the requirements in the 1985 recovery plan to warrant delisting.

No critical habitat has been designated for the California least tern. Conservation for the California least tern is addressed in multiple memoranda of understanding and integrated natural resource management plans for military lands in the Southern California region, including Marine Corps Base Camp Pendleton, Naval Amphibious Base Coronado (U.S. Department of the Navy 2002), and Naval Base Ventura County Point Mugu.

3.6.2.5.2 Habitat and Geographic Range

The preferred nesting habitat consists of beaches, dunes, and sand bars on the ocean shore (U.S. Fish and Wildlife Service 1985). The California least tern nests in areas generally free of vegetation above the high tide mark. Colony sites are often near estuaries, lagoons, rivers, or the seacoast (U.S. Fish and Wildlife Service 1985). Atwood and Minsky (1983) noted that before the decline of the species, at least 82 percent of known nesting sites in California were within 1 mile (mi.) (1.6 kilometers [km]) of a river mouth or estuarine habitat.

California least terns spend the breeding season (April through August) in coastal waters along the central and Southern California coast, as well as along the west and southwestern coast of Mexico. Their distribution is from San Francisco to Baja California on the Pacific Coast of North America (U.S. Fish and Wildlife Service 2010b). The California least tern historically nested on coastal beaches of Monterey, California, to Cabo San Lucas, Baja California.

Foraging habitats include nearshore ocean waters, bays, river mouths, salt marshes, marinas, river channels, lakes, and ponds (Thompson et al. 1997). California least terns feed within 2 mi. (3.2 km) of the shoreline in ocean waters less than 60 ft. (18.3 m) deep, with most foraging within 1 mi. (1.6 km) of shore (Atwood and Minsky 1983). Atwood and Minsky (1983) also observed a tendency for foraging birds to be concentrated in coastal waters near major river mouths. Foraging habitat use varies within and between years, depending on the stage of breeding and prey availability (Atwood and Minsky 1983; BirdLife International 2009). Atwood and Minsky (1983) noted in their coastal colony study that, before terns disperse after breeding, they typically forage within 2 mi. (3.2 km) of nesting sites, although large groups were occasionally observed foraging at greater distances from colonies, including inland water sources. The presence of eelgrass is important because it is habitat for several prey species of the least tern such as topsmelt, one of the California least terns' preferred prey (BirdLife International 2009).

3.6.2.5.2.1 California Current Large Marine Ecosystem

California least terns occur in coastal waters throughout the Southern California portion of the Study Area during the breeding, non-breeding, and migration seasons. The current nesting range is from San Francisco Bay and south along the California coast to San Diego County which includes the Southern California portion of the Study Area in the California Current Large Marine Ecosystem and parts north of the Study Area (Massey and Fancher 1989). During migration, California least terns remain near the coast, although they have been observed foraging in multispecies feeding flocks 1 to 20 mi. (1.6 to 32.2 km) off the western coast of Baja California in late April and early May (U.S. Fish and Wildlife Service 2005b). The California least tern can be found in more offshore waters during the breeding season (courtship and incubation stages) when they forage farther from the nest site over open and deep water. Adults tend to travel farther when food availability is low, foraging in open ocean waters (BirdLife International 2009).

3.6.2.5.3 Population and Abundance

The California least tern population in California averaged about 4,300 pairs between 2000 and 2002, making up about 10 percent of the North American population (U.S. Fish and Wildlife Service 2005b). The California population has increased almost 12-fold from a low of 600 pairs in the early 1970s to roughly 7,100 pairs in 2005 (U.S. Fish and Wildlife Service 2001, 2005b).

3.6.2.5.4 Predator and Prey Interactions

California least terns forage by plunge-diving to catch prey in upper surface waters, usually within the first meter of water depth. In general, other tern species do not usually dive deeper than 3 ft. (0.9 m) (Eriksson 1985). No information exists on specific dive depths for California least terns. Prey species include anchovies, topsmelt, silverside smelt, opaleye, and gobies (BirdLife International 2009). Prey species composition varies throughout the year, depending on availability. Length of foraging and peak foraging behavior typically occur from the end of May through mid-July after chicks hatch.

California least terns are preyed upon by various species. These include gulls, ravens, crows, rodents, raccoons and coyotes prey on California least tern eggs, chicks, and adults (U.S. Fish and Wildlife Service 2006).

3.6.2.5.5 Species-Specific Threats

Threats to breeding least terns include the alteration of river habitat, flooding and development of coastal areas, disruptive recreation, an increase in aggressive gulls that compete for nesting sites, and predation by native and feral species, such as rats, great horned owls, black-crowned night herons, dogs, and cats (Sidle et al. 1992; United States Fish and Wildlife Service 1990). Oil pollution is also a concern within coastal and inland habitats.

3.6.2.6 Hawaiian Petrel (*Pterodroma sandwichensis*)

The Hawaiian petrel (*Pterodroma sandwichensis*) was recently split from the Galapagos petrel (*Pterodroma phaeopygia*) based on genetic and morphological evidence; before the split they were collectively known as the dark-rumped petrel (U.S. Fish and Wildlife Service 2005a).

3.6.2.6.1 Status and Management

The Hawaiian petrel is found only in Hawaii and is listed as endangered throughout its range under the ESA (U.S. Fish and Wildlife Service 2005a); there is no designated critical habitat. The greatest threat to adult survival and breeding success is predation by introduced animals, such as mongooses, cats, and rats. In some cases, predation has caused more than 70 percent nesting failure (U.S. Fish and Wildlife Service 2005a).

3.6.2.6.1.1 Habitat and Geographic Range

Hawaiian petrels nest only in Hawaii, specifically in the main Hawaiian Islands, though there are specimen records from Japan, Philippines, and Mollucas at the western edge of the distribution (International Union for the Conservation of Nature 2010d). Under pressure of predation, most nesting habitat is at the highest elevations available in the main Hawaiian Islands. Most sites (Haleakala National Park in Maui and Mauna Kea, Mauna Loa, and Kilauea in Hawaii) are characterized by high elevation (6,560 to 9,840 ft. [1,999.5 to 2,999.2 m]), dry climate, and sparse vegetation (less than 10 percent plant cover). Nesting habitat is poorly known on other islands. The Hawaiian petrel is present throughout the offshore waters of the Hawaiian Islands (International Union for the Conservation of Nature 2010d).

The Hawaiian petrel typically feeds well offshore but tends to feed closer to shore (0 to 45 mi. [0 to 72.4 km]) during spring than in the fall (most abundant at 170 to 230 mi. [273.6 to 370.1 km]) (Spear et al. 1999). The Hawaiian petrel favors open ocean water conditions, with an average sea surface temperature of 80 degrees (°) Fahrenheit (F) (27° Celsius [C]), sea surface salinity of 34 parts per thousand, wind speed of 19 mi. per hour (30.6 km per hour), and a wave height of 5 ft. (1.5 m). It also prefers an average depth from the warmer surface water to the point where cold water begins (the thermocline) of 35 ft. (10.7 m) (Spear et al. 1995).

The Hawaiian petrel is an open ocean species of the central tropical Pacific (U.S. Fish and Wildlife Service 2005a). They occur in open ocean waters throughout most of the Hawaii portion of the Study Area and the western portion of the Transit Corridor in the Insular Pacific-Hawaiian Large Marine Ecosystem. The Hawaiian petrel occurs largely in equatorial waters of the eastern tropical Pacific, generally from 10° South (S) to 20° North (N). Because of the difficulty in identification, the precise southeastern extent of the Hawaiian petrel and the northwestern extent of the similar Galapagos petrel remains uncertain (Spear et al. 1995).

3.6.2.6.1.2 Insular Pacific-Hawaiian Large Marine Ecosystem

Hawaiian petrels have important resting sites in coastal waters throughout the Hawaii portion of the Study Area in portions of the Insular Pacific-Hawaiian Large Marine Ecosystem. An area of the north shore of Kauai is widely known as a resting location for Hawaiian petrels (Birding Hawaii 2004). Based on known or suspected colony sites, gathering areas likely occur near shore on Lehua Rock, Kauai, Molokai, Lanai, Maui, and Hawaii (Day and Cooper 1995; Day et al. 2003; International Union for the Conservation of Nature 2010d; U.S. Fish and Wildlife Service 2005a) and perhaps around Kahoolawe (U.S. Fish and Wildlife Service 2005a). These areas provide resting habitat before the birds fly to inland nesting colonies. Hawaiian petrels move to and from nesting colonies during dusk and dawn (International Union for the Conservation of Nature 2010d).

3.6.2.6.2 Population and Abundance

The total population of Hawaiian petrels was estimated at 20,000, with a breeding population of 4,500 to 5,000 pairs (Spear et al. 1995; U.S. Fish and Wildlife Service 2005a); overall population trends on the Hawaiian islands are not known (U.S. Fish and Wildlife Service 2005a). Numbers of breeding Hawaiian petrels on Maui appear stable and have increased in areas of the Haleakala National Park, where predators are being managed (U.S. Fish and Wildlife Service 2005a). On Hawaii, numbers may be declining because of predation by introduced species (U.S. Fish and Wildlife Service 2005a).

3.6.2.6.3 Predator and Prey Interactions

Hawaiian petrels eat mostly squid (50 to 75 percent of their diet), fish, and crustaceans (International Union for the Conservation of Nature 2010d). They forage both night and day; they capture prey by resting on the water surface and dipping their bill and by aerial pursuit of flying fish (International Union for the Conservation of Nature 2010d). The foraging member of a pair may fly up to 930 mi. (1,496.7 km) from the nesting island (U.S. Fish and Wildlife Service 2005a).

Adult and young Hawaiian petrels are preyed on by introduced animals such as mongooses, cats, and rats.

3.6.2.6.4 Species-specific Threats

Threats to this endangered seabird include predation by introduced mammals, development, light attraction and collision, ocean pollution, and disturbance of its breeding grounds. The petrel does not have any natural defenses against predators such as rats, feral cats, and mongooses, and its burrows are very vulnerable. Collisions with artificial lights, utility poles, and fences kill Hawaiian petrels on some islands (International Union for the Conservation of Nature 2010d).

3.6.2.7 Short-tailed Albatross (*Phoebastria albatrus*)

The short-tailed albatross (*Phoebastria albatrus*) was formerly in the genus *Diomedea* and known as Steller's albatross; it is the largest of the North Pacific albatrosses.

3.6.2.7.1 Status and Management

The short-tailed albatross is widely regarded as one of the rarest species of albatrosses and one of the world's rarest birds (Harrison 1983; International Union for the Conservation of Nature 2010c). The short-tailed albatross is listed as endangered under the ESA throughout its range. Additionally, it is listed as endangered by the state of Hawaii (NatureServe 2004; U.S. Fish and Wildlife Service 2000, 2005b). No critical habitat has been designated for this species because little is known about its life in the open ocean (Piatt et al. 2006; U.S. Fish and Wildlife Service 2000).

Current threats to this species include ingestion of plastics mistaken for food items, volcanic eruption (at Torishima, Japan), typhoons, sunken longline fishing in Alaska and Russia, jig/troll fishery in Japan, invasive species at colonies (cats, rats, and plants), and researcher disturbance (U.S. Fish and Wildlife Service 2005c).

3.6.2.7.2 Habitat and Geographic Range

Short-tailed albatrosses are typically found in the open ocean and tend to concentrate along the edge of the continental shelf (NatureServe 2004). Upwelling zones are not only nutrient rich, but they also bring prey (for example, squid and fish) typically found only in deeper water to the surface, where they become available to albatrosses. Upwelling occurs when the wind moves warm, nutrient poor water away from the area, which allows colder, nutrient rich water to rise to the surface of the ocean. Short-tailed albatross nest on isolated, windswept, offshore islands with restricted human access (U.S. Fish and Wildlife Service 2000). Current and historical nesting habitat can be described as flat to steep slopes that are sparsely or fully vegetated. Short-tailed albatrosses disperse throughout the temperate and subarctic North Pacific approximately from May to October when they are not breeding, from Japan through California (U.S. Fish and Wildlife Service 2005b; 2008b?). Nonbreeders and failed breeders disperse from the colony months sooner. While many nonbreeders return to the colonies each year, the presence of immature birds far from the colony (such as the U.S. Pacific coast) during the breeding season suggests that some immature birds may spend years at sea before they return to the colony (U.S. Fish and Wildlife Service 2005c).

3.6.2.7.2.1 Open Ocean

The short-tailed albatross is an open ocean species that occurs throughout the Hawaii Range Complex (HRC), Transit Corridor, and Southern California (SOCAL) Range Complex portions of the Study Area. The range of the short-tailed albatross extends from Siberia south to the China coast, into the Bering Sea and Gulf of Alaska south to Baja California, Mexico, and throughout the North Pacific, including the Northwestern Hawaiian Islands (Committee on the Status of Endangered Wildlife in Canada 2003; Harrison 1983; Roberson 2000). Their at-sea distribution includes the entire North Pacific Ocean north of about 20° N latitude. Short-tailed albatrosses move seasonally around the North Pacific Ocean, with high densities observed during the breeding season (December through May) in Japan and throughout Alaska and along the west coast of North America during the non-breeding season (April through September) (International Union for the Conservation of Nature 2010c). Non-breeding subadults can be found in all areas throughout the year. They are seen regularly in the North Pacific Subtropical Gyre (U.S. Fish and Wildlife Service 2005c).

3.6.2.7.2.2 California Current Large Marine Ecosystem

Short-tailed albatross occasionally occur in SOCAL Range Complex portion of the California Current Large Marine Ecosystem, which is part of the Study Area. As the population began a gradual recovery after 1950, sporadic sightings have been recorded off California (International Union for the Conservation of Nature 2010c). Based on the number of sightings in the SOCAL Range Complex, the short-tailed albatross is considered rare in that portion of the Study Area, as well as off the entire California coast. Breeding does not occur in the SOCAL Bight, but because of the unique circulation and upwelling characteristics of this area, potential foraging habitat exists. Two documented sightings of the short-tailed albatross have occurred in SOCAL. Roberson (2000) reported a sighting in 1977 of an all-dark immature bird approximately 90 mi. (144.8 km) west of the San Diego area. McCaskie and Garrett (2002) reported a sighting in the vicinity of Santa Barbara Island in late February of 2002.

3.6.2.7.2.3 Insular Pacific-Hawaiian Large Marine Ecosystem

Short-tailed albatross occur in coastal waters throughout the Hawaii portion of the Study Area in the Insular Pacific-Hawaiian Large Marine Ecosystem. The short-tailed albatross regularly occurs on Midway Atoll and has been observed at other Northwestern Hawaiian Islands. Since the 1930s, short-tailed albatrosses have been occasionally reported during the breeding season at Midway Atoll. Some of these short-tailed albatrosses were recorded for several successive years. Although unconfirmed successful nesting was reported in 1961 and 1962 (Tickell 2000), the first confirmed nest site that produced an egg did not occur until 1993 (International Union for the Conservation of Nature 2010c). Nesting on the Northwestern Hawaiian Islands has been attempted, but successful nesting has not been confirmed (U.S. Fish and Wildlife Service 2005c). In the Hawaiian Islands, there was an unconfirmed sighting at Barking Sands on Kauai during March 2000 (Birding Hawaii 2004). Other known occurrences in Hawaii are of single birds (in 1976 and 1981) at French Frigate Shoals in the Northwestern Hawaiian Islands (U.S. Fish and Wildlife Service 2008b).

3.6.2.7.3 Population and Abundance

In 2005, the total population was estimated at 1,712, with 513 pairs at Torishima and 340 birds and 85 breeding pairs at Minami-Kojima (located northeast of Taiwan) (U.S. Fish and Wildlife Service 2005c). The Japan and Taiwan population is growing extremely rapidly at about 7.3 percent annually (International Union for the Conservation of Nature 2010c; U.S. Fish and Wildlife Service 2005c). Average population survival rate is 96 percent, and the current annual population growth is greater than 6 percent (U.S. Fish and Wildlife Service 2005c). Short-tailed albatross regularly visit the Hawaiian islands; although breeding attempts on Midway Atoll have been unsuccessful historically (U.S. Fish and Wildlife Service 2005c), a pair successfully bred in late 2010, hatching a chick in early 2011 which successfully fledged.

3.6.2.7.4 Predator and Prey Interactions

Short-tailed albatrosses are surface feeders and scavengers, feeding more inshore than other North Pacific albatrosses. In Japan, their diet consists of shrimp, squid, and fish (including bonita, flying fish, and sardines); diet information is not available for birds in the Study Area (U.S. Fish and Wildlife Service 2005c). Unlike other North Pacific albatrosses, short-tailed albatrosses frequently feed in sight of land.

Short-tailed albatross chicks are predated by other birds and introduced mammals such as cats and rats on nesting colonies (U.S. Fish and Wildlife Service 2005c).

3.6.2.7.5 Species-specific Threats

Short-tailed albatrosses have survived multiple threats to their existence. During the late 1800s and early 1900s, feather hunters clubbed to death an estimated five million of them, stopping only when the species was nearly extinct. In the 1930s, nesting habitat on the only active nesting island in Japan was damaged by volcanic eruptions, leaving fewer than 50 birds by the 1940s. Loss of nesting habitat to volcanic eruptions, severe storms, and competition with black-footed albatrosses for nesting habitat continue to be natural threats to short-tailed albatrosses today.

Human-induced threats include hooking and drowning on commercial longline gear, entanglement in derelict fishing gear, ingestion of plastic debris, contamination from oil spills, and potential predation by introduced mammals on breeding islands.

3.6.2.8 Marbled Murrelet (*Brachyramphus marmoratus*)

3.6.2.8.1 Status and Management

The marbled murrelet (*Brachyramphus marmoratus*) is listed as a threatened species in California, Oregon, and Washington under the ESA (U.S. Fish and Wildlife Service 1992) and is considered endangered by the state of California (California Department of Fish and Game 2010). Marbled murrelet populations have suffered significant declines in the Pacific Northwest, caused primarily by the removal of essential habitat by logging and coastal development (International Union for the Conservation of Nature 2010a). To stem these declines, critical habitat was designated in 1996 in mature and old-growth forest nesting habitat within 30 mi. (48.3 km) off the coast in Washington, Oregon, and California (U.S. Fish and Wildlife Service 1997). The entire critical habitat, as well as Primary Constituent Elements, are outside of the Study Area.

3.6.2.8.2 Habitat and Geographic Range

Marbled murrelets do not build a nest but use natural features, such as moss, clumps of mistletoe, or piles of needles as a nest site on tree limbs (International Union for the Conservation of Nature 2010a). Nests are in large conifers, such as coast redwood and western hemlock, in old-growth stands typically within 35 mi. (56.3 km) of marine waters. Important features in nesting habitat are stands of 500 acres (ac.) (202.3 hectares [ha]) or larger, multistoried canopy layers, and less than average canopy closures (Grenier and Nelson 1995; Hamer and Nelson 1995; Miller and Ralph 1995). In addition, habitat along major drainages (e.g., rivers and streams) is a key component (International Union for the Conservation of Nature 2010a), as murrelets tend to use these drainages as flight corridors to and from inland nest sites.

Marbled murrelets generally remain near breeding sites year-round in most areas (U.S. Fish and Wildlife Service 2005b). Foraging habitat is generally found within 3 mi. (4.8 km) from shore and in water less than 195 ft. (59.4 m) deep (Day and Nigro 2000; International Union for the Conservation of Nature 2010a). Birds occur closer to shore in exposed coastal areas and farther offshore in protected coastal areas (International Union for the Conservation of Nature 2010a). The highest concentrations are found in protected inshore waters (U.S. Fish and Wildlife Service 2005b). Physical and biological oceanographic processes that concentrate prey (such as upwelling and rip currents) have an important influence on the foraging distribution of marbled murrelets (Ainley et al. 1995; Burger 1995, 2002; Day and Nigro 2000; International Union for the Conservation of Nature 2010a; Strong et al. 1995). They are more commonly found inland during the summer breeding season but make daily trips to the ocean to gather food and have been detected in forests throughout the year. When not nesting, the birds live at sea, spending their days feeding close to shore and then moving several miles offshore at night.

3.6.2.8.2.1 California Current Large Marine Ecosystem

Marbled murrelets only occur in coastal waters of the California Current Large Marine Ecosystem within the northeast corner of the SOCAL Range Complex portion of the Study Area. Eight reported sightings of marbled murrelets have been documented within the Study Area off the California coast. Sightings have been reported at Marina del Rey, off Santa Barbara Island, at Mugu Lagoon in Ventura County, along the coast in San Diego County, and at the northern end of the Study Area near San Simeon Point (McCaskie and Garrett 2001). All of these documented sightings were recorded between November and March.

Foraging habitat in the Southern California Bight occurs usually within 3 mi. (4.8 km) of the coast in waters less than 195 ft. (59.4 m) deep (Day and Nigro 2000; International Union for the Conservation of Nature 2010a); however, because upwelling areas represent important foraging habitat for the marbled murrelet, the potential exists for individuals to be observed farther offshore in the Southern California Bight.

Winter distributions of marbled murrelets are poorly documented. In California, most birds appear to be year-round residents near breeding areas (Naslund 1993), although dispersal in the winter as far south as SOCAL and northern Mexico has been documented (Erickson et al. 1995). A single sighting has occurred at Enseñada Harbor (Erickson et al. 1995). The species is a rare fall/winter vagrant (occurring outside of its normal range) to SOCAL, and is “accidental” from the U.S.-Mexico border south along the Mexico coastline (International Union for the Conservation of Nature 2010a).

3.6.2.8.3 Population and Abundance

The largest number of marbled murrelets occurs in Alaska, where the population is estimated at 270,000, although the population has experienced a dramatic decline of approximately 70 percent over the last 25 years (Piatt et al. 2007). The population in British Columbia is estimated to be between 54,000 and 92,000 (Piatt et al. 2007). Current populations in Washington, Oregon, and California are small compared with the historical populations of British Columbia and Alaska, which at one time were believed to number in the hundreds of thousands (Piatt et al. 2007). A recent population estimate for Washington, Oregon, and California is a combined 20,200 (Raphael et al. 2007).

3.6.2.8.4 Predator and Prey Interactions

Marbled murrelets feed opportunistically on small fish, including sand lance, anchovy, herring, capelin, and smelt, and also on invertebrates (U.S. Fish and Wildlife Service 1997, 2005b). Feeding takes place in the nearshore marine environment, primarily in protected waters where both Pacific sand lance and surf smelt occur (Burger 2002; Whitworth et al. 2000). Individuals forage by diving, using their wings for underwater propulsion. The murrelet forages by pursuit diving in relatively shallow waters, usually between 20 and 80 m (6.1 and 24.4 ft.) in depth. The majority of birds are found as pairs or as singles in a band about 300 to 2,000 m (91.4 to 609.6 ft.) from shore. Foraging dive times averaged about 16 seconds. Murrelets generally forage during the day, and are most active in the morning and late afternoon hours. Some foraging occurs at night (Ralph et al 1995).

While at sea, marbled murrelets are preyed on by birds and mammals including peregrine falcons, bald eagles, western gulls, and northern fur seals. Birds such as common ravens, Steller’s jays, and sharp-shinned hawks are predators of marbled murrelet eggs, chicks, and adults during the nesting season (Nelson 1997).

3.6.2.8.5 Species-specific Threats

The principal factor threatening the persistence of marbled murrelet over the southern portions of its range is harvesting of old-growth and mature forests. In addition to habitat loss, interactions with fisheries, especially gill-net fisheries, and oil spills have also contributed to population declines (Ralph et al 1995). An estimated 3,500 murrelets are killed annually in Alaska by gill-net fisheries (Carter et al. 2005; Piatt and Naslund 1995). In addition, more than 1,000 oiled marbled murrelet carcasses were collected after the Exxon Valdez oil spill in Alaska (Carter and Kuletz 1995). Nest failure is caused by predation by raptors, ravens, and jays (Nelson 1997).

3.6.2.9 Newell's Shearwater (*Puffinus auricularis newelli*)

The classification of the Newell's shearwater (*Puffinus auricularis newelli*) is in flux. It was, until recently, regarded by some authorities as a distinct species, *Puffinus newelli* (International Union for the Conservation of Nature 2010a). Since 1982, most authorities have considered it a subspecies of Townsend's shearwater (*Puffinus auricularis*) (American Ornithologists' Union 1998). At least one author (Harrison 1983) regarded Newell's shearwater as a subspecies of Manx shearwater (*Puffinus puffinus newelli*). The U.S. Fish and Wildlife Service (2005b) identifies Newell's shearwater as a subspecies of Townsend's shearwater. Newell's shearwater is also known as Newell's dark-rumped shearwater.

3.6.2.9.1 Status and Management

Newell's shearwater is an ESA-listed threatened species, found only in the Hawaiian Islands. This species is also listed as threatened by the state of Hawaii (U.S. Fish and Wildlife Service 2005b). A federal recovery plan was finalized in 1983 (U.S. Fish and Wildlife Service 1983). Within the Hawaiian Islands Bird Conservation Region, Newell's shearwater is evaluated as highly imperiled, the most serious category, because of restricted breeding distribution and threats to breeding populations (U.S. Fish and Wildlife Service 2003). There is no critical habitat designation for the Newell's shearwater.

Newell's shearwater was thought to be extinct by 1908 as a consequence of subsistence hunting by Polynesians and predation by introduced rats, pigs, and dogs. However, they were rediscovered offshore in 1947. One was collected on Oahu in 1954 (Day et al. 2003) and Newell's shearwaters were confirmed as still breeding on Kauai in 1967 (U.S. Fish and Wildlife Service 2005b).

3.6.2.9.2 Habitat and Geographic Range

Newell's shearwater occurs in open ocean waters in the southern portion of the Hawaii portion of the Study Area and into the western portion of the Transit Corridor Study Area. They spend most of their time in the open ocean year-round (U.S. Fish and Wildlife Service 2005b) and come ashore only to nest. They avoid inshore waters except when gathering before they fly inland to breeding colonies at night (International Union for the Conservation of Nature 2010e).

Newell's shearwaters forage only over open ocean waters of depths reportedly much greater than 6,560 ft. (1,999.5 m) (Spear et al. 1995). Even when nesting, they feed over deep waters and are typically not within 15 mi. (24.1 km) of island shores (International Union for the Conservation of Nature 2010e). In particular, they find abundant food along oceanic fronts, such as the Equatorial Countercurrent (Spear et al. 1995). Preferred average ocean conditions are 80°F (26.7°C) sea surface temperature, 34.5 parts per thousand sea surface salinity, and 250 ft. (76.2 m) depth to cold water (Spear et al. 1995). The meteorological conditions favored by Newell's shearwaters are frequent clouds and rain squalls typical of intertropical convergence zones (Spear et al. 1995).

3.6.2.9.2.1 Insular Pacific-Hawaiian Large Marine Ecosystem

Newell's shearwater occurs in coastal waters throughout the Hawaii portion of the Study Area during the breeding season. Newell's shearwater nesting is entirely confined to the main Hawaiian Islands, from Lehua Rock east to Hawaii. Nesting is known on Lehua Rock, Kauai, Molokai, and Hawaii. No population estimates exist for the small nesting colonies that exist on Lehua Rock and Molokai (Day and Cooper 1995; International Union for the Conservation of Nature 2010e; U.S. Fish and Wildlife Service 2005b). About 20 breeding colonies of Newell's shearwaters are known in the main Hawaiian Islands, but others probably exist (International Union for the Conservation of Nature 2010e). In 1992, 11 colonies were known on Kauai. There is evidence but no confirmation of nesting on Oahu, Maui, and Lanai (U.S. Fish and Wildlife Service 2005b).

Newell's shearwaters nest on Kauai at high elevations (525 to 3,935 ft.) (160.02 to 1,199.4 m) on steep, densely vegetated mountain slopes and in burrows or deep rock crevices, although a substantial number also nest on dry sparsely vegetated cliffs on the Na Pali coast of Kauai and on Lehua Island (Reynolds and Ritchotte 1997; U.S. Fish and Wildlife Service 2005b). The use of steep slopes (mostly greater than 65°) for nesting is probably a consequence of predation pressure from introduced pigs, mongooses, and cats; they select sites where there is either an open canopy of trees and ground cover of uluhe ferns or a dense ground cover of tussock grasses (International Union for the Conservation of Nature 2010e).

On the Island of Hawaii, Newell's shearwaters fly over the entire island except the southwestern coast. Shearwaters are most numerous flying to and from the Kohala Mountains on the north coast (Day et al. 2003). During adult presence in the breeding season (April to September), Newell's shearwaters gather on the water close to shore before they fly inland around sunset (International Union for the Conservation of Nature 2010e). Based on known or suspected colony locations, Newell's shearwaters are expected to be found gathering in early evening at Niihau (north end around Lehua Rock), Kauai, Oahu, Maui, Molokai, Lanai, and Hawaii from April to September.

3.6.2.9.2.2 Open Ocean

During the breeding season, some birds forage west and north of the Hawaiian Islands so that the central part of their marine range moves northward in the Transit Corridor portion of the Study Area (International Union for the Conservation of Nature 2010e; U.S. Fish and Wildlife Service 2005b).

3.6.2.9.3 Population and Abundance

Population in the 1980s and early 1990s was estimated at about 84,000, but numbers in 2000 may have been only 21 percent of what they were in 1987 (U.S. Fish and Wildlife Service 2005b). The largest known population, found on Kauai, was devastated by two hurricanes in 1982 and 1992. Since that last storm, the species has been in steady decline on Kauai. The remaining adults and fledglings are suffering significant deaths from utility pole and line strikes (International Union for the Conservation of Nature 2010e). Continuing forest habitat destruction and predation from introduced mammals are also taking a toll on this species (International Union for the Conservation of Nature 2010e).

3.6.2.9.4 Predator and Prey Interactions

Although diet is not well known, evidence suggests that squid are a major dietary item. Newell's shearwaters capture food by pursuit-plunging (diving into water and swimming after prey, typically 10 to 30 m [32.8 to 98.4 ft.] deep), usually in company with multispecies feeding flocks associated with tuna (International Union for the Conservation of Nature 2010e). This species is not attracted to discarded fish byproducts and does not follow ships (Onley and Scofield 2007).

Newell's shearwaters are preyed on by introduced animals at their breeding sites, such as cats and birds such as barn owls (Ainley et al. 1997). Nocturnal activity and cavity-nesting behaviors are their only defense against mammal predators.

3.6.2.9.5 Species-specific Threats

Historical threats included subsistence hunting by Polynesians and predation by rats, dogs, and pigs. Current threats include artificial lights (e.g. street and resort lights) along the coast that blind and disorient fledglings. Once on the ground, these fledglings are unable to fly and thousands are killed each year by cars, cats, and dogs. In addition, adults can collide with power facilities and associated utility wires and associated lines are in the direct path of known Newell's flight corridors. Additional threats are the loss and degradation of forested habitat caused by introduced plants and herbivores.

Sections 3.6.2.10 to 3.6.2.12 describe the taxonomic groups of non ESA-listed seabird species in the Study Area.

3.6.2.10 Albatrosses, Petrels, Shearwaters, and Storm-petrels (order Procellariiformes)

The Procellariiformes is a large order of open ocean seabirds that are divided into four families: Diomedeidae (albatrosses), Procellariidae (petrels and shearwaters), Hydrobatidae (storm-petrels), and Pelecanoididae (diving-petrels) (Enticott and Tipling 1997; Onley and Scofield 2007). There are 39 species representing 3 families - albatrosses, petrels and shearwaters, and storm-petrels - that occur in the Study Area (Table 3.6-2 and Table 3.6-3). These species are generally long-lived, breed once a year, and lay only one egg. They have extremely broad distributions and include all marine birds that spend most of their lives at sea and exclusively feed in the open ocean, primarily on fish, crustaceans, and crabs. They can be found in high numbers resting on the water in flocks where prey is concentrated (Enticott and Tipling 1997). Some species feed around fishing boats or become injured from longline gear (Enticott and Tipling 1997; Onley and Scofield 2007). They nest in colonies on remote islands uninhabited by people. Some are ground nesters; others nest in cavities or burrows (Ramos et al. 1997). They return to their birth colonies. Most species of this order are monogamous and mate for life. Both parents participate in egg incubation and chick rearing (Elphick et al. 2001). Representative species include Laysan albatross, Northern fulmar, mottled petrel, pink-footed shearwater, and Wilson's storm-petrel.

3.6.2.11 Tropicbirds, Boobies, Pelicans, Cormorants, and Frigatebirds (order Pelecaniformes)

The Pelecaniformes order includes anhingas, pelicans, gannets and boobies, tropicbirds, cormorants, and frigatebirds. There are 14 species representing 5 families that occur in the Study Area: tropicbirds, boobies, pelicans, cormorants, and frigatebirds (Table 3.6-2 and Table 3.6-3). They all have webbed feet and eight toes, and all have a throat sac, called a gular sac (Brown and Harshman 2008). This sac is highly developed and visible in pelicans and frigatebirds but is also readily apparent in boobies and cormorants. Pelicans use the sac to trap fish, frigatebirds use it as a mating display and to feed on fish, squid, and similar marine life (Dearborn et al. 2001); and cormorants and boobies utilize the sac for heat regulation. These birds nest in colonies, but individual birds are monogamous (Brown and Harshman 2008). Representative species within the Study Area include white-tailed tropicbird, blue-footed booby, California brown pelican, pelagic cormorant, and magnificent frigatebird.

3.6.2.12 Phalaropes, Gulls, Noddies, Terns, Skua, Jaegers, and Alcids (order Charadriiformes)

There are 54 species representing three families from this diverse group that occur within the Study Area (Table 3.6-2 and Table 3.6-3). Gulls, noddies, and terns in the family Laridae are a diverse group of small to medium sized seabirds that inhabit coastal, nearshore, and open sea waters. Skuas and jaegers in the family Stercorariidae are stocky powerful birds with long pointed wings, long tails, strong hooked bills, and sharp talons known for robbing the food of smaller seabirds, teasing and harassing them until they drop their prey. Murres, murrelets, and auklets in the family Alcidae are good swimmers and divers and have short wings, which require them to flap their wings rapidly to fly.

Species in the order Charadriiformes occupy diverse habitats. Some species in this order spend most of their time at sea (e.g., jaegers, skuas, alcids), whereas others are more coastal or near shore (e.g., gulls). Many charadriiforms inhabit marine and freshwater wetlands; others spend most of their lives in or near the ocean. Many species breed in colonies, and some species lay more than one egg (Ericson et al. 2003; Fain and Houde 2007; Harrison 1983; Onley and Scofield 2007). Representative species within the Study Area include Sabine's gull, black-legged kittiwake, black noddy, sooty tern, South polar skua, pomerine jaeger, common murre, long-billed murrelet, rhinoceros auklet, and horned puffin.

3.6.3 ENVIRONMENTAL CONSEQUENCES

This section evaluates how and to what degree the activities described in Chapter 2, Description of Proposed Action and Alternatives, affect seabirds and seabird communities known to occur within the Study Area. For this Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS), seabirds are evaluated as groups of species characterized by distribution, body type, or behavior relevant to the stressor being evaluated. Activities are evaluated for their potential effect on all seabirds in general, on each taxonomic grouping, and on the five seabirds in the Study Area listed as endangered or threatened under the ESA. An impacts analysis for seabirds has been conducted for potential mortality, habitat destruction, or breeding and roosting disturbance. Migratory and breeding seabirds utilize portions of the Study Area to differing degrees depending on the foraging and breeding requirements of each species. As listed in the ESA-listed species descriptions, there is no critical habitat or primary constituent elements for listed species within the Study Area. Therefore, the analysis of stressors on critical habitat is not carried though this EIS document.

The alternatives for training and testing activities were examined to determine if the Proposed Action would produce one or more of the following impacts:

- A direct or indirect impact on seabirds or seabird populations from mortality attributed to military training and testing activities taking place within the Study Area.
- A direct or indirect impact on seabird populations from destruction or disturbance of foraging habitat attributed to military training and testing activities taking place within the Study Area.
- A direct or indirect impact on seabird populations from destruction or disturbance of seabird breeding colonies, foraging or roosting areas attributed to military training and testing activities taking place within the Study Area.

The consequences of the proposed military readiness activities on non-federally listed migratory seabirds or on modification of their habitat are evaluated based on the criteria described in the final rule authorizing DoD to incidentally take migratory seabirds during military readiness activities (50 C.F.R. Part 21, 28 February 2007) which states that military readiness activities are exempt from the take prohibitions of the Migratory Bird Treaty Act provided they do not result in a significant adverse effect on a population of a migratory seabird species. An activity has a significant adverse effect if, over a reasonable period of time, it diminishes the capacity of a population of migratory seabird species to maintain genetic diversity, to reproduce, and to function effectively in its native ecosystem. A population is defined as "a group of distinct, coexisting, same species, whose breeding site fidelity, migration routes, and wintering areas are temporally and spatially stable, sufficiently distinct geographically (at some point of the year), and adequately described so that the population can be effectively monitored to discern changes in its status." (U.S. Bureau of Land Management and U.S. Fish and Wildlife Service 2010).

Navy training and testing activities have the potential to contribute acoustic, energy, physical disturbance/strike, entanglement or ingestion stressors to seabird populations within the Study Area. These stressor types are induced by the training and testing activity types noted in Chapter 2, which vary in intensity, frequency, duration, and location within the Study Area; therefore, seabird species may be impacted by different proposed activities. Certain activities take place in specific locations or depth zones within the Study Area outside of the range or foraging abilities of seabirds. Therefore, seafloor device strike, cable and wire entanglement, parachute entanglement, and ingestion of munitions were not carried forward in this analysis for seabirds. Tables 2.8-1 through 2.8-5 present the baseline and proposed training and testing activity locations for each alternative (including number of events and ordnance expended). Based on the general threats to seabirds and shorebirds discussed in Section 3.6.2 (Affected Environment) the stressors applicable to ESA-listed species in the Study Area and analyzed below include the following:

- Acoustic stressors (tactical acoustic sonar and other acoustic devices, explosive detonations, pile driving, vessel noise, and aircraft noise)
- Energy stressors (electromagnetic)
- Physical disturbance and strike (aircraft, vessels and in-water devices, military expended materials non-explosive)
- Ingestion (military expended materials other than ordnance)
- Secondary stressors (air quality, water quality)

3.6.3.1 Acoustic Stressors

This section evaluates the potential for acoustic and explosive stressors to affect seabirds during training and testing activities in the Study Area. These stressors are associated with sonar and other underwater active acoustic sources, explosives, pile driving, aircraft noise, and vessel noise. Following the Conceptual Framework for Assessing Effects from Sound-Producing Activities (Section 3.0.5.7.1), categories of potential impacts from exposure to explosions and sound are direct trauma, hearing loss, auditory masking, behavioral reactions, and physiological stress. Potential negative nonphysiological consequences to seabirds from acoustic and explosive stressors include disturbance of foraging, roosting, or breeding; degradation of foraging habitat; and degradation of known seabird breeding colonies.

The types of seabirds exposed to sound-producing activities or explosive detonations depend on where training and testing activities occur relative to the coast. Seabirds can be divided into three groups based on breeding and foraging habitat: (1) those species such as albatrosses, petrels, frigatebirds, tropicbirds, boobies, and some terns that forage over the ocean and nest on oceanic islands; (2) species such as pelicans, cormorants, gulls, and some terns that nest along the coast and forage in nearshore areas; and (3) those few species such as marbled murrelet that nest in inland habitats and come to the coastal areas to forage.

The area from the beach to about 10 nautical miles (nm) offshore provides foraging areas for breeding terns, gulls, skimmers, and pelicans; a migration corridor and winter habitat for terns, gulls, skimmers, pelicans, loons, cormorants, and gannets; and supports nonbreeding and transient pelagic seabirds.

Offshore pelagic waters support nonbreeding and transient pelagic seabirds, loons, gannets, and several tern species (Davis et al. 2000; Hunter et al. 2006a). Pelagic seabirds are generally widely distributed, but they tend to congregate in areas of higher productivity and prey availability (Haney 1986a). Such areas include the Pacific Current, particularly areas of eddies and upwelling; areas with productive live/hard bottom habitats; and large algal mats.

Seabirds and migrating birds could be exposed to sounds from sources near the water surface or from airborne sources. While foraging seabirds will be present near the water surface, migrating birds may fly at various altitudes. Some species such as sea ducks and loons may be commonly seen flying just above the water's surface, but the same species can also be spotted flying so high that they are barely visible through binoculars (United States Geological Service 2006). While there is considerable variation, the favored altitude for most small birds appears to be between 500 ft. (152.4 m) and 1,000 ft. (304.8 m). Radar studies have demonstrated that 95 percent of the migratory movements occur at less than 10,000 ft. (3,048 m), the bulk of the movements occurring under 3,000 ft. (914.4 m) (United States Geological Service 2006).

Seabirds use a variety of foraging behaviors that could expose them to underwater sound. Most seabirds plunge-dive from the air into the water or perform aerial dipping (the act of taking food from the water surface in flight); others surface-dip (swimming and then dipping to pick up items below the surface) or jump-plunge (swimming, then jumping upward and diving under water). Birds that plunge-dive typically submerge for no more than a few seconds, and any exposure to underwater sound would be very brief. Other seabirds pursue prey under the surface, swimming deeper and staying underwater longer than other plunge-divers. Some of these seabirds may stay underwater for up to several minutes and reach depths between 50 ft. (15.2 m) and 550 ft. (167.6 m) (Jones 2001; Ronconi 2010). Sounds generated under water during training and testing would be more likely to impact seabirds that pursue prey, although as previously stated, little is known about seabird hearing ability underwater. Birds that forage in the open ocean often forage more actively at night, when prey species are more likely to be near the surface and naval training and testing is more limited.

If a seabird is close to an explosive detonation, the exposure to high pressure levels and sound impulse can cause barotrauma, physical injury due to a difference in pressure between an air space inside the body and the surrounding air or water. Damage could occur to the structure of the ear, resulting in hearing loss, or to internal organs, causing hemorrhage and rupture. If a seabird is close to an intense sound source, it could suffer hearing loss due to fatigue of the hair cells of the ear. Studies have examined hearing loss and recovery in only a few species of birds, and none studied hearing loss in seabirds (e.g., Hashino et al. 1988; Ryals et al. 1999; Ryals et al. 1995; Saunders and Dooling 1974). Unlike other species, birds have the ability to regenerate hair cells in the ear, usually resulting in considerable anatomical, physiological, and behavioral recovery within several weeks. Still, intense exposures are not always fully recoverable, even over periods up to a year after exposure, and damage and subsequent recovery vary significantly by species (Ryals et al. 1999). Birds may be able to protect themselves against damage from sustained sound exposures by regulating inner ear pressure, an ability that may protect ears while in flight (Ryals et al. 1999).

Numerous studies have documented that birds respond to anthropogenic noise, including aircraft overflights, weapons firing, and explosions (Larkin et al. 1996; National Park Service 1994; Plumpton 2006). Studies generally indicate that birds hear in-air sounds over a very limited range between 1 and 5 kHz but specific species hearing can extend to higher and lower frequencies (Beason 2004). The manner in which birds respond to noise depends on several factors, including life-history characteristics of the species, characteristics of the noise source, loudness, onset rate, distance from the noise source, presence or absence of associated visual stimuli, and previous exposure (Larkin et al. 1996; National Park Service 1994; Plumpton 2006). Researchers have documented a variety of behavioral responses of birds to noise, such as alert behavior, startle response, flying or swimming away, diving into the water, and increased vocalizations. While they are difficult to measure in the field, some of these behavioral responses are likely accompanied by physiological responses, such as increased heart rate, or stress (National Park Service 1994).

Chronic stress can compromise the general health of birds, but stress does not necessarily result in negative consequences to individual birds or to populations (Larkin et al. 1996; National Park Service 1994). For example, the reported behavioral and physiological responses of birds to noise exposure are within the range of normal adaptive responses to external stimuli, such as predation, that birds face on a regular basis. Unless they are repeatedly exposed to loud noises or simultaneously exposed to a combination of stressors, individuals may return to normal behavior and physiology almost immediately after exposure. Studies also have shown that birds can become habituated to noise following frequent exposure and cease to respond behaviorally to the noise (Larkin et al. 1996; National Park Service 1994; Plumpton 2006).

3.6.3.1.1 Sonar and Other Active Acoustic Sources

Sonar and other underwater active acoustic sources could be used throughout the Study Area. Information regarding the impacts from sonar on seabirds and the ability for seabirds to hear underwater is virtually unknown. The exposure to these sounds by seabirds, other than pursuit diving species, is likely to be very limited due to spending a very short time under water (plunge-diving or surface-dipping) or foraging only at the water surface. Pursuit divers may remain under water for minutes, increasing the chance of underwater sound exposure.

If the sound levels are sufficiently intense, even a short exposure could be problematic. Assuming that a seabird disturbed by an underwater sound would avoid the stressor by swimming to the surface, a physiological impact, such as hearing loss, would only occur if a seabird is close to an intense sound source. In general, birds are less susceptible to both temporary and permanent threshold shift than mammals (Saunders and Dooling 1974), so an underwater sound exposure would have to be intense and of a sufficient duration to cause temporary or permanent threshold shift. Avoiding the sound by returning to the surface would limit extended or multiple sound exposures underwater. There have been no studies documenting diving seabirds' reactions to sonar.

Seabirds that approach vessels while foraging would be most likely to be exposed to underwater active acoustic sources. If the presence of a ship attracts diving seabirds, the seabirds could be more likely to be exposed to an underwater sound if the ship is engaged in anti-submarine warfare or mine warfare with active acoustic sources. Some seabirds commonly follow vessels, including certain species of gulls, storm petrels, and albatrosses, for increased potential of foraging success as the prop wake brings prey to the surface (Hamilton III 1958; Hyrenbach 2001, 2006b; Melvin et al. 2001). However, most hull-mounted sonars do not project sound aft of ships (behind the ship, opposite the direction of travel), so most seabirds diving in ship wakes would not be exposed to sonar.

The possibility of an ESA-listed seabird species to be exposed to sonar and other active acoustic sources depends on whether it submerges during foraging and whether it forages in areas where these sound sources may be used. Although petrels and albatrosses forage in open ocean areas where sonar training and testing occurs, they would not be exposed to underwater sound because they forage at the surface.

Least terns forage in coastal shallow waters where they could be exposed to sonar and other active acoustic sources, notably near ports and shipyards where sonar maintenance and testing occur. However, their plunge dives are brief, so any chance of exposure would be minimal. Most other sonar use occurs farther offshore, however, so the chance for an exposure would be low.

3.6.3.1.1.1 No Action Alternative

Training Activities

Training activities under the No Action Alternative include activities that produce in-water noise from the use of sonar and other active non-impulsive acoustic sources include anti-submarine warfare, mine warfare, object detection and navigation, communication, and maintenance. These activities could occur throughout the Study Area, but would be concentrated in the SOCAL and HRC portions of the study area. The Pacific Current runs through the SOCAL Range Complex portion of the Study Area, and is an area of increased productivity that attracts foraging seabirds. Therefore, seabirds that forage in these open ocean areas would have a greater chance of underwater sound exposure than seabirds that forage in coastal areas.

Diving seabirds may not respond to an underwater sound, but if a diving seabird does react to an underwater sound source, it could result in a short-term behavioral response. Seabirds would avoid any additional exposures during a foraging dive when they surface. Due to the limited duration of training events and widespread availability of open ocean foraging habitat, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Least terns may briefly submerge while foraging, so there is a remote chance that a least tern could be briefly exposed to underwater sound sonar and other active acoustic sources. However, least terns forage in the nearshore waters, in areas where the acoustic sources used are minimal, further reducing the potential for exposure.

It is likely that few seabirds would be affected by sonar and other underwater active acoustic sources because:

- sources are used intermittently during a training event,
- training events are dispersed in space and time,
- most seabirds spend little time submerged, and
- exposures sufficiently intense (i.e., of a certain duration or within a close proximity) to cause physiological impacts are unlikely.

Sonar and other underwater acoustic sources used during training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of sonar and other underwater acoustic sources during training activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Testing activities under the No Action Alternative include activities that produce in-water noise from the use of sonar and other active non-impulsive acoustic sources could occur throughout the Study Area, but would be concentrated in the SOCAL and HRC portions of the study area. The Pacific Current runs through the SOCAL Range Complex portion of the Study Area, and is an area of increased productivity that attracts foraging seabirds. Therefore, seabirds that forage in these open ocean areas would have a greater chance of underwater sound exposure than seabirds that forage in coastal areas.

Diving seabirds may not respond to an underwater sound, but if a diving seabird does react to an underwater sound source, it could result in a short-term behavioral response. Seabirds would avoid any additional exposures during a foraging dive when they surface. Due to the limited duration of training events and widespread availability of open ocean foraging habitat, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

It is likely that few seabirds would be affected by sonar and other underwater active acoustic sources because:

- sources are used intermittently during a training event,
- training events are dispersed in space and time,
- most seabirds spend little time submerged, and
- exposures sufficiently intense (i.e., of a certain duration or within a close proximity) to cause physiological impacts are unlikely.

Hawaiian petrels and short-tailed albatrosses do not submerge while foraging; therefore, they would not be exposed to underwater sound from sonar and other active acoustic sources. Least terns, marbled murrelet, and Newell's shearwater may briefly submerge while foraging, either during plunge-diving (terns) or pursuit diving (murrelet and shearwater), so there is a remote chance that these species could be exposed to underwater sound sonar and other active acoustic sources.

Sonar and other underwater acoustic sources used during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of sonar and other underwater acoustic sources during testing activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.1.2 Alternative 1

Training Activities

The number of annual training activities that produce in-water noise from the use of sonar and other active acoustic sources under Alternative 1 would approximately double from the No Action Alternative. This includes overall increases to anti-submarine warfare; mine warfare; object detection and navigation; communication; and maintenance. Training activities would occur in similar areas as under the No Action Alternative for similar activities. Based on the increased operations under Alternative 1 versus the No Action Alternative, more seabirds could be exposed to sonar and other active acoustic sources. Although the quantity of underwater acoustic stressors would increase, any impacts on seabirds would likely be limited to short-term behavioral reactions by diving seabirds as described under the No Action Alternative. Due to the limited duration of training events and widespread availability of open ocean foraging habitat, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Hawaiian petrels and short-tailed albatrosses do not submerge while foraging; therefore, they would not be exposed to underwater sound from sonar and other active acoustic sources. Least terns, marbled murrelet, and Newell's shearwater may briefly submerge while foraging, either during plunge-diving (terns) or pursuit diving (murrelet and shearwater), so there is a remote chance that these species could be exposed to underwater sound sonar and other active acoustic sources. However, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Sonar and other underwater acoustic sources used during training activities under the Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of sonar and other underwater acoustic sources during training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Section 3.0 and Table 3.0-8 describe the use of sonar and other underwater active acoustic sources during testing activities under Alternative 1. Use of sonar and other active acoustic sources would approximately double under Alternative 1 versus the No Action Alternative. Sonar and other active acoustic sources would be used in waters throughout the range complexes and testing ranges, and smaller amounts would be used in waters beyond the range complexes or in nearshore areas, including locations not used under the No Action Alternative. Although the quantity of underwater acoustic stressors would increase, any impacts on seabirds would likely be limited to short-term behavioral reactions by diving seabirds, as described under the No Action Alternative. Due to the limited duration of testing events and widespread availability of open ocean foraging habitat, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Hawaiian petrels and short-tailed albatrosses do not submerge while foraging; therefore, they would not be exposed to underwater sound from sonar and other active acoustic sources. Least terns, marbled murrelet, and Newell's shearwater may briefly submerge while foraging, either during plunge-diving (terns) or pursuit diving (murrelet and shearwater), so there is a remote chance that these species could be exposed to underwater sound sonar and other active acoustic sources. However, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Sonar and other underwater acoustic sources used during testing activities under Alternative 1 may affect, not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of sonar and other underwater acoustic sources during testing activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.1.3 Alternative 2

Training Activities

The number of annual training activities that produce in-water noise from the use of sonar and other active acoustic sources under Alternative 2 would increase over the No Action Alternative. This includes overall increases to anti-submarine warfare; mine warfare; object detection and navigation; communication; and maintenance. Training activities would occur in similar areas as under the No Action Alternative for similar activities. Based on the increased operations under Alternative 2 versus the No Action Alternative, more seabirds could be exposed to sonar and other active acoustic sources. Although the quantity of underwater acoustic stressors would increase, any impacts on seabirds would likely be limited to short-term behavioral reactions by diving seabirds, as described under the No Action Alternative. Due to the limited duration of training events and widespread availability of open ocean foraging habitat, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Hawaiian petrels and short-tailed albatrosses do not submerge while foraging; therefore, they would not be exposed to underwater sound from sonar and other active acoustic sources. Least terns, marbled murrelet, and Newell's shearwater may briefly submerge while foraging, either during plunge-diving (terns) or pursuit diving (murrelet and shearwater), so there is a remote chance that these species could be exposed to underwater sound sonar and other active acoustic sources.

Sonar and other underwater acoustic sources used during training activities under the Alternative 2 may affect, not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of sonar and other underwater acoustic sources during training activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Section 3.0.5.3.1.1 describes the use of sonar and other underwater active acoustic sources during testing activities under Alternative 2, including relative concentrations and locations within the Study Area. Use of sonar and other active acoustic sources would increase under Alternative 2 versus the No Action Alternative. The proposed testing activities would also increase over Alternative 1. Sonar and other active acoustic sources would be used in waters throughout the range complexes and testing ranges, and smaller amounts would be used in waters beyond the range complexes or in nearshore areas, including locations not used under the No Action Alternative. Although the quantity of underwater acoustic stressors would increase, any impacts on seabirds would likely be limited to short-term behavioral reactions by diving seabirds, as described under the No Action Alternative. Due to the limited duration of testing events and widespread availability of open ocean foraging habitat, any sound exposures would be minimal and are unlikely to have a long-term impact on an individual or a population.

Hawaiian petrels and short-tailed albatrosses do not submerge while foraging; therefore, they would not be exposed to underwater sound from sonar and other active acoustic sources. Least terns, marbled murrelet, and Newell's shearwater may briefly submerge while foraging, either during plunge-diving (terns) or pursuit diving (murrelet and shearwater), so there is a remote chance that these species could be exposed to underwater sound sonar and other active acoustic sources.

Sonar and other underwater acoustic sources used during testing activities under Alternative 2 may affect, not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of sonar and other underwater acoustic sources during testing activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.2 Explosive Detonations

The potential for seabirds to be exposed to explosive detonations from training or testing activities depends on several factors, including the presence of seabirds at, beneath, or above the water surface near the detonation; location of the detonation at, below, or above the water surface; size of the explosive; and distance from the detonation. Explosions are associated with detonations of high-explosive missiles and projectiles in air; high-explosive grenades, bombs, missiles, rockets, and projectiles at or immediately below the sea surface; mine neutralization charges on the bottom and in the water column; high-explosive torpedoes near the surface and in the water column; explosive sonobuoys in the water column; and other small charges used at various depths during testing. Section 3.0 describes the shock waves and acoustic waves imparted to a surrounding medium by an explosive detonation and how these waves propagate. Because airguns are an impulsive source, with the potential for similar non-traumatic impacts as explosives, they are considered in this section.

A seabird close to an explosive detonation could be killed or injured. Blast injuries are usually most evident in the gas-containing organs, such as those of the respiratory and gastrointestinal systems. Blasts can also damage pressure-sensitive components of the auditory system. In general, the impacts of explosions would be reduced with increasing distance of the seabird from the explosion, and would range from lethal injury in the immediate vicinity of an explosion to short-term behavioral impacts on the outer edges of the zone of influence.

Underwater detonations could affect diving seabirds and seabirds on the water surface. Studies have shown that birds are more susceptible to underwater explosions when they are submerged versus on the surface (Yelverton et al. 1973). Underwater detonations could have lethal impacts on seabirds in water if impulse exceeds 36 pounds per square inch (in.) (psi)– milliseconds (msec) (psi-msec) (248 Pascal [Pa]-second [sec]) for birds underwater and 100 psi-msec (690 Pa-sec) just below the water surface for birds at the water surface (Yelverton et al. 1973). These impulse levels correspond to onset mortality, or the level at which one percent of animals would not be expected to survive. Exposures to higher impulse levels would have greater likelihoods of mortality. No injuries would be expected for seabirds underwater at blast pressures below 6 psi-msec (41 Pa-sec) and for seabirds on the surface at blast pressures below 30 psi-msec (207 Pa-sec). Table 3.6-4 shows estimated ranges to onset mortality and to the safety range (no injury expected) for several classes of charges proposed to be used in the Study Area, assuming a diving seabird is exposed at 15 ft. (4.6 m) below the water surface, using the Yelverton method. Ranges to impacts are based on several factors including charge size, depth of the detonation, and how far the seabird is beneath the water surface. It should be cautioned that these are estimates, and actual ranges to impacts would depend on conditions at each detonation site.

Table 3.6-4: Estimated Ranges to Impacts for Diving Birds Exposed to Underwater Detonations

Source Class	Representative Munitions	Net Explosive Weight (lb.)	Depth of Charge	Distance to Onset Mortality	Safety Range
E6	Air-to-Surface missile	11-20	33 ft. (10 m)	220–330 ft. (70–100 m)	780–920 ft. (240–280 m)
E12	2,000-lb. bomb	601-1,000	10 ft. (3 m)	460-600 ft. (140–180 m)	1,000–1,200 ft. (330–370 m)
E17	40,000-lb. HBX charge	14,501–58,000	200 ft. (61 m)	2,700-3,900 ft. (800–1200 m)	7,300–9,700 ft. (2,200–3,000 m)

Note: ft. = feet; HBX = high blast explosive; lb. = pounds; m = meters

Detonations in air could also injure seabirds while either in flight or at the water surface. Experiments that exposed seabirds to blast waves in air provided a relationship between charge size, distance from detonation, and likelihood of seabird injury or mortality (Damon et al. 1974). Table 3.6-5 shows the safe distance from a detonation in air beyond which no injuries to seabirds would be expected.

Table 3.6-5: Safe Distance from Detonations in Air for Birds

Explosive Source Class	Sample Ordnance	Net Explosive Weight	Safe Distance (no Injury)[1]
E3	76-mm round	0.6–2 lb.	22 ft. (7 m)
E5	5-in. projectiles	6–10 lb.	22 ft. (10 m)
E7	Rolling Airframe Anti-Air Missile	21–60 lb.	70 ft. (21 m)

Note: ft. = feet; in. = inches; lb.= pound(s); m = meters; mm = millimeters
[1]Damon, 1974

The airborne noise associated with underwater explosions and airgun use is minimal. Because of the differences in acoustic transmission in water and in air, an effect called the Lloyd mirror reflects underwater sound at the water surface. Therefore, sound generated in the water will not pass over to the air (refer to the acoustic and explosives primer in Section 3.0). Sounds generated by most small underwater explosions, therefore, are unlikely to disturb seabirds above the water surface. If a detonation is sufficiently large or is near the water surface, however, pressure will be released at the air-water interface. Birds above this pressure release could be injured or killed.

Most high-explosive ordnance used in anti-surface warfare training and testing detonates at the water surface or a short distance below the water surface. The blast waves and acoustic waves would propagate through both water and air, although near the surface most pressure release would be into the air. Birds close to the detonation point would be injured or killed. Detonations in air during anti-air warfare training and testing would typically occur at much higher altitudes (greater than 3,000 ft. [914.4 m] above sea level) where seabirds and migrating birds are less likely to be present (U.S. Geological Survey 2006). Foraging seabirds will typically be at lower elevations where they are likely to be unaffected by in-air explosions. Therefore, seabirds are unlikely to be injured or killed by high-altitude in-air detonations.

At distances beyond those to injury, responses to noise from an explosive detonation would be limited to short-term behavioral or physiological responses (e.g., alert response, startle response, and temporary increase in heart rate). Startle or alert reactions to muzzle blasts are not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any seabirds. Birds may be temporarily displaced and there may be temporary increases in stress levels; however, behavior and use of habitat would return shortly after the training is complete. (Beason 2004) notes that birds exposed to up to 146 A-weighted sound level (dBA) within 325 ft. (99.1 m) of the sound source flushed but then returned within minutes of the disturbance. The range of impacts could depend on the charge size, distance from the charge, and the seabird's life activity at the time of the exposure.

Fleeing response to an initial explosion may reduce seabird exposure to any additional explosions that occur within a short timeframe. Seabirds could also be attracted to an area to forage if an explosion resulted in a fish kill. This would only be a concern for events that involved multiple explosions in the same area within a single event, such as firing exercises, which involves firing multiple high-explosive 5-

in. rounds at a target area, and bombing exercises, which could involve multiple bomb drops separated by several minutes.

3.6.3.1.2.1 No Action Alternative

Training Activities

Explosive detonations are associated with training activities under the No Action Alternative that use high-explosive charges, including bombs, missiles, explosive munitions, explosive sonobuoys, grenades, munitions used in sinking exercises, and underwater detonations associated with mine neutralization training. The detonations would include explosive source classes up to E13 (1,000 – 1,740 lb. net explosive weight) (see Table 3.0-2). Training activities involving explosive detonations are spread throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by HRC, Silver Strand Training Complex (SSTC), and the Transit Corridor. Training activities using explosives generally do not occur within 1.6 nm of shore or within 3 nm of bays, rivers, or estuaries except those used in the San Diego Bay and boat training lanes of SSTC (E1 - E6 [less than 20 lb. net explosive weight]). A more detailed description of these training activities and their proposed locations are presented in Tables 2.9-2 and 2.9-3 of Chapter 2.

Nearshore waters are the primary foraging habitat for many seabird species. Any small detonations close to shore could have a short-term adverse impact on nesting and nearshore foraging species. Most larger detonations would occur near areas with the potential for relatively high concentrations of seabirds (upwelling areas associated with the Pacific Current; productive live/hard bottom habitats; and large algal mats); therefore, any impacts on seabirds are likely to be greater in these areas. While the impacts of explosive detonations on seabirds under the No Action Alternative cannot be quantified due to limited data on seabird density, lethal injury to some seabirds could occur. Lethal injuries would likely be associated with detonations of bombs with larger net explosive weights, although any event employing static targets may attract seabirds to the detonation site. Because explosive detonations occur at varying locations over a short time period and seabird presence changes seasonally and on a short-term basis, individual seabirds would not be expected to be repeatedly exposed to explosive detonations. Any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations.

Airborne detonations would occur during gunnery and air-to-air missile activities, although these would occur at relatively high altitudes. Any impacts would likely be limited to short-term startle reactions, as the detonations would occur far above typical seabird flight altitudes.

ESA-listed seabirds are known to be present in areas where detonations would occur during training under the No Action Alternative. While the information known about seabird distribution limits the ability to quantify the impacts of explosions, the likelihood of an injurious exposure seems remote based on the very low density of seabirds. An exposure resulting in a short-term behavioral response would be more likely to occur than an exposure that causes injury. Least terns could startle in the vicinity of explosive detonations from training at SSTC as they forage areas where detonations occur. However, the detonations used in these foraging areas are restricted to less than 20 lb. net explosive weight. If a detonation occurred in the vicinity of least terns, impacts would likely be limited to short-term startle reactions as the zone of impact around these smaller detonations are minimal. Protective measures, such as restricting underwater explosions if flocks of seabirds are rafting on the water’s surface inside a training area or if flocks of seabirds are migrating directly above the proposed training site minimize impacts on seabirds (Chapter 5, Mitigation). Further, at SSTC, the detonation area is monitored for 30 minutes prior to and 30 minutes after a detonation and that successive detonations be more than 30 minutes or less than 10 seconds apart, which further reduces the potential impact upon seabirds.

Explosive detonations used during training activities under the No Action Alternative may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of explosive detonations during training activities described under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Explosive detonations are associated with testing activities under the No Action Alternative that use high-explosive charges, including bombs, missiles, explosive munitions, explosive sonobuoys, grenades, munitions used in sinking exercises, and underwater detonations associated with mine neutralization training. The detonations would include explosive source classes up to E11 (500 – 650 lb. net explosive weight) (see Table 3.0-9). Testing activities involving explosive detonations are spread throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by the HRC. Further, under the No Action Alternative, the vast majority (4,546) of explosive detonations are explosive source class E1 - E4 (less than 5 lb. net explosive weight). A more detailed description of these training activities and their proposed locations are presented in Tables 2.9-2 and 2.9-3 of Chapter 2.

Nearshore waters are the primary foraging habitat for many seabird species. Any small detonations close to shore could have a short-term adverse impact on nesting and nearshore foraging species. Most larger detonations would occur near areas with the potential for relatively high concentrations of seabirds (upwelling areas associated with the Pacific Current; productive live/hard bottom habitats; and large algal mats); therefore, any impacts on seabirds are likely to be greater in these areas. However, under the No Action Alternative, only 15 explosive detonations are of explosive class source E5 or greater (greater than 5 lb. net explosive weight) (Table 3.0-9). While the impacts of explosive detonations on seabirds under the No Action Alternative cannot be quantified due to limited data on seabird density, lethal injury to some seabirds could occur. Lethal injuries would likely be associated with detonations of bombs with larger net explosive weights, although any event employing static targets may attract seabirds to the detonation site. While some seabird mortality could occur, the mortality potential is very low, given the low number of large net explosive weight detonations and the dispersed nature of seabirds in the study area. Because explosive detonations occur at varying locations over a short time period and seabird presence changes seasonally and on a short-term basis, individual seabirds would not be expected to be repeatedly exposed to explosive detonations. Any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations.

ESA-listed seabirds are known to be present in areas where detonations would occur during training under the No Action Alternative. While the information known about seabird distribution limits the ability to quantify the impacts of explosions, the likelihood of an injurious exposure seems remote based on the very low density of seabirds and low net explosive weight used. An exposure resulting in a short-term behavioral response would be more likely to occur than an exposure that causes injury.

Explosive detonations used during testing activities under the No Action Alternative may affect, not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of explosive detonations during testing activities described under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.2.2 Alternative 1

Training Activities

The total number of explosive detonations throughout the Study Area would decrease by 15 percent under Alternative 1 (Table 3.0-9) as compared to the No Action Alternative. The detonations would include explosive source classes up to E13 (1,000 – 1,740 lb. net explosive weight). Training activities involving explosive detonations occur throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by HRC, SSTC, and the Transit Corridor. Training activities using explosives generally do not occur within 1.6 nm of shore or within 3 nm of bays, rivers, or estuaries except those used in the San Diego Bay and boat training lanes of SSTC (E1 - E7 [less than 60 lb. net explosive weight). Alternative 1 would introduce the use of high explosive rockets. The majority of these rockets would be used in the SOCAL Range Complex portions of the Study Area, with the remainder being used in the HRC portion of the Study Area, and none would be used in the SSTC portion of the Study Area. A more detailed description of these training activities and their proposed locations are presented in Tables 2.9-2 and 2.9-3 of Chapter 2.

Potential impacts on seabirds by explosive detonations are expected to be similar to those under the No Action Alternative, but the potential for exposure would decrease with lower number of explosive detonations. While some seabird mortalities could occur, only a small number of seabirds would be affected. Any impacts on seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term (behavioral) and infrequent and would not impact seabird or migratory bird populations. Repeated exposure of individual seabirds or groups of seabirds would be unlikely, based on the large operational area of the Study Area and the dispersed nature of the activities.

ESA-listed seabirds are known to be present in areas where detonations would occur during training under Alternative 1. While the information known about seabird distribution limits the ability to quantify the impacts of explosions, the likelihood of an injurious exposure seems remote based on the very low density of seabirds and smaller number of explosive detonations. An exposure resulting in a short-term behavioral response would be more likely to occur than an exposure that causes injury.

Explosive detonations used during training activities under Alternative 1 may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of explosive detonations during training activities described under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Explosive detonations associated with testing activities under Alternative 1 would nearly triple as compared to the No Action Alternative. The detonations would include explosive source classes up to E11 (500 – 650 lb. net explosive weight) (see Table 3.0-9). However, the vast majority (13,336 of 13,618) of explosive detonations are explosive source class E1 – E4 (less than 5 lb. net explosive weight).Testing activities involving explosive detonations are spread throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by the HRC. A more detailed description of these training activities and their proposed locations are presented in Tables 2.9-2 and 2.9-3 of Chapter 2.

Small detonations close to shore could have a short-term adverse impact on nesting and nearshore foraging species. Most larger detonations would occur near areas with the potential for relatively high concentrations of seabirds (upwelling areas associated with the Pacific Current; productive live/hard bottom habitats; and large algal mats); therefore, any impacts on seabirds are likely to be greater in these areas. However, under Alternative 1, only 282 explosive detonations are of explosive class source E5 or greater (greater than 5 lb. net explosive weight) (Table 3.0-9). While the impacts of explosive detonations on seabirds under Alternative 1 cannot be quantified due to limited data on seabird density, lethal injury to some seabirds could occur. Lethal injuries would likely be associated with explosive detonations with larger net explosive weights, although any event employing static targets may attract seabirds to the detonation site. While some seabird mortality could occur, the mortality potential is low, given the number of large net explosive weight detonations and the dispersed nature of seabirds in the study area. Because explosive detonations occur at varying locations over a short time period and seabird presence changes seasonally and on a short-term basis, individual seabirds would not be expected to be repeatedly exposed to explosive detonations. Similar to the No Action Alternative, any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations.

ESA-listed seabirds are known to be present in areas where detonations would occur during training under Alternative 1. While the information known about seabird distribution limits the ability to quantify the impacts of explosions, the likelihood of an injurious exposure seems remote based on the very low density of seabirds and net explosive weight used. An exposure resulting in a short-term behavioral response would be more likely to occur than an exposure that causes injury.

Explosive detonations used during testing activities under Alternative 1 may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of explosive detonations during testing activities described under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.2.3 Alternative 2

Training Activities

The total number of explosive detonations throughout the Study Area would decrease by 15 percent under Alternative 2 (Table 3.0-9) as compared to the No Action Alternative. The detonations would include explosive source classes up to E13 (1,000 – 1,740 lb. net explosive weight). Training activities involving explosive detonations occur throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by HRC, SSTC, and the Transit Corridor. Training activities using explosives generally do not occur within 1.6 nm of shore or within 3 nm of bays, rivers, or estuaries except those used in the San Diego Bay and boat training lanes of SSTC (E1 - E7 [less than 60 lb. net explosive weight). Alternative 2 would introduce the use of high explosive rockets. The majority of these rockets would be used in the SOCAL Range Complex portions of the Study Area, with the remainder being used in the HRC portion of the Study Area, and none would be used in the SSTC portion of the Study Area. A more detailed description of these training activities and their proposed locations are presented in Tables 2.9-2 and 2.9-3 of Chapter 2.

Potential impacts on seabirds by explosive detonations are expected to be similar to those under the No Action Alternative, but the potential for exposure would decrease with lower number of explosive detonations. While some seabird mortalities could occur, only a small number of seabirds would be affected. Any impacts on seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term (behavioral) and infrequent and would not impact seabird or migratory bird populations. Repeated exposure of individual seabirds or groups of seabirds would be unlikely, based on the large operational area of the Study Area and the dispersed nature of the activities.

ESA-listed seabirds are known to be present in areas where detonations would occur during training under Alternative 2. While the information known about seabird distribution limits the ability to quantify the impacts of explosions, the likelihood of an injurious exposure seems remote based on the very low density of seabirds and smaller number of explosive detonations. An exposure resulting in a short-term behavioral response would be more likely to occur than an exposure that causes injury.

Explosive detonations used during training activities under Alternative 2 may affect, but are not likely to adversely affect ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of explosive detonations during training activities described under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Explosive detonations associated with testing activities under Alternative 2 would approximately triple as compared to the No Action Alternative. The detonations would include explosive source classes up to E11 (500 – 650 lb. net explosive weight) (see Table 3.0-9). However, the vast majority (14,727 of 15,043) of explosive detonations are explosive source class E1 – E4 (less than 5 lb. net explosive weight).Testing activities involving explosive detonations occur throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by the HRC. A more detailed description of these training activities and their proposed locations are presented in Tables 2.9-2 and 2.9-3 of Chapter 2.

Small detonations close to shore could have a short-term adverse impact on nesting and nearshore foraging species. Most larger detonations would occur near areas with the potential for relatively high concentrations of seabirds (upwelling areas associated with the Pacific Current; productive live/hard bottom habitats; and large algal mats); therefore, any impacts on seabirds are likely to be greater in these areas. However, under Alternative 1, only 282 explosive detonations are of explosive class source E5 or greater (greater than 5 lb. net explosive weight) (Table 3.0-9). While the impacts of explosive detonations on seabirds under Alternative 1 cannot be quantified due to limited data on seabird density, lethal injury to some seabirds could occur. Lethal injuries would likely be associated with explosive detonations with larger net explosive weights, although any event employing static targets may attract seabirds to the detonation site. While some seabird mortality could occur, the mortality potential is low, given the number of large net explosive weight detonations and the dispersed nature of seabirds in the study area. Because explosive detonations occur at varying locations over a short time period and seabird presence changes seasonally and on a short-term basis, individual seabirds would not be expected to be repeatedly exposed to explosive detonations. Similar to the No Action Alternative, any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations.

ESA-listed seabirds are known to be present in areas where detonations would occur during training under the No Action Alternative. While the information known about seabird distribution limits the ability to quantify the impacts of explosions, the likelihood of an injurious exposure seems remote based on the very low density of seabirds and net explosive weight used. An exposure resulting in a short-term behavioral response would be more likely to occur than an exposure that causes injury.

Explosive detonations used during testing activities under Alternative 2 may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the use of explosive detonations during testing activities described under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.3 Pile Driving

Acoustic sources from pile driving could occur within the SSTC portion of the Study Area during elevated causeway construction activities. During an elevated causeway event, a pier is constructed off of the beach. The pier is designed to allow for offload of materials and equipment from supply ships. Piles are driven into the sand with an impact hammer. Causeway platforms are then hoisted and secured onto the piles with hydraulic jacks and cranes. The elevated causeway pier, including associated piles, is removed at the conclusion of training. Noise associated with elevated causeway installation activities includes a loud impulsive sound derived from driving piles into the soft sandy substrate of the SSTC waters to temporarily support a causeway of linked pontoons.

Information regarding the impacts from acoustic sources on seabirds and the ability for seabirds to hear underwater is virtually unknown. The exposure to these sounds by seabirds, other than pursuit diving species, is likely to be very limited due to spending a very short time under water (plunge-diving or surface-dipping) or foraging only at the water surface. Pursuit divers may remain under water for minutes, increasing the chance of underwater sound exposure.

Responses to noise from pile driving would be limited to short-term behavioral or physiological responses (e.g., alert response, startle response, and temporary increase in heart rate). Startle or alert reactions to muzzle blasts are not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any seabirds. Birds may be temporarily displaced and there may be temporary increases in stress levels; however, behavior and use of habitat would return shortly after the training is complete. Beason (2004) notes that birds exposed to up to 146 A-weighted sound level (dBA) within 325 ft. (99.1 m) of the sound source flushed but then returned within minutes of the disturbance. The range of impacts could depend on the charge size, distance from the charge, and the seabird's life activity at the time of the exposure.

3.6.3.1.3.1 No Action Alternative, Alternative 1, and Alternative 2

Training Activities

Pile driving is associated with four training activities annually under the No Action Alternative, Alternative 1, and Alternative 2. Training activities involving pile driving is limited to the SSTC portion of the Study Area.

Nearshore waters are the primary foraging habitat for many seabird species. Noise from pile driving close to shore could have a short-term adverse impact on nesting and nearshore foraging species. However, human activity such as vessel or boat movement, and equipment setting and movement, could cause seabirds to flee the activity area before the onset of pile driving. If seabirds were in the activity area, they would likely flee the area prior to the release of military expended materials or just after the initial strike of the pile. In-air pile driving noise could elicit short-term behavioral or physiological responses but are not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any seabirds. Beason (2004) notes that birds exposed to up to 146 A-weighted sound level (dBA) within 325 ft. (99.1 m) of the sound source flushed but then returned within minutes of the disturbance. Pile driving noise is not expected to be at this sound level in air.

Information regarding the impacts from underwater pile driving noise on seabirds and the ability for seabirds to hear underwater is virtually unknown. The exposure to these sounds by seabirds, other than pursuit diving species, is likely to be very limited due to spending a very short time under water (plunge-diving or surface-dipping) or foraging only at the water surface. Pursuit divers may remain under water for minutes, increasing the chance of underwater sound exposure. Assuming that a seabird disturbed by an underwater sound would avoid the stressor by swimming to the surface, a physiological impact, such as hearing loss, would only occur if a seabird is close to an intense sound source. In general, birds are less susceptible to both temporary and permanent threshold shift than mammals (Saunders and Dooling 1974), so an underwater sound exposure would have to be intense and of a sufficient duration to cause temporary or permanent threshold shift. Avoiding the sound by returning to the surface would limit extended or multiple sound exposures underwater. Any impacts on migratory or breeding seabirds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent and would not impact seabird or migratory bird populations.

One ESA-listed seabird is known to be present in areas where pile driving would occur during training under the No Action Alternative, Alternative 1, or Alternative 2. California least terns could be exposed to intermittent pile driving noise during the approximate two week period of each elevated causeway event. However, during the elevated causeway activity, any impact based on displacement from the activity area would be minimized due to the availability of suitable foraging habitat in adjacent boat training lanes at SSTC. Further, an exposure resulting in a short-term behavioral response would only be expected if the seabirds did not leave the area prior to the start of the elevated causeway activity. Repeated exposure of individual seabirds is unlikely based on the seabird's capability to avoid or rapidly vacate an area of disturbance and availability of non-impacted foraging habitats.

Noise from pile driving events from training activities under all alternatives may affect, but is not likely to adversely affect, the ESA-listed California least tern. Noise from pile driving events from training activities under all alternatives would have no effect on the remaining ESA-listed seabirds in the Study Area.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from pile driving events during training activities under any alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under the No Action Alternative, Alternative 1, or Alternative 2, no pile driving events are planned during testing activities.

3.6.3.1.4 Vessel and Simulated Vessel Noise

The training and testing proposed in the Study Area involve maneuvers by various types of surface ships, boats, and submarines (collectively referred to as vessels). Birds could be exposed to noise from vessels throughout the Study Area, but few exposures would occur based on the infrequency of operations and the low density of vessels within the Study Area at any given time. However, if in the immediate area where vessels are operating, seabirds from any of the six taxonomic groups found within the Study Area (Table 3.6-2 and Table 3.6-3) could potentially be disturbed by vessel noise. Noise impacts on wildlife from recreational and commercial activities, vehicle traffic, and military training operations can include altering habitat use and activity patterns, increasing stress response, decreasing immune response, reducing reproductive success, increasing predation risk, degrading conspecific communication, and damaging hearing (Pater et al. 2009).

Birds respond to vessels in various ways. Some seabirds are commonly attracted to and follow vessels including certain species of gulls, storm petrels, and albatrosses (Hamilton 1958; Hyrenback 2001, 2006), while other species such as frigatebirds and sooty terns seem to avoid vessels (Borberg et al. 2005; Hyrenback 2006). Vessel noise could elicit short-term behavioral or physiological responses but are not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any seabirds. Beason (2004) notes that birds exposed to up to 146 A-weighted sound level (dBA) within 325 ft. (99.1 m) of the sound source flushed but then returned within minutes of the disturbance. Vessel noise is not expected to be at this sound level. Harmful seabird/vessel interactions are commonly associated with commercial fishing vessels because birds are attracted to concentrated food sources around these vessels (Melvin and Parrish 1999); Dietrich and Melvin 2004). The concentrated food sources that attract seabirds to commercial fishing vessels are not present around Navy vessels.

Although loud sudden noises can startle and flush birds, Navy vessels are not expected to result in major acoustic disturbance of seabirds in the Study Area. Noises from Navy vessels are similar to or less than those of the general maritime environment. Birds respond to the physical presence of a vessel, regardless of the associated noise. The potential is very low for noise generated by Navy vessels to impact seabirds and would not result in major impacts on seabird populations; therefore, this issue is not addressed further in the analysis of impacts on this resource.

Noise from vessel or simulated vessel noise from training and testing activities under all alternatives would have no effect on ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from vessels or simulated vessel noise during training or testing activities under any alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.5 Aircraft Noise

Fixed wing aircraft and helicopters are used for a variety of training and testing activities throughout the Study Area. Impacts of those activities on seabirds are applicable to everywhere in the Study Area that aircraft overflights occur, although some areas experience more aircraft activity than others. Various types of fixed-wing aircraft and helicopters are used in training and testing exercises throughout the Study Area (see Chapter 2, Description of Proposed Action and Alternatives). Seabirds and other migratory birds could be exposed to airborne noise associated with subsonic and supersonic fixed-wing aircraft overflights and helicopter operations while foraging or migrating in open water, near-shore, or coastal environments within the Pacific Ocean. If in an area where overflights are occurring, all taxonomic groups found within the Study Area (Table 3.6-2 and Table 3.6-3) could potentially be temporarily disturbed by aircraft noise.

Seabird exposure to fixed-wing aircraft noise would be brief (seconds) as an aircraft quickly passes overhead. Exposures would be infrequent based on the transitory and dispersed nature of the overflights; repeated exposure of individual seabirds over a short period of time (hours or days) is unlikely. If seabirds were to respond to an overflight, the responses would be limited to short-term behavioral or physiological reactions (e.g., alert response, startle response, temporary increase in heart rate), and the general health of individual seabirds would not be compromised. Birds repeatedly exposed to aircraft noise often become habituated to the noise and do not respond behaviorally (National Park Service 1994); (Larkin et al. 1996; Plumpton 2006). However, habituation seems unlikely in the Study Area given the widely dispersed nature of the operations and the relative infrequency of the operations.

Most fixed-wing aircraft flights occur at distances greater than 12 nautical miles (nm) offshore. Birds could be exposed to elevated noise levels while foraging or migrating in these open water environments, as well as in near-shore or coastal environments when aircraft flights occur in those areas. Most fixed-wing sorties would occur greater than 3,000 ft. (914.4 m) altitude and would be associated with air combat maneuver training and U.S. Navy Air Systems Command testing. Typical altitudes would range from 5,000 to 30,000 ft. (1,524 to 9,144km) and typical airspeeds would range from very low (less than 100 knots [kt]) to high subsonic (less than 600 kt). Sound exposure levels at the sea surface from most air combat maneuvers overflights are expected to be less than 85 dBA re 20 μPa, based on an F/A-18 aircraft flying at an altitude of 5,000 feet and at a subsonic airspeed of 400 knots (kt). Exceptions include sorties associated with air-to-surface ordnance delivery and sonobuoy drops from 500 to 5,000 ft. (152.4 to 1,524 m) altitude. Approximately 95 percent of bird flight during migrations occurs below 10,000 ft. (3,048 m) with the majority below 3,000 ft. (914.4 m) (U.S. Geological Survey 2006). While there is considerable variation, the favored altitude for most small birds appears to be between 500 and 1,000 ft. (152.4 and 304.8 m). Bird exposure to fixed-wing aircraft noise would be brief (seconds) as an aircraft quickly passes. Unlike the situation at a busy commercial airport or military landing field, repeated exposure of individual seabirds or groups of seabirds would be unlikely based on the dispersed nature of the overflights.

Some air combat maneuver training would involve high altitude, supersonic flight, which would produce sonic booms, but such airspeeds would be infrequent. Boom duration is generally less than 300 milliseconds. Sonic booms would cause seabirds to startle, but the exposure would be brief, and any reactions are expected to be short-term. Startle impacts range from altering behavior (e.g., stop feeding or preening), minor behavioral changes (e.g., head turning), or at worst, a flight response. Because most fixed-wing flights are not supersonic and both seabirds and aircraft are transient in any area, exposure of seabirds in the open ocean to sonic booms would be infrequent. It is unlikely that individual seabirds would be repeatedly exposed to sonic booms in the open ocean.

Unlike fixed-wing aircraft, helicopters typically operate below 1,000 ft. (304.8 m) altitude and often occur as low as 75–100 ft. (22.9–30.5 m) altitude. This low altitude increases the likelihood that seabirds would respond to noise from helicopter overflights. Helicopters travel at slower speeds (less than 100 kt) which increases durations of noise exposure compared to fixed-wing aircraft. In addition, some studies have suggested that birds respond more to noise from helicopters than from fixed-wing aircraft (Larkin et al. 1996; National Park Service 1994). Noise from low-altitude helicopter overflights would be expected to elicit short-term behavioral or physiological responses in exposed seabirds. Repeated exposure of individual seabirds or groups of seabirds is unlikely based on the dispersed nature of the overflights and seabird’s capability to avoid or rapidly vacate an area of disturbance. Therefore, the general health of individual seabirds would not be compromised.

3.6.3.1.5.1 No Action Alternative

Training Activities

Under the No Action Alternative, a variety of aircraft would be used throughout the Study Area, as described in Tables 2.8-1 through 2.8-5, Description of Proposed Action and Alternatives. Under the No Action Alternative, 10,896 fleet training activities utilize some type of aircraft ranging from fixed-wing aircraft to helicopters. The highest concentrations of aircraft noise would be associated with the greater number of flights in the SOCAL Range Complex compared to other portions of the Study Area, although training flights occur in each range complex and outside of the range complexes. These activities involve low-flying aircraft as part of training. Most of the helicopter training operations occur at low altitudes (75 to 100 ft. [22.9 to 30.5 m]), which increases the exposure of seabirds to their noise. Takeoffs and landings occur at established airfields and on vessels at sea at unspecified locations throughout the Study Area. Aircraft noise under the No Action Alternative could elicit short-term behavioral or physiological responses in some individual seabirds. Helicopter overflights are more likely to elicit responses than fixed-wing aircraft, but the general health of individual seabirds would not be compromised.

Navy aircraft training activities over the Pacific Ocean are concentrated near the continental shelfs and surrounding islands, removed from seabird nesting areas. Seabirds that forage in these areas may have greater presence in these productive areas, so aircraft overflights may cause more behavioral disturbances in these areas. A seabird in the open ocean would be exposed for a few seconds to fixed-wing aircraft noise as the aircraft quickly passes overhead. Seabirds foraging or migrating through a training area in the open ocean may respond by avoiding areas of concentrated aircraft noise. Exposures to seabirds would be infrequent, based on the brief duration and dispersed nature of the overflights. Repeated exposure to individual seabirds over hours or days is unlikely. Startle or alert reactions to aircraft are not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any seabirds. While behavioral or physiological impacts of airborne activity on individual seabirds may occur, none of these impacts are long-lasting, and none are expected to have an adverse impact on seabirds at the population level.

Birds using wetlands, mud flats, beaches, and other shoreline habitats or shallow coastal foraging areas would be exposed to noise from near-shore helicopter training and aircraft in transit to off-shore training areas. The presence of dense aggregations of seabirds (terns) is a potential concern during low-attitude helicopter operations. Although seabirds may be more likely to react to helicopters than to fixed-wing aircraft, Navy helicopter pilots would avoid large flocks of seabirds to protect aircrews and equipment, thereby reducing disturbance to seabirds as well.

California least terns could be exposed to intermittent aircraft noise from aircraft originating from airfields located along the coast. If present in the open water areas where training activities involving aircraft overflights occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Short-term behavioral responses such as startle responses, head turning, or flight responses would be expected. Repeated exposures would be limited due to the transient nature of aircraft use and regular movement of seabirds. No long-term or population-level impacts are expected.

Noise from aircraft during training activities under the No Action Alternative may affect, but is not likely to adversely affect ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from aircraft during training activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under the No Action Alternative, approximately 840 testing activities involve the use of some type of aircraft ranging from fixed-wing aircraft to helicopters. Testing activities involving aircraft closely resemble training activities and would therefore have similar aircraft noise impacts.

California least terns could be exposed to intermittent aircraft noise from aircraft originating from airfields located along the coast. If present in the open water areas where testing activities involving aircraft overflights occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Short-term behavioral responses such as startle responses, head turning, or flight responses would be expected. Repeated exposures would be limited due to the transient nature of aircraft use and regular movement of seabirds. No long-term or population-level impacts are expected.

Noise from aircraft during testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from aircraft during testing activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.5.2 Alternative 1

Training Activities

Under Alternative 1, the total number of training activities involving aircraft throughout the Study Area would increase 13.2 percent over the No Action Alternative from 10,896 to 12,334 activities, with the highest increase in aircraft training events occurring in the SOCAL Range Complex portion of the Study Area (7,568 to 8,987 activities). The locations and types of aircraft would not differ from the No Action Alternative, as described in Tables 2.8-1 through 2.8-5, Description of Proposed Action and Alternatives.

The additional aircraft hours would increase noise overall but would not change the nature of the short-term reversible impacts described for the No Action Alternative.

Based on the increased training operations under Alternative 1, more seabirds could be exposed to noise; the number of times an individual seabird is exposed could also increase. Similar to the No Action Alternative, the responses would be limited to short-term behavioral or physiological reactions, and the general health of individual seabirds would not be compromised. While behavioral or physiological impacts of airborne activity on individual seabirds may occur, none of these impacts are long-lasting, and none are expected to have an adverse impact on migratory seabirds at the population level.

California least terns could be exposed to intermittent aircraft noise from aircraft originating from airfields located along the coast. If present in the open water areas where training activities involving aircraft overflights occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Short-term behavioral responses such as startle responses, head turning, or flight responses would be expected. Repeated exposures would be limited due to the transient nature of aircraft use and regular movement of seabirds. No long-term or population-level impacts are expected.

Noise from aircraft during training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from aircraft during training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under Alternative 1, the total number of testing activities involving aircraft throughout the Study Area would increase approximately 12 percent over the No Action Alternative from 840 to 941 annual events. The locations and types of aircraft would not differ from the No Action Alternative, as described in Tables 2.8-1 through 2.8-5, Description of Proposed Action and Alternatives. The additional aircraft activities would increase noise overall but would not change the nature of the short-term reversible impacts described for the No Action Alternative.

Based on the increased testing operations under Alternative 1, more seabirds could be exposed to noise; the number of times an individual seabird is exposed could also increase. Similar to the No Action Alternative, the responses would be limited to short-term behavioral or physiological reactions, and the general health of individual seabirds would not be compromised. While behavioral or physiological impacts of airborne activity on individual seabirds may occur, no long-term or population level impacts are expected.

California least terns could be exposed to intermittent aircraft noise from aircraft originating from airfields located along the coast. If present in the open water areas where testing activities involving aircraft overflights occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Short-term behavioral responses such as startle responses, head turning, or flight responses would be expected. Repeated exposures would be limited due to the transient nature of aircraft use and regular movement of seabirds. No long-term or population-level impacts are expected.

Noise from aircraft during testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from aircraft during testing activities Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.5.3 Alternative 2

Training Activities

Under Alternative 2, the total number of training activities involving aircraft throughout the Study Area would increase 13.2 percent over the No Action Alternative from 10,896 to 12,334 activities, with the highest increase in aircraft training events occurring in the SOCAL Range Complex portion of the Study Area (1,568 to 8,987 activities). The locations and types of aircraft would not differ from the No Action Alternative, as described in Tables 2.8-1 through 2.8-5, Description of Proposed Action and Alternatives. The additional aircraft hours would increase noise overall but would not change the nature of the short-term reversible impacts described for the No Action Alternative.

Noise from aircraft during training activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from aircraft during training activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under Alternative 2, the total number of testing activities involving aircraft throughout the Study Area would increase over the No Action Alternative from 840 to 941 annual events. The locations and types of aircraft would not differ from the No Action Alternative, as described in Tables 2.8-1 through 2.8-5, Description of Proposed Action and Alternatives. The additional aircraft activities would increase noise overall but would not change the nature of the short-term reversible impacts described for the No Action Alternative.

Based on the increased testing operations under Alternative 2, more seabirds could be exposed to noise; the number of times an individual seabird is exposed could also increase. Similar to the No Action Alternative, the responses would be limited to short-term behavioral or physiological reactions, and the general health of individual seabirds would not be compromised. While behavioral or physiological impacts of airborne activity on individual seabirds may occur, no long-term population level.

Noise from aircraft activities during testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from noise from aircraft during testing activities Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.1.6 Summary of Impacts of Acoustic Stressors

Under the No Action Alternative, Alternative 1, or Alternative 2, noise from sonar, explosive detonations, pile driving, vessel noise, and aircraft noise would be expected to elicit brief behavioral or physiological responses in exposed seabirds. Repeated exposure of individual seabirds or groups of seabirds would be unlikely, based on the large operational area of the Study Area and the dispersed nature of the overflights, and the ability to easily avoid or rapidly vacate the action area. The general health of individual seabirds would not be compromised. Birds could be exposed to elevated noise levels while foraging or migrating, but would only be exposed to potentially disturbing levels of noise during low altitude helicopter or fixed wing exercises, especially in nearshore areas, or when in immediate proximity of an in-air explosion, firing event, or underwater detonation. Transiting seabirds or those resting on the water may be startled and also experience concussive injury from in-air explosions, firing events, or underwater detonations. However, protective measures, such as restricting activities to when seabirds are absent from the immediate vicinity of an underwater detonation training or testing activity, are implemented prior to and during these activities to minimize impacts on seabirds from these activities. Individual seabirds may be affected, but in-air explosions, firing events, or underwater detonations would have no impact on species or populations due to (1) the vast area over which training activities occur, (2) the implementation of Navy resource protection measures, (3) the ability of seabirds to flee disturbance.

3.6.3.2 Energy Stressors

This section analyzes the potential impacts of the various types of energy stressors that can occur during training and testing activities within the Study Area. This section includes analysis of the potential impacts from electromagnetic devices.

3.6.3.2.1 Impacts from Electromagnetic Devices

Several different types of electromagnetic devices are used during training and testing activities throughout the Study Area, as described in Chapter 2, Description of Proposed Action and Alternatives. Electromagnetic training and testing activities include an array of magnetic sensors used in mine countermeasure operations in the Study Area. Some electromagnetic devices such as a vessel radar and radio are devices that could impact seabirds above the water. Towed electromagnetic device impacts to seabirds would only occur underwater and would only impact diving species or species on the surface in the immediate area where the device is deployed. There is no information available on how birds react to electromagnetic fields underwater.

Electromagnetic devices are used primarily in towed-mine neutralization and port security training. Similar testing activities include the use of electromagnetic devices (e.g., mine detection/neutralization and electromagnetic activities [Littoral Combat Ship mission package testing, unmanned and autonomous surface/underwater vehicle testing, etc.]). The kinetic energy weapon is also included as an electromagnetic testing activity. In most cases, such as mine detection/neutralization, the device simply mimics the electromagnetic signature of a vessel passing through the water. None of the devices emit any type of electromagnetic “pulse.”

Potential impacts of those activities on seabirds are applicable to everywhere in the Study Area that electromagnetic devices are used. Electromagnetic devices used in Navy training and testing activities may potentially impact seabird navigation through disruption of electromagnetic fields. Birds use numerous other orientation cues to navigate in addition to magnetic fields. These include position of the sun, celestial cues, visual cues, wind direction, and scent (Fisher 1971, Haftorn et al. 1988, Wiltschko and Wiltschko 2005, Åkesson and Hedonström 2007). It is believed that by using a combination of these cues birds are able to successfully navigate long distances.

It has been demonstrated that some seabirds use the Earth's magnetic field as a navigational cue during seasonal migrations (Fisher 1971, Wiltschko and Wiltschko 2005, Åkesson and Hedonström 2007). A magnetite-based receptor mechanism in the upper bill of some birds provides information on position and compass direction (Wiltschko and Wiltschko 2005). Electromagnetic devices send out electromagnetic signals into the environment that seabirds could potentially detect and respond to.

Studies have been conducted on electromagnetic sensitivity in birds typically associated with land, though little information exists specifically on seabird response to electromagnetic changes at sea. Results from a study conducted by Larkin and Sutherland (1977) show that during nocturnal flights, birds are capable of sensing electromagnetic fields emitted from antenna in Wisconsin used for the Navy's Project Seafarer. A study conducted by Hanowski et al. (1993) on the effects of extremely low frequency electromagnetic fields on breeding and migrating birds around the Navy's extra low frequency communication system antenna in Wisconsin found no evidence that bird distribution or abundance was affected by electromagnetic fields produced by the antenna.

Possible effects on birds from disrupting electromagnetic fields include behavioral responses such as temporary disorientation and change in flight direction (Larkin and Sutherland 1977, Wiltschko and Wiltschko 2005). Many bird species return to the same stopover, wintering, and breeding areas every year and often follow the exact same or very similar migration routes (Åkesson 2003, Alerstam et al. 2006). However, ample evidence exists that displaced birds can successfully reorient and find their way when one or more cues are removed (Haftorn et al. 1988, Åkesson 2003). For example, Haftorn et al. (1988) found that after removal from their nests and release into a different area, snow petrels (*Pagodrama nivea*) were able to successfully navigate back to their nests even when their ability to smell was removed. Furthermore, Wiltschko and Wiltschko (2005) report that electromagnetic pulses administered to birds during an experimental study on orientation do not deactivate the magnetite-based receptor mechanism in the upper beak altogether, but instead cause the receptors to provide altered information, which in turn causes birds to head in different directions. However, these effects were temporary and the ability of the birds to correctly orient themselves returned after a few days.

3.6.3.2.1.1 No Action Alternative

<u>Training Activities</u>

Under the No Action Alternative, electromagnetic activities are planned as described in Tables 2.8-1, Description of Proposed Action and Alternatives. Training activities that include an electromagnetic component include anti-air warfare and electronic warfare.

The distribution of seabirds in the Study Area is patchy (Fauchald et al. 2002; Schneider and Duffy 1985). Exposure of seabirds would be limited to those foraging at or below the surface (e.g., cormorants, loons, petrels, grebes, etc.) because that is where the devices are used. Birds that forage inshore could be exposed to these electromagnetic stressors because their habitat overlaps with some of the activities that occur in the nearshore portions of SOCAL Range Complex and SSTC. However, the electromagnetic fields generated would be distributed over time and location, and any influence on the surrounding environment would be temporary and localized. More importantly, the electromagnetic devices used are typically towed by a helicopter and it is likely that any seabirds in the vicinity of the approaching helicopter would be dispersed by the sound and disturbance generated by the helicopter (see Section 3.6.3.1.5 [Aircraft Noise]) and move away from the device before any exposure could occur.

In the unlikely event that a seabird is temporarily disoriented by an electromagnetic device, it would still be able to re-orient using their internal magnetic compass to aid in navigation (Wiltschko et al. 2011).

California least terns could be exposed to intermittent electromagnetic stressors in nearshore areas where training activities occur. If present in the open water areas where training activities involving electromagnetic stressors occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Impacts on seabirds from potential exposure to electromagnetic fields would be temporary and inconsequential based on: (1) relatively low intensity of the magnetic fields generated (0.2 microtesla at 656 ft. [200 m] from the source), (2) very localized potential impact area, (3) temporary duration of the activities (hours), and (4) occurring only underwater. No long-term or population-level impacts are expected.

Electromagnetic devices used during training activities under the No Action Alternative may affect, but are not likely to adversely affect, ESA-listed seabirds.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from electromagnetic devises used during training activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under the No Action Alternative, electromagnetic activities are planned as described in Tables 2.8-2 through 2.8-5, Description of Proposed Action and Alternatives.

For reasons stated in Section 3.6.3.2.1 (No Action Alternative), any behavioral changes are not expected to have lasting effects on the survival, growth, recruitment, or reproduction of seabird populations. California least terns could be exposed to intermittent electromagnetic stressors in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving electromagnetic stressors occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Any temporary disorientation experienced by seabirds from electromagnetic changes caused by testing activities in the Study Area may be considered a short-term impact and would not hinder seabird navigation abilities. Repeated exposures would be limited due to the transient nature of the testing activities using electromagnetic devices and regular movement of seabirds. No long-term or population-level impacts are expected.

Electromagnetic devices used during testing activities under the No Action Alternative may affect, but are not likely to adversely affect, ESA-listed seabirds.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from electromagnetic devises used during testing activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.2.1.2 Alternative 1

Training Activities

The number of electromagnetic activities proposed for the Study Area under Alternative 1 each year does not increase from the No Action Alternative, as described in Tables 2.8-1 of Chapter 2, Description of Proposed Action and Alternatives. Therefore, the impacts on seabirds from activities performed during Alternative 1 would be the same as for the No Action Alternative.

Electromagnetic devices used during training activities under Alternative 1 may affect, but are not likely to adversely affect, ESA-listed seabirds.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from electromagnetic devises used during training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

The number of electromagnetic activities proposed for the Study Area under Alternative 1 each year increases from the No Action Alternative by less than one percent, as described in Tables 2.8-1 of Chapter 2, Description of Proposed Action and Alternatives. Under Alternative 1, kinetic energy weapon testing would be introduced in the HRC portion of the Study Area, with 200 events per year. The electromagnetic kinetic energy weapon uses electrical energy to accelerate projectiles to supersonic velocities. The kinetic energy weapon would be operated from ships, firing projectiles toward land targets.

This unique weapons system charges for approximately two minutes and discharges in less than a second. The duration of the firing event is extremely short (about 8 milliseconds [ms]), which makes it quite unlikely that a seabird would fly over at the precise moment of firing. The short duration of each firing event also means that the likelihood of affecting any animal using magnetic fields for orientation is extremely small. Further, the high magnetic field levels experienced within 80 ft. (24.4 m) of the launcher quickly dissipate and return to background levels beyond 80 ft. (24.4 m) The magnetic field levels outside of the 80-ft. (24.4-m) buffer zone would be below the most stringent guidelines for humans (i.e., people with pacemakers or AIMD). Therefore, the electromagnetic impacts would be temporary in nature and not expected to result in impacts on organisms (U.S. Department of the Navy 2009).

The increase in activities and introduction of activities would not measurably increase the probability of seabirds being exposed to electromagnetic energy as compared to the No Action Alternative. The species and groups with potential to co-occur with these activities remain the same and potential impacts would be temporary and inconsequential, as discussed above for the No Action Alternative.

California least terns could be exposed to intermittent electromagnetic stressors in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving electromagnetic stressors occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be temporarily disturbed while foraging or migrating. Any temporary disorientation experienced by seabirds from electromagnetic changes caused by testing activities in the Study Area may be considered a short-term impact and would not hinder seabird navigation abilities. Repeated exposures would be limited due to the transient nature of the testing activities using electromagnetic devices and regular movement of seabirds. For reasons stated in Section 3.6.3.2.1 (No Action Alternative, Testing Activities), any behavioral changes are not expected to have lasting effects on the survival, growth, recruitment, or reproduction of seabird populations. No long-term or population-level impacts are expected.

Electromagnetic devices used during testing activities under Alternative 1 may affect, but are not likely to adversely affect, ESA-listed seabirds.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from electromagnetic devises used during testing activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.2.1.3 Alternative 2

Training Activities

The number of electromagnetic activities proposed for the Study Area under Alternative 2 each year does not increase from the No Action Alternative, as described in Tables 2.8-1 of Chapter 2, Description of Proposed Action and Alternatives. Therefore, the impacts on seabirds from activities performed during Alternative 2 would be the same as for the No Action Alternative.

Electromagnetic devices used during training activities under Alternative 2 may affect, but are not likely to adversely affect, ESA-listed seabirds.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from electromagnetic devises used during training activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

The number of electromagnetic activities proposed for the Study Area under Alternative 2 each year increases less than one percent from the No Action Alternative, as described in Tables 2.8-1 of Chapter 2, Description of Proposed Action and Alternatives. Under Alternative 2, kinetic energy weapon testing would be introduced in the HRC portion of the Study Area, with 200 events per year. The electromagnetic kinetic energy weapon uses electrical energy to accelerate projectiles to supersonic velocities. The kinetic energy weapon would be operated from ships, firing projectiles toward land targets.

This unique weapons system charges for approximately two minutes and discharges in less than a second. The duration of the firing event is extremely short (about 8 ms), which makes it quite unlikely that a seabird would fly over at the precise moment of firing. The short duration of each firing event also means that the likelihood of affecting any animal using magnetic fields for orientation is extremely small. Further, the high magnetic field levels experienced within 80 ft. (24.4 m) of the launcher quickly dissipate and return to background levels beyond 80 ft. (24.4 m). The magnetic field levels outside of the 80-ft. (24.4-m) buffer zone would be below the most stringent guidelines for humans (i.e., people with pacemakers or AIMD). Therefore, the electromagnetic impacts would be temporary in nature and not expected to result in impacts on organisms (U.S. Department of the Navy 2009).

The increase in activities and introduction of activities would not measurably increase the probability of seabirds being exposed to electromagnetic energy as compared to the No Action Alternative. The species and groups with potential to co-occur with these activities remain the same and potential impacts would be temporary and inconsequential, as discussed above for the No Action Alternative.

California least terns could be exposed to intermittent electromagnetic stressors in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving electromagnetic stressors occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell’s shearwater could be temporarily disturbed while foraging or migrating. Any temporary disorientation experienced by seabirds from electromagnetic changes caused by testing activities in the Study Area may be considered a short-term impact and would not hinder seabird navigation abilities. Repeated exposures would be limited due to the transient nature of the testing activities using electromagnetic devices and regular movement of seabirds. For reasons stated in Section 3.6.3.2.1 (No Action Alternative, Testing Activities), any behavioral changes are not expected to have lasting effects on the survival, growth, recruitment, or reproduction of seabird populations. No long-term or population-level impacts are expected.

Electromagnetic devices used during testing activities under Alternative 2 may affect, but are not likely to adversely affect, ESA-listed seabirds.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from electromagnetic devises used during testing activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.2.2 Summary of Impacts of Energy Stressors

The impact of electromagnetic devices on seabirds is expected to be negligible based on (1) the limited geographic area in which they are used, (2) the rare chance that an individual seabird might encounter these devices in use, (3) the startle behavior of seabirds and the mobility of seabirds to temporarily leave the area when the devices are in use, and (4) the absence of physiological damage and the temporary nature of any impacts if an individual seabird encountered these devices.

The impacts of electromagnetic devices would be limited to individual cases where a seabird might become temporarily disoriented and change flight direction. Although individuals may be temporarily impacted, these behaviors would have no direct impact at the population level.

3.6.3.3 Physical Disturbance and Strike Stressors

This section describes the potential impacts to seabirds by aircraft and aerial target strikes, vessels (disturbance and strike), and military expended material strike. Aircraft include fixed-wing and rotary-wing aircraft; vessels include various sizes and classes of ships, submarines, and other boats, towed devices, unmanned surface vehicles, and unmanned underwater vehicles; military expended material includes non-explosive practice munitions, target fragments, parachutes, and other objects.

Physical disturbance and strike risks, primarily from aircraft, have the potential to impact all taxonomic groups found within the Study Area if seabirds are in the same area with aircraft, vessels, and military expended material. Impacts of physical disturbance include behavioral responses such as temporary disorientation, collision, change in flight direction, and avoidance response behavior. Physical disturbances may elicit short-term behavioral or physiological responses such as alert response, startle response, cessation of feeding, fleeing the immediate area, and a temporary increase in heart rate. These disturbances can also result in abnormal behavioral, growth, or reproductive impacts in nesting seabirds and can cause foraging and nesting seabirds to flush from or abandon their habitats and or nests. Aircraft strikes often result in bird mortalities or injuries.

Although seabirds likely hear and see approaching vessels and aircraft, they cannot avoid all collisions. Birds are known to be attracted to lights which can lead to collisions (Gehring et al. 2009; Poot et al. 2008). High-speed collisions with large objects can be fatal to birds. Training and testing activities around concentrated numbers of seabirds would cause greater disturbance and increase the potential for strikes.

3.6.3.3.1 Aircraft and Aerial Target Strikes

Wildlife aircraft strikes are a grave concern for the Navy because they can harm aircrews. Wildlife aircraft strikes can also damage equipment, and injure or kill wildlife (Bies et al 2006). The Naval

Aviation Safety Program Instruction, Chief of Naval Operations Instruction 3750.6R, identifies measures to evaluate and reduce or eliminate bird/aircraft strike hazards to aircraft, aircrews, and birds and requires the reporting of all strikes when damage or injuries occur as a result of a bird/aircraft strike. However, the numbers of bird deaths that occur annually from all Navy activities are insignificant from a bird population standpoint From 2000 to 2009, the Navy Bird Aircraft Strike Hazard program recorded 5,436 bird strikes with the majority occurring during the fall period from September to November. During the 10-year period, bird strikes were greatest in 2007 with 827 strikes and lowest in 2001 with 48. Bird strike potential is greatest in foraging or resting areas, in migration corridors, and at low altitudes. For example, birds can be attracted to airports because they often provide foraging and nesting resources.

While bird strikes can occur anywhere aircraft are operated, Navy data indicate that they occur most often over land or close to shore. The potential for bird strikes to occur in offshore areas is relatively low because Navy activities are widely dispersed and above 3,000 ft. (914.4 m) (for fixed-wing aircraft) where bird densities are low. The majority of bird flight is below 3,000 ft. (914.4 m) and approximately 95 percent of bird flight during migrations occurs below 10,000 ft. (3,048 m) (U.S. Geological Survey 2006). Bird and aircraft encounters are more likely to occur during aircraft takeoffs and landings than when the aircraft is engaged in level low-altitude flight. Approximately 97 percent of aircraft-wildlife collisions occur at or near airports when aircraft are operating at or below 2,000 ft. (609.6 m). In a study that examined 38,961 bird and aircraft collisions, Dobson (2010) found that the majority (74 percent) of collisions occurred below 500 ft. (152.4 m). However, collisions have been recorded at elevations as great as 12,139 ft. (3,699.9 m) (Dobson 2010).

3.6.3.3.1.1 No Action Alternative

Training Activities

Various types of fixed-wing aircraft and helicopters are used in training throughout the Study Area, (see Tables 2.8-1 through 2.8-5). Certain portions of the Study Area, such as areas near Navy airfields, installations, and ranges are used more heavily by Navy aircraft than other portions as described in further detail in Tables 2.8-2 to 2.8-3 in Chapter 2 (Description of Proposed Action and Alternatives). Under the No Action Alternative, approximately 10,896 activities involve the use of aircraft. Flight altitudes for all fixed-wing activities would be above 3,000 ft. (914.4 m) mean sea level with the exception of sorties associated with air-to-surface bombing exercises. Typical flight altitudes during air-to-surface bombing exercises are from 500 to 5,000 ft. (152.4 to 1,524 m) above mean sea level. Most fixed-wing aircraft flight hours (greater than 90 percent) occur at distances greater than 12 nm offshore. Most of the helicopter training operations occur at low altitudes (75 to 100 ft.) (22.9 to 30.5 m), which increases the exposure of seabirds.

In general, seabird populations consist of hundreds or thousands of individuals, ranging across a large geographical area. In this context, the loss of several or even dozens of birds due to physical strikes may not constitute a population-level impact, although some species gather in large flocks. Some bird strikes and associated bird mortalities or injuries could occur as a result of aircraft and aerial target use in the Study Area under the No Action Alternative; however, population-level impacts to seabirds would not likely result from aircraft strikes. If in the immediate area where aircraft are operating at low altitudes, ESA-listed species could be impacted by aircraft disturbance and strike during migration.

Bird exposure to strike potential would be relatively brief as an aircraft quickly passes. Birds actively avoid interaction with aircraft; however, disturbances or strike of various bird species may occur from aircraft on a site-specific basis. As a standard operating procedure, aircraft avoid large flocks of birds to minimize the personnel safety risk involved with a potential bird strike. Some seabird and aircraft strikes and associated seabird mortalities or injuries could occur in the Study Area under the No Action Alternative; however, no increased risk of impacts on seabird populations would result from aircraft strikes. No long-term or population-level impacts are expected.

California least terns could be exposed to intermittent aircraft overflights and strike potential in nearshore areas where training activities occur. If present in the open water areas where training activities involving aircraft occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be briefly exposed to strike potential. However, the data that Navy has collected on bird strikes reports that no ESA-listed species have been struck in the past, so it is not likely they would be struck by aircraft or aerial targets during training activities.

Aircraft used during training activities under the No Action Alternative may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from aircraft used during training activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under the No Action Alternative, a total of approximately 1,019 testing activities are planned using fixed wing aircraft and helicopters. These aircraft would be used in all portions of the Study Area.

In general, seabird populations consist of hundreds or thousands of individuals, ranging across a large geographical area. In this context, the loss of several or even dozens of birds due to physical strikes may not constitute a population-level impact, although some species gather in large flocks. Strikes to species listed under the ESA may have more impact because the population size has already been reduced to near or below sustainable levels.

Seabird exposure to strike potential would be relatively brief as an aircraft quickly passes. Seabirds actively avoid interaction with aircraft; however, disturbances of various seabird species may occur from aviation operations on a site-specific basis. As a standard operating procedure, aircraft avoid large flocks of birds to minimize the safety risk involved with a potential bird strike. Some seabird and aircraft strikes and associated seabird mortalities or injuries could occur in the Study Area under the No Action Alternative; however, the potential impacts from aircraft testing activities would be the same as for Training activities, albeit at a lesser degree.

California least terns could be exposed to intermittent aircraft overflights and strike potential in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving aircraft occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be briefly exposed to strike potential. However, the data that Navy has collected on bird strikes reports that no ESA-listed species have been struck in the past, so it is not likely they would be struck by aircraft or aerial targets during testing activities.

Aircraft used during testing activities under the No Action Alternative may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from aircraft used during testing activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.1.2 Alternative 1

Training Activities

Under Alternative 1, the number of training activities involving aircraft in the Study Area would increase by 1,438 activities as compared to the No Action Alternative, for a total of 12,334 activities involving aircraft, potentially leading to an increase in aircraft and aerial disturbance and strikes in some portions of the Study Area, as described in Table 2.8-1, Description of Proposed Action and Alternatives. While bird strikes can occur anywhere aircraft are operated, Navy data indicate that they occur most often over land or close to shore. The potential for seabird strikes to occur in offshore areas is relatively low because Navy activities are widely dispersed and above 3,000 ft. (914.4 m) (for fixed-wing aircraft) where seabird densities are low. Because seabird exposure to aircraft disturbance and strikes would be relatively brief and infrequent, no major impacts on seabirds would result from aircraft strikes. Furthermore, protective measures, such as avoiding large flocks of birds to minimize the safety risk involved with a potential bird strike, minimize impacts on seabirds (Chapter 5, Mitigation).

California least terns could be exposed to intermittent aircraft overflights and strike potential in nearshore areas where training activities occur. If present in the open water areas where training activities involving aircraft occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be briefly exposed to strike potential. However, the data that Navy has collected on bird strikes reports that no ESA-listed species have been struck in the past, so it is not likely they would be struck by aircraft or aerial targets during training activities.

Aircraft used during training activities under Alternative 1 may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from aircraft used during training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under Alternative 1, the number of testing activities involving aircraft in the Study Area would increase by 373 activities as compared to the No Action Alternative, for a total of 1,392 activities involving aircraft, potentially leading to an increase in aircraft and aerial disturbance and strikes in some portions of the Study Area, as described in Tables 2.8-2 through 2.8-5, Description of Proposed Action and Alternatives. As described for the No Action Alternative, because seabird exposure to aircraft disturbance and strikes would be relatively brief and infrequent, no major impacts on seabirds would result from aircraft strikes. Furthermore, protective measures, such as avoiding large flocks of birds to minimize the safety risk involved with a potential seabird strike, minimize impacts on seabirds (Chapter 5, Mitigation).

California least terns could be exposed to intermittent aircraft overflights and strike potential in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving aircraft occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be briefly exposed to strike potential. However, the data that Navy has collected on bird strikes reports that no ESA-listed species have been struck in the past, so it is not likely they would be struck by aircraft or aerial targets during testing activities.

Aircraft used during testing activities under Alternative 1 may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from aircraft used during testing activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.1.3 Alternative 2

Training Activities

Under Alternative 2, the number of training activities involving aircraft in the Study Area would increase by 1,438 activities as compared to the No Action Alternative, for a total of 12,334 activities involving aircraft, potentially leading to an increase in aircraft and aerial disturbance and strikes in some portions of the Study Area, as described in Table 2.8-1, Description of Proposed Action and Alternatives. as described for the No Action Alternative, because seabird exposure to aircraft disturbance and strikes would be relatively brief and infrequent, no major impacts on seabirds would result from aircraft strikes. Furthermore, protective measures, such as avoiding large flocks of birds to minimize the safety risk involved with a potential seabird strike, minimize impacts on seabirds (Chapter 5, Mitigation).

California least terns could be exposed to intermittent aircraft overflights and strike potential in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving aircraft occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be briefly exposed to strike potential. However, the data that Navy has collected on bird strikes reports that no ESA-listed species have been struck in the past, so it is not likely they would be struck by aircraft or aerial targets during testing activities.

Aircraft used during training activities under Alternative 2 may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from aircraft used during training activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under Alternative 2, the number of testing activities involving aircraft in the Study Area would increase by 519 activities as compared to the No Action Alternative, for a total of 1,538 activities involving aircraft, potentially leading to an increase in aircraft and aerial disturbance and strikes in some portions of the Study Area, as described in Tables 2.8-2 through 2.8-5, Description of Proposed Action and Alternatives. However, as described for the No Action Alternative, because seabird exposure to aircraft disturbance and strikes would be relatively brief and infrequent, no major impacts on seabirds would result from aircraft strikes. Furthermore, protective measures, such as avoiding large flocks of birds to minimize the safety risk involved with a potential seabird strike, minimize impacts on seabirds (Chapter 5, Mitigation).

California least terns could be exposed to intermittent aircraft overflights and strike potential in nearshore areas where testing activities occur. If present in the open water areas where testing activities involving aircraft occur, Hawaiian petrel, short-tailed albatross, marbled murrelet or Newell's shearwater could be briefly exposed to strike potential. However, the data that Navy has collected on bird strikes reports that no ESA-listed species have been struck in the past, so it is not likely they would be struck by aircraft or aerial targets during testing activities.

Aircraft used during testing activities under Alternative 2 may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from aircraft used during testing activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.2 Vessel and In-water Device Strikes

Several different types of vessels (ships, submarines, boats) and in-water devices (towed devices, unmanned underwater vehicles) are used during training and testing activities throughout the Study Area, as described in Chapter 2, Description of Proposed Action and Alternatives. Potential impacts of those activities on seabirds are applicable to everywhere in the Study Area that vessels and in-water devices are used. Training and testing activities within the Study Area involve maneuvers by various types of surface ships, boats, and submarines. The number of Navy ships and smaller vessels in the Study Area varies based on training schedules. Activities involving vessel movements occur intermittently, ranging from a few hours to a few weeks. Events involving large vessels are widely spread over the open ocean, while smaller vessels are more active and more concentrated in nearshore areas.

Vessel transit speed of various types of Navy vessels ranges from 10 to 20 kt). During training, speeds generally range from 10 to 14 kt; however, vessels can and will on occasion operate within the entire spectrum of their specific operational capabilities. It is necessary for vessels to operate at higher speeds during specific events, such as pursuing and overtaking hostile vessels, taking evasive maneuvers, and performing maintenance and performance checks, such as in ship trials. During these events, vessels may often operate at the high end of the vessel's speed capability.

In addition to vessels, mine warfare devices that are towed through the water and remotely operated vehicles used during mine neutralization training could also strike seabirds. No documented instances of seabirds being struck by towed devices have occurred in the Study Area. Additionally, based on the low altitudes and relatively slow air speeds, seabirds would be able to detect and avoid the aircraft and cables that connect the aircraft to the towed device.

Impacts would be the physiological and behavioral disturbance from a vessel. Birds respond to moving vessels in various ways. Some species, such as gulls and albatross, commonly follow vessels (Hamilton 1958; Hyrenback 2001, 2006), while other species, such as plovers and curlews, seem to avoid vessels (Borberg et al. 2005; Hyrenback 2006). There could be a slightly increased risk of impacts during the winter, or fall/spring migrations when migratory birds are concentrated in coastal areas. However, despite this concentration, most birds would still be able to avoid collision with a vessel. Vessel movements could elicit brief behavioral or physiological responses, such as alert response, startle response, or fleeing the immediate area. Such responses typically conclude as rapidly as they occur. However, the general health of individual seabirds would not be compromised.

The possibility of collision with an aircraft carrier or surface combatant vessels (or a vessel's rigging, cables, poles, or masts) could increase at night, especially during inclement weather. Birds can become disoriented at night in the presence of artificial light (Black 2005), and lighting on vessels may attract some birds (Hunter et al. 2006b), increasing the potential for harmful encounters. Lighting on boats and vessels have also contributed to bird fatalities in open-ocean environments when birds are attracted to these lights (Merkel and Johansen 2011). This could be a scenario that Navy vessels could face, especially during the migration season when migrating birds are using celestial clues during night time flight. Many seabird species are attracted to artificial lighting, particularly Procrocellariiformes. In particular, Newell’s shearwater and Hawaiian petrel fledglings are particularly susceptible to light attraction, which can cause exhaustion and increase potential for collision with land-based structures (Reed et al. 1985). Other harmful seabird-vessel interactions are commonly associated with commercial fishing vessels because seabirds are attracted to concentrated food sources around these vessels (Dietrich and Melvin 2004; Melvin and Parrish 2001). However, birds following vessels would not be the case for Navy vessels.

Navy aircraft carriers, surface combatant vessels, and amphibious warfare ships are minimally lighted for tactical purposes. For vessels of this type there are two white lights that shine forward and one that shines behind the boat, these lights must be visible for at least 6 nm. There is one red light the shines port and a green one that shines starboard, and these must be visible for at least 3 nm. Solid white lighting appears more problematic for birds, especially nocturnal migrants (Gehring et al. 2009; Poot et al. 2008). Navy vessel lights are mostly solid, but sometimes may not appear solid because of the constant movement of the vessel (wave action), making vessel lighting potentially less problematic for birds in some situations.

In addition to vessels, towed devices and unmanned vehicles are also used; however, no documented instances of birds being struck by in-water devices exist. It would be anticipated that most seabird species would move away from an unmanned vehicle or a towed device.

The other type of vessel movements in the Study Area with the potential to strike a seabird are those used during amphibious landings. These amphibious warfare vessels have the potential to impact shorebirds and seabirds by disturbing or striking individual animals as well as trampling nest sites. Amphibious vessel movements could elicit short-term behavioral or physiological responses such as alert response, startle response, cessation of feeding, fleeing the immediate area, nest abandonment, and a temporary increase in heart rate. Amphibious vessels have the potential to disturb nesting or foraging shorebirds such as the ESA-listed California least tern. However, the general health of individual seabirds would not be compromised, unless a direct strike occurred. However, it is highly unlikely that a seabird would be struck in this scenario because most foraging shorebirds in the vicinity of the approaching amphibious vessel would likely be dispersed by the sound of the approaching vessel before it could come close enough to strike a seabird.

3.6.3.3.2.1 No Action Alternative, Alternative 1 and Alternative 2

Training Activities

As indicated in 3.6.3.3.2, the majority of training activities utilize some type of vessel ranging from ships to submarines. Training involving vessel movements occurs intermittently and ranges in duration from a few hours up to a few weeks. These activities are widely dispersed throughout the Study Area. Training activities involving vessels occur throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by SSTC, HRC, and the Transit Corridor. Ship movements on the ocean surface have the potential to affect seabirds by disturbing or striking individual animals. The probability of ship and seabird interactions occurring in the Study Area depends on several factors, including the presence and density of seabirds;

numbers, types, and speeds of vessels; duration and spatial extent of activities; and protective measures implemented by the Navy. The number of Navy ships operating in the Study Area varies based on training schedules and can range up to 10 ships at any given time.

Vessel movements could result in short-term behavioral responses and low potential for injury/mortality from collisions, though based on the lower density of Navy vessels in pelagic waters, the generally intermittent and short duration of activities, and the high mobility of seabirds, the probability of seabird/vessel interaction is low. There would be a higher likelihood of vessel strikes over the higher productivity portions of the Study Area because of the concentration of seabirds is expected to be higher in those areas. However, even in areas of concentrated vessel use or seabird density, the probability of seabird/vessel interaction is low because of the high mobility of seabirds. Navy protective measures, which include avoidance of seabird colonies and habitats where seabirds may concentrate, would further reduce the probability of seabird/vessel collisions. The combination of these procedures, the relatively lower vessel density in pelagic waters in the Study Area, and the ability of seabirds to detect and avoid vessels reduce the probability that vessel strikes would impact seabird populations under the No Action Alternative.

Birds would not be exposed to unmanned underwater vehicles or remotely operated vehicles because they are typically used on or near the seafloor. The other in-water devices used are typically towed by a helicopter. As discussed for electromagnetic devices, it is likely that any seabirds in the vicinity of the approaching helicopter would be dispersed by the sound of the helicopter (see Section 3.6.3.1.3 [Aircraft Noise]) and move away from the in-water device before any exposure could occur.

Amphibious landings are the primary activity that could potentially impact ESA-listed seabird species, specifically California least tern. California least terns use the beaches of SSTC as a resting area and are typically found foraging in the waters near the beach. While they could be present, it is highly unlikely that a California least tern would be struck in this scenario because most foraging or resting seabirds in the vicinity of the approaching amphibious vessel would likely be dispersed by the sound of the approaching vessel before it could come close enough to strike a seabird. Therefore, amphibious assault activities would not cause any potential risk to California least tern in the Study Area. Furthermore, Naval Base Coronado has a specific Integrated Natural Resource Management Plan for addressing ESA-listed seabird species and those plans already include project avoidance and minimization actions that reduce threats from military activities to terns to a minimal level.

Vessel disturbance and strikes during training activities under the No Action Alternative, Alternative 1, or Alternative 2 may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from vessel disturbance and strikes during training activities under the No Action Alternative, Alternative 1 or Alternative 2 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

As indicated in 3.6.3.3.2, the majority of testing activities utilize some type of vessel ranging from ships to submarines. Testing activities involving vessels occur throughout the Study Area, but would be concentrated in the SOCAL Range Complex portion of the Study Area, followed in descending order of numbers of activities by HRC, SSTC, and the Transit Corridor. All of the Naval Sea Systems Command testing activities utilize some type of vessel ranging from ships to submarines.

The potential for interaction is greater in coastal areas than pelagic areas where Navy vessel use is less concentrated. However, even in areas of concentrated vessel use, the probability of seabird/vessel interaction is low because of the high mobility of seabirds and intermittent and temporary vessel use. Certain portions of the Study Area, such as areas near ports, naval installations, or testing locations are used more heavily by vessels than other portions of the Study Area. Ship movements on the ocean surface have the potential to affect seabirds by disturbing or striking individual seabirds. The probability of ship and seabird interactions occurring in the Study Area depends on several factors, including the presence and density of seabirds; numbers, types, and speeds of vessels; duration and spatial extent of activities; and protective measures implemented by the Navy. The number of Navy ships operating in the Study Area varies based on the testing activity and can range up to 10 vessels at any given time.

The potential for interaction is greater in coastal areas than pelagic areas where Navy vessel use is less concentrated. However, even in areas of concentrated vessel use, the probability of seabird/vessel interaction is low because of the high mobility of seabirds that they could move away from an oncoming vessel. Flushing of seabirds is expected to be greatest with fast-moving, agile vessels. Impacts from Navy vessels would be limited to short-term behavioral responses and are not expected to have long-term effects. While such flushing or other effects of vessels on individual seabirds may occur, none of these temporary effects are expected to have an adverse effect on seabirds at the population level.

The relatively lower vessel density in pelagic waters in the Study Area, and the ability of seabirds to detect and avoid vessels reduce the probability that vessel strikes would impact seabird populations under the No Action Alternative. The impacts of vessel movements would be short-term, temporary, and localized disturbances of individual seabirds in the vicinity. No increased risk of impact to seabirds would result from physical disturbance and strikes with Navy vessels. If in the immediate area where vessels or in-water devices are operating, ESA-species could be disturbed, but this would not result in adverse impacts (impacts would be limited to short-term behavioral responses and are not expected to have long-term effects). No long-term or population-level impacts are expected.

Vessel disturbance and strikes during testing activities under the No Action Alternative, Alternative 1, or Alternative 2 may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from vessel disturbance and strikes during testing activities under the No Action Alternative, Alternative 1, or Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.3 Military Expendable Materials

Many different types of military expended materials are left at sea during training and testing activities throughout the Study Area, as described in Chapter 2, Description of Proposed Action and Alternatives. During these training and testing events, various items may be introduced and expended into the marine environment and are referred to as military expended materials. Chapter 2 includes quantities of military expended materials used during training and testing activities in the Study Area.

Expended materials do have the potential to strike seabirds as they travel through the air. Statistical modeling to estimate the probability of seabird and military expended material strikes is not practical. The widely dispersed area in which bombs and missiles would be expended in the Study Area annually (see Chapter 2, Description of Proposed Action and Alternatives), coupled with the often patchy distribution of seabirds (Schneider and Duffy 1985, Haney 1986, Fauchald et al. 2002), suggest that the probability of these types of ordnance striking a seabird would be low. The number of small-caliber projectiles that would be expended annually during gunnery exercises is much higher than the number of large-caliber projectiles. However, the total number of rounds expended is not a good indicator of strike probability during gunnery exercises because multiple rounds are fired at individual targets.

Human activity such as vessel movement, aircraft overflights, and target setting, could cause seabirds to flee a target area before the onset of firing, thus avoiding harm. If seabirds were in the target area, they would likely flee the area prior to the release of military expended materials or just after the initial rounds strike the target area (assuming seabirds were not struck by the initial rounds). Additionally, the force of military expended material fragments dissipates quickly once the pieces hit the water, so direct strikes on seabirds foraging below the surface would not be likely. Also, munitions would not be used in shallow/nearshore areas. Individual seabirds may be impacted, but ordnance strikes would likely have no impact on seabird populations.

The potential for seabirds to experience strikes would remain quite low based on the large area over which ordnance is used, the relatively small size of the seabirds, and the ability of seabirds to readily flee. Individual seabirds may be impacted, but ordnance strikes would likely have no impact on seabird populations.

3.6.3.3.3.1 No Action Alternative

Training Activities

Current military training in the Study Area includes firing a variety of weapons employing a variety of non-explosive training rounds and explosive rounds including bombs, missiles, naval gunshells, cannon shells, and small-, medium-, and large-caliber projectiles, as well as sonobuoys released from aircraft. The majority of material expended in the Study Area consists of non-explosive training rounds (Table 3.0-63). While gunnery exercises are a common training activity, few Sinking Exercises per year are proposed under the No Action Alternative. During a sinking exercise, aircraft, ship, and submarine crews deliver ordnance on a seaborne target, usually a clean deactivated ship, which is deliberately sunk using multiple weapon systems. Sinking exercises occur in open-ocean areas and expend target fragments that could have the potential to strike seabirds. The potential impact of military expended material to seabirds in the Study Area is dependent on the ability of seabirds to detect and avoid foreign objects through their visual and auditory sensory systems and the relatively-fast flying speeds and good maneuverability of most seabird species.

The small number of bombs that would be expended in the Study Area annually, coupled with the often patchy distribution of seabirds suggest that the probability of this type of strike for a seabird would be extremely low. The number of small-caliber projectiles that would be expended annually during gunnery exercises is much higher. However, the total number of rounds expended is not a good indicator of strike probability during gunnery exercises because multiple rounds are fired at individual targets. Given the implementation of protective measures, and the lower density of seabirds away from nesting or roosting areas, non-explosive ordnance or sonobouys dropped from aircraft, under the No Action Alternative would have limited potential to affect seabirds.

Direct strikes from firing weapons or air-launched devices (e.g. sonobouys, torpedoes) are a potential stressor to seabirds. Seabirds in flight, resting on the water's surface, or foraging just below the water surface would be vulnerable to an direct strike. Strikes have the potential to injure or kill seabirds in the Study Area. However, there would not be long-term population level impacts. The vast area over which training activities occur combined with the ability of seabirds to flee disturbance, would make direct strikes unlikely. Individual seabirds may be affected, but strikes would have no impact on species or populations.

If in the immediate area where military expended materials are present, ESA-listed species could be impacted by military expended material strikes. It is highly unlikely that a seabird would be struck by military expended material because most seabirds in the vicinity of the approaching aircraft or vessel, from which the military expended material is released, would likely be dispersed by the sound of the approaching aircraft or vessel before it could come close enough to strike a seabird. Therefore, activities that release military expended materials would not cause any potential strike risk to ESA-listed seabirds in the Study Area.

Military expended material strikes from training activities under the No Action Alternative may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from military expended material strikes from training activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

Testing Activities

Under the No Action Alternative, testing activities would result in military expended material left in the Study Area, as described in Table 2.8-2, Description of Proposed Action and Alternatives. The potential impact of military expended material to seabirds in the Study Area is dependent on the ability of seabirds to detect and avoid foreign objects through their visual and auditory sensory systems and the relatively-fast flying speeds and good maneuverability of most seabird species.

Direct strikes from firing weapons and air-launched devices (e.g. sonobouys, torpedoes) are a potential stressor to seabirds. Seabirds in flight, resting on the water's surface, or foraging just below the water surface would be vulnerable to an direct strike. Strikes have the potential to injure or kill seabirds in the Study Area. However, there would not be long-term population level impacts. The vast area over which testing activities occur combined with the ability of seabirds to flee disturbance, would make direct strikes unlikely. Individual seabirds may be affected, but strikes would have no impact on species or populations.

If in the immediate area where military expended materials are present, ESA-listed species could be impacted by military expended material strikes. It is highly unlikely that a seabird would be struck by military expended material because most seabirds in the vicinity of the approaching aircraft or vessel, from which the military expended material is released, would likely be dispersed by the sound of the approaching aircraft or vessel before it could come close enough to strike a seabird. Therefore, activities that release military expended materials would not cause any potential strike risk to ESA-listed seabirds in the Study Area.

Military expended material strikes from testing activities under the No Action Alternative may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from military expended material strikes from testing activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.3.2 Alternative 1

Training Activities

The total number of military expended materials throughout the Study Area would increase under Alternative 1. Under Alternative 1, the number of bombs increase by 350 high explosive bombs and 400 nonexplosive bombs as compared to the No Action Alternative, for a total of 884 high explosive bombs and 1,265 nonexplosive bombs. The number of small-caliber projectiles fired would increase by 2,201,400 as compared to the No Action Alternative, for a total of 2,409,000 small-caliber rounds. The number of medium-caliber rounds would increase by 6,900 as compared to the No Action Alternative for a total of 562,000 medium-caliber rounds. The number of nonexplosive large-caliber rounds would decrease by 2,078 as compared to the No Action Alternative, for a total of 25,280 nonexplosive large-caliber projectiles expended during training events and activities. The number of missiles utilized during training activities would increase by 184 as compared to the No Action Alternative for a total of 680 nonexplosive missiles expended. The number of sonobouys dropped would increase by 9,111 over the No Action Alternative, for a total of 51,391.

While the number of military expended materials increases under Alternative 1 as compared to the No Action Alternative, the potential for direct strikes remains low. The vast area over which training activities occur combined with the ability of seabirds to flee disturbance, would make direct strikes unlikely. Individual seabirds may be affected, but strikes would not be responsible for long-term population level impacts.

If in the immediate area where military expended materials are present, ESA-listed species could be impacted by military expended material strikes. It is highly unlikely that a seabird would be struck by military expended material because most seabirds in the vicinity of the approaching aircraft or vessel, from which the military expended material is released, would likely be dispersed by the sound of the approaching aircraft or vessel before it could come close enough to strike a seabird. Therefore, activities that release military expended materials would not cause any potential strike risk to ESA-listed seabirds in the Study Area.

Military expended material strikes from training activities under Alternative 1 may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from military expended material strikes from training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

The total number of military expended materials throughout the Study Area would increase under Alternative 1. Alternative 1 also introduces the use of 9,000 small-caliber projectiles. Under Alternative 1, the number of nonexplosive medium-caliber rounds would increase by 80,404 as compared to the No Action Alternative for a total of 87,404 medium-caliber rounds. Alternative 1 would also increase the use of high explosive medium-caliber projectiles by 12,500 as compared to the No Action Alternative, for a total of 15,000 high explosive medium-caliber projectiles. The number of nonexplosive large-caliber rounds would decrease by 5,792 as compared to the No Action Alternative, for a total of 8,343 nonexplosive large-caliber projectiles expended during testing events and activities. Alternative 1 would also introduce the usage of 1,469 high explosive projectiles. The number of high explosive missiles utilized during testing activities would increase by 60 as compared to the No Action Alternative for a total of 70 high explosive missiles expended. The number of sonobouys dropped would increase by

4,940 over the No Action Alternative, for a total of 12,079. Alternative 1 would also introduce the usage of 152 nonexplosive missiles. Alternative 1 would introduce the use of 270 high explosive rockets. The number of nonexplosive rockets utilized during testing activities would increase by 695 as compared to the No Action Alternative, for a total of 710 nonexplosive rockets.

These increases would result in increased strike potential from ordnance, however, the vast area over which testing activities occur, combined with the ability of seabirds to flee disturbance, would make direct strikes unlikely. Individual seabirds may be affected, but ordnance strikes would have no impact on species or community populations.

If in the immediate area where military expended materials are present, ESA-listed species could be impacted by military expended material strikes. It is highly unlikely that a seabird would be struck by military expended material because most seabirds in the vicinity of the approaching aircraft or vessel, from which the military expended material is released, would likely be dispersed by the sound of the approaching aircraft or vessel before it could come close enough to strike a seabird. Therefore, activities that release military expended materials would not cause any potential strike risk to ESA-listed seabirds in the Study Area.

Military expended material strikes from testing activities under Alternative1 may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from military expended material strikes from testing activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.3.3 Alternative 2

Training Activities

The total number of military expended materials throughout the Study Area would increase under Alternative 2. Under Alternative 2, the number of bombs increase by 350 high explosive bombs and 400 nonexplosive bombs as compared to the No Action Alternative, for a total of 884 high explosive bombs and 1,265 nonexplosive bombs. The number of small-caliber projectiles fired would increase by 2,201,400 as compared to the No Action Alternative, for a total of 2,409,000 small-caliber rounds fired. The number of medium-caliber rounds (all nonexplosive practice munitions) would increase by 6,900 as compared to the No Action Alternative for a total of 562,000 medium-caliber rounds. The number of nonexplosive large-caliber rounds would decrease by 2,078 as compared to the No Action Alternative, for a total of 25,280 nonexplosive large-caliber projectiles expended during training events and activities. The number of missiles utilized during training activities would increase by 184 as compared to the No Action Alternative for a total of 680 nonexplosive missiles expended. The number of sonobouys dropped would increase by 9,111 over the No Action Alternative, for a total of 51,391. Alternative 2 would introduce the use of 4,180 high explosive rockets.

These increases would result in increased strike potential from ordnance, however, the vast area over which testing activities occur, combined with the ability of seabirds to flee disturbance, would make direct strikes unlikely. Individual seabirds may be affected, but ordnance strikes would have no impact on species or community populations.

If in the immediate area where military expended materials are present, ESA-listed species could be impacted by military expended material strikes. It is highly unlikely that a seabird would be struck by military expended material because most seabirds in the vicinity of the approaching aircraft or vessel, from which the military expended material is released, would likely be dispersed by the sound of the approaching aircraft or vessel before it could come close enough to strike a seabird. Therefore, activities that release military expended materials would not cause any potential strike risk to ESA-listed seabirds in the Study Area.

Military expended material strikes from training activities under Alternative 2 may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from military expended material strikes from training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

Testing Activities

The total number of military expended materials throughout the Study Area would increase under Alternative 2. Alternative 2 would introduce the use of 9,800 small-caliber projectiles. The number of nonexplosive medium-caliber rounds would increase by 80,404 as compared to the No Action Alternative for a total of 87,404 medium-caliber rounds. Alternative 2 would also increase the use of high explosive medium-caliber projectiles by 12,500 as compared to the No Action Alternative, for a total of 15,000 high explosive medium-caliber projectiles. The number of nonexplosive large-caliber rounds would decrease by 5,792 as compared to the No Action Alternative, for a total of 8,343 nonexplosive large-caliber projectiles expended during testing events and activities. The number of high explosive missiles utilized during testing activities would increase by 60 as compared to the No Action Alternative for a total of 70 high explosive missiles expended. The number of sonobouys dropped would increase by 6,100 over the No Action Alternative, for a total of 13,239. Alternative 2 would also introduce the usage of 152 nonexplosive missiles. Alternative 2 would introduce the use of 270 high explosive rockets and increase the number of nonexplosive rockets utilized during testing activities by 695 as compared to the No Action Alternative, for a total of 710 nonexplosive rockets.

There is the potential for individual seabirds to be injured or killed by direct strikes. However, there would not be long-term population level impacts. The vast area over which testing activities occur and implementation of Navy resource protection measures, combined with the small size and ability of seabirds to flee disturbance, would make direct strikes unlikely. Individual seabirds may be affected, but ordnance strikes would have no impact on species or community populations.

If in the immediate area where military expended materials are present, ESA-listed species could be impacted by military expended material strikes. It is highly unlikely that a seabird would be struck by military expended material because most seabirds in the vicinity of the approaching aircraft or vessel, from which the military expended material is released, would likely be dispersed by the sound of the approaching aircraft or vessel before it could come close enough to strike a seabird. Therefore, activities that release military expended materials would not cause any potential strike risk to ESA-listed seabirds in the Study Area.

Military expended material strikes from testing activities under Alternative 2 may affect, but are not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from military expended material strikes from testing activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.3.4 Summary of Impacts of Physical Stressors

Three physical disturbance or strike sub-stressors were identified and analyzed that have potential to affect seabirds: aircraft or aerial target strikes, vessel and in-water device strikes, and military expended materials. While bird strikes can occur anywhere aircraft are operated, Navy data indicate that they occur most often over land or close to shore. The potential for seabird strikes to occur in offshore areas is relatively low because (1) activities are widely dispersed, (2) seabird densities are low, (3) the seabirds are small and have the ability to flee disturbance, and (4) Navy protective measures include avoidance of seabird colonies and habitats where seabirds may concentrate.

Vessel movements could result in short-term behavioral responses and potential for injury/mortality from collisions. However, the probability of seabird/vessel collisions is extremely low based on (1) the low Navy vessel density, (2) the patchy distribution of seabirds throughout the Study Area, and (3) the implementation of Navy protective measures, which include avoidance of seabird colonies and habitats where seabirds may concentrate further reducing the probability of seabird/vessel collisions.

There is the potential for individual seabirds to be injured or killed by ordnance. However, there would not be long-term population level impacts. Individual seabirds may be affected, but ordnance strikes would have no impact on species or populations due to (1) the vast area over which training and testing activities occur, (2) implementation of Navy resource protection measures as described in Chapter 5, and (3) the small size of seabirds and their ability to flee disturbance.

3.6.3.4 Ingestion Stressors

This section analyzes the potential impacts of the various types of expended materials used by the Navy during training and testing activities within the Study Area. Birds could potentially ingest expended materials used by the Navy during training and testing activities within the Study Area. The Navy expends the following types of materials that could become ingestion stressors for seabirds during training and testing in the Study Area: chaff and flare endcaps/pistons. Ingestion of expended materials by seabirds could occur in all large marine ecosystems and open ocean areas and would occur either at the surface or just below the surface portion of the water column, depending on the size and buoyancy of the expended object and the feeding behavior of the seabirds. Floating material of ingestible size could be eaten by seabirds that feed at or near the water surface, while materials that sink pose a potential risk to diving seabirds that feed just below the water's surface. Some items, such as parachutes or sonobuoys are too large to be ingested and will not be discussed further. Also, parachutes sink rapidly to the seafloor.

Foraging depths of most diving seabirds are generally restricted to shallow depths, so it is highly unlikely that benthic, nearshore, or intertidal foraging would occur in areas of munitions use, and these seabirds would not encounter any type of munitions or fragments from munitions in nearshore or intertidal areas. Ingestion of military expended material from munitions is not expected to occur because the solid metal and heavy plastic objects from these ordnances sink rapidly to the seafloor, beyond the foraging depth range of most seabirds. Therefore, no impact of ingestion of military expended material from munitions would result for seabirds. As a result, the analysis in this section includes the potential ingestion of military expended materials other than munitions, all of which are expended away from nearshore habitats and close to the water surface.

A variety of ingestible materials may be released into the marine environment by Navy training and testing activities. Birds of all sizes and species are known to ingest a wide variety of items, which they might mistake for prey. For example, 21 of 38 seabird species (55 percent) collected off the coast of North Carolina from 1975 to 1989 contained plastic particles (Moser and Lee 1992). The mean particle sizes of ingested plastic were positively correlated with the birds' size though the mean mass of plastic found in the stomachs and gizzards of 21 species was below 3 grams (g) (0.11 ounce [oz.]).

Plastic is often mistaken for prey and the incidence of plastic ingestion appears to be related to a species' feeding mode and diet. Seabirds that feed by pursuit-diving, surface-seizing, and dipping tend to ingest plastic, while those that feed by plunging or piracy typically do not ingest plastic. Birds of the family Procellariidae, which include petrels and shearwaters, tend to accumulate more plastic than do other species. Some seabirds, including gulls and terns, regularly regurgitate indigestible parts of their food items such as shell and fish bones. However, most procellariiforms have small gizzards and an anatomical constriction between the gizzard and stomach that make it difficult to regurgitate solid material such as plastic (Azzarello and Van Vleet 1987; Pierce et al. 2004). Two species of albatross (Diomedeidae) have also been reported to ingest plastic while feeding at sea. While such studies have not conclusively shown that plastic ingestion is a significant source of direct mortality, it may be a contributing factor to other causes of albatross mortality (Naughton et al. 2007).

Moser and Lee (1992) found no evidence that seabird health was affected by the presence of plastic, but other studies have documented adverse consequences of plastic ingestion. As summarized by Pierce et al. (2004) and Azzarello and Van Vleet (1987), documented consequences of plastic ingestion by seabirds include blockage of the intestines and ulceration of the stomach, reduction in the functional volume of the gizzard leading to a reduction of digestive capability, and distention of the gizzard leading to a reduction in hunger. Studies have found negative correlations between body weight and plastic load, as well as body fat, a measure of energy reserves, and the number of pieces of plastic in a seabird's stomach (Auman et al. 1997; Ryan 1987; Sievert and Sileo 1993). Other possible concerns that have been identified include toxic plastic additives and toxic contaminants that could be adsorbed to the plastic from ambient seawater. Pierce et al. (2004) described a case where plastic ingestion caused seabird mortality from starvation of a member of family Procellariidae. Dissection of an adult greater shearwater gizzard revealed that a 1.5 in. (3.81 centimeters [cm]) by 0.5 in. (1.27 cm) fragment of plastic blocked the pylorus, obstructed the passage of food, and resulted in death from starvation.

Species such as storm-petrels, albatrosses, and shearwaters that forage by picking prey from the surface may have a greater potential to ingest any floating plastic debris. Although ingestion of plastic military expended material by any species from the taxonomic groups found within the Study Area (Table 3.6-2) has the potential to impact individual seabirds.

The distribution of floating expended items would be irregular in both space and time, as training activities do not occur in the same place each time. The random distribution of items across the large Study Area yields very low probabilities that seabirds will encounter a floating item. However, when a seabird does encounter a floating item of ingestible size, an ingestion risk may exist. Although most military expended materials components are expected to sink to the sea floor and spend limited periods within the water column, some items remain buoyant for an extended period. Expended training material, such as missile and target components that float, may be encountered by seabirds in the waters of the Study Area, increasing the potential for ingestion of smaller components.

3.6.3.4.1.1 Chaff

Based on the dispersion characteristics of chaff, large areas of air space and open water within the Study Area would be exposed to chaff, but the chaff concentrations would be very low. A general discussion of chaff as an ingestion stressor is presented in Section 3.0.4.6.5. It is unlikely that chaff would be selectively ingested (U. S. Department of the Air Force 1997). Ingestion of chaff fibers is not expected to cause physical damage to a bird's digestive tract based on the small size (ranging in lengths of 0.25 to 3 in. [0.6 4 to 7.6 cm] with a diameter of about 40 micrometers [µm] [0.001574 in.]) and flexible nature of the fibers and the small quantity that could reasonably be ingested. In addition, concentrations of chaff fibers that could reasonably be ingested are not expected to be toxic to seabirds. Scheuhammer (Scheuhammer 1987) reviewed the metabolism and toxicology of aluminum in birds and mammals and found that intestinal adsorption of orally ingested aluminum salts was very poor, and the small amount adsorbed was almost completely removed from the body by excretion. Dietary aluminum normally has small effects on healthy birds and mammals, and often high concentrations (greater than 0.016 oz./lb. [~1,000 mg/kg]) are needed to induce detrimental effects (Nybo 1996). It is highly unlikely that a seabird would ingest a toxic dose of chaff based on the anticipated environmental concentration of chaff for a worst-case scenario of 360 chaff cartridges simultaneously released at a single drop point (1.8 fibers/ft.^{2} [0.2 fibers/m^2]).

3.6.3.4.1.2 Flares

Ingestion of flare end caps 1.3 in. (3.3 cm) in diameter and 0.13 in. (0.33 cm) thick (U. S. Department of the Air Force 1997) by birds may result in gastrointestinal obstruction or reproductive complications. If a seabird were to ingest a plastic end cap or piston, the response would vary based on the species and individual seabird. The responses could range from none, to sublethal (reduced energy reserves), to lethal (digestive tract blockage leading to starvation). Ingestion of end caps and pistons by species that regularly regurgitate indigestible items would likely have no adverse impacts. However, end caps and pistons are similar in size to those plastic pieces described above that caused digestive tract blockages and eventual starvation. Therefore, ingestion of plastic end caps and pistons could be lethal to some individuals of some species of seabirds. Species with small gizzards and anatomical constrictions that make it difficult to regurgitate solid material would likely be most susceptible to blockage (such as Procellariiformes). Based on available information, it is not possible to accurately estimate actual ingestion rates or responses of individual seabirds.

3.6.3.4.2 No Action Alternative

3.6.3.4.2.1 Training Activities

Current Navy training activities in the Study Area include firing a variety of weapons. As listed in Chapter 2, these weapons employ a variety of nonexplosive and explosive training rounds, including bombs, missiles, naval gunshells, cannon shells, chaff or flares and small-caliber ammunition. These materials are used in the open ocean away from shore. These activities account for the majority of naval shells and rounds used in the Study Area. Expended materials resulting from ordnance use include remnants and shrapnel from explosive rounds and nonexplosive training rounds. These solid materials, many of which have a high metal content, quickly drop through the water column to the sea floor. Ingestion of expended ordnance does not occur in the water column because ordnance-related materials quickly sink.

Ordnance related materials would sink in relatively deep waters, would not present an ingestion risk to seabirds, and therefore, would likely have a negligible impact. However, seabirds could be exposed to some materials such as chaff fibers used during air combat maneuver, electronic warfare operations, or chaff exercises (Tables 2.8-1 through 2.8-5) in the air or at the sea surface through direct contact or inhalation. Seabirds could also ingest some types of expended materials if the materials float on the sea surface.

Other expended materials that could be ingested by seabirds include small plastic end caps and pistons associated with chaff and self-protection flares. The chaff end cap and piston are both round and are 1.3 in. (3.3 cm) in diameter and 0.13 in. (0.33 cm) thick (U.S. Department of the Navy 2011). This plastic expended material sinks in saltwater, which reduces the likelihood of ingestion.

Birds would have the potential to ingest military expended material. However, the concentration of military expended material in the Study Area is low and seabirds are patchily distributed (Schneider and Duffy 1985, Haney 1986, Fauchald et al. 2002). As discussed in Chapter 2, the highest density of chaff and flare end caps/pistons would be expended in the SOCAL Range Complex portion of the Study Area. Assuming that all end caps and pistons expended in the SOCAL Range Complex potion of the Study Area would be evenly distributed, the relative end-cap and piston concentration would be very low (0.24 pieces/nm^2/year, based on an area of 120,000 nm^2 and 29,065 end caps/pistons per year). The overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under the No Action Alternative is negligible.

Ingestion of military expended materials from training activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from ingestion of military expended materials from training activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.4.2.2 Testing Activities

Current Navy testing activities in the Study Area include firing a variety of weapons. As listed in Chapter 2, these weapons employ a variety of nonexplosive and explosive rounds, including missiles, naval gunshells, cannon shells, and small-caliber ammunition. These materials are used in the open ocean away from shore. These activities account for the majority of naval shells and rounds used in the Study Area. Expended materials resulting from ordnance use include remnants and shrapnel from explosive rounds and nonexplosive rounds. These solid materials, many of which have a high metal content, quickly drop through the water column to the sea floor. Ingestion of expended ordnance does not occur in the water column because ordnance-related materials quickly sink. Under the No Action Alternative, ordnance related materials would sink in relatively deep waters, would not present a low ingestion risk to seabirds. However, seabirds could ingest some types of expended materials if the materials float on the sea surface. No flares (plastic end caps or pistons) or chaff is utilized under the No Action Alternative, therefore the ingestion risk of expended materials from testing activities is very low.

Ingestion of military expended materials from testing activities under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from ingestion of military expended materials from testing activities under the No Action Alternative would not result in a significant adverse effect on migratory bird populations.

3.6.3.4.3 Alternative 1

3.6.3.4.3.1 Training Activities

Under Alternative 1, an overall increase of military expended material would be expended in the Study Area from the No Action Alternative, as described in Table 3.0-63 though 3.0-65, Description of Proposed Action and Alternatives. However, of the expended materials that could be ingested (chaff canisters, flares, and plastic end caps), there is no net increase from the No Action Alternative, therefore the ingestion risk is the same as for the No Action Alternative. As discussed in Chapter 2 and Section 3.6.3.4.2 (No Action Alternative), the highest density of chaff and flare end caps/pistons would be expended in the SOCAL Range Complex portion of the Study Area. The concentration of military expended material in the Study Area is low and seabirds are patchily distributed. The overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under Alternative 1 is negligible. If foraging in an area where military expended material are present seabirds could potentially be impacted by ingestion of military expended material, but this would not result in impacts on populations of these ESA-listed species.

Ingestion of military expended materials from training activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from ingestion of military expended materials from training activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.4.3.2 Testing Activities

Under Alternative 1, up to 221,794 additional military expended materials from testing activities would be expended in the Study Area from the No Action Alternative (24,372), as described in Table 3.0-65, Description of Proposed Action and Alternatives. However, of the expended materials that could be ingested (chaff canisters, flares, and plastic end caps), there is an increase of 604 from the No Action Alternative (where none were used). The chaff end cap and piston are both round and are 1.3 in. (3.3 cm) in diameter and 0.13 in. (0.33 cm) thick (U.S. Department of the Navy 2011). This plastic expended material sinks in saltwater, which reduces the likelihood of ingestion.

Birds would have the potential to ingest military expended material. However, the concentration of military expended material in the Study Area is low and seabirds are patchily distributed. The overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under Alternative 1 is low. Assuming that all end caps and pistons expended throughout the entire Study Area would be evenly distributed, the relative end-cap and piston concentration would be extremely low (0.002 pieces/nm^2/year, based on an area of 355,000 nm^2 and 604 end caps/pistons per year). The concentration of military expended material in the Study Area is low and seabirds are patchily distributed. The overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under Alternative 1 is negligible. If foraging in an area where military expended material are present seabirds could potentially be impacted by ingestion of military expended material, but this would not result in impacts on populations of these ESA-listed species.

Ingestion of military expended materials from testing activities under Alternative 1 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from ingestion of military expended materials from testing activities under Alternative 1 would not result in a significant adverse effect on migratory bird populations.

3.6.3.4.4 Alternative 2

3.6.3.4.4.1 Training Activities

Under Alternative 2, an overall increase of military expended material would be expended in the Study Area from the No Action Alternative, as described in Table 3.0-65, Description of Proposed Action and Alternatives. However, of the expended materials that could be ingested (chaff canisters, flares, and plastic end caps), there is no net increase from the No Action Alternative, therefore the ingestion risk is the same as for the No Action Alternative. The concentration of military expended material in the Study Area is low and seabirds are patchily distributed. Therefore, the overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under Alternative 2 is negligible. If foraging in an area where military expended material are present seabirds could potentially be impacted by ingestion of military expended material, but this would not result in impacts on populations of these ESA-listed species.

Ingestion of military expended materials from training activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from ingestion of military expended materials from training activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.4.4.2 Testing Activities

Under Alternative 2, up to 236,348 additional military expended material from testing activities would be expended in the Study Area from the No Action Alternative (24,372), as described in Table 3.0-65, Description of Proposed Action and Alternatives. However, of the expended materials that could be ingested (chaff canisters, flares, and plastic end caps), there is an increase of 604 from the No Action Alternative (where none were used). The chaff end cap and piston are both round and are 1.3 in. (3.3 cm) in diameter and 0.13 in. (0.33 cm) thick (U.S. Department of the Navy 2011). This plastic expended material sinks in saltwater, which reduces the likelihood of ingestion.

Birds would have the potential to ingest military expended material. However, the concentration of military expended material in the Study Area is low and seabirds are patchily distributed. The overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under Alternative 1 is low. Assuming that all end caps and pistons expended throughout the entire Study Area would be evenly distributed, the relative end-cap and piston concentration would be extremely low (0.002 pieces/nm^2/year, based on an area of 355,000 nm^2 and 668 end caps/pistons per year). The concentration of military expended material in the Study Area is low and seabirds are patchily distributed. Therefore, the overall likelihood that seabirds would be impacted by ingestion of military expended material in the Study Area under Alternative 2 is negligible. If foraging in an area where military expended material are present seabirds could potentially be impacted by ingestion of military expended material, but this would not result in impacts on populations of these ESA-listed species.

Ingestion of military expended materials from testing activities under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabird species.

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the impacts from ingestion of military expended materials from testing activities under Alternative 2 would not result in a significant adverse effect on migratory bird populations.

3.6.3.4.5 Summary of Impacts of Ingestion Stressors

It is possible that persistent expended materials could be accidentally ingested by seabirds while they were foraging for natural prey items, though the probability of this event is low as (1) foraging depths of diving seabirds is generally restricted to the surface of the water or shallow depths, (2) the material is unlikely to be mistaken for prey, and (3) the material remains at or near the sea surface for a short length of time.

Based on available information, it is not possible to accurately estimate actual ingestion rates or responses of individual seabirds. Nonetheless, the number of end caps or pistons ingested by seabirds is expected to be very low and only an extremely small percentage of the total would be potentially available to seabirds due to their relatively low concentration throughout the Study Area. Anatomical characteristics of species within family Procellariidae may elevate the risk of plastic ingestion relative to other species or families; however, exposure to species of family Procellariidae would still remain low. Plastic ingestion under the No Action Alternative, Alternative 1, or Alternative 2 would not result in a significant adverse impact on seabird populations. Sublethal and lethal impacts, if they occur, would be limited to a few individual seabirds.

3.6.3.5 Secondary Stressors

The potential of water and air quality stressors associated with training and testing activities to indirectly affect seabirds was analyzed. The assessment of potential water and air quality stressors refers to previous sections in this EIS/OEIS (Section 3.1 Sediments and Water Quality and Section 3.2 Air Quality), and addresses specific activities in local environments that may affect seabird habitats. At-sea activities that may impact water and air include general emissions.

As noted in Section 3.1.3, Sediments and Water Quality, Environmental Consequences, implementation of the No Action Alternative, Alternative 1, or Alternative 2 would not adversely affect water or sediment quality. Any physical impacts on seabird habitats would be temporary and local because training activities would occur infrequently. Impacts from activities would not be expected to adversely impact seabirds or seabird habitats.

Indirect impacts on water or air quality under the No Action Alternative, Alternative 1, or Alternative 2 would not affect ESA-listed seabird species due to: (1) the temporary nature of impacts on water or air quality, (2) the distribution of temporary water or air quality impacts, (3) the wide distribution of seabirds in the Study Area, and (4) the dispersed spatial and temporal nature of the training and testing activities that may have temporary water or air quality impacts. No long-term or population-level impacts are expected.

3.6.4 SUMMARY OF POTENTIAL IMPACTS (COMBINED IMPACTS OF ALL STRESSORS)ON SEABIRDS

This section evaluates the potential for combined impacts of all the stressors from the Proposed Action. The analysis and conclusions for the potential impacts from each of the individual stressors are discussed in the analyses of each stressor in the sections above. There are generally two ways that a seabird could be exposed to multiple stressors. The first would be if a seabird were exposed to multiple sources of stress from a single activity or activity (e.g., an amphibious landing activity may include an amphibious vessel that would introduce potential acoustic and physical strike stressors). The potential for a combination of these impacts from a single activity would depend on the range of effects to each of the stressors and the response or lack of response to that stressor. Most of the activities as described in the Proposed Action involve multiple stressors; therefore, it is likely that if a seabird were within the potential impact range of those activities, they may be impacted by multiple stressors simultaneously. This would be more likely to occur during large-scale exercises or activities that span a period of days or weeks (such as a sinking exercise or composite training unit exercise).

Secondly, an individual seabird could be exposed to a combination of stressors from multiple activities over the course of its life. This is most likely to occur in areas where testing and training activities are more concentrated (e.g., near ports, testing ranges, and routine activity locations) and in areas that individual seabirds frequent because it is within the animal's home range, migratory route, breeding area, or foraging area. Except for in the few concentrated areas mentioned above, combinations are unlikely to occur because training and testing activities are generally separated in space and time in such a way that it would be very unlikely that any individual seabirds would be exposed to stressors from multiple activities. However, animals with a small home range intersecting an area of concentrated Navy activity have elevated exposure risks relative to animals that simply transit the area through a migratory route. The majority of the proposed training and testing activities occur over a small spatial scale relative to the entire Study Area, have few participants, and are of a short duration (the order of a few hours or less).

Multiple stressors may also have synergistic effects. For example, seabirds that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors via a decreased ability to detect and avoid threats. Birds that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to physical strike stressors via malnourishment and disorientation. These interactions are speculative, and without data on the combination of multiple Navy stressors, the synergistic impacts from the combination of Navy stressors on seabirds are difficult to predict.

Although potential impacts to certain seabird species from the Proposed Action could include injury or mortality, impacts are not expected to decrease the overall fitness or result in long-term population-level impacts of any given population. In cases where potential impacts rise to the level that warrants mitigation, mitigation measures designed to reduce the potential impacts are discussed in Chapter 5. The potential impacts anticipated from the Proposed Action are summarized below in Endangered Species Act Determinations (3.6.5) and Migratory Bird Act Determinations (3.6.6) with respect to each regulation applicable to seabirds.

3.6.5 ENDANGERED SPECIES ACT DETERMINATIONS

Table 3.6-6 summarizes the ESA determinations for each substressor analyzed.

Table 3.6-6: Summary of Endangered Species Act Effects Determinations for Birds, for the Preferred Alternative

Navy Activities and Stressors		California least tern	Hawaiian petrel	Short-tailed albatross	Marbled murrelet	Newell's shearwater
Acoustic Stressors						
Sonar and other acoustic sources	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Explosive Detonations	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Pile Driving	Training Activities	May affect, not likely to adversely affect	No effect	No effect	No effect	No effect
	Testing Activities	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Vessel and simulated vessel noise	Training Activities	No effect	No effect	No effect	No effect	No effect
	Testing Activities	No effect	No effect	No effect	No effect	No effect
Aircraft Noise	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Energy Stressors						
Electromagnetic devices	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Physical Disturbance and Strike Stressors						
Aircraft and Aerial Target	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect

Table 3.6 6: Summary of Endangered Species Act Effects Determinations for Birds, for the Preferred Alternative (continued)

Navy Activities and Stressors		California least tern	Hawaiian petrel	Short-tailed albatross	Marbled murrelet	Newell's shearwater
Physical Disturbance and Strike Stressors (continued)						
Vessels and in-water devices	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Military expended materials	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Ingestion Stressors						
Military expended materials	Training Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect
	Testing Activities	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect	May affect, not likely to adversely affect

3.6.6 MIGRATORY BIRD ACT DETERMINATIONS

Under the Migratory Bird Treaty Act regulations applicable to military readiness activities (50 C.F.R. Part 21), the stressors introduced during training and testing activities would not result in a significant adverse effect on migratory bird populations.

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