3.3 MARINE BIOLOGICAL RESOURCES

This section of the Revised Analysis of Public Trust Resources (APTR) describes the marine biological resources (i.e., the intertidal, subtidal and open water habitats) with the potential to be impacted by the Broad Beach Restoration Project (Project). Marine biological resources include local habitat types, biological communities, and common as well as sensitive species. This section describes environmental and regulatory settings related to the offshore biological resources in the Broad Beach Restoration Area, and potential effects of this beach replenishment and dune restoration project on public trust resources and values. The information presented in this section is intended to inform the California State Lands Commission (CSLC) as it considers whether to issue a lease for those portions of the Project within the CSLC's jurisdiction. Implementation of the Project by the Broad Beach Geologic Hazard Abatement District (BBGHAD or Applicant) is statutorily exempt from the California Environmental Quality Act (CEQA) pursuant to Public Resources Code sections 26601 and 21080, subdivision (b)(4) (see Section 1, *Introduction*). Therefore:

- The public trust scope of review and analysis provided here is limited only to those areas where impacts to public trust resources and values may occur. These areas of the Project include the CSLC Lease Area and the broader Public Trust Impact Area (refer to Section 1 and Figure 1-2);
- Areas outside the Public Trust Impact Area are evaluated qualitatively for non-public trust affected resources, and include the three existing permitted quarries in inland Ventura County from which the BBGHAD proposes to obtain sand for the Project, and the inland sand transportation routes between these sites and the inland stretch of Pacific Coast Highway (PCH), including sections of the coastline stretch of PCH to Zuma Beach Parking Lot 12. These sites are fully permitted quarries and have been subject to past environmental review by Ventura County for impacts to biological resources.

Analysis in this section focuses on marine biological resources at both Broad Beach and the west end of Zuma Beach that may be affected directly or indirectly by any of the primary Project components. This analysis builds upon surveys and analysis performed by Chambers Group, Inc., analysis performed by AMEC Environment & Infrastructure, Inc. (AMEC), and information provided by State and Federal resource agencies. Information used to prepare this section includes the following sources:

- A Survey of Marine Biological Resources of Broad Beach, Malibu, California (Chambers Group 2012a);
- 2012 Summer Kelp Canopy Map (Moffatt & Nichol 2013a);

- Broad Beach Intertidal Sampling for the Broad Beach Shore Protection Project (Chambers Group 2012b);
- Subtidal Reef Survey, December 2012 (Chambers Group 2012c);
- Broad Beach June Intertidal Sampling for the Broad Beach Shore Protection Project, Los Angeles County, California (Chambers Group 2013a);
- Mapping of Eelgrass off Broad Beach in Malibu for the Broad Beach Restoration Project (Chambers Group 2013b);
- Comment letters from the California Department of Fish and Wildlife (CDFW; December 18, 2012), National Marine Fisheries Services (NMFS; December 21, 2012), other public agencies, environmental organizations, and individuals; and
- Supplemental Marine Habitat Survey and Mapping for the Broad Beach Restoration Project (Moffatt & Nichol 2014).

Intertidal and subtidal habitats at Broad Beach have been subject to relatively comprehensive surveys over the last several years. On June 25, 2013, The Chambers Group conducted intertidal surveys along belt transects parallel to the shoreline at various tidal levels ranging from a low tide of -1.5 feet to a high tide of +4.5 feet. Subtidal reef and eelgrass surveys were performed over 5 days in 2012 and 2013 using both divers and sonar from a survey vessel. These surveys provided detail regarding character and aerial extent of rocky intertidal and subtidal habitats, including the extent of surfgrass and eelgrass beds. However, the NMFS expressed concern: (1) about the adequacy of these studies and whether they comprehensively disclose the acreage and quality of habitats likely to be impacted; and (2) that sand transport modeling may not accurately characterize the extent and duration of potential sand coverage of rocky and intertidal and subtidal habitats, with particular concerns regarding possible impacts to surfgrass (letter dated March 31, 2014). In order to address at least some of these issues the Applicant funded supplemental marine habitat surveys and mapping for Broad Beach, which was conducted in May and June 2014. These surveys included a side scan sonar survey to characterize habitat as well as associated subtidal dive transect surveys to characterize subtidal benthic structure and associated biological communities (Moffatt & Nichol 2014). These surveys and the associated results are described in more detail in Section 3.3.4, *Public Trust Impact Analysis*.

3.3.1 Environmental Setting Pertaining to the Public Trust

<u>CSLC Lease Area and Public Trust Impact Area</u>

Broad Beach is located in the city of Malibu, which lies along the coast in the northwestern portion of Los Angeles County. The CSLC Lease Area and Public Trust Impact Area (refer to Figures 1-2, and 2-3 through 2-6) extend laterally for approximately 6,200 feet from Lechuza Point to Trancas Creek Lagoon, and vertically from the inland limits of dune construction to the seaward limits of proposed beach nourishment. This area encompasses the approximate 46-acre beach and dune construction area, including approximately 27 acres of existing intertidal habitats and 13.5 acres of subtidal habitats. Construction staging at the west end of Zuma Beach Parking Lot 12, stockpiling of imported sand on Zuma Beach adjacent to the parking lot, and vehicle access from the parking lot to Broad Beach are also included in this area.

The Public Trust Impact Area also includes intertidal and subtidal areas off down coast beaches, including Zuma Beach, Point Dume State Beach, and Los Angeles County beaches, and shoreline marine biological resources farther south, which may be indirectly affected by changes in sand supply and distribution through littoral drift. Refer to Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*, for further analysis of these impacts. Longshore transport moves sand supply from Broad Beach to down coast beaches, such as Puerco Beach, Amarillo Beach, and Big Rock Beach, within the Santa Monica Littoral Cell (Figure 3.1-1). These down coast areas vary from sandy beaches to rocky headlands. The coastline comprises sensitive rocky intertidal and subtidal habitat areas.

<u>BBGHAD Inland Project Area</u>

The BBGHAD Inland Project Area includes three operating quarries proposed as sand supply sources, as well as the sand transportation routes inland of PCH, that would be used by heavy haul trucks to transport sand to Broad Beach (see Figure 1-2). The quarries are fully permitted by the State and Ventura County. These areas also do not support public trust resources administered by the CSLC related to marine biology and are not discussed further in this section.

<u>Relationship between Marine Biological Resources and Public Trust Resources</u>

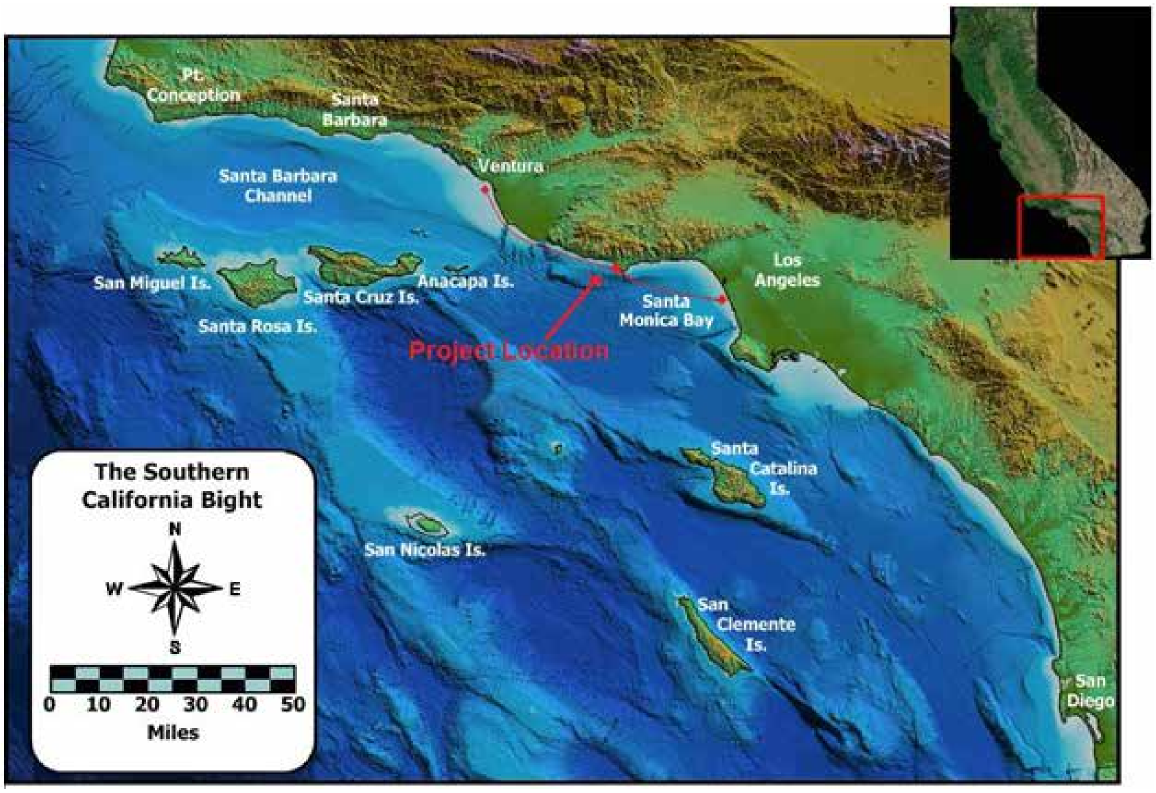
Intertidal and offshore lands and waters of the State and marine biological resources are key public trust resources, supporting intrinsic wildlife values and the public's right to commercial and recreational use and enjoyment of these resources. In the immediate Broad Beach area, these include the intertidal zone along Broad Beach and the waters offshore. Similarly, on beaches down coast from Broad Beach, public trust resources include offshore waters and State tidelands.

The beaches and offshore waters of the Public Trust Impact Area provide significant public resources, any changes to which could affect the public's interest in and ability to use these public resources. The California Supreme Court in *National Audubon Society v. Superior Court (1981) 685 P.2d 709* stated that the "core of the public trust doctrine is the State's authority as sovereign to exercise a continuous supervision and control over" the lands, waters and underlying intertidal lands of the State to protect ecological and recreational values, including the use and enjoyment of these lands. California's Constitution also establishes the right of the public to access and use public trust lands (Cal. Const. Article X, Section 4; Cal. Const. Article I, Section 25).

Broad Beach Area Overview

Broad Beach and its intertidal zone, as well as offshore waters and submerged lands, are located within a geographic region commonly known as the Southern California Bight (SCB), where the north-south trending coastline found off much of western North America experiences a significant curvature or indentation south of Point Conception. The SCB includes coastal Southern California, the Channel Islands, and the local portion of the Pacific Ocean (see Figure 3.3-1).

Figure 3.3-1. Project Location within the Southern California Bight



The portion of the Pacific Ocean that occupies this region, from Point Conception in the north to just past San Diego in the south and extending offshore of San Nicolas Island, is characterized by complex current circulation patterns and a diverse range of marine habitats. The mainland coast and offshore islands contain rocky shores, long stretches of sandy beach, and numerous embayments. A series of submarine canyons, ridges, and basins that exceed depths of several thousand feet lies between the mainland and islands. The variety of habitats found in the SCB allows rich and varied marine life.

Marine biological resources in the vicinity of Broad Beach can be described in terms of three major habitat areas: open ocean, subtidal (soft-bottom and hard-bottom seafloor), and intertidal shoreline. Within the SCB, each of these three biological habitats is exceptionally diverse and productive. For example, many of the more than 600 fish species reported along the Pacific Outer Continental Shelf (OCS) region occur within the SCB. Eelgrass (*Zostera* spp.) beds, considered to be one of the most productive habitat types found on soft-bottom substrate, occur along the protected shoreline of the SCB, while rocky nearshore substrates often support dense stands of kelp (*Macrocystis* spp.) (see Figure 3.3-4). Additionally, every year more than 27 species of whales and dolphins visit or inhabit the region, including blue whales (*Balaenoptera musculus*), humpback whales (*Megaptera novaeangliae*), and gray whales (*Eschrichtius robustus*). Several species of marine mammals and numerous seabird species preferentially use the shores of the nearby Channel Islands and rocky outcroppings along the mainland coast as haul-outs and rookeries. The following discussion summarizes the various habitats, marine flora, and fauna, rare and endangered species, and other protected species that exist in the vicinity of Broad Beach. This section discusses marine biological resources in the context of their associated habitat, and is organized into the following sections: open-ocean, subtidal (soft-bottomed and hard-bottomed seafloor), and intertidal shoreline. Following the sections regarding habitats and associated biota, there is a discussion of Marine Managed Areas (MMAs).

<u>Open-Ocean Habitat and Biota</u>

Open-ocean, or pelagic, habitat refers to the coastal and open-ocean regions of water above the benthos and away from the shoreline. Organisms using resources in this zone often spend most, if not all, of their lives in a three-dimensional matrix of water, rarely encountering any substrate on which to attach or subsist. This section describes the organisms that are found in the open ocean offshore Broad Beach.

Plankton

Plankton are aquatic organisms that have either limited or no swimming ability and therefore drift or float with the ocean currents. Plankton include both phytoplankton (plants) and zooplankton (animals). Phytoplankton, or plant plankton, form the base of the marine food web by photosynthesizing organic matter from water, carbon dioxide, and light. Phytoplankton are usually unicellular or colonial algae and provide a food source for zooplankton and fish. Through their decay, phytoplankton also support large quantities of marine bacteria. Zooplankton, or animal plankton, are the primary link between phytoplankton and larger organisms in marine food webs. Zooplankton include a wide array of organisms that may spend all or only a portion of their life cycle as plankton. All zooplankton, including the larval stages of larger organisms, consume other organisms or organic material.

Plankton distribution in California waters tends to be patchy and is characterized by high seasonal and inter-annual variability. Generally, plankton distribution, abundance, and productivity are dependent on light, nutrients, water quality, terrestrial runoff, and upwelling. Data from several studies (e.g., Bolin and Abbott 1963, Allen 1945) have indicated that the phytoplankton community is similar in species composition along the entire coast of California. Dinoflagellates are usually dominant in the water column; however, diatoms may dominate the community under certain circumstances, such as during upwelling conditions or after intense rainstorms (MBC Applied Environmental Sciences [MBC] 1994).

Fish

Fish are generally separated into two major groups based on whether they have a bony skeleton (Class Osteichthyes) or rely on cartilage for support (Class Chondrichthyes), (e.g., sharks and rays). The dominant pelagic bony fish species in the area are comprised of Pacific or chub mackerel (*Scomber japonicus*), jack mackerel (*Trachurus symmetricus*), northern anchovy, and Pacific sardine. These species are also the primary targets of the Southern California commercial fishing industry. Meanwhile, sharks are the dominant cartilaginous fish in the pelagic environment throughout the region, although their abundance has declined in recent decades.

Epipelagic Fish

Epipelagic fish reside in the open ocean down to depths of approximately 655 feet, where waters are well mixed and support photosynthetic algal communities (i.e., they are well lit). Many epipelagic species within the SCB, including large predators (e.g., tuna, sharks, swordfish, and forage fish) such as northern anchovy, Pacific sardine, Pacific saury (*Cololabis saira*), and Pacific hake (*Merluccius productus*), are widely distributed along the California coast. Some species, such as albacore tuna and salmon, are known to migrate extensively over vast areas of the Pacific. Pelagic sport fish such as yellowtail (*Seriola lalandi*) and Pacific barracuda (*Sphyraena argentea*) are migratory species that move northward in the spring and summer and are often particularly abundant off the coast during El Niño years. In contrast, other species, such as rockfish (Scorpaenidae), may live out their entire lives around the offshore oil platforms and natural reefs within the region.

Other species found in Santa Monica Bay include queenfish, jacksmelt (*Atherinopsis californiensis*), and topsmelt (*Atherinops affinis*) in shallow depths, and rockfish (*Sebastes* spp.) along the outer shelf. White croaker and white seaperch (*Phanerodon furcatus*) school in the water column but feed on the bottom. Vermillion rockfish (*Sebastes miniatus*), bocaccio (*Sebastes paucispinis*), and sablefish (*Anoplopoma fimbria*) feed in the water column at night but remain associated with the bottom during the day (MBC 1993).

At least 40 species of sharks and rays are known to occur in the greater SCB region. Some large sharks may inhabit the SCB during seasonal migrations, while others may permanently reside in the area. Many smaller sharks and rays are permanent residents of the nearshore coastal areas. Leopard sharks (*Triakis semifasciata*), for example, are one of the most common sharks in California bays and estuaries and along Southern

California beaches. They are a popular sport fish in nearshore waters, where they are commonly caught from piers and jetties. Historically, the most abundant sharks in the region include blue sharks (*Prionace glauca*), thresher sharks (*Alopias vulpinus*), and basking sharks (*Cetorhinus maximus*). Shark species also support several important regional commercial fisheries, most notably thresher, mako (*Isurus* spp.), and blue sharks. Large great white sharks (*Carcharodon carcharias*) are uncommon in Southern California; however, several of the juvenile white sharks displayed at the Monterey Bay Aquarium in the past decade were captured from the waters in or near Santa Monica Bay. White sharks are thought to give birth in Southern California waters, and use inshore waters as a nursery area. Great white sharks feed on fish, rays, and small sharks.

Demersal Fish

The extensive soft-bottom habitats within Santa Monica Bay support an abundant and diverse assemblage of more than 100 species of demersal (living on or just above the bottom) fish. Flatfish (Families Pleuronectidae, Paralichthyidae, Cynoglossidae, and Bothidae), rockfish (Family Scorpaenidae), sculpins (Family Cottidae), combfish (Family Zaniolepididae), and eelpouts (Family Zoarcidae) make up most of the soft-bottom fish fauna in the Bay (MBC 1993). The inner shelf assemblage is dominated by speckled sanddab (*Citharichthys stigmaeus*), the middle shelf by stripetail rockfish (*Sebastes saxicola*), and the outer shelf by slender sole (*Lyopsetta exilis*) (Allen 1982).

Dominant species collected in otter trawl surveys along the 20-, 40-, and 60–foot isobaths near Scattergood and El Segundo Generating Stations in 1988 included white croaker, queenfish, speckled sanddab, spotted turbot (*Pleuronichthys ritteri*), and California halibut (Orange County Sanitation District [OCSD] 1989). The following year, 1989, otter trawl surveys near the Hyperion Treatment Plant distinguished five demersal fish assemblages in the area. The dominant species found nearshore included horneyhead turbot (*P. verticalis*), speckled sanddab, California tonguefish (*Symphurus atricauda*), white croaker, and California halibut.

Protected Fish Species

California Grunion. The California grunion, is the subject of a unique recreational fishery in the region and is protected under the Malibu General Plan, which recognizes their spawning grounds as a sensitive marine resources. Additionally, although grunion are not listed as threatened or endangered, NMFS requires that their eggs be protected from disturbance. This small inshore fish is endemic to Southern California, and serves as a significant food source for larger nearshore fish. The species is unusual because it comes ashore on sandy beaches to spawn. Female grunion can spawn as many as six times during a season, laying between 1,600 and 3,600 eggs each time, with larger females producing more eggs.

Spawning generally occurs from March through August, peaking from April through June, and coincides with the peak of the high tide during and just after high spring tides (tides of highest magnitude during new and full moons). During these high tides, spawning females come ashore and use their tails to dig in to the moist sand high up in the intertidal zone to lay their eggs. A number of males then curl around the embedded female and attempt to fertilize the eggs. The adult fish leave on succeeding waves while the eggs remain. The grunion eggs incubate in the sand during the lower tide levels, kept moist by residual water in the sand. There, they are safe from the disturbance of wave action until the next spring tides, approximately 10 days to 2 weeks later. During these high tides, as water agitates and inundates the eggs, they hatch and the larvae are carried out to sea. Grunion are harvested by hand as they come ashore to spawn.

Grunion runs were monitored at Broad Beach between March and August 2010 (Buena 2010). While no grunion were observed in the Broad Beach area due to the lack of a beach during spring tides, grunion were observed to spawn just east of Broad Beach on Zuma Beach near Trancas Creek (Buena 2010).

Marine and Coastal Birds

The SCB supports a rich population of seabirds (Baird 1993), providing a major foraging area for both residents and migrants. Much of the taxonomic diversity in the region arises because the SCB acts as the transition zone between two zoogeographic provinces. The northern portions of the SCB (i.e., the Santa Barbara Channel), support boreal seabird populations, such as Cassin's auklets, that are more characteristic of colder regions as far north as the Gulf of Alaska. Conversely, the Channel Islands also harbor important nesting colonies for subtropical seabirds, such as those found in the Gulf of California. The latter include California's entire nesting populations of both the recently delisted California brown pelican (*Pelecanus occidentalis californicus*), and the State-threatened Xantus's murrelet (*Synthliboramphus hypoleucus*). Both species have southern breeding distributions and also nest on islands off Baja California. As such, the distribution of the various seabird taxa within the region exhibits substantial seasonal and spatial variation (Pierson et al. 1999, Marine Mammal Center 2001).

Seabirds can be segregated into two main groups, coastal and pelagic. Coastal seabirds feed in the pelagic realm but tend to remain within approximately 5 miles of the mainland shore. Common coastal seabirds include Western and Clark's grebes, surf scoters (*Melanitta perspicillata*), cormorants (*Phalacrocorax* spp.), loons (*Gavia* spp.), California brown pelicans, and gulls (Subfamily Laridae). The highest coastal seabird densities occur in the SCB during winter months. However, California brown pelican populations generally peak in the summer months when birds from larger Mexican colonies migrate northward.

In contrast, pelagic seabirds spend most of their time farther from shore. As with coastal seabirds, they spend much of their time on the sea surface or diving into the water column to feed. Some of the most common offshore birds in the region include: shearwaters (*Puffinus* spp.), northern fulmars (*Fulmarus glacialis*), phalaropes (*Phalaropus* spp.), jaegers (*Stercorarius* spp.), and common murres (*Uria aalge*). Storm-petrels (*Oceanodroma* spp.), puffins (*Fratercula* spp.), and auklets (Family Alcidae) also frequent the offshore waters of Broad Beach. Seasonal population peaks vary among the taxa, but pelagic seabirds, as a group, are comparatively stable (Marine Mammal Center 2001). Most seabird rookeries in the region are located on offshore islands, predominately the northern Channel Islands; few, if any, seabirds nest on the mainland coast of the SCB (Carter et al. 1992).

Feeding strategies vary among seabirds, with California brown pelicans and terns, including the endangered California least tern (*Sterna antillarum browni*), diving into the water from the air to catch fish, while cormorants (*Phalacrocorax* spp.), murres, puffins, and auklets dive from the sea surface in pursuit of fish and zooplankton. Red-necked phalaropes (*Phalaropus lobatus*) feed at the sea surface using a characteristic spinning pattern that causes fish eggs and other planktonic species to accumulate immediately underneath them.

In October 2012 and June 2013, bird transects were conducted along Broad Beach (Chambers Group 2012b, 2013a). During the two surveys, 19 bird species were observed on Broad Beach either offshore or flying over the site. The most abundant species observed during the 2012 bird transects was black-bellied plover, followed by western gulls and Heermann's gulls (Chambers Group 2012b). Three marine bird species—ring-billed gull (*Larus delawarensis*), snowy egret (*Egretta thula*) and willet (*Catophorus semipalmtus*)—were observed on Broad Beach after the transects had been completed (Chambers Group 2012b). During the 2013 survey the most abundant species was western gull followed by brown pelican (Chambers Group 2013a). Table 3.3-1 lists the bird species found at Broad Beach during these transect surveys.

During the 2012 and 2013 surveys at Broad Beach, additional bird transect surveys were carried out at El Matador State Beach transects, located approximately 0.75 miles west of the Broad Beach area. A total of 11 bird taxa were observed at El Matador State Beach during the 2012 survey. The majority of these species were the same bird species observed during the survey at Broad Beach and listed in Table 3.3-1. However, spotted sandpiper, black-crowned night heron, western grebe, marbled godwit, and royal tern were not observed at El Matador during either survey. Additionally, Forster's tern (*Sterna forsteri*), ring-billed gull (*Larus delawarensis*), snowy egret (*Egretta thula*) and an unidentified tern (*Sterna* sp.) were found at El Matador and not at Broad Beach (Chambers Group 2012b, 2013a). The most numerous bird species observed during the El Matador surveys was Brandt's cormorant in 2012 (Chambers Group 2012b) and Heermann's gull in 2013 (Chambers Group 2013a).

Table 3.3-1. Bird Species Observed at Broad Beach during 2012 and 2013 Transect Surveys

Common Name	Scientific Name	Observed in 2012	Observed in 2013
American crow	*Corvus brachyrhynchos*		ü
Black-bellied plover	*Pluvialis squatarola*	ü	
Black-crowned night heron	*Nycticorax nycticorax*	ü	ü
Black phoebe	*Sayornis nigricans*		ü
Brandt's cormorant	*Phalacrocorax pencillatus*	ü	ü
Brown pelican	*Pelecanus occidentalis*	ü	ü
Cliff swallow	*Petrochelidon pyrrhonota*		ü
Double-crested cormorant	*Phalacrocorax auritus*		ü
Great egret	*Casmerodius albus*	ü	
Gull	*Larus* sp.		ü
Heermann's gull	*Larus heermanni*	ü	ü
Marbled godwit	*Limosa fedoa*	ü	
Northern rough-winged swallow	*Stelgidopteryx serripennis*		ü
Parrot	*Amazona* sp.		ü
Royal tern	*Sterna maxima*	ü	
Spotted sandpiper	*Actitis macularia*	ü	
Western grebe	*Aechmophorus occidentalis*	ü	ü
Western gull	*Larus occidentalis*	ü	ü
Whimbrel	*Numenius phaeopus*	ü	

Sources: Chambers Group 2012b, 2013a.

Protected Marine Bird Species

Descriptions are provided below for the special status marine bird species that are reasonably likely to be encountered offshore Broad Beach. Seabird species occurring in the Project vicinity that are protected under either the State or Federal Endangered Species Acts (ESA) include the State threatened Xantus's murrelet (*Synthliboramphus hypoleucus*), and the State endangered bald eagle (*Haliaeetus leucocephalus*). Table 3.3-2 includes several additional seabirds classified as species of concern by CDFW.

Table 3.3-2. Special Status Seabirds Occurring in the Broad Beach Area

Common Name	Scientific Name	Status
Bald eagle	*Haliaeetus leucocephalus*	State Endangered, SFPS, BGEPA [1]
Xantus's murrelet	*Synthliboramphus hypoleucus*	State Threatened
California brown pelican	*Pelecanus occidentalis californicus*	SFPS[1]

Notes: SSC = State Species of Special Concern; SFPS = State Fully Protected Species; BGEPA = Bald and Golden Eagle Protection Act

[1] Delisted from the Federal ESA in 2007.

[2] Delisted from the Federal ESA in 2009.

Finally, although the California brown pelican was delisted from both the Federal and State endangered species lists in 2009, it remains a State Fully Protected Species (SFPS) under the California Fish and Game Code. Special status shorebirds, such as the western snowy plover and California least tern, are addressed in Section 3.4, *Terrestrial Biological Resources*.

Bald Eagle. The bald eagle is generally found in coastal areas in California or near large inland lakes or rivers that have abundant fish. Coastal bald eagles nest near the shoreline, and hunt for food over the water using their talons to capture aquatic prey. Until 2007, the bald eagle was a listed species protected under the Federal ESA; however, it currently remains listed as an endangered species in California. Additionally, bald eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA). While bald eagle population precipitously declined earlier this century, this species has now successfully nested on four of the Channel Islands, Catalina, Santa Cruz, Anacapa, and Santa Rosa. The population of bald eagles on the Channel Islands is currently believed to number between 60 and 70 birds. Bald eagles range widely throughout the year, with many of the island residents making forays or extended visits to the mainland, including in the vicinity of the Broad Beach area.

Xantus's Murrelet. The Xantus's murrelet is a small diving bird of the family Alcidae, which includes puffins and murres. It is listed as threatened by the State of California, and is currently a candidate for listing under the Federal ESA because of its limited breeding range, small and declining global population size, and vulnerability to multiple threats, including predation, oil spills, and loss of habitat (Wolf et al. 2005). The murrelet breeds on islands between Point Conception, California, and Punta Abreojos in Baja California. The entire global population is currently estimated between 5,000 and 10,000 breeding pairs, while approximately 3,000 birds breed on the Channel Islands, primarily Santa Barbara Island.

Murrelets subsist on zooplankton and small fish including northern anchovies, sardines, rockfish, Pacific sauries, and crustaceans. They spend most of their lives at sea, far from the mainland, and come ashore only to breed. Their nesting period extends from February through July, but may vary depending on food supplies. During the nesting season, they forage in the immediate vicinity of the colony. Nests are located in natural rock crevices or under shrubs, especially along or near cliffs.

Current threats to the population of Xantus's murrelet include native and non-native predators and competitors, oil pollution, changes in oceanography and prey availability, and by-catch in fisheries. Recently, concerns have also arisen over the effects of artificial light pollution from fishing and other vessels that overnight near the island colonies, potentially attracting birds to their death by collision or contamination aboard ship.

California Brown Pelican. California brown pelicans are large, fish-eating birds commonly seen foraging in the nearshore waters from British Columbia to southwest Mexico. Nesting colonies of brown pelicans are located from the Channel Islands south to the islands off Nayarit, Mexico. While the majority of nesting takes place in Baja California, some occurs on the Channel Islands (Garrett and Dunn 1981, U.S. Fish and Wildlife Service [USFWS] 2008).

Estimates of the U.S. breeding population size for the brown pelican were approximately 6,000 pairs in 1991 (Carter et al. 1992). However, in 2006 approximately 11,695 breeding pairs were documented at ten locations throughout the SCB (USFWS 2008). The Channel Islands are known to support a range of 5,000 to 12,000 nesting pairs during 2004-2006 (National Park Service [NPS] 2008).

A formally listed species, the pelican was delisted, but retains Federal protection under the Migratory Bird Treaty Act (MBTA) and is a fully protected species under California Fish and Game Code section 3511.

Marine Turtles

Though uncommon in the region, four species of marine turtles are known to inhabit the waters off the northeastern Pacific Ocean off the coast of California, all of which are protected under the Federal ESA (see Table 3.3-3). The leatherback is the most frequently encountered turtle offshore of California, followed by the green, loggerhead, and olive ridley sea turtles (Stinson 1984); however, most leatherback sightings are concentrated north of Point Conception. Within the central and southern portions of the SCB, including the Project vicinity, green and loggerhead turtles are the most commonly encountered species. Marine turtles in the SCB generally occur in greatest abundance from July through September.

Table 3.3-3. Marine Turtle Species in Southern California Waters

Common Name	Scientific Name	Occurrence in SCB	Likelihood at Site	Protected Status
Green turtle	*Chelonia mydas*	Uncommon	Possible	Federal Threatened. Breeding populations in Mexico are listed as Federal Endangered
Loggerhead turtle	*Caretta caretta*	Uncommon	Possible	Federal Endangered
Olive ridley turtle	*Lepidochelys olivacea*	Uncommon	Possible	Federal Threatened. Breeding populations in Mexico are listed as Federal Endangered
Leatherback turtle	*Dermochelys coriacea*	Uncommon	Unlikely	Federal Endangered

Sources: National Oceanic and Atmospheric Administration (NOAA) 2007, Caretta et al. 2005.

Green Turtle (*Chelonia mydas*). Green turtles are the most commonly observed marine turtle along the Southern California coast. Although there are no nesting beaches on the west coast of the U.S., two permanent colonies of turtles are currently known to exist in the region. One colony of 60 to 100 turtles resides in San Diego Bay, while another group of approximately 30 turtles is now recognized as residing where warm water is discharged into the brackish mouth of the San Gabriel River from a Long Beach power plant (the Los Angeles Department of Water and Power’s Haynes Generating Station). Green sea turtles are also occasionally seen elsewhere along the California coast, usually in El Niño years when the ocean temperature is higher than normal.

Loggerhead Turtle (*Caretta caretta*). Loggerhead turtles, so named for their relatively large heads, are a cosmopolitan species, found in temperate waters and inhabiting pelagic waters, continental shelves, bays, estuaries, and lagoons worldwide. California sightings of loggerhead turtles generally consist of juveniles that have crossed the Pacific Ocean after hatching on beaches in southern Japan (Stebbins 2003). Sightings off Southern California are typically confined to the summer months, peaking from July to September. However, sightings may occur throughout much of the year during El Niño events when ocean temperatures rise.

Olive Ridley Sea Turtle (*Lepidochelys olivacea*). The olive ridley sea turtle is considered the most abundant sea turtle in the world, with an estimated 800,000 nesting females annually (National Oceanic and Atmospheric Administration [NOAA] 2013b). The olive ridley sea turtle gets its name from the olive coloration of its heart-shaped top shell. This species is mainly pelagic, but has been known to inhabit coastal areas, including bays and estuaries (NOAA 2013b). Olive ridleys are globally distributed in the tropical regions of the South Atlantic, Pacific, and Indian Oceans. In the Eastern Pacific, they occur from Southern California to Northern Chile (NOAA 2013b).

Leatherback Sea Turtle (*Dermochelys coriacea*). Similar to olive ridley sea turtles, leatherback sea turtles are commonly known found in pelagic waters, but they also forage in coastal waters. Leatherback sea turtles are the most migratory and wide ranging of sea turtle species. Found mostly in tropical waters, they move into temperate waters during the summer. They have been recorded from cold waters in Norway, Iceland, and Alaska. Leatherbacks in the Pacific Ocean are generally smaller in size than leatherbacks in the Atlantic Ocean (NOAA 2013a). Leatherback sea turtles can occur almost anywhere on the coast of California, but most sightings are not documented. Most sightings in California occur from boats out at sea. Locations where leatherback sea turtles have been observed in California include areas as far south as San Diego County and as far north as Marin County (California Herps 2014). The Broad Beach area is located in federally designated critical habitat for leatherback sea turtles; however, this species is not likely to occur within the immediate vicinity of Broad Beach.

Marine Mammals

Because of its transitional location between the cooler (Oregonian) zoogeographic province to the north of Point Conception and the subtropical (San Diegan) province to that comprises most of Southern California's waters, the Project vicinity supports a variety of marine mammals. Marine mammals reported within the area are represented by more than 40 species, all of which are protected under the Marine Mammal Protection Act (MMPA). These include 34 species of cetaceans (whales, dolphins and porpoises) and six species of pinnipeds (seals and sea lions) (Carretta et al. 2005, Leatherwood et al. 1982 and 1987, Leatherwood and Reeves 1983). The southern sea otter (*Enhydra lutris nereis*), a representative of the weasel family, Mustelidae, is also found in the region. Six species of cetaceans are federally listed as endangered, while two species of pinnipeds and the southern sea otter are listed as threatened under the Federal ESA.

Marine mammal species in the SCB can be classified into three categories: (1) migrants that pass through the area on their way to calving or feeding grounds; (2) seasonal visitors that remain for a limited time; and (3) residents that remain much or all of the year. Five whale species transit waters offshore Broad Beach during annual migrations, while all but one of the dolphin species have resident populations within the area. Since no Project activities beyond the beach nourishment footprint would occur offshore, descriptions of whale and dolphin species present in the SCB are not provided.

California sea lions are the most abundant pinnipeds offshore Southern California and are the most commonly sighted pinniped in the Project vicinity. California sea lions maintain rookeries on the offshore islands, including San Miguel Island, and frequently rest on nearshore rocks and navigation buoys. Harbor seals are also very common along the Southern California coast and may come into bays and harbors, but do not exhibit the overt social behavior of sea lions. Along the outer coast, both species haul out on offshore rocks or may rest on sand bars at low tide. Unlike the wider-ranging sea lions, however, harbor seals forage relatively close to shore, with 75 percent remaining within 6.2 miles of the shoreline (Marine Mammal Center 2001). Harbor seal rookeries are mostly located in central and northern California, with the nearest established rookeries located on the Channel Islands, at Carpinteria, and near San Diego.

Broad Beach is located near the geographic middle of the SCB. As such, marine mammal species whose extreme range limit is the SCB, such as the northern fur seal, northern elephant seal, and Steller sea lion, are not likely to be encountered.

<u>Subtidal Habitats and Biota</u>

As discussed in Section 3.5, *Marine Water Quality*, most of the deep seafloor within Santa Monica Bay consists of unconsolidated (soft) sediments (various mixtures of sand, silt, and clay) overlying a moderately sloping bottom, while the nearshore areas consist of sandy and soft-bottom sediments. The Santa Monica Bay has two major rocky headlands, Malibu and the Palos Verdes Peninsula (Claisse et al. 2008). Cobble and gravel substrates are restricted to the innermost shelf south of El Segundo and limited parts of the shelf edge. Patches of sand and gravel are interspersed with rocky substrates on the high-relief marginal plateau and along parts of the shelf break just offshore Malibu (Edwards et al. 2003). Limited regions of hard-bottom substrate and kelp beds exist at the periphery of Santa Monica Bay, including near Broad Beach at Lechuza Point (Allen 1982, Terry et al. 1956) (see Figure 3.3-2).

Small percentages (1 to 5 percent) of the total area of each of the MPAs designated in the vicinity of Broad Beach contain the shallow rocky reef habitat (Table 3.3-4). While this critical habitat makes up only a few percent of the newly designated MPAs in the region, it supports substantial regional fisheries (Claisse et al. 2008).

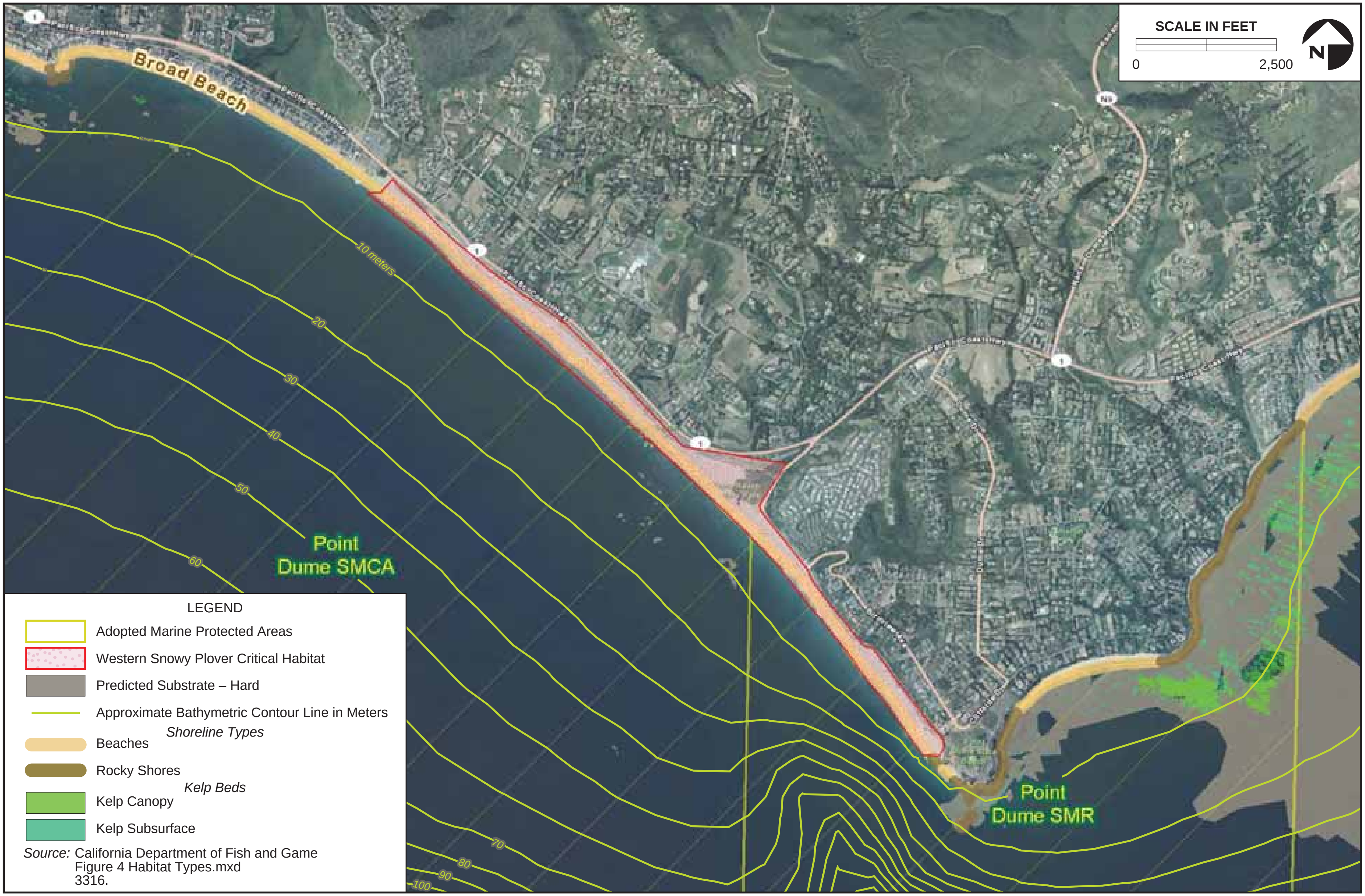
Table 3.3-4. Rocky Reef Habitat within MPAs in the Vicinity of Broad Bach

MPA	Rocky Reef Area (acres)	Percent of MPA Area	Percent of Regional Mapped Habitat
Point Dume SMCA	39.3	1.0%	1.7%
Point Dume SMR	95.7	4.9%	4.3%

Source: Claisse et al. 2008.

The subtidal habitat areas offshore Broad Beach were determined using aerial photography analysis, dive transect surveys, and sonar surveys, occurring primarily in 2012, 2013, and 2014. Marine habitat coverage in this area, particularly with regards to intertidal and shallow subtidal habitats, is highly dependent on storm cycles, wave action, and sand coverage. As longshore sand transport varies on daily, seasonal, annual, and decadal cycles, coverage of various marine habitats in these areas also varies on these timescales. For example, exposure of rocky intertidal habitats in Lechuza Cove varies substantially between seasons with this area sometimes dominated by sand. Additionally, the extent of kelp forest is known to vary considerably over time, due largely to major storms, which can dislodge kelp hold-fasts, and climatic factors, such as El Niño cycles, which vary water temperatures and storm intensity. As such, habitat surveys in dynamic intertidal and shallow subtidal areas should be considered snapshots that can be affected over time by the factors described above.

Differences in survey techniques can also artificially result in variability in mapped habitat at Broad Beach. For example, subtidal reef habitat was estimated using transect surveys in 2012. While kelp canopy offshore Broad Beach was previously estimated by aerial photography (CDFW 2009), side scan sonar surveys in 2014 revealed the presence of kelp at a higher resolution, contributing to the increase in kelp observed since 2012. While there was likely some increase in subtidal reef habitat due to natural scouring of subtidal sand offshore, the increased resolution provided by side scan sonar surveys may have resulted in the observed increase in habitat between 2012 and 2014.



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Shoreline Habitats near the Project Site

FIGURE 3.3-2

Soft-bottom Habitats

The soft-bottom habitat of the region supports a diverse and abundant infauna (animals that live in the substrate), with as many as 1,200 infaunal species having been reported from Santa Monica Bay (Dorsey 1988). The abundance and distribution of infauna varies seasonally and interannually; however, infauna at Broad Beach are usually dominated, in both number of species and individuals, by polychaete worms. Other important infaunal groups in the region include crustaceans, mollusks, and echinoderms (Phylum Echinodermata).

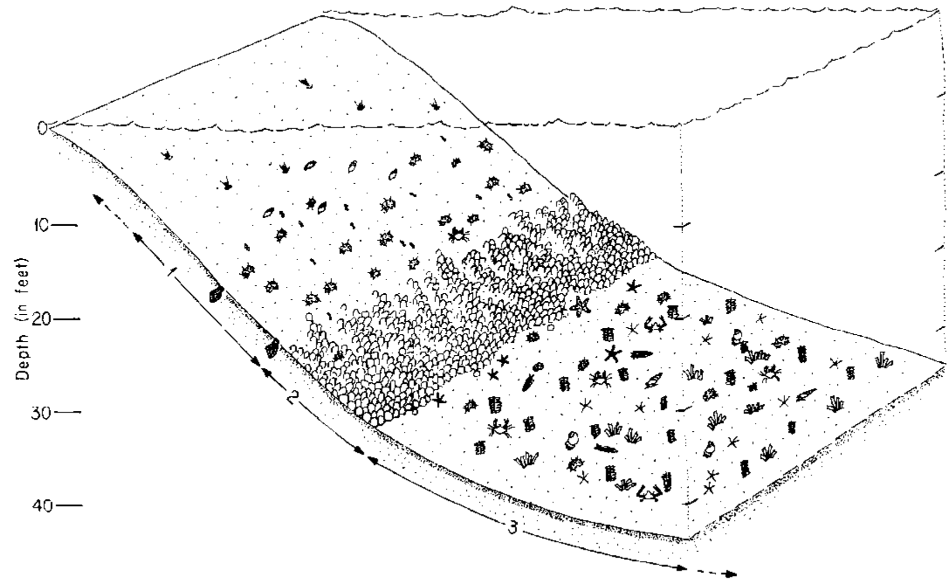
Most polychaetes either feed on the bottom by engulfing sediments and digesting the attached bacteria, filter feed on bits of organic detritus in the water, or prey on other infauna (Morris et al. 1980). For example, the blood worm (*Glycera dibranchiata*) is an infaunal polychaete that feeds on bacteria, microalgae, and smaller invertebrates beneath the sand. Polychaetes play an important role in reworking the sediments and are important constituents in the diet of many demersal fish.

Epibenthic (living on the bottom) invertebrates of the Bay include sea stars, sea cucumbers, sand dollars (*Dendraster excentricus*), sea urchins, crabs, snails, and sea slugs. These organisms are larger than infaunal species, generally less common and, therefore, spaced further apart. However, sand dollars and sea urchins often occur in very dense, single-species patches that limit the abundance of other species. Historically, the area offshore Zuma Beach east of the Broad Beach area, has supported nearshore populations of sand dollar beds, Pismo clam beds and a biological zonation of the supporting habitat that varies with both depth and wave action (see Figure 3.3-3; Morin et al. 1985, 1988).

During a 2010 subtidal survey of Broad Beach (Chambers Group 2012c), sand dollar beds were observed at depths of between 10 and 14 feet along the eastern half of the site. Other characteristic organisms observed in this sand bottom habitat were tube worms (*Diopatra ornata*), sea pens (*Stylatula elongate*), sea pansies (*Renilla kollikeri*) and several species of crabs (*Cancer gracilis, Randallia ornata,* and *Heterocrypta occidentalis*). These species were also observed during subtidal dive surveys conducted in June 2014 (Moffatt & Nichol 2014).

Bivalves in the region include the aforementioned Pismo clams (*Tivela stultorum*), along with Pacific littleneck clams (*Leukoma staminea*), and Gould bean clams (*Donax gouldi*). Pismo clams have occurred historically in the shallow sand bottom habitats off the eastern end of Broad Beach and are most common at depths of 10 to 20 feet, while the Pacific littleneck clam, is found in coarse sand and gravel near rocky areas (Morin and Harrington 1979, Blunt 1980). Pismo clams are an important invertebrate species that once supported a significant commercial fishery, along with an extremely popular recreational fishery that still exists today.

Figure 3.3-3.
Biological Zonation of Nearshore Sandy Bottom Habitat near Broad Beach



Species	Zone
Spiny Sand Crab (Blepharipoda occidentalis)	1
Purple Olive Snail (Olivella biplicata)	1
Pismo Clam (Tivela stultorum) [side view]	1
Pismo Clam (Tivela stultorum) [surface view]	1
Sea Pansy (Renilla kollikeri)	1,3
Purple Crab (Cancer gracilis)	1-3
Sand Dollars (Dendraster excentricus)	2
Pink Star (Pisaster brevispinas)	2

Species	Zone
Shallow Sand Star (Astropecten armatus)	2,3
Deep Sand Star (Astropecten verrilli)	3
Carpenter's Turrid (Megasurcula carpenteriana)	3
High Moon Snail (Polinices altus)	3
Pansy Nudibranch (Armina californica)	3
Sea Pen (Stylatula elongata)	3
Gray Tube Worm (Diopatra ornata)	3
Elbow Crab (Hetero crypta occidentalis)	3

Primarily as a result of overharvesting and habitat degradation, declines in abundance have occurred in all three clam species (Shaw and Hassler 1989, Chew and Ma 1987, CDFW 2006). Although no live Pismo clams were observed during the 2010 or 2014 dive surveys conducted at Broad Beach by Chambers Group (Chambers Group 2010, Moffatt & Nichol 2014), empty shells were observed suggesting that this species may still be present in the area.

The most obvious sandy intertidal crustacean in the area is the sand crab (*Emerita analoga*), which is collected commercially for fishing bait and is also an important food source for fishes that live in the surf zone. Individuals of this species burrow in the wave swash zone of high-energy sandy beaches where they often occur in dense aggregations (many thousands per square yard). Sand crabs are prey for a number of shorebirds and several species of fish including California corbina (*Menticirrhus undulatus*), barred surfperch (*Amphisticus argenteus*), and black croaker (*Cheilotrema saturnum*).

Most of the variability in infaunal populations is natural and is difficult to separate from variability associated with human impacts (Reish et al. 1980). However, any disturbance of the sediments or oceanographic change is likely to affect benthic soft-bottom invertebrate populations. For example, severe storms during the El Niño period in 1983 may have been responsible for changes in the invertebrate assemblage of the SCB, including areas off the Palos Verdes Peninsula (Swartz et al. 1986).

Hard-bottom Habitats

Extensive reefs are known to occur off Lechuza Point, with the reefs becoming increasingly scattered proceeding east from Lechuza Point. Based on the December 2012 subtidal reef survey, approximately 4.6 acres of subtidal reef occur adjacent to the Broad Beach area (Chambers Group 2012c). However, seasonal, annual, decadal coastal processes at Broad Beach are constantly shifting and scouring sand offshore, resulting in periodic increases in rocky subtidal habitat exposure. During the side scan sonar survey conducted in May 2014, approximately 20.2 acres of rocky subtidal habitat was documented, representing a variability of 15.6 acres in this habitat type over the course of 2 years. Variability in habitat area between these survey events is likely due to some combination of differences in survey techniques, as well as variable sand coverage. The reefs adjacent to the Broad Beach area are indurated rock reefs notable for the general physical heterogeneity created by large igneous bed rock protrusions, which produce cliffs, overhangs, cracks and crevices. The major reef blocks usually run parallel to shore and are interspersed with large sand flats (Chambers Group 2012a).

Rocky reefs are important to algal, invertebrate, and fishery species. While rocky reefs are a relatively rare benthic habitat, such habitats support groundfish populations. Key habitats associated with the rocky substrate include kelp forests and associated algal communities which are key elements of the ecosystem and provide important groundfish habitat. Kelp forest is known as a nursery, feeding ground, and shelter for a range of groundfish species and their prey (Ebeling et al. 1980, Feder et al. 1974). Giant kelp communities are known as highly productive habitats as compared to wetlands and areas with sandy substrate. Such habitats are net primary producers contributing to energy flow within food webs. Foster and Schiel (1985) reported that the net primary productivity of kelp beds may be the highest of any marine community.

Hard-bottom habitats host a diverse and abundant assemblage of organisms that are often unique to their habitat (MBC 1993). These areas provide substrate suitable for attachment of a variety of plants and sessile (immobile) invertebrates, as well as shelter and forage for more motile organisms (organisms that move spontaneously and actively, consuming energy in the process). Sessile species using hard-bottom substrate include mussels, rock scallops (Family Pectinidae), barnacles, sponges, sea anenomes, sea fans (Order Gorgonacea), feather duster worms (Family Serpulidae), wormsnails (Family Vermetidae), and sea squirts (Order Ascidiacea). Most of these sessile invertebrates feed by filtering plankton and detritus from the water column. Motile invertebrates, including crabs, octopuses, and shrimp hide in crevices or are protectively colored. Invertebrates associated with hard bottom substrates are frequently a food source for birds (in the exposed intertidal zone) and fish (in the subtidal zone).

At the western portions of Broad Beach, shallow water rocks and reefs, which are the most likely to be affected by beach sand, occur from the intertidal zone to about 15 feet water depth. These low reefs and isolated boulders are close to shore and are strongly affected by swell, longshore currents, sanding in, high turbidity and scour, by local runoff from the land, and even by lowered salinity from rain storms (Morin and Harrington 1979). Biological communities on these shallow rocks are often characterized by rapid turnover of species. Long-lived, sand-tolerant species typical of nearshore rocks at this depth include aggregate anemones, surfgrass, feather boa kelp and California mussels.

Nearshore reefs at depths between 15 feet and 30 feet represent a transition between shallow water reefs and offshore reefs. The most prominent species on the tops of these reefs tend to be the shrub-like intermediate-height brown kelps, such as sea palms (*Eisenia arborea* and *Pterygophora californica*) and bladder kelp (*Cystoseira osmundacea*). The sides of the reefs generally support a rich encrusting fauna of sponges, tunicates and bryozoans. Giant kelp also occurs on these nearshore reefs, and sea urchins (*Strongylocentrotus purpuratus* and *S. franciscaus*) may be abundant.

Nearshore reefs also provide substrate for giant kelp (*Macrocystis pyrifera*), feather boa kelp (*Egregia menziesii*), and palm kelp (*Pterogophora californica*), which provide additional habitat for a multitude of organisms. Since most hard bottom habitats in the Broad Beach area are of low relief, the presence of kelp often lends a vertical element to the habitat that is otherwise lacking. A shallow subtidal survey was conducted within the Broad Beach area, which identified surfgrass, eelgrass (*Zostera pacifica*), giant kelp (*Macrocystis pyrifera*), feather boa kelp (*Egregia menziesii*), southern palm kelp (*Eisenia arborea*), palm kelp (*Pterygophora californica*), and gorgonians (*Muricea californica* and *M. fruticosa*). These species are considered indicator species because they add important structure to the environment and increase the value of the habitat when they are present (Chambers Group 2012a). Similar species were also identified during targeted dive surveys conducted in June 2014 (Moffatt & Nichol 2014).

Because rocky reefs are diverse and have an abundance of unique organisms, they are typically important sites for recreational diving and fishing; California spiny lobster (*Panulirus interruptus*), yellow and Pacific rock crabs (*Cancer* spp.), red and purple sea urchins (*Strongylocentrotus franciscanus* and *S. purpuratus*, respectively), and spot shrimp/prawn (*Pandalus platyceros*) are fished recreationally in the Project region

(MBC 1993). Abalone was also fished both recreationally and commercially in the area until the 1990s.

Although spiny lobsters usually are found in rocky habitat, where they take shelter in holes and crevices, a large portion of the population migrates annually in response to changes in water temperature. During winter months, lobsters are typically found offshore at depths of 50 feet or more; however, in spring, lobsters move into warmer nearshore waters of less than 30 feet in depth. The higher temperatures in the nearshore waters shorten the development time for lobster eggs. Nearshore waters also have a more plentiful supply of food. Lobsters move back offshore during fall and early winter in response to storms that cause increased wave action in shallow water.

Over hard-bottom substrates, fish assemblages generally differ in composition relative to depth. Common shallow-water families include sea basses (Family Serranidae), surfperches, rockfishes, kelpfishes (Family Clinidae), sculpins, damselfishes (Family Pomacentridae), and wrasses (Family Labridae). In deeper waters, vermilion rockfish, bocaccio, cowcod (*Sebastes levis*), and flag rockfish (*Sebastes rubrivinctus*) dominate (Allen et al. 1976, Moore and Mearns 1980). Over 25 different fish species were observed within subtidal reef habitat offshore of Broad Beach during the June 2014 targeted dive surveys (Moffatt & Nichol 2014).

Kelp Beds

Rocky subtidal habitats in the vicinity of Broad Beach, and throughout much of the SCB, are vegetated with a variety of red and brown algae (MBC 1993). Red algae generally form a low turf or understory of coralline, foliose, and filamentous forms from shore to the edge of the photic zone. Brown algae are generally larger and form an overstory; locally, feather-boa kelp is dominant nearshore, while giant kelp dominates deeper areas of reefs, forming large beds at depths of 20 to 120 feet (CDFW 2001, Quast 1968).

Giant kelp is a large, fast-growing, perennial algae that thrives in protected nearshore waters from Baja California to Santa Cruz (Druehl 1970). Kelp usually attaches to rock outcrops or large cobbles to stay in place; however, under calm conditions kelp plants have occasionally established themselves successfully in sandy subtidal regions as well, generally by attaching themselves to worm tubes (North 1971, Chambers Group 1991).

Key Terms

Kelp: Attaches to hard substrata and provides vertical heterogeneity important for invertebrates and fish.

Eelgrass: Found on muddy or sandy bottoms. Act as protective nursery grounds for many fish species.

Surfgrass: Found in the intertidal and subtidal zones. Surfgrass provides shelter, foraging, primary productivity, and substrate for a variety of species and can act to dissipate wave energy, providing refuge and protection for resident and transient species.

Giant kelp beds form an important and distinct marine habitat along the rocky coastal reaches of the SCB. The rocky bottoms found offshore Leo

Carrillo State Beach, the Malibu coast, and along the Palos Verdes Shelf support the majority of the kelp stands within Santa Monica Bay, although individual plants occasionally manage to gain a foothold on temporarily exposed rocks along the sandy, central portions of the Bay (MBC 1993). In 2012, kelp coverage offshore Broad Beach was estimated at approximately 9.5 acres (Chambers Group 2012a). However, surveys in May 2014 estimated that approximately 15.1 acres of bedrock were characterized by attached kelp (Moffatt & Nichol 2014). Additionally, Moffatt & Nichol (2014) estimated the kelp canopy at 23.1 acres. The variability in these kelp coverage estimates is likely due to some combination of increased resolution from side scan sonar survey techniques as well as increased hard substrata available for kelp attachment. However, it should be noted that the availability of hard substrata fluctuates on seasonal, annual, and decadal time scales associated with coastal processes, including longshore sand transport.

Giant kelp beds create a vertically structured habitat that extends from the seafloor up to the sea surface, providing food, shelter, and nursery areas for a variety of invertebrates and fishes. Kelp bass, black perch, rubberlip seaperch, opaleye, kelp rockfish, and olive rockfish (*Sebastes serranoides*) are all commonly encountered in kelp beds. Topsmelt, kelp pipefish (*Syngnathus californiensis*), kelp perch (*Brachyistius frenatus*), giant kelpfish (*Heterostichus rostratus*), kelp clingfish (*Rimicola muscarum*), and kelp gunnel (*Apodichthys* [=*Ulvicola*] *sanctaerosae*) are fishes known to frequent the canopy, or upper reaches of the kelp forest (MBC 1993). Lower down in the water column, where the leafy canopy is not as dense, yellowtail, white sea bass (*Atractoscion* [=*Cynoscion*] *nobilis*), rubberlip seaperch, halfmoon (*Medialuna californiensis*), and halfblind goby (*Lethops connectens*) can be found. Several of these species are important commercial and recreational fishery species. Giant kelp has historically been harvested commercially within the region for a variety of purposes.

As previously described, almost all kelp forests occur on hard substrata. Important environmental factors influencing kelp communities include light, substrata, sedimentation, nutrients, water motion, salinity, and temperature Sedimentation and scour are highly detrimental to kelp plants. In most cases their effects are most severe on spores, gametophytes, and young plants (Dayton 1985). Due to their small size, *Macrocystis* gametophytes and embryonic sporophytes are highly vulnerable to sand scour and smothering by sediments (Graham et al. 2007).

Seagrass Beds

Seagrass beds are regarded worldwide as some of the most productive marine habitats. Not only do these beds act as protective nursery grounds for many finfish and shellfish, but they also act as substrate for epiphytic algae and micro-invertebrates, and serve as an important food source for waterbirds. Two types of seagrass are found along the Southern California coast, eelgrass and surfgrass. Although these two plants look similar superficially, they are adapted for very different types of habitat. Surfgrass generally grows on rocky substrates and is found in high-energy near-shore environments, such as tidepools and the surf zone. Wider-bladed eelgrass typically grows in sandy, sheltered areas, where there is adequate protection from waves and storms. Seagrasses are used in studies as a marker of the upper limit of the lower tidal zone, and for their sensitivity to pollution. They are also important for sediment deposition and substrate stabilization.

Eelgrass. Pacific eelgrass has long, bright green, ribbon-like leaves, with short stems. It grows submerged or partially floating in the marine environment and is found in estuaries and along protected coastlines, on muddy and sandy bottoms, from the low intertidal to a depth of approximately 65 feet. Eelgrass beds grow rapidly in the spring and summer, then decay in the fall and winter with dead eelgrass blades often washing up on the beach where their decay adds crucial nutrients to coastal environments.

During surveys in 2010, 2012, 2013, and 2014 a substantial Pacific eelgrass bed (thought to be *Zostera pacifica*, though nearshore species may be different from those farther offshore) was documented offshore Broad Beach at depths of approximately 21 to 40 feet (Chambers Group 2013b; Moffatt & Nichol 2014) (see Figure 3.3-4). Additionally, a September 2010 reconnaissance survey of marine biological resources confirmed the presence of surfgrass (*Phyllospadix* spp.) at the west end of Broad Beach, primarily off Lechuza Point, which becomes more scattered and patchy along the beach to the east (Chambers Group 2012a) (see Figure 3.3-4). Dive surveys of eelgrass off Broad Beach were performed on October 23 and November 1, 2012, and a sonar survey was performed in 2013 (Chambers Group 2013b). During these surveys, an eelgrass bed approximately 8.75 acres in size (1,104 feet long by about 456 feet wide at its widest point near its eastern edge) was documented extending from a water depth of about 21 feet below MLLW to about 40 feet below MLLW (Chambers Group 2013b) (see Figure 3.3-4). Additional side scan sonar surveys were conducted in this area in May 2014 and additional targeted dive surveys were conducted in June 2014 (Moffatt & Nichol 2014). These surveys identified approximately 7.1 acres of eelgrass, similar in size to that documented in 2013 (Moffat & Nichol 2014). The discrete portion of the bed is fairly dense in places, although the bed contains sand patches within the bed and the edges of the bed are patchy. Reefs were observed along the western edge of the bed and the bed curved around the reefs. A list of the organisms observed in the eelgrass bed during the October and November 2012 dives, as well as the June 2014 targeted dives, is provided in Table 3.3-5. The majority of these organisms are considered common shallow water sand bottom species; however, a greater number of fishes (both individuals and species) were observed in the eelgrass bed than is typical of unvegetated sand bottoms. Further, the eelgrass bed appeared to be providing shelter to spiny lobsters and the fishes.

Table 3.3-5. Organisms Observed in Eelgrass Bed

Scientific Name		Common Name
Anthophyta	*Zostera pacifica*	Eelgrass
Cnidaria	*Harenactis attenuata*	Burrowing anemone
	Stylatula elongata	White sea pen
Mollusca	*Aplysia californica*	Sea hare
	Kelletia kelletii	Kellet's whelk
	Nassarius fossatus	Channeled basket whelk
Annelida	*Diopatra ornata*	Ornate tube worm
Arthropoda	*Cancer antennarius*	Rock crab
	Cancer gracillis	Slender caner crab
	Heterocrypta occidentalis	Elbow crab
	Loxorhynchus gradis	Sheep crab
	Panulirus interruptus	California spiny lobster
Echinodermata	*Astropecten armatus*	Spiny sand star
Vertebrata	*Damalichthys vacca*	Pile perch
	Citharichthys stigmaeus	Speckled sanddab
	Embiotica jacksoni	Black perch
	Heterodontus francisci	Horn shark
	Oxyjulis californica	Seniorita
	Paralabrax clathratus	Kelp bass
	Paralabrax nebulifer	Sand Bass
	Synodus lucioceps	California lizardfish
	Urooophus halleri	Round stingray

Source: Chambers Group 2012a; Moffatt & Nichol 2014.

Similar to kelp beds, eelgrass beds are also sensitive to substantial increases in turbidity and sedimentation. Mills and Fonseca (2011), experimentally buried eelgrass to 0, 25, 50, 75 and 100 percent of its average aboveground height in an existing bed. Increasing percentages of plant burial significantly increased mortality and decreased productivity. Survival and productivity of eelgrass were substantially reduced when only 25 percent of the plant height was buried. Plants buried 75 percent or more of their height were characterized by survival and productivity measures of 0 (Mills and Fonseca 2011). Additionally, a major indirect factor responsible for the decline of seagrasses, including eelgrass, is lower light level reaching sandy substrata. Light is one of the primary factors determining the limits of eelgrass growth. A potential factor decreasing water clarity is sedimentation (Newell and Koch 2004). Not only can burial cause direct mortality of the plant, but suspension of sediments can have a negative impact on the growth of surrounding eelgrass plants, even if they are not directly buried.

Surfgrass

Surfgrasses (*Phyllospadix* sp.) (Illustration 3.3-1) grow in large clumps or beds exposed during low tide and submerged at high tide and are found attached to rocks ranging from the middle to low intertidal zones to a depth of about 40 to 50 feet. The bright green leaves of surfgrass are typically narrow (0.04 to 0.15 inch), but can range up to 10 feet in length depending on the species. Surfgrasses bloom in late fall, then release tiny seeds shaped like horseshoes with sharp, barbed ends that can latch onto branches of coralline red algae, anchoring the young seedlings against winter storm waves. Surfgrass seeds typically sprout between January and March, with the plants growing rapidly once sunlight and nutrients are plentiful.

Illustration 3.3-1: *Surfgrass occurs in the rocky intertidal habitats off of Lechuza Point and provides critical habitat for many intertidal species.*

Surfgrass provides shelter, foraging, primary productivity, and substrate for a variety of species and can act to dissipate wave energy, providing refuge and protection for resident and transient species. Surfgrass provides a key nursery habitat for a variety of invertebrates, such as California spiny lobster (Engle 1979), and also provides habitat for algae (Stewart and Myers 1980). Shaw (1986) suggests that the importance of surfgrass as a nursery for juvenile lobsters in Southern California is clearly apparent. Surfgrasses also exhibit late successional traits, recover very slowly from disturbance, require facilitation from algae before settling, and are strong competitors (Turner 1985). Removal of surfgrass from a rocky reef community has profound impacts to community structure (Turner 1985). Therefore, surfgrass habitat is largely determined by patterns of disturbance.

During surveys in 2010 and 2012, surfgrass was observed and mapped in subtidal and intertidal habitat off of Lechuza Point and down coast. A shallow subtidal reconnaissance survey was conducted on September 29, 2010, during which divers swam transects parallel to the shore between Lechuza Point and Trancas Creek, documenting surfgrass, eelgrass, and kelp stands. The first intertidal survey on October 7, 2010 consisted of biologists walking the beach between Lechuza Point and Trancas Creek during a -0.5 feet low tide. The location of rocky intertidal habitat, boulders, and surfgrass were noted and surfgrass was mapped during this survey. A second intertidal survey was performed on April 10, 2012 during a -0.8 feet low tide. The purpose of the second survey was to map surfgrass and rocky habitat along the western portion of

Broad Beach in order to compare seasonal levels of sand exposure of these resources. Frequent patches of surfgrass were observed during the April 2012 survey in the vicinity of Lechuza Point in approximately the same location they were observed in the October 2010 survey. However, the rocky area near Lechuza Point observed in October 2010, had experienced considerable sand inundation. Additionally, during this survey, the outer edge of the surfgrass was conservatively extrapolated based on the presence of rocky habitat and the occasional glimpse of surfgrass on the top of rocks when waves receded (Chambers Group 2012a). The size of the surfgrass patches (observed and extrapolated) documented during these surveys is approximately 2 acres (see Figure 3.3-4). However, as observed during the 2012 survey the patch sizes are subject to fluctuation based on sand inundation (Chambers Group 2012a). Surfgrass was not specifically mapped or targeted as a part of the 2014 surveys and the bed observed in 2012 was assumed to be similar in size (Moffatt & Nichol 2014).

Similar to other seagrasses, surfgrass can also be adversely affected by turbidity impacts. Surfgrasses are likely to be impacted by beach nourishment and shoreline protection projects that place sand either directly or indirectly onto surf grass beds. Since the roots and rhizomes of *Phyllospadix* spp. attached to rocks are normally exposed, their responses to sediment burial may differ from other seagrasses whose roots and rhizomes are normally covered with sediments. Craig et al. (2008) found that that short-term burial results in shoot mortality, decreased shoot counts, and reduced growth of *Phyllospadix* species. Disturbances that result in long-term (or permanent) burial of the hard substrate in an area will preclude recovery. No amount of elapsed time since disturbance will compensate for destruction or covering of the necessary hard substrate for *Phyllospadix* spp. (Reed et al. 1999).

Marine Invertebrates

Abalone. Abalone are large marine snails associated with rocky intertidal and subtidal areas where they cling to rocks, feeding on kelp and other algae that they scrape off the substrate. For a time during the 1970s to 1990s, they comprised a highly valuable fishery in Southern California. Surveys of the Broad Beach intertidal and subtidal areas did not indicate the presence of any abalone species (Chambers Group 2011, 2012b, Moffatt & Nichol 2014). Of the seven abalone species historically found in the waters along the Southern California coast near the Broad Beach area, two are currently listed as federally endangered and two are currently recognized as Federal species of concern (see Table 3.3-6). The primary factors contributing to the decline of these species are over-harvesting, illegal harvesting and trade, predation, disease, and El Niño events. Illegal poaching and disease, and reproductive constraints currently constitute the biggest threats to the continued survival and recovery of these species. None of these species are likely to occur in the Broad Beach area.

Table 3.3-6. Abalone Species of Southern California

Common Name	Species Name	Likelihood at Site	Protected Status	Preferred Depth[1]
Black Abalone[2]	*Haliotis cracheirodii*	Unlikely	Federal Endangered	Intertidal to 20 ft
Green Abalone	*Haliotis fulgens*	Unlikely	Species of Concern[3]	Intertidal to ≥30 ft
Pink Abalone	*Haliotis corrugate*	Unlikely	Species of Concern	20 ft to ≥120 ft
White Abalone	*Haliotis sorenseni*	Unlikely	Federal Endangered	Subtidal to ≥200 ft
Red Abalone	*Haliotis refescens*	Unlikely	None	Subtidal to ≥100 ft
Threaded Abalone	*Haliotis assimilis*	Unlikely	None	20 ft to ≥80 ft
Flat Abalone[2]	*Haliotis walallensis*	Unlikely	None	20 ft to ≥70 ft

[1] ft = feet
[2] Flat and Black abalone are no longer found south of Point Conception (Owen 2006, NMFS 2011).
[3] Federal species of concern

Intertidal Shoreline Habitat and Biota

Habitats within the intertidal zone include rocky and sandy intertidal habitat (Illustration 3.3-2). Similar to offshore marine habitat, intertidal habitat areas at Broad Beach were determined using a combination of transect surveys and sonar surveys, occurring primarily in 2012 and 2014. Similar to offshore habitats, intertidal habitats (e.g., rocky intertidal areas) are highly dependent on sand coverage. As longshore sand transport varies on seasonal, annual, and decadal cycles, exposed intertidal rocky substrata also varies on these timescales. This is demonstrated by the wide sandy beaches present at Broad Beach and other California Beaches in the mid to late 1970s (e.g., University of California, Santa Barbara [UCSB] and Goleta Beaches) and by the narrower rocky beaches present at Broad Beach and many other area beaches over the last decade or more.

Additionally, differences in survey techniques may also result in artificially increased variability in mapped habitat at Broad Beach. For example, while rocky intertidal areas at Broad Beach were previously estimated by transect surveys, side scan sonar surveys in 2014 revealed the presence of rocky intertidal habitat at a higher resolution, contributing at least in part to the increase in this habitat type observed since 2012 (see Figure 3.3-4).

Illustration 3.3-2: *Rocky intertidal habitat within Lechuza Cove provides habitat for a number of intertidal species.*

Rocky Intertidal

Rocky intertidal (shoreline) habitats within Santa Monica Bay are generally limited to the extreme northern (Malibu) and southern (Palos Verdes Peninsula) areas. The western end of Broad Beach is bounded by the rocky headland of Lechuza Point (see Figure 3.3-4), and to the east the promontory of Point Dume also contains rocky shoreline habitat.

Low relief areas of rocky substrate and cobble also occur in several patches throughout the western portion of Broad Beach. However, these lower relief areas are intermittently covered by sand (Chambers Group 2012a). As discussed previously, Broad Beach is subject to substantial fluctuations in sand levels and sand levels have varied over time, with these fluctuations occurring seasonally and over multi-years. The higher relief intertidal community at Lechuza Point is also characteristic of a sand-influenced site with intermittent emergent rock (Raimondi et al. 2012).

Plants in the rocky intertidal habitats typically display vertical zonation, with distinct species assemblages at different tidal levels, although the patterns may be disrupted by grazing by marine animals. Lichens dominate the splash zone (highest zone), whereas the upper intertidal (below the splash zone) flora includes green algae (Subphylum Chlorophyta) such as sea felt (*Enteromorpha* spp.) and sea lettuce (*Ulva* spp.), brown algae (Subphylum Phaeophyta) such as rockweeds (*Selvetia* spp.), and various red algae (Subphylum Rhodophyta). The middle intertidal includes a more diverse algal assemblage with red and brown algae. The lower intertidal consists of red and brown algae as well as surfgrass (*Phyllospadix* spp.) (Hedgepeth and Hinton 1961, Dawson 1966).

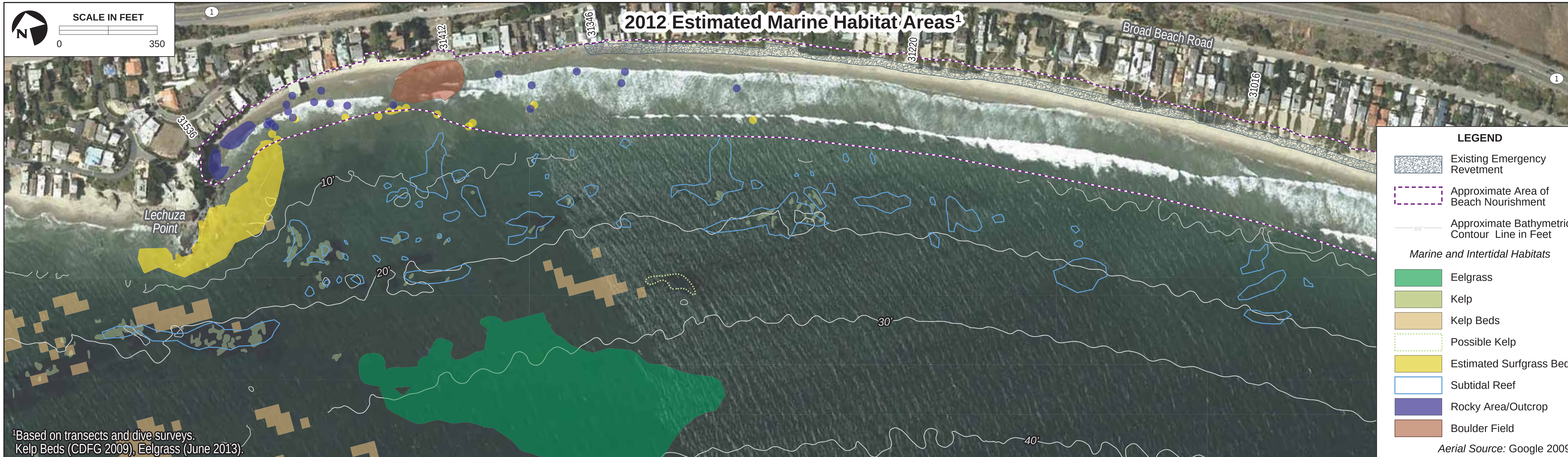
Table 3.3-7 lists the marine organisms present in the rocky intertidal habitats. Invertebrates that live in the highest intertidal zones are typically shelled species able to tolerate exposure to the air for long periods of time. In the upper intertidal zone, species diversity increases. The middle intertidal is marked by filter feeders and deposit feeders. The lower intertidal is similar to the rocky subtidal, with abundant invertebrates (Hedgepeth and Hinton 1961).

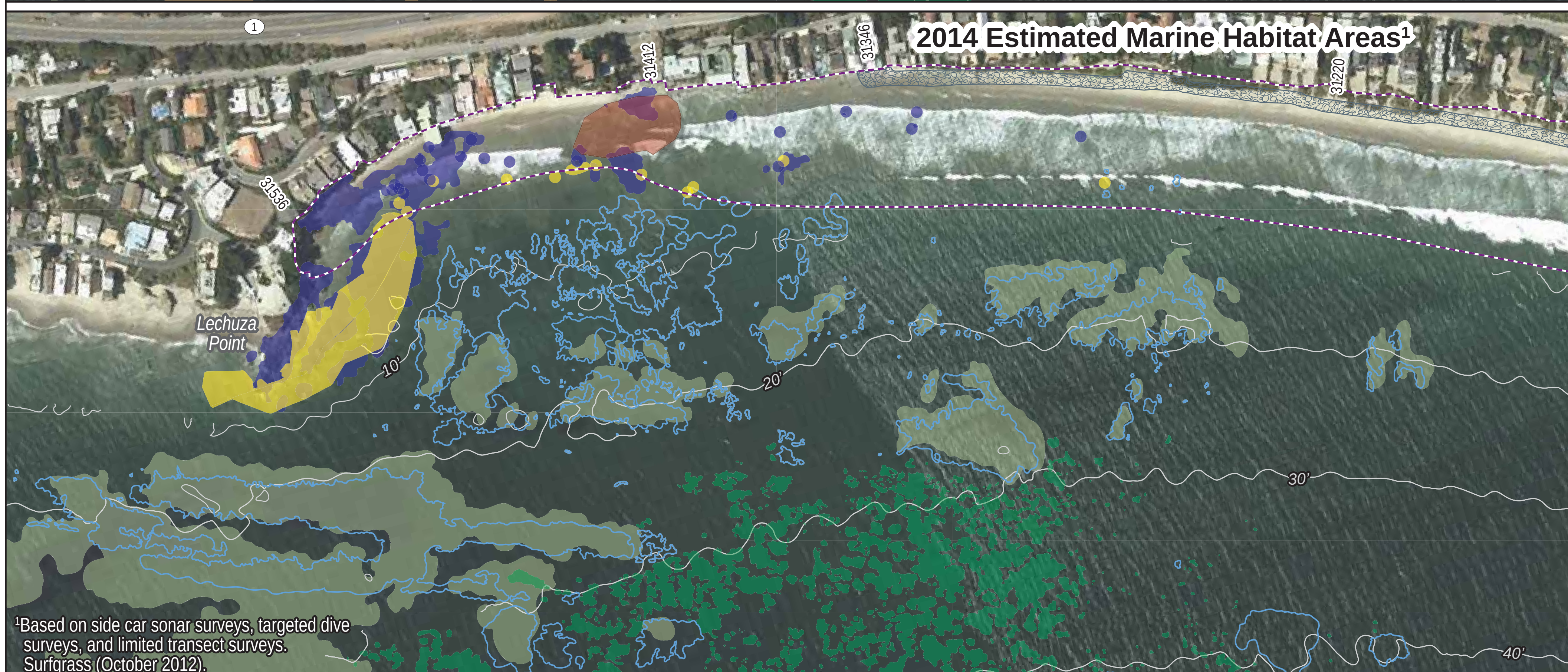
In October 2012, the intertidal biological communities at Broad Beach, including rocky intertidal habitat in Lechuza Cove and the boulder field down coast from Lechuza Cove were sampled to obtain baseline information on intertidal organisms that may be affected by the Project (Chambers Group 2012b, 2013a). During the October 2012 survey, Broad Beach was narrow. Large organisms counted on the belt transects included one striped shore crab (*Pachygrapsus crassipes*) and one surfgrass plant (*Phyllospadix torreyi*) in the low intertidal. Unvegetated bedrock, boulder and cobble were the predominant substrate types in the high and middle intertidal. In the low intertidal the cover of red algal turf increased (Chambers Group 2012b). Additional transects were identified in the west end of the Broad Beach area and surveyed for the first time in spring 2013 (Chambers Group 2013a).

Table 3.3-7. Organisms in Rocky Intertidal Habitat

Common Name	Classification	Common Name	Classification
High Intertidal Zone		**Upper Intertidal Zone**	
periwinkles	*Littorina* spp.	Snails	Class Gastropoda
barnacles	*Balanus* and *Chthamalus* spp.	bivalves (attached)	Class Bivalvia
limpets	Family Acmaeidae	chitons	Class Polyplacophora
rock lice	*Ligia* spp.	hermit crabs	Tribe Paguridea
		striped shore crabs	*Pachygrapsus crassipes*
Middle Intertidal Zone		**Lower Intertidal Zone**	
California mussels	*Mytilus californianus*	sponges	Class Demospongiae
gooseneck barnacles	*Lepas* spp.	sea anemones	Order Actiniaria
sea anemones	Order Actiniaria	snails	Class Gastropoda
snails	Class Gastropoda	sea slugs	Class Opisthobranchia
sea slugs	Class Opisthobranchia	bivalves (attached)	Class Bivalvia
octopus	*Octopus* spp.	octopus	*Octopus* spp.
polychaetes	Class Polychaeta	bryozoans	Phylum Ectoprocta
barnacles	*Balanus* and *Chthamalus* spp.	amphipods	Order Ampipoda
isopods	Order Decapoda	isopods	Order Decapoda
crabs	Order Decapoda	shrimp	Order Decapoda
shrimp	Order Decapoda	hermit crabs	Tribe Paguridea
brittle stars	Class Ophiuroidea	crabs	Order Decapoda
		sea stars	Class Asteroidea

In the high intertidal, bare rock and the barnacles *Chthamalus* and *Balanus* accounted for most of the percent cover. In the middle intertidal the cover of red algae increased. Red algae that were abundant in the middle intertidal included *Gracilaria andersonii*, *Ceramium* sp. and *Mazaella leptorhynchos*. In the low intertidal red algae and the feather boa kelp *Egregia menziesii* were dominant. Red algae in the low intertidal included *Gastroclonium subarticulatum* and *Ceramium* sp. On October 16, 2012, most of the boulder field was covered with a thin layer of sand (Chambers Group 2012, 2013a). In the mid and low intertidal feather boa kelp, red algae and surfgrass protruded above the sand layer. A total of 30 ochre sea stars (*Pisaster ochraceus*) were counted on a transect in the middle intertidal. In the low intertidal, 13 ochre sea stars and one octopus were counted on a transect and 16 ochre sea stars were counted on belt transect. Table 3.3-8 lists the indicator species that were present in the Lechuza Cove intertidal sampling areas on October 16, 2012.





Habitat Type	Habitat Area 2012 (acres)	Habitat Area 2014 (acres)	Variability (acres)
Rocky Intertidal	1.0	4.4	+3.4
Low Intertidal/ Surfgrass	2.0	2.0	0
Subtidal Reef*	4.6	20.2	+15.6
Kelp[‡]	9.5	23.1	+13.6
Eelgrass	8.75	7.1	-1.65

Notes: Differences in habitat area can be attributed to different survey techniques as well as differences in sand coverage resulting from seasonal and decadal variability in coastal processes.
*Surfgrass overlies rocky intertidal habitat within Lechuza Point.
‡Approximately 15.1 acres of subtidal reefs along Broad Beach are characterized by attached kelp.

Sources: Chambers Group 2012a and 2013b; Moffatt & Nichol 2014.

During these survey efforts rocky intertidal areas within Lechuza Cove were estimated at 0.28 acre. Additionally, down coast scattered rocky intertidal areas as well as a boulder area approximately 500 feet to the east added an additional 0.71 acre of habitat, totaling approximately 1 acre of rocky intertidal within the Broad Beach area (Chambers Group 2012a). However, as previously described, these habitat areas are subject to change with sand inundation (Chambers Group 2012a). Side scan sonar surveys conducted in May 2014 estimated total rocky intertidal habitat at approximately 4.4 acres, representing a variability of approximately 3.4 acres in over the course of 2 years. While some of this variation is likely due to differences in sampling techniques, seasonal and decadal differences in sand coverage are the primary influences on rocky intertidal habitat exposure.

Table 3.3-8. Indicator Species Observed Within Lechuza Cove Intertidal Habitat

Common Name	Classification
Intertidal	
barnacles	*Balanus/Chthamalus* spp.
sea lettuce	*Ulva/Enteromorpha* spp.
sea anemone	*Anthopleura* spp.
algae	*Egregia* spp.
limpets	*Patella* spp.
red algae	*Chondracanthus canaliculata*
surfgrass	*Phyllospadix* spp.
red algae	*Gelidium/Pterocladiella* spp.
red algae	*Mastocarpus papillatus*
Swash Zone	
sand crabs	*Blepharipoda occidentalis*
polychaete worm	*Nephtys* sp.
baetic olive snail	*Olivella baetica*
sand crabs	*Emerita analoga*
Pismo clam	*Tivela stultorum*

Sources: Chambers Group 2012b, 2013a.
Notes: Red and green algae were also observed.

Sandy Intertidal

Broad Beach and adjacent Zuma Beach support large areas of sandy intertidal beach habitat, with Broad Beach estimated to support just under 30 acres of intertidal beach (Moffatt & Nichol 2014), primarily with sandy substrate. Sandy beach habitats can help sustain fishery resources as they can support high densities of filter-feeding, benthic macroinvertebrates. These invertebrates are a valuable link to upper level predators such as fishes and shorebirds (Leber 1982). Recreational fish including barred surfperch, white seabass, queenfish, spotfin croaker, California halibut, jacksmelt and California grunion use this habitat for foraging (Allen and Pondella 2006). In addition, leopard shark (*Triakus semifasicata*), managed under the Pacific Groundfish Fishery

Management Plan, use shallow coastal waters as pupping and feeding/rearing grounds. Neonate pups occur in and just beyond the surf zone in areas of Southern California.

During 2012 intertidal surveys, swash zone samples were taken to collect larger sandy intertidal invertebrates that might not be well represented in the core samples. Five taxa were collected in the swash zone samples at Broad Beach. The sand crabs *Blepharipoda occidentalis* and *Emerita analoga* and an unidentified polychaete worm (*Nephtys* sp.) were the most abundant taxa. Two baetic olive snails (*Olivella baetica*) and one Pismo clam (*Tivella stultorum*) were also collected. The presence of the Pismo clam is noteworthy; Pismo clams were common at Broad Beach and Zuma Beach prior to the 1982/1983 El Niño but are now rare (Chambers Group 2012b, 2013a).

A total of 66 macroinvertebrates comprised of 14 taxa were collected in 45 Broad Beach macroinvertebrate samples taken in October 2012. Table 3.3-9 lists the 14 taxa found.

Table 3.3-9. Macroinvertebrate Taxa Observed within Lechuza Cove Intertidal Habitat

Habitat Zone	Species Name
High Intertidal	*Emerita analoga*
	Nephtys californiensis
Middle Intertidal	*Nephtys californiensis*
	Donax gouldii
	Emerita analoga
	Exosphaeroma inornata
	Oligochaeta
	Cerithidea californica (juv)
	Eohaustorius sawyeri
	Nephtys californiensis
	Americhelidium sp. (juv)
	Scolelepis sp. (juv)
Low Intertidal	*Nephtys californiensis*
	Donax gouldii
	Emerita analoga
	Eohaustorius sawyeri
	Gibberosus myersi
	Rhepoxynius homocuspidatus
	Nephtys sp. (pf)
	Scoloplos acmeceps
	Spionidae (pf)
	Rhepoxynius menziesi

Sources: Chambers Group 2012b, 2013a.

The polychaete worm *Nephtys californiensis* was the most abundant species with 17 total individuals. The fewest number of individuals and taxa were collected in the high intertidal and the highest abundance and number of taxa were found in the low intertidal. The sand crab *Emirita analoga* and the polychaete worm *Nephtys californiensis* were the only species collected in the high intertidal. These species are characteristic of the middle and low intertidal zones and indicate the lack of a true upper intertidal zone at Broad Beach in October, 2012 (Chambers Group 2012b, 2013a).

A total of 286 macroinvertebrates comprised of 10 taxa were collected in the 45 Broad Beach core samples in June 2013 (Chambers Group 2013a). In contrast, only 66 organisms were collected in the 45 core samples taken in October 2012. The high abundance in the June cores was due to large numbers of small sand crabs *Emerita analoga* that were collected in the high intertidal. The abundance of small sand crabs likely reflects the start of the summer recruitment period. The large numbers were seen in the high intertidal samples. *Emerita* is a characteristic species of the middle and low intertidal zone of sand beaches. Because of the narrow beach width at Broad Beach, a true high intertidal zone is lacking.

El Matador State Beach Surveys

Similar intertidal surveys were also conducted at El Matador State Beach, on October 17, 2012 and more recently in 2013. El Matador State Beach is located approximately 0.75 miles west of Broad Beach and was sampled as a control site because of its proximity to Broad Beach and because it is a bluff backed beach that appears to have experienced erosion. Further, because this beach has no revetments or seawalls, it was considered useful for delineating changes caused by natural processes. El Matador State Beach has more rocky habitat than Broad Beach, although it also has areas of sandy intertidal habitat.

In October 2012, both Broad Beach and El Matador State Beach had a short beach with lack of a true high intertidal zone (Chambers Group 2012b, 2013a). El Matador State Beach did not have any shore protection structures and erosion of the bluffs resulted in pocket coves where wrack accumulated. The rocky intertidal at Lechuza Cove at the west end of Broad Beach had a low amount of sand cover at the time of the sampling although sand inundation in this area was observed previously in April 2012. The rocky intertidal at El Matador State Beach and the boulder field at Broad Beach both had a high amount of sand cover in October 2012. In addition to differences in sand cover, there were differences in rock substrate between the rocky intertidal habitats at the two beaches. Broad Beach was a combination of bedrock and boulders while El Matador State Beach was all bedrock (Chambers Group 2012b).

During the field survey, the beach was narrow and the cover in the sampled areas in the high and middle intertidal areas was primarily sand. Rocks in the high intertidal were sparsely vegetated with barnacles (*Balanus/Chthamalus*) and red and green algae. Diversity of cover on the rocks increased in the middle intertidal and included red algae (primarily *Gastroclonium subarticulatum*), anemones (*Anthopleura* spp.) and the sand tube worm *Phragmatopoma californica*. In the low intertidal, sand cover decreased and the cover and diversity of red algae (*Gastroclonium subarticulatum, Chondracanthus canaliculata,* articulated corallines*, Mastocarpus papillatus, Mazzaella affinis*) on the rocks increased. The sand tube worm also accounted for significant cover in several sampled areas in the low intertidal and surfgrass was found in half of the sampled areas. For comparative purposes, the swash zone samples at El Matador State Beach were dominated by the sand crab *Emerita analoga.* One nemertean worm and three *Nephtys* sp. were also collected.

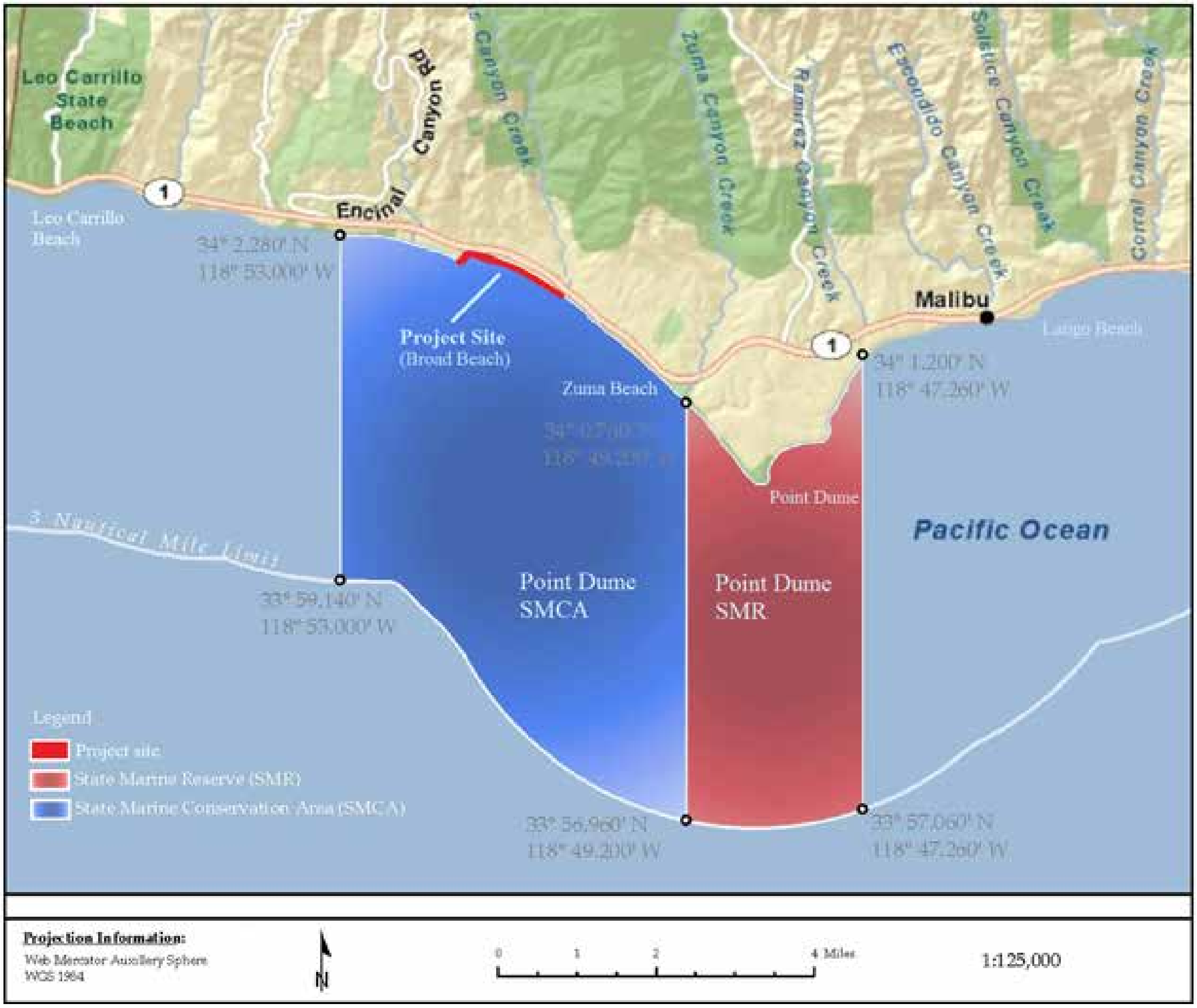
A total of 328 macroinvertebrates comprised of 10 taxa were collected in the 30 macroinvertebrate samples at El Matador State Beach in 2013. As was true in October 2012, the sand crab Emerita analoga was by far the most abundant species. The total number of sand crabs in the 2013 samples was 308 compared to 125 in October 2012. Therefore, the sand crab recruitment observed at Broad Beach also occurred at El Matador, but the sand crabs recruited in greater numbers at El Matador. In addition, at El Matador the sand crabs were collected in the mid and low intertidal; but at Broad Beach sand crabs were collected in the high intertidal as well. The presence of sand crabs in samples taken as high as possible on Broad Beach, indicates the beach is truncated by erosion and no true high intertidal exists. In contrast, the high intertidal samples at El Matador were taken at the visible wrack line; and insects, which associate with wrack, were collected (Chambers Group 2013a).

Marine Managed Areas, Marine Sanctuaries, Parks, and Reserves

A wide array of Federal and State managed marine areas lie off the coast of Southern California. Efforts to integrate some of these areas under a uniform system of management and oversight include the California Marine Life Protection Act (MLPA) of 1999, which required the evaluation of existing data for some 220,000 square miles (mi^2) of submerged State lands. The following year, the California Marine Managed Areas Improvement Act of 2000 extended the State's management jurisdiction into the marine environment. The purpose of both acts was to establish an integrated system of MMAs, both existing and new, up and down the California coast that would ensure the long-term ecological viability and biological productivity of marine and estuarine ecosystems and preserve cultural resources for future generations. There are six categories of MMA: State Marine Reserves (SMR), State Marine Parks, State Marine Conservation Areas (SMCA), State Marine Cultural Preservation Areas, State Marine Recreational Management Areas, and Areas of Special Biological Significance (ASBS).

The Broad Beach area lies within a Marine Protected Area (MPA): the Point Dume SMCA, which extends from Encinal Canyon in the north to Westward Beach in the south and is adjacent to the Point Dume SMR, which begins at Westward Beach, and continues around Point Dume to the west end of Paradise Cove (see Figure 3.3-5). These adjoining MPAs became effective on January 1, 2012.

Figure 3.3-5. Marine Protected Areas



Source: Adapted from CDFW 2011.

The Point Dume SMR incorporates an area of offshore reefs, a submarine canyon (Dume Canyon), and a kelp forest that is popular with kayak fishers and the diving community. Although access to the entire Point Dume area will remain open to scuba diving, boating and other recreational activities, the take of all living marine resources within this area is prohibited.[1] This area is described as "rare and vitally important habitat" and was one of the MLPA Science Advisory Teams top preservation priorities.

Within the Point Dume SMCA, fishing activities are also restricted, but not banned entirely; the recreational taking of pelagic finfish (i.e., thresher sharks, barracuda, dolphinfish) is allowed, as well as the take of white sea bass, and Pacific bonito by spear fishing. Limited commercial fishing of coastal pelagic fish (like squid) is permitted

[1] Beach nourishment and other sediment management activities are allowed inside the conservation area pursuant to any required agency permits, or as otherwise authorized by the CDFW (Cal. Code Regs., tit. 14, § 632).

in the SMCA but is restricted to capture by round-haul net. Round-haul fishing is a smaller operation than purse-seine boats or other methods. Commercial fishing of swordfish by harpoon is also allowed.

Other nearby MPAs include several around the Channel Islands. In October 2002, the California Fish and Game Commission approved a comprehensive marine zoning network in the State waters of the Channel Islands National Marine Sanctuary (CINMS). The State implemented part of the marine zones in 2003, under the California Fish and Game regulations. Fishing and other extractive uses in the 10 marine reserves and two conservation areas created within the CINMS were restricted in 2006 to provide protection to the seafloor and groundfish (CDFW and CINMS 2001, CDFW 2002). The NMFS designated the Federal water portions offshore of the State marine zones as habitat areas of particular concern and prohibited bottom fishing under the Magnuson-Stevens Fishery Conservation and Management Act.

Additionally, on July 29, 2007, NMFS finalized a plan that added approximately 20 mi^2 of no-fish zone just off the southeastern coast of Santa Cruz Island and expanded the borders of several of the existing marine reserve areas. In total, the plan created 146.3 mi^2 of strict no-fishing marine reserves and 2.3 mi^2 of limited take marine conservancy zones. When taken in concert with the existing SMRs in the nearshore waters of the sanctuary, the combined sea life protection network totals nearly 215 mi^2 of fishing-restricted ocean waters (refer to Figure 3.3-5).

Areas of Special Biological Significance

In the 1970s, California designated 34 regions along the coast as ASBS in an effort to preserve biologically unique and sensitive marine ecosystems for future generations. ASBS are designated by the State Water Resources Control Board (SWRCB) to protect species or biological communities from undesirable alterations in natural water quality (McArdle 1997). This designation recognizes that certain biological communities, because of their fragility or value, deserve special protection. Under the California Ocean Plan (COP), the discharge of wastes to ocean waters in these areas is generally prohibited. The COP states: “Waste shall be discharged a sufficient distance from areas designated as being of special biological significance to assure maintenance of natural water quality conditions in these areas” (State Water Board 1972).

One ASBS in Southern California encompasses Broad Beach. It extends offshore to 100 feet in depth for most of the 24 miles along the coast from just north of Mugu Lagoon in Ventura County to Latigo Point in the south. The Mugu-Latigo ASBS is the largest of the mainland ASBS in Southern California, encompassing 18.5 mi^2 of marine waters.

The Mugu-Latigo ASBS was set aside, “not because of any single unique component or habitat, but because of the multiplicity of distinct habitats and organisms in a relatively healthy state, which collectively make the area unique.” Specific organisms which were considered especially unique components of the ASBS at the time of its incorporation include: giant kelp, surfgrass, sand dollars, Pismo clams, tube worms, sea urchins, and California halibut. These organisms were recognized for their ecological dominance within the community structure, and/or their contribution as recreational or commercially important species.

Commercial and Recreational Fisheries

Commercial and recreational fishing activities occur at various locations within the Project region that could potentially be impacted by activities associated with the Project. Most of the region's commercial and recreational fisheries occur within the open-ocean habitat. Important recreational species in Santa Monica Bay include kelp bass (*Paralabrax clathratus*), brown rockfish (*Sebastes auriculatus*), pile perch (*Damalichthys vacca*), black perch (*Embiotoca jacksoni*), white seaperch (*Phanerodon furcatus*), rubberlip seaperch (*Rhacochilus toxotes*), señorita (*Oxyjulis californica*), and opaleye (Carlisle et al. 1964, Stephens et al. 1984b, MBC 1993).

A variety of additional finfish and shellfish species are harvested in the Project region, while kelp is harvested in specific beds managed by the CDFW. An analysis of fishery and kelp data collected around the Broad Beach area for the 10-year period from 2001 to 2010 forms the basis for the summary of commercial and recreational fishing that is included in Appendix D.

3.3.2 Selected Regulations Pertaining to Marine Biological Resources

State and other statutes related to marine biological resources are listed in Table 3.3 in Section 3.0, *Issue Area Analysis*. The USFWS and the NMFS are the Federal agencies directly responsible for protecting biological resources in the Project vicinity, including coastal estuaries and marshlands. The U.S. Environmental Protection Agency (USEPA) is also concerned with protecting marine and estuarine life through water quality standards. The CDFW is the lead agency responsible for protecting biological resources at the State level. The CDFW is obligated to protect species that are officially listed as threatened or endangered by the State, candidates for listing as threatened or endangered, and California Species of Special Concern. The CDFW also administers the California Oil Spill Prevention and Response Act (OSPRA). The SWRCB sets water quality standards for the protection of aquatic life. The Los Angeles Regional Water Quality Control Board (LARWQCB) supervises these standards locally.

3.3.3 Public Trust Impact Criteria

This section describes criteria for evaluating the significance of Project-related activities or incidents that may result in impacts to marine biological resources. In general, the persistence, extent, and amplitude of such impacts dictate their significance. The significance of impacts to specific living resources can largely be determined from existing laws and regulations, such as the MMPA or the Federal ESA or CESA. The location of the impact, for example, if it occurs within a sensitive habitat such as a wetland or marine sanctuary, can also determine its significance.

Impacts to marine biological resources would be considered a major adverse effect if the Project results in:

- Potential for any part of the population of a threatened, endangered, or candidate species to be directly affected, or if its habitat is lost or disturbed;
- Any “take” of a Federal- or State-listed endangered, threatened, regulated, fully protected, or sensitive species;
- Destruction or prolonged disturbance to sensitive habit (e.g., burial by at least 1 foot of sand for 1 or more years), [2] or substantial take of a species that is recognized as biologically or economically significant in local, State, or Federal policies, statutes, or regulations;
- Conflict with an adopted habitat conservation plan or result in a net loss in the functional habitat value of: a sensitive biological habitat, including salt, freshwater, or brackish marsh; marine mammal haul-out or breeding area; eelgrass; river mouth; coastal lagoon or estuary; seabird rookery; ASBS; MMAs, or EFH;
- Permanent change in the community composition or ecosystem relationships among species that are recognized for scientific, recreational, ecological, or commercial importance;
- Permanent alteration or destruction of habitat that precludes re-establishment of native biological populations;
- Potential for the movement or migration of fish or wildlife to be impeded; or
- A substantial loss in the population or habitat of any native fish, wildlife, or vegetation, or if there is an overall loss of biological diversity. Substantial is defined as any change that could be detected over natural variability.

An impact to commercial and sport fisheries would be considered a major adverse effect if the Project would result in:

- Activities that would temporarily reduce any fishery in the vicinity by 10 percent or more during a season, or reduce any fishery by five percent or more for more than one season;

[2] Permanent impact acreage for marine habitats is defined as the area of each habitat predicted to be buried by 12 inches or more of sand at 1 year following placement. This depth of coverage is based on model predictions and is identical to other large scale beach nourishment projects, RBSP I and II, and USACE Feasibility Studies (Moffatt & Nichol 2014).

- Activities that would affect kelp and aquaculture harvest areas by 5 percent or more;
- Loss or damage to commercial fishing or kelp harvesting equipment; or
- Harvesting time lost due to harbor closures, impacts on living marine resources and habitat, and equipment or vessel loss, damage, or subsequent replacement.

Where applicable, this impact analysis considers the Broad Beach area both in its existing setting, following the 2010 emergency rock and sand bag revetments installation, and in its historical setting in 2005 prior to the installation of the emergency revetments when Broad Beach was characterized by a narrow beach and dune habitat.

3.3.4 Public Trust Impact Analysis

The Project could result in adverse impacts on public trust marine biological resources (i.e., biotic communities of the public trust tide and submerged lands) through authorization of the revetment, beach nourishment, and backpassing. Changes in long-term sand transport down drift from Broad Beach may also have adverse impacts to marine biological resources outside of the immediate Broad Beach area. Impact analysis relied on the following resources:

- An analysis of habitat impacts associated with the construction, formation, and placement of plastic sand bags including sand sculpting activities provided in *Marine Biology Responses to California Coastal Commission February 8, 2013 Letter* (Chambers Group 2013c).
- An analysis of the long-term marine habitat impacts associated with permanent authorization of the 2010 revetment, unpermitted sand bags, and unpermitted revetment provided in *Marine Biology Responses to California Coastal Commission February 8, 2013 Letter* (Chambers Group 2013c).
- A table summarizing the type, location and acreage of habitats estimated to be impacted by the Project and by Project alternatives provided as in *Broad Beach Project Habitat Impacts* (Chambers Group 2014).
- Depth of burial analysis for existing and new transects provided in *Marine Biology Responses to California Coastal Commission February 8, 2013 Letter* (Chambers Group 2013c).
- Impact of coarse grained sand on sandy intertidal invertebrate community provided in Upland Sand Source Coarser-than-Native Grain Size Impact Analysis (Moffatt & Nichol 2013b).
- Supplemental Marine Habitat Survey and Mapping for the Broad Beach Restoration Project (Moffatt & Nichol 2014).
- Scientific studies including: *Using GIS Mapping of the Extent of Nearshore Rocky*

Reefs to Estimate the Abundance and Reproductive Output of Important Fishery Species (Claisse et al. 2012), *Short-Term Sediment Burial Effects on the Seagrass Phyllospadix scouleri* (Craig et al. 2008), and *Mortality and Productivity of Eelgrass Zostera marina under Conditions of Experimental Burial with Two Sediment Types* (Mills and Fonseca 2003).

Habitat impact analysis incorporates survey data from 2010, 2012, 2013, and 2014; however, the quantitative analysis relies most heavily on side scan sonar surveys conducted in May 2014 and target dive surveys conducted in June 2014. These surveys give the most recent picture of the intertidal and marine habitats at Broad Beach. However, it should be noted that sand coverage in the nearshore and offshore environment at Broad Beach is dependent on a number of characteristics and properties, includes seasonal, annual, and decadal shifts in wave action and longshore sand transport. Consequently, habitat coverage as determined by the most recent side scan sonar surveys and targeted dive surveys should be considered as a snapshot estimate of habitats rather than a long-term average.

The side scan sonar survey collected data using an interferometric wide-swath sonar system. Parallel survey track lines were navigated through the survey area until the entire survey footprint was covered. Rocky outcroppings with greater complexity (e.g., increased relief) and sand waves have greater variation in terms of high signal intensity mixed with low signal return in the areas that lie in the shadows of the reef or sand wave. Habitats were classified according to the USFWS Classification of Wetlands and Deepwater Habitats of the U.S. However, in order to compare to past transect surveys these habitat classifications were grouped into terms more commonly understood by the public (Table 3.3-10).

Table 3.3-10. Side Scan Sonar Survey Habitat Groupings

Previous Survey Designations	Sonar Designations
Boulder Field	Boulder Field
Rocky Area/Outcrop	Rocky Outcrops
	Bedrock, Marine: Intertidal: Rock Bottom
	Rubble/Cobble, Marine: Intertidal: Rock Bottom
Surfgrass	Observed Surfgrass Points
	Observed Surfgrass
	Extrapolated Surfgrass
Subtidal Reef	Bedrock with Kelp, Marine: Subtidal: Rock Bottom
	Bedrock, Marine: Subtidal: Rock Bottom
	Rubble/Cobble, Marine: Subtidal: Rock Bottom
Sand	Sand, Marine: Intertidal: Unconsolidated Bottom
	Sand, marine: Subtidal: Unconsolidated Bottom
	Shell Hash, Marine: Subtidal: Unconsolidated Bottom
Kelp	Kelp Canopy
Eelgrass	Eelgrass

Source: Moffatt & Nichol 2014.

Habitat area is dependent on sand coverage offshore Broad Beach. Longshore sand transport varies on seasonal, annual, and decal cycles. It is known that fires, floods, and climatic variation significantly affect sand supply and beach width. For examples, studies of Goleta Beach in Santa Barbara County north of Broad Beach show beach width closely tracking Pacific Decadal Oscillation on roughly a 20 to 30 year cycle and varying by hundreds of feet in width over these cycles. Consequently, the habitat areas surveyed in 2012 and 2014 should be considered snapshots of habitat coverage rather than a long-term average. Impacts discussed below are based on the 2014 side scan sonar survey because coverage of each habitat type was greatest during this survey. Therefore, by using the 2014 survey areas as a baseline, the analysis below provides a conservative estimate of impacts to marine habitat offshore Broad Beach (Table 3.3-11).

Table 3.3-11. Marine Habitat Coverage at Broad Beach in 2012 and 2014

Habitat Type	Estimated Habitat Area 2012 (acres)	Estimated Habitat Area 2014 (acres)	Variability (acres)
Rocky Intertidal	1.0	4.4	+3.4
Low Intertidal/Surfgrass	2.0	2.0	0
Subtidal Reef*	4.6	20.2	+15.6
Kelp Canopy†	9.5	23.1	+13.6
Eelgrass	8.75	7.1	-1.65

Sources: Chambers Group 2012a, 2012c; Chambers Group 2013b; Moffatt & Nichol 2014.
Notes: Differences in habitat area can be attributed to different survey techniques as well as differences in sand coverage resulting from seasonal and decadal variability in coastal processes.
*Surfgrass overlies rocky intertidal habitat within Lechuza Point.
† Approximately 15.1 acres of subtidal reefs along Broad Beach are characterized by attached kelp.

Historical Marine Biological Resource Characteristics

Broad Beach has been characterized by gradually eroding beach width over the last 3 to 4 decades. Beach width and sand depth appears to have reached a peak in the early- to mid-1970s, with large areas of currently rocky intertidal habitat in Lechuza Cove buried under sand, at least during the summer months. It is unclear if this wide sandy beach was a historical condition or the result of a single or unusual pulse of sediment into the system. It has been noted that construction of Pacific Coast Highway in the late 1920s resulted in the deposition of well over a million cubic yards (cy) of sediment into the littoral cell upcoast of Broad Beach, which may have resulted in a substantial widening of beaches along this area of shoreline. Further, a former source of sediment input from major rivers in the upcoast Santa Barbara littoral cell may have been interrupted by the landward migration of the Mugu Submarine Canyon, decreasing sediment supply to the system over time. The wide sandy beaches of the 1970s may also reflect large scale sediment input from the major winter storms of 1969. However, regardless of cause, over time the formerly wide sandy beach present at Broad Beach has eroded landward, regularly exposing rocky substrate. This shift from a wide sandy beach to a largely intertidal beach, has resulted in this area supporting rocky intertidal habitat and surf grass beds which are regularly extant along the west end of the beach, particularly within Lechuza Cove. Please refer to Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards,* for a more complete discussion of current and historic coastal process.

Prior to the construction of the sand bag revetments and the installation of the emergency temporary rock revetment, the beach was likely characterized by limited high intertidal habitat, but largely lacking a dry sand beach berm. However, at the time of the revetment construction, the beach was eroded and had no high intertidal or dry sand beach berm. As such, the Broad Beach area likely supported little or no beach wrack. The majority of Broad Beach at this time was characterized by lower or middle intertidal habitat, a portion of which would have been impacted by the installation of sand bags and the emergency rock revetment in 2010, as described below in Impact MB-1.

<u>Impacts Associated with Future Projects in the Vicinity of Broad Beach</u>

Related projects occurring in the vicinity of Broad Beach include the Regional Water Quality Control Board Basin Plan Amendment, PCH bridge replacement project, and the Trancas Creek restoration project, as described in Section 1, *Introduction.* These related projects would have indirect and direct impacts that would be generally confined to terrestrial and high intertidal habitats within the Trancas Lagoon. In particular, although the Trancas Lagoon project is not yet designed, potential for improved tidal interchange could increase the frequency and duration of the opening of this Lagoon to tidal interchange with associated increases in sediment outflow from this creek, incrementally contributing to increasing transport of sediment down coast. In addition, sediment may be potentially removed from the Trancas Lagoon to improve tidal prism and increase the area of wetland habitat. If such sediment were disposed of on the beach, it could also temporally increase down coast sediment transport. These changes could incrementally contribute to changes in longshore transport with associated effects on down coast habitats as discussed below.

Impact MB-1: Revetment and Sand Bag Placement Impacts to Sandy Intertidal Habitat and Organisms

Installation of sand bag and rock revetments from 2008 to 2010 resulted in loss of intertidal habitat and disturbance and mortality of intertidal species. (Minor, Class Mi).

<u>Impact Discussion (MB-1)</u>

Beginning in 2008 at the time of sand bag revetment construction and later during the emergency rock revetment construction, Broad Beach was eroded and had no areas of high intertidal habitat or beach wrack (i.e., seaweed washed up and stranded onshore).[3] Consequently, impacts to intertidal habitat resulting from the installation of these shoreline protection structures were primarily to the middle intertidal. Characteristic organisms of this habitat include blood worms (*Euzonus* sp.), polychaete worms (*Nephtys* sp.), and the sand crab *Emerita analoga*.

Installation of the sand bags resulted in the permanent loss of approximately 0.46 acre of intertidal habitat. Further, as the sand used to fill the sand bags was taken from the areas seaward of the escarpment (WRA, Inc. 2013), temporary additional impacts resulted to approximately 0.92 acre of intertidal sand habitat. Organisms in the sand scooped into bags or covered by the placement of bags would be expected to have died, resulting in a potential corresponding loss of prey for shorebirds.

Installation of the emergency rock revetment in 2010 resulted in the permanent loss of approximately 1.79 acres of sandy middle intertidal habitat (Chambers Group 2014). Based on surveys in October 2012 and June 2013 (Chambers Group 2013a), this represents a loss of approximately 805,982 intertidal organisms. In addition, approximately 0.93 acre was affected by sand sculpting (landward of sand bags) during revetment construction. Many of the organisms in sand moved by equipment would be expected to have died; however, sand habitat not covered by revetment or sand bags would potentially be re-colonized in the spring (Greene 2002). Staging was located in the Zuma Beach parking lot and did not impact natural habitat. However, some temporary impacts to middle intertidal sandy beach invertebrates may have occurred from the movement of equipment from the Zuma Beach parking lot to the construction site. The path of the vehicles was approximately 10 feet wide, and the trucks followed essentially the same path each time. Assuming a travel distance of approximately 5,000 feet from the Zuma parking lot to the westernmost extent of revetment construction activities (including truck turnarounds) across a 10-foot-wide strip of beach, an estimated 1.15 acres of intertidal habitat were impacted by trucking activities along the foot of the revetment. This 1.15 acres of mid- intertidal habitat (in the 2009 condition) was temporarily disturbed by vehicles in addition to the 1.79 acres permanently covered by the revetment. However, as discussed in previous submittals to the California Coastal Commission, biological monitors were present to ensure that construction activities did not disturb potential foraging or roosting western snowy plovers. In addition, no disturbance to other shorebirds was observed by the monitors during construction. One minor pollution incident occurred during revetment construction when an excavator leaked hydraulic fluid near the base of the revetment. The spill was cleaned up before any oil entered the water. Therefore, no impacts occurred to any habitat except the mid-intertidal where the spill occurred. The area affected by the spill was not quantified, but it was no more than a few square feet.

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[3] The year 2005 was selected as an accurate pre-project condition, as this year predates the placement of the sandbag revetments (Chambers Group 2013c).

Areas impacted by sand excavation or trucking would be expected to recover (Greene 2002); however, areas covered by the sand bag and subsequent rock revetment, some of which lay on Public Trust Land, would not be available to support high intertidal habitat. Although the precise configuration of the sand bag and rock revetments is unknown, together these structures may cover more than 2 acres of mid elevation intertidal beach habitat. This would constitute a long-term or permanent loss of such habitat.

The loss of such habitat would be offset by the beach restoration project would expand high intertidal and middle intertidal habitat, substantially expanding these habitats over the estimated 20-year life of the project. Although coarse sand may function differently than finer sand as an environment for plant and wildlife species, the coarse sand grain size could be potentially less optimal for certain macroinvertebrates due to roughness, but is not prohibitive. Sand grain size may change conditions for existing invertebrate habitat on-site, but not necessarily adversely. The total sand volume added and the area affected is a relatively small portion of the entire existing sandy intertidal habitat area in the region and the overall impact is negligible. In contrast, the benefits of creating lost high intertidal habitat are significant (Moffatt & Nichol 2013b).

Although portions of these habitats would be subject to disturbance through backpassing, a more diverse set of sandy beach habitats would be supported, including high intertidal with associated beach wrack. However, with erosion of the beach over time, these benefits would cease and the sand bag and rock revetments would again displace then limited intertidal beach habitat.

Avoidance and Minimization Measure(s)

> **AMM TBIO-3a** (Biologist and Biological Monitors for Backpassing Activities) would address impacts of sand placement to marine biological resources. **AMM TBIO-3b** (Avoidance of Sensitive Resource Zones and Vegetation) would address marine biological resources. **AMM TBIO-3c** (Sensitive Biological Resources Report) would apply to this impact would address marine biological resources. **AMM REC-4a** (Requirement of Additional Nourishment) would address foreseeable future impacts to biological resources from long-term erosion of the restored sandy beach and dune system.

Rationale for Avoidance and Minimization Measure(s)

Incorporation of AMM TBIO-3a, -3b, and -3c would address impacts to sensitive sandy beach habitat as these AMMs would require a qualified and approved Project biologist to conduct preconstruction surveys of the sandy beach and dune habitats, identifying sensitive biological resources, including the presence of dense areas of beach wrack. The Project biologist would clearly designate these areas as sensitive resources zones to be avoided during backpassing. Additionally, impacts resulting from the long-term erosion of the sandy beach would be addressed by the incorporation of AMM REC-4a.

Impact MB-2: Sand Placement Impacts to Rocky Intertidal Habitat and Organisms

Sand placement from Project construction and one renourishment event would result in direct and indirect burial as well as disturbance of sensitive rocky intertidal habitats within Lechuza Cove. (Major Adverse Effect, Class Mj).

Impact Discussion (MB-2)

The habitats and species found within the marine habitats of Broad Beach lie within the jurisdiction of the Mugu to Point Dume ASBS and the Point Dume SMCA, and the coastal waters offshore the Project are designated as Essential Fish Habitat (EFH) under section 305(b)(4)(A) of the Magnuson-Stevens Fishery Conservation and Management Act, and an ESHA under the Malibu LCP. In the 1970s before sand within the Broad Beach area was lost to extensive erosion, Lechuza Cove appears to have supported limited rocky intertidal habitat aside from that associated with the rocky outcrop of Lechuza Point (see Figure 3.3-6). However, regardless of the natural historic sand conditions at Broad Beach and in Lechuza Cove in particular, rocky intertidal habitats appear to have been a dominant habitat in Lechuza Cove for the last 20 or more years. Due to the sand erosion trend since the 1970s, rocky intertidal habitat has become more extensive over the years.

The deposition of sand on Broad Beach, and extension of the seaward footprint of the beach would result in the direct burial of existing sensitive rocky intertidal areas near Lechuza Point. Burial from the initial nourishment event would occur in two phases: initial direct burial by placement of sand from trucks on the upper beach area and its distribution by bulldozers, and subsequent burial of lower intertidal areas as the sand is redistributed by wave action down the beach profile. Based on the surveys conducted in 2012 and 2014, direct burial impacts to rocky intertidal habitat could range from 0.94 acre (2012) to 1.96 acres (2014), depending on sand coverage in Lechuza Cove at the time of sand deposition. As previously described, in order to provide a more conservative analysis of impacts to this habitat type, the habitat area surveyed in 2014 has been used as a baseline.

Additionally, when accounting for long-term indirect burial (e.g., more than 1 foot of sand for more than 1 year) due to redistribution of beach sand, a total of approximately 4.01 acres of rocky intertidal habitat would be lost over the long-term depending on coastal processes, including longshore sand transport (Moffatt & Nichol 2014). Such habitats become uncovered incrementally as sand is carried down coast, but would be partially buried again during backpassing and upon renourishment.

Figure 3.3-6. Chronology of Intertidal Conditions Within Lechuza Cove

Further, the proposed Project would result in the direct burial of 0.96 acre of surfgrass, which occurs in the lower intertidal zone, with long-term indirect burial also occurring in this area over the long-term (Moffatt & Nichol 2014). As demonstrated by Craig et al. (2008), indirect placement can occur when sand placed onto beaches near the surfgrass beds subsequently moves onto the surfgrass beds, resulting in either partial or total burial of the beds. The results of this study suggest that short-term burial results in shoot mortality, decreased shoot counts, and reduced growth of surfgrass. Further, as previously described disturbances that result in long-term (or permanent) burial of the hard substrate in an area will preclude recovery as long as the rocky substrate remains buried. Even when such rocky areas become uncovered, the eventual potential for recovery of surf grass is difficult to project and would likely require extended periods of time.

In the first several months to a year following beach nourishment, sand levels in the intertidal areas are predicted to be about 2 to 3 feet deeper than average seasonal levels. The deeper cover means that fewer rocks will be exposed in spring when sand levels are seasonally low, and burial during the fall when sand levels typically are high will be greater than under the existing condition.

Extension of the beach profile in this area would result in 100 percent mortality to the intertidal and subtidal organisms that are currently located within areas planned for the dunes and beach berm footprint. Although these organisms are adapted to frequent burial that lasts for weeks and sometimes months, the years-long burial and disturbance associated with the Project would be expected to eliminate these species. However, in areas along the seaward side of the beach nourishment periphery, mortality would be somewhat lower as burial would be shallower and sand would be transported away from these areas relatively quickly.

Additionally, the placement of sand would result in temporary increases in nearshore turbidity; however, the larger grain size of the sand may reduce the severity of these impacts. Nevertheless, increases in nearshore turbidity would likely result in the smothering or burial of additional organisms and habitat beyond the actual footprint of beach nourishment. Areas of rocky intertidal habitat anticipated to be buried by more than 1 foot of sand for more than 1 year include approximately 4.01 acres of rocky intertidal habitat and 0.96 acre of surfgrass. Project design would somewhat limit impacts to the natural rocky intertidal habitat and surfgrass habitats that exist at the west end of Broad Beach near Lechuza Point.[4] Project design in this area restricts sand placement to the upper beach only and narrows beach fill to 150 feet or less. This area within Lechuza Cove would also have higher beach berms and a steeper slope, ranging from 14 to 17 feet above MLLW at a 3:1 slope. However, areas of the shoreline below the Mean High Tide Line (MHTL) in Lechuza Cove extending seaward for approximately 150 feet that support rocky intertidal habitat would be directly buried.

As previously described, based on conservative area measurements of rocky intertidal habitat from side sonar surveys conducted in May 2014, approximately 1.96 acres of rocky intertidal habitat would be directly impacted by initial Project construction, with 4.01 acres impacted by direct and indirect burial over the long-term. This would primarily consist of contiguous rocky intertidal habitat in Lechuza Cove as well as

[4] Surfgrass occurs both in the intertidal zone as well as in shallow subtidal zone. Consequently, impacts to surfgrass are also discussed in Impact MB-4.

isolated rock outcrops and the boulder fields further east. Similarly, an estimated 0.96 acre of surfgrass supported by lower rocky intertidal habitat would be directly impacted by the placement of fill as well as short-term and long-term indirect burial. This includes stands off of Lechuza Point that have been extrapolated to be present, but not comprehensively mapped in Applicant prepared surveys.

The duration and degree of impacts to intertidal habitats is difficult to estimate as various models and analytical analyses exist for projecting the duration of beach nourishment efforts (refer to Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*). The severity of such impacts is strongly correlated to the rate of longshore transport and cross beach distribution of sand, which distribute sand along the coast and into offshore areas. While all of these intertidal habitats are adapted to periodic burial by sand, long-term burial (e.g., more than 1 foot of sand for more than 1 year) would result in high mortality and slow recovery rates. Lower intertidal areas near Lechuza Point could become uncovered again in 1 to 2 years, while mid to upper intertidal habitats would be buried under beach berm and dunes over a 4 to 10 year period after initial nourishment. However, the impacts of burial of such habitats would be extended and exacerbated by backpassing, repeatedly impacting the rocky intertidal habitat (see Impact MB-5) and would also be repeated in an estimated 10 years with the single planned major renourishment event.

The deposition and placement of sand on the beach during both initial nourishment and a single major renourishment event would involve the repeated transit of heavy construction equipment (e.g., dozers, skiploaders) along the beach from the staging area located at the western end of Zuma Beach. Depending on how equipment is operated at the western end of the beach, this would result in additional disturbance and degradation to the rocky intertidal habitats along Broad Beach, directly affecting invertebrate species such as sand crabs. Further, as described in Impact MB-5, backpassing would be conducted based on an evaluation of beach width measurements, beach profile monitoring results, sand volume calculations, visual observations, and with respect to minimizing impacts to biological resources. Backpassing events would occur annually as needed with up to 20 backpassing events during the Project life to maintain beach width on a proportionate basis. This would also result in potential adverse impacts to intertidal habitats.

As discussed previously, the Point Dume SMCA includes a provision that beach nourishment and other sediment management activities are allowed inside the conservation area pursuant to any required agency permits, or as otherwise authorized by the CDFW (Cal. Code Regs., tit. 14, § 632). However, through personal communications, public comment with the 2012 Draft APTR, and interagency meetings, the CDFW has communicated that the regulations that were established for the Point Dume SMCA were not intended to allow for major adverse impacts to sensitive marine resources and would not allow for construction of new, enhanced or restored habitat within this area. Further, the MLPA laws and regulations do not include provisions for the construction of artificial reefs to minimize impacts to habitats located within an MPA (Fish & G. Code, § 2857, subd. (c)]. See Appendix N for 2012 CDFW comment letter.

The following AMMs attempt to reduce Project impacts to rocky intertidal habitats, but are not expected to reduce impacts to a minor adverse level. Impacts are expected to remain a major adverse effect.

Avoidance and Minimization Measure(s)

AMM MB-2a: Compliance with Existing Laws. Prior to commencement of construction activities, the Applicant shall provide California State Lands Commission (CSLC) staff copies of permits or other applicable written approvals from the California Coastal Commission (CCC), California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), and U.S. Army Corps of Engineers (USACE) that placement of fill west of the existing rock revetment is not inconsistent with the California Coastal Act (CCA), California Marine Life Protection Act (MLPA), Magnuson-Stevens Fishery Conservation and Management Act, and Federal Rivers and Harbors Act, respectively.

AMM MB-2b: Multi-Agency Collaboration for Sensitive Marine Habitat Impacts. Prior to commencement of construction activities, the Applicant shall work with jurisdictional marine habitat protection agencies, including CCC, CDFW, NMFS, USACE, and CSLC for review and endorsement of all marine habitat baseline surveys, impact analyses, and appropriate monitoring and any compensation for impacts to sensitive marine habitats and species. Prior to commencement of construction activities, the Applicant shall provide to CSLC staff any resultant surveys, impact analyses, and monitoring and compensation protocols determined through the multi-agency process and required by jurisdictional agencies.

AMM MB-2c: Sand Placement Footprint Limitation. If the Applicant receives agency approvals for placement of fill west of the existing rock revetment and if supported by the multi-agency coordination process of AMM MB-2b, construction contracts shall specify that all initial sand deposits during nourishment events shall be placed on the upper beach west of the existing revetment at Broad Beach area near Point Lechuza. Sand placement and mechanical distribution will be limited to areas falling within 120 feet of the bluffs and existing homes. To maximize sand dispersion over time and reduce the depth of burial of lower intertidal rocky habitat, sand to the west of the existing revetment shall be placed in two separate intervals so that only half the total amount of sand is placed at one time. The intervals shall be at the beginning of the placement, and then at the last stage of placement to allow the maximum time span between placements.

<u>Rationale for Avoidance and Minimization Measure(s)</u>

Burial of sensitive intertidal habitat, increased subtidal turbidity, and potential disturbance of sensitive species during Project construction would be minimized to the maximum extent feasible via the avoidance and minimization measures (AMMs). However, even with implementation of AMMs, impacts to rocky intertidal habitats and organisms are expected to have a major adverse effect. Replacing the loss of intertidal habitats is difficult and in particular, replanting or replacement of surfgrass has proved particularly difficult and problematic, as discussed further in AMEC's 2014 *Review of Subtidal and Intertidal Habitat Compensatory Mitigation Approaches* (see Appendix D). Initial sand losses after placement are expected to be approximately 25 percent. Therefore, with regard to AMM MB-2c, placing sand in two phases (at the beginning and near the end of beach construction) would allow for some of the initial losses to occur prior to depositing the full amount. This phased approach could allow some species to adjust to the new conditions, as they would occur more gradually.

However, sand burial and coverage of rocky intertidal and subtidal habitat would likely substantially increase under the Project and endure for up to 10 to 20 years. Restoration (re-establishment or rehabilitation), establishment (creation), or enhancement of rocky intertidal habitat and lower intertidal habitat may face technical challenges, especially related to the longevity of establishment/creation of such habitat in the coastal process zone. While surfgrass restoration or transplanting has had some limited success, it too faces substantial challenges. Protection, restoration, or enhancement of local subtidal and intertidal habitats may be a preferred option to at least partially offset Project impacts. Compensatory actions are generally recognized by State and Federal agencies as the restoration, establishment, enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts, which remain after all appropriate and practicable avoidance and minimization has been achieved. Compensation for unavoidable impacts to resources that are difficult to replace, such as surfgrass, is often provided through in-kind rehabilitation, enhancement, or preservation.

Burial of intertidal habitat would still occur with AMMs. Although burial of much of this habitat occurred historically in this area and currently occurs on an intermittent basis within areas, initial beach and dune habitat construction is expected to bury sensitive habitats at a greater depth and duration following the first and second renourishment events than has occurred naturally under historic conditions. The Project would also extend the duration and increase the frequency of burial during the time that Project-deposited sand remains within the Broad Beach area.

Impact MB-3: Sand Placement Impacts to Sandy Intertidal Habitats and Organisms

Sand placement from Project construction and one renourishment event would result in burial and disturbance of sensitive sandy intertidal habitats along Broad Beach. (Minor Adverse Effect, Class Mi).

<u>Impact Discussion (MB-3)</u>

The deposition of sand on Broad Beach, and extension of the seaward footprint of the beach would result in the burial of existing sandy intertidal habitats that are recognized as being sensitive. Approximately up to 22.75 acres of sandy bottom intertidal would be impacted by direct fill (Moffatt & Nichol 2014). As a result of direct fill extension of the beach profile would result in 100 percent mortality to the intertidal organisms that are currently located within areas planned for the dunes and beach berm footprint. Although these organisms are adapted to frequent burial that lasts for weeks and sometimes months, the years-long burial and disturbance associated with the Project would be expected to eliminate species or individuals that do not relocate vertically or laterally to suitable locations. However, in areas along the seaward side of the beach nourishment periphery, mortality would be somewhat lower as burial would be shallower and sand would be transported away from these areas relatively quickly.

The upper beach area proposed for dune and upper beach berm creation would be buried under 17 to 22 feet of sand depth tapering down to 1 to 2 feet deep on the seaward edge of the beach face. However, although substantial mortality of intertidal species would occur during initial nourishment and the single planned renourishment event, all of these intertidal habitats are adapted to periodic burial by sand. Organisms would potentially re-colonize the new beach within one to two seasons (Greene 2002), including both lower and upper intertidal areas. Beach habitats would be diversified as new mid to upper intertidal beach would support beach wrack, while lower intertidal areas would support habitat seaward of the new dry sand beach berm. However, impacts of disturbance to and burial of such habitats would be repeated by backpassing (see Impact MB-5) and would be generally repeated in an estimated 10 years with the single planned major renourishment event.

The deposition and placement of sand on the beach during both initial nourishment and a single major renourishment event would involve the repeated transit of heavy construction equipment (e.g., dozers, skiploaders) along the beach from the staging area located at the western end of Zuma Beach. This would result in additional disturbance and degradation to the sandy shoreline habitats along Broad Beach and the west end of Zuma Beach, directly affecting invertebrate species, such as sand crabs.

Although beach nourishment has the potential to restore ecosystem functions of sandy beach communities, persistent disturbances may preclude natural recovery. Revell et al. (2011) evaluated the recovery rate of beach ecological metrics following a major El-Niño event on nearby beaches. Recovery of wrack abundance and shorebirds to pre-El Niño levels took 3 years. Reductions in biomass and mean size of invertebrates were still detected 2 years after the event. The loss of larger and older cohorts of intertidal invertebrates (e.g., sand crabs, *Emerita analoga*, and pismo clams, *Tivela stultorum*) may take 1 to 10 years for recovery. For these invertebrate communities to recover, appropriate grain size and beach slopes must be available to allow successful recruitment. It is unclear whether the proposed nourishment and backpassing would provide adequate conditions for full uniform recovery along the entire beach. In addition, although the coarseness of sand may be similar to beach sands, other physical characteristics, such as angularity, may differ and can affect biological communities. Compound this chronic, anthropogenic placement and movement of sediment with natural impacts associated with major storm events and the result may be a beach in a persistently degraded state. Following nourishment, the coarse sand grain size from inland quarry sites could be potentially less optimal for certain macroinvertebrates due to roughness, but would not be prohibitive. Sand grain size may change conditions for existing invertebrate habitat on-site but not necessarily adversely. The total sand volume added and the area affected is a relatively small portion of the entire existing sandy intertidal habitat area in the region and the overall impact would be minimal (Moffatt & Nichol 2013b).

Sandy intertidal areas also provide key foraging, nesting and overwintering habitat for a variety of coastal seabirds and shorebirds, including the federally threatened western snowy plover and federally threatened California least tern. No western snowy plover nesting occurs on Broad Beach or Zuma Beach, although the far eastern end of the Broad Beach area and adjacent Zuma Beach are federally designated as critical habitat for this species (Chambers Group 2012a). During the initial beach nourishment Project, heavy equipment operation could disturb foraging by such species over the 6-month construction period while burial, disturbance and reduction of food sources over the 6 months to 1 year following beach restoration could incrementally impact such species. The potential for impacts to breeding western snowy plovers or California least terns are considered of very low probability given absence of suitable existing nesting habitat on Broad Beach and lack of past breeding activities. In addition, the newly widened beach and dune system would provide a greater diversity of beach habitats than currently exists as exposed sandy beach is generally limited to lower tides, limiting this beaches' availability for shorebird foraging.

Additionally, sandy intertidal habitat provides spawning areas for species like the California grunion. Grunion spawning grounds are considered sensitive habitat under the Malibu Local Coastal Program (LCP) because the continued success of the species depends on the availability of spawning habitat. Broad Beach is currently a low tide beach with little or no sandy beach berm or persistent beach face which severely limits its potential as California grunion spawning habitat. This beach is backed by a variety of coastal protection structures, including the emergency revetment, which further limit suitable spawning habitat through displacement and potential for increased wave reflection back across the existing low tide beach. Further, although grunion have been observed spawning at the western end of Zuma Beach, they are not known to spawn on Broad Beach and their potential to use this beach for spawning under existing conditions is considered low.

Although sensitive species, such as the western snowy plover and California grunion, are not anticipated to use Broad Beach for nesting or spawning under existing conditions, successful restoration of Broad Beach and the adjacent dune system would greatly increase the suitability of this beach for nesting and spawning activities by these species. While the potential for successful reuse of Broad Beach by these species cannot be definitively forecast, the renourishment event has the potential to create substantial effects upon these species should successful nesting and spawning occur. Therefore, the Project would potentially create and maintain habitat for nesting and spawning by these sensitive species, but could also potentially impact the newly created habitat via renourishment activities.

Avoidance and Minimization Measure(s)

AMM MB-3: Monitoring for Grunion. If possible, construction activities shall be conducted outside the spawning season for grunion (March through August). If construction cannot be avoided during this period, pre-construction biological surveys for spawning grunion shall be conducted by a certified biologist. If spawning is observed, construction will halt in that area, and the spawning area plus a 250-foot buffer to each side of the spawning area will be protected from Project activities until after the next spring tides (approximately 10 days to 2 weeks).

AMM MB-5a (Backpassing Management Plan) would apply to sand placement impacts to marine biological resources.

Rationale for Avoidance and Minimization Measure(s)

Re-colonization of the newly widened beach with invertebrate species would be expected to occur naturally, though the timing would be less predictable. AMM MB-5a, described under Impact MB-5, would limit impacts from backpassing and would slightly increase the recovery time for affected sandy intertidal habitat. Monitoring for grunion spawning, as required by AMM MB-3, would ensure that if grunion begin to use Broad Beach in the future, they would be protected from the effects of sand placement until after their eggs have hatched and the larvae have been washed out to sea.

Impact MB-4: Sand Placement Impacts to Subtidal Habitats and Organisms

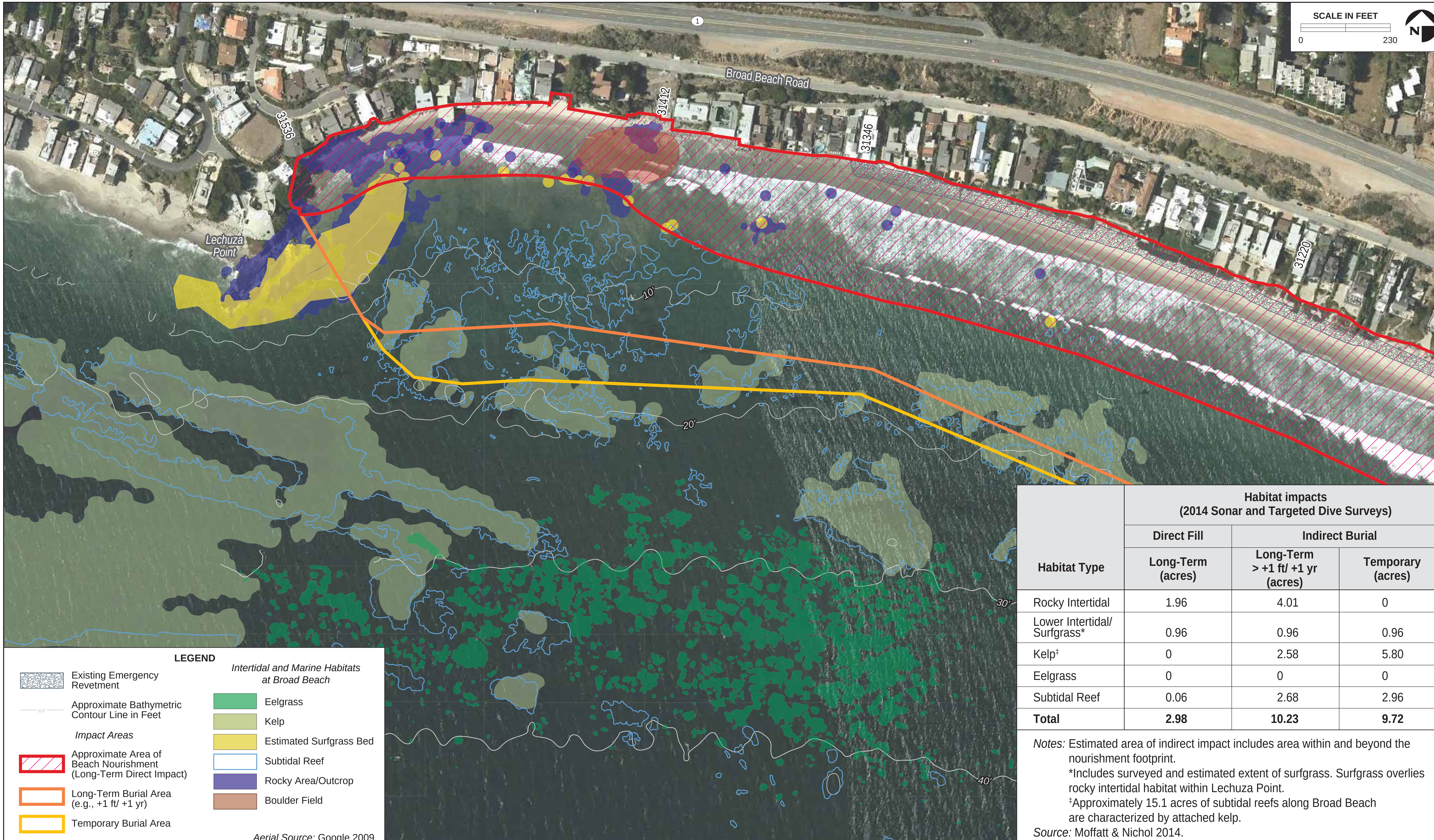
Sand placement from Project construction and one renourishment event would result in burial and disturbance of sensitive subtidal habitats offshore of Broad Beach. (Major Adverse Effect, Class Mj).

Impact Discussion (MB-4)

The habitats and species found within the marine habitats of Broad Beach lie within the jurisdiction of the Mugu to Point Dume ASBS and the Point Dume SMCA, and the coastal waters offshore the Project are designated as Essential Fish Habitat (EFH) under section 305(b)(4)(A) of the Magnuson-Stevens Fishery Conservation and Management Act, and an ESHA under the Malibu LCP. Because California's system of MPAs have been explicitly designed to function as a network, any impacts to the Point Dume SMCA may also affect the overall function of MPAs in a broader area. Impacts to subtidal areas would therefore potentially be inconsistent with several sections of the MLPA and MPA/SMCA/ASBS regulations, as well as Section 305(b)(4)(A) of the Magnuson-Stevens Fishery Conservation and Management Act. The deposition of sand on Broad Beach, and extension of the seaward footprint of the beach would result in the burial of existing intertidal habitats, discussed in Impacts MB-2 and Impact MB-3, as well as subtidal habitats. This would affect sensitive rocky and sandy bottom subtidal areas along the western portions of Broad Beach, including kelp and surfgrass beds, the latter of which occur in the intertidal as well as the shallow subtidal zones.

As discussed previously, the Point Dume SMCA includes a provision that beach nourishment and other sediment management activities are allowed inside the conservation area pursuant to any required Federal, State, and local permits, or as otherwise authorized by the CDFW (Cal. Code Regs., tit. 14, § 632). However, through personal communications, public comment with the 2012 DAPTR, and interagency meetings, the CDFW has communicated that the regulations that were established for the Point Dume SMCA were not intended to allow for major adverse impacts to sensitive marine resources and would not allow for construction of new, enhanced or restored habitat within this area. Further, the MLPA laws and regulations do not include provisions for the construction of artificial reefs to minimize any impacts to habitats located within an MPA (Fish & G. Code, § 2857, subd. (c)]. See Appendix N for 2012 CDFW comment letter.

The Project is projected to have direct impacts to approximately 0.06 acre of shallow subtidal reefs located offshore of the Broad Beach area; however, the Project would result in direct and indirect long-term burial (e.g., more than 1 foot for sand for more than 1 year) of approximately 2.68 acres. Additionally, while the Project would not result in the direct fill of kelp beds, it would result in the indirect long-term burial of approximately 2.58 acres of kelp habitat and indirect short-term burial of approximately 2.96 acres (Moffatt & Nichol 2014; see Figure 3.3-7).



Habitat Type	Habitat impacts (2014 Sonar and Targeted Dive Surveys)		
	Direct Fill	Indirect Burial	
	Long-Term (acres)	Long-Term > +1 ft/ +1 yr (acres)	Temporary (acres)
Rocky Intertidal	1.96	4.01	0
Lower Intertidal/ Surfgrass*	0.96	0.96	0.96
Kelp‡	0	2.58	5.80
Eelgrass	0	0	0
Subtidal Reef	0.06	2.68	2.96
Total	**2.98**	**10.23**	**9.72**

Notes: Estimated area of indirect impact includes area within and beyond the nourishment footprint.
*Includes surveyed and estimated extent of surfgrass. Surfgrass overlies rocky intertidal habitat within Lechuza Point.
‡Approximately 15.1 acres of subtidal reefs along Broad Beach are characterized by attached kelp.
Source: Moffatt & Nichol 2014.

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Impacts to Marine Habitats at Broad Beach

FIGURE 3.3-7

The organisms that live on these shallow reefs are adapted to sand movement. These species include rapid colonizers such as sea lettuce (*Ulva* spp.) and sand tube worms (*Phragmatopoma* spp.) as well as sand-tolerant species such as aggregate anemones (*Anthopleura* spp.) and surfgrass. These organisms are adapted to the seasonal cycles of sand movement, but it is unknown whether the greater predicted burials in the year following beach construction would be beyond their tolerance levels.

Surveys from the 1970s, when the beach at Broad Beach was much wider than today (and similar to the Project condition that is based on replicating historic shoreline widths), observed surfgrass and other rocky intertidal organisms in the lee of Lechuza Point (Morin and Harrington 1979) indicating that these species existed at Broad Beach during a period when the system had a greater amount of sand. Young surfgrass plants are frequently buried by as much as 30 to 40 centimeters of sand for periods up to several months (Reed et al. 1999). Thus, the Project may incrementally affect species diversity and richness of near shore subtidal rocky reef habitats. As previously described, the Project aims to limit impacts to the natural rocky habitat and surfgrass habitats that exist offshore Lechuza Point by nourishing a narrower portion of beach, thus limiting erosion in that area to only those times of greater wave run-up.

Extension of the beach profile would result in 100 percent mortality to the subtidal organisms that are currently located within the proposed beach footprint. Although these organisms are adapted to frequent burial that lasts for weeks and sometimes months, the years-long burial and disturbance associated with the Project would be expected to eliminate these species. However, in areas along the seaward side of the beach nourishment periphery, mortality would be somewhat lower as burial would be shallower and sand would be transported away from these areas relatively quickly. Additionally, the placement of sand would result in temporary increases in nearshore turbidity, resulting in the smothering or burial of additional organisms and habitat beyond the actual footprint of the expansion.

The proposed deposition of sand at Broad Beach in two nourishment events could incrementally increase sand coverage of, and turbidity impacts to, shallow subtidal rocky reefs located off of Lechuza Point and the west end of Broad Beach. These habitats could be impacted by an increased duration of sand burial. However, while modeling indicates that added sand to the system would not affect offshore areas deeper than 15 to 17 feet that support eelgrass, shallow reefs that extend from these subtidal areas shoreward into lower intertidal areas could suffer increased sand coverage (Moffatt & Nichol 2014; Chambers Group 2012b). Although many species on such shallow subtidal reefs are adapted to periodic sand coverage, it is unknown whether the greater predicted burials in the initial years following beach construction would be beyond their tolerance levels.

Benthic fauna at the beach site will be killed by burial following nourishment unless an organism is capable of burrowing through the overburden of sand (Greene 2002). Several factors determine survival of beach invertebrate fauna, including the ability for vertical migration through the sand overburden and the recruitment potential of larvae, juveniles, and adult organisms from adjacent areas (Greene 2002). Peterson et al. (2000) found an 86 to 99 percent reduction in the abundance of dominant species of beach macroinvertebrates ten weeks after nourishment on a North Carolina beach. These observations were made between the months of June and July, when the abundances of beach macro-invertebrates are typically at their maximum and providing the important ecosystem service of feeding abundant surf fishes and ghost crabs (Peterson et al. 2000).

Results of studies assessing the recovery of organisms at nourished beaches are highly variable (Greene 2002). While some studies conclude that beach infauna populations may recover to previous levels between two to seven months, other studies suggest recovery times are much longer (Greene 2002). Peterson et al. (2000) found a large reduction in prey abundance and body size of benthic macroinvertebrates at a nourished intertidal beach that likely translated to trophic level impacts on surf zone fishes and shorebirds.

Sandy subtidal areas, which are the most common habitat types located offshore Broad Beach, provide valuable habitat for key invertebrate species including sand dollars, crabs and potentially Pismo clams, as well as foraging areas for various demersal fishes. Under the Project approximately 13.5 acres of sandy bottom subtidal habitat would be directly impacted by fill; however, approximately 52 acres of this habitat type would be affected by short-term indirect burial (Moffatt & Nichol 2014). Based on modeling conducted by Moffatt & Nichol, the beach fill was predicted to add approximately 2 to 4 feet of sand to shallow sandy subtidal in this area compared to the average fall profile. However, because the increased sedimentation would be by gradual erosion of sand placed on the beach via wave action, the increased sedimentation would not be expected to persist over the long-term (e.g., more than 1 foot of sand for more than 1 year) and would not be have an adverse effect on shallow subtidal sand bottom organisms, which are adapted to sand movement.

The aerial extent and depth of increased sand cover is based on detailed modeling; however key estimates for longshore transport vary. Using available modeling information, increased sand cover is predicted to occur out to a depth of -20 feet. Approximately one year after beach construction, the total predicted sand cover in the low intertidal and shallow subtidal would be 1 to 5 feet. Additional sand cover beyond the average spring profile is projected to extend to about -18 feet. By the second fall following beach construction, sand levels between -2 and -20 feet MLLW would be 1 to 4.5 feet greater than the average fall profile. In the second spring two years after placement, sand cover above normal spring profiles would range from about 1 to 3 feet above average seasonal levels; and increased sedimentation would extend out to -14 feet. At 2.5 years after beach fill, sedimentation above the average fall profile would be 1 to 3 feet. By year 3, increased spring sand cover would be 1 to 2 feet out to a water depth of about -10 feet. By year 3.5, the increase above the average fall profile would be 6 to 18 inches. Between years 4 and 5, the increases over the average seasonal profiles are about 1 foot to 18 inches. By 5.5 years after the fill, increases in sand cover over existing profiles are minimal. However, although impacts would be much less severe, backpassing could prolong such burial, particularly of habitats in closer proximity to the shoreline.

The following AMMs attempt to reduce Project impacts to rocky subtidal habitats and species, but impacts are expected to remain a major adverse effect.

Avoidance and Minimization Measure(s)

AMM MB-2a and **AMM MB-2b** would apply and shall be completed prior to commencement of construction to demonstrate agency authorization of marine habitat and species impacts and to determine multi-agency endorsement of marine habitat protection measures.

Rationale for Avoidance and Minimization Measure(s)

Unlike intertidal habitats, California has an extensive although variable history of subtidal reef creation; although creation of such habitats is feasible, substantial debate continues over whether such artificial reefs can fully replicate the functioning of natural reefs, and even if successful, constitute creation of new biomass as opposed to relocation of species. While a number of more recent reef creation projects have met many but not all of their success criteria, increases in fish biomass, reestablishment of kelp forest and algal cover have all shown promise. These issues are discussed in detail in AMEC's 2014 *Review of Subtidal and Intertidal Habitat Compensatory Mitigation Approaches* (see Appendix D). However, regardless of potential for success, opportunities for restoration, preservation or enhancement should be prioritized and may be available to offset Project impacts. Further, conducting shallow subtidal reef establishment or creation may also be a valuable exercise and, if results could be used to develop effective strategies for rocky reef establishment and restoration, could potentially result in benefits across many locations.

Long-term monitoring of the shallow subtidal reefs would allow for adaptive management of Broad Beach, providing a feedback that could result in changes in timing, area, or extent of future nourishment or backpassing. Such monitoring would also provide important data to be used by regulatory agencies when considering nourishment projects at other beaches with shallow subtidal reefs. However, even with implementation of AMMs and the potential for success of subtidal reef creation, impacts of the proposed Project to rocky subtidal habitats and organisms are expected to have a major adverse effect.

Impact MB-5: Backpassing Impacts to Marine Resources

Annual or biannual backpassing would prolong disturbance of both rocky and sandy intertidal habitats impacting intertidal species diversity and abundance (Minor Adverse Effect, Class Mi).

Impact Discussion (MB-5)

Backpassing would be conducted based on an evaluation of beach width measurements, beach profile monitoring results, sand volume calculations, visual observations, and with respect to minimizing impacts to biological resources. Backpassing events would occur annually as needed with up to 20 backpassing events during the Project life to maintain beach width on a proportionate basis. The full beach profile measurements at transects 408, 409, 410, 411, and 412 as measured one (1) year following completion of initial project construction, or following any subsequent renourishment episode when the beach area reaches an equilibrium state, would be used for a baseline comparison to establish beach proportions. Backpassing, as currently proposed, would disturb significant areas of the beach over the long-term, with heavy equipment excavating approximately 3 to 8 acres along 2,200 to 2,700 feet along the eastern end of Broad Beach to a depth of 5 feet and transporting this sand for 1,000 to 3,000 feet east along Broad Beach via heavy scrapper or haul truck for deposition on the west end of the beach. The receiver or fill site would be approximately 100 feet wide and extend along 2,600 feet occupying approximately 6 acres. A total of 25,000 to 50,000 cy of sand would be moved during each backpassing event. Therefore, the amount of sandy beach habitat that would be affected by backpassing from the eastern reach to the western reach is estimated to be approximately 9 to 14 acres of intertidal sand beach, or up to approximately 30 percent, of the 46-acre Broad Beach area. Maintenance activities would not occur below MLLW (Chambers Group 2013c). The direct and indirect impacts (e.g., burial) of each backpassing event are expected to be similar to those of the initial beach nourishment within the affected area. Additional impacts would occur within the transit zones, which would be located in intertidal areas.

Backpassing on this scale is typically practiced at highly managed and/or artificially created beaches, such as those in Long Beach Harbor or Newport Beach. Such beaches are largely recreationally oriented and may lack the existing intact natural systems and habitats that remain present at Broad Beach, at least in intertidal and subtidal areas. The high intertidal zone of mainland Southern California beaches supports a diverse and important macroinvertebrate community with macrophyte wrack as a food base (Dugan et al. 2008). The high intertidal macroinvertebrate communities provide a food base for foraging gulls and shorebirds, including western snowy plover. High intertidal habitats (e.g., beach strand) and macroinvertebrate sand beach community in Southern California mainland beaches has been lost or impacted by a variety of factors including coastal armoring, beach grooming, and sea level rise (Chambers Group 2012a).

Annual backpassing would transform existing subtidal and intertidal habitats along Broad Beach that currently functions as a largely natural, although often submerged, beach into a highly managed beach. Repeated disturbances of large areas of Broad Beach would prevent full recovery of intertidal and high intertidal species, particularly in the areas designated as borrow and fill sites. Transit corridors, particularly the intertidal beach, would also be impacted. While species in these habitats are accustomed to disturbance and are known to recover quickly, the resiliency of these habitats to repeated longer term disturbances of this scale is not well understood. Effects may be similar to repeated beach grooming, where species begin to recover from major nourishment or the most recent backpassing, only to be disturbed again. Over the 20-year Project life, the level of backpassing proposed would result in the transformation of the currently functioning largely natural sandy and rocky intertidal habitats, into a more managed beach environment, with consequent loss of natural species richness and diversity. Opportunities for this beach to develop and evolve into a more diverse and natural functioning intertidal and high intertidal beach habitat in place of existing habitats may be substantially curtailed by the extent and frequency of disturbance associated with backpassing.

In addition, a newly restored Broad Beach would have all the attributes of a grunion spawning beach. While creation or restoration of a grunion spawning beach would be a beneficial effect of the initial nourishment, backpassing during the grunion spawning season could adversely impact spawning grunion.

Avoidance and Minimization Measure(s)

AMM MB-5a: Backpassing Management Plan. The Applicant shall retain a qualified biologist to prepare an initial backpassing management plan, with input from project engineers, to guide backpassing over the life of the project. This plan shall be designed to protect undisturbed beach habitat areas while also achieving the Project objectives for ongoing beach nourishment. This plan shall be prepared and submitted for review and approval to the California State Lands Commission (CSLC) staff, California Department of Fish and Wildlife (CDFW), and the California Coastal Commission (CCC) prior to commencement of Project construction activities. The plan shall have the following goals and standards:

- Protection of sandy beach habitat during backpassing events.
- Minimizing the aerial extent of beach disturbance (i.e., areas of excavation or fill) while maximizing sand availability for backpassing consistent with this goal and maintaining an acceptable beach profile and proportionate beach width.

- Protection of contiguous areas of macro-invertebrate habitat, particularly within the lower, mid and upper intertidal zones.
- Protection and retention of areas of beach wrack
- Prior to backpassing, relocation of all beach wrack from areas proposed for excavation or fill to areas that will remain undisturbed using hand crews or light equipment only.
- Retention of areas of undisturbed connectivity between portions of the dune habitat and the intertidal zone.
- Avoidance of backpassing in spring and early summer to avoid periods of high macro-invertebrate productivity.
- Consistent with approved nourishment plans, sand transported from backpassing will be placed high on the beach profile to minimize loss to coastal processes and impacts to rocky intertidal habitat
- Backpassing vehicle corridors shall be clearly defined and limited to minimize beach disturbance
- Backpassing will be limited to a maximum of one 3-week period annually

In no case shall more than 50 percent of the total dry sand and intertidal beach area be subject to disturbance by either excavation or fill.

AMM MB-5b: Annual Backpassing Plans. The Applicant shall retain a qualified biologist to prepare brief annual backpassing plans, with input from project engineers, to guide each backpassing event over the life of the Project. Each annual backpassing plan shall achieve the goals of the Backpassing Management Plan (AMM MB-1a). Each plan shall be prepared and submitted for review and approval to California State Lands Commission (CSLC) staff, California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and California Coastal Commission (CCC) a minimum of three months prior to initiation of backpassing. The annual backpassing plan shall be designed to build upon the goals, standards and analysis within the initial backpassing management plan and be tailored to account for changing circumstance over time.

AMM MB-5c: Beach Habitat Management Plan. Prior to commencement of construction activities, the Applicant shall prepare and submit to CSLC staff a Beach Habitat Management Plan (BHMP). The BHMP will set forth measures to minimize the impacts of backpassing and maintain biological productivity of intertidal and high intertidal habitats, including but not limited to prohibition of grooming, creation and maintenance of areas of beach wrack and beach strand habitat on areas of the berm outside of backpassing borrow and deposition zones.

AMM MB-3 (Monitoring for Grunion) would also apply to backpassing impacts.

<u>Rationale for Avoidance and Minimization Measure(s)</u>

Limitations on the extent of beach disturbance associated with and the frequency of backpassing operations would permit more time and recovery of intertidal and high intertidal species and limit disturbance of these species. Preparation of a BHMP would permit enhancement of some additional areas along the beach to offset long-term disturbances. The newly created beach, once at equilibrium, would include a similar area of intact intertidal habitat as currently exists. Impacts to the sensitive intertidal and high intertidal beach habitats and species would be reduced through application of AMMs. Monitoring for grunion spawning would ensure that if grunion begin to use Broad Beach in the future, they would be protected from the effects of backpassing until after their larvae have hatched and been washed out to sea.

Backpassing is a key component of the Project to ensure longevity of beach nourishment activities to improve shoreline protection, dune restoration, and public coastal access and recreation. However, unregulated backpassing has the potential to create damage to sandy beach and intertidal habitats, lowering the biological productivity of the beach. AMM MB-5a to AMM MB-5c are designed to balance these competing interests and uses of the beach to maximize protection of undisturbed beach while also achieving the Project objectives (Section 2, *Project Description*).

Impact MB-6: Impacts to Marine Resources from Potential Fuel or Oil Release

The increased vehicle traffic and equipment use associated with the Project would result in an increased risk of oil or fuel release as a consequence of onshore spillage (Minor Adverse Effect, Class Mi).

<u>Impact Discussion (MB-6)</u>

As discussed in Section 3.5, *Marine Water Quality,* the Project would involve increased traffic from vehicles and diesel-fueled equipment on Broad Beach during beach construction activities, increasing the chances of potential fuel or oil spills. If not quickly contained, a spill of fuel or oil from Project vehicles would potentially impact a variety of marine biological resources. Fuel and oil are physical and chemical hazards, and intertidal organisms are especially vulnerable to the physical effects of oil (Percy 1982). Sessile species, such as barnacles, may be smothered, while mobile animals, such as amphipods, may be immobilized and glued to the substrate or trapped in surface slicks in tidepools. It has been hypothesized (Hancock 1977) that organisms in the upper intertidal areas where the oil dries rapidly are more apt to be affected by physical effects of fuel oil, such as smothering, whereas organisms in the lower intertidal areas are more exposed to the chemical toxic effect of the liquid petroleum.

Plankton populations on the open coast are expected to have low vulnerability to a Project-related fuel or oil spill, as a spill of oil from a vehicle on the beach would not result in a large quantity of oil entering the ocean. Even if a large number of individual organisms contacted the fuel or oil, rapid replacement by individuals from adjacent waters is expected. In addition, the regeneration time of phytoplankton cells is rapid (9 to 12 hours) and zooplankton organisms are characterized by wide distributions, large numbers, short generation times, and high fecundity (National Research Council [NRC] 1985).

Open coast sandy beaches, like those generally located in the Broad Beach area would not be expected to suffer long-term damage from a Project-related fuel oil spill. Once the fuel or oil has been removed, recolonization by sandy beach organisms tends to be rapid (Aspen Environmental Group 2005).

Avoidance and Minimization Measure(s)

AMM TBIO-4a (Emergency Action Plan Measures Regarding Protection of Biological Resources) would apply fuel release impacts.

Rationale for Avoidance and Minimization Measure(s)

Prevention of fuel oil spills and minimization of spread of spills that do occur would reduce any potential impact to marine biological resources.

Impact MB-7: Sand Placement Impacts to Down Coast Marine Biological Resources

The deposition of sand supply on Broad Beach would contribute additional sand sources to down coast intertidal habitat through longshore transport within the Santa Monica Littoral Cell (Negligible Effect, Class N).

Impact Discussion (MB-7)

Down coast beaches, including Zuma Beach, Point Dume State Beach, and Los Angeles County beaches, intertidal habitat areas, and shoreline marine biological resources farther south may be indirectly affected by changes in sand supply and distribution through littoral drift. Longshore transport moves sand supply from Broad Beach to down coast beaches, such as Puerco Beach, Amarillo Beach, and Big Rock Beach, within the Santa Monica Littoral Cell (refer to Figure 3.1-1). These down coast areas vary from sandy beaches to rocky headlands. The coastline comprises sensitive rocky intertidal habitat areas that would constitute ESHA.

The Project involves deposition of 600,000 cy of inland sand supply on Broad Beach during the initial nourishment event, followed by a supplemental nourishment of 450,000 cy 10 years after the initial event. Erosion of a newly widened beach would increase longshore transport down coast, incrementally contributing to increased sand supply effects within rocky intertidal habitats (e.g., burial of rocky intertidal areas). Average annual longshore drift is 280,000 cy per year. Over 20 years, an estimated 5.6 million cy of sand would be gradually and non-uniformly transported down coast (see Section 3.1, *Coastal Processes, Sea Level Rise, and Geologic Hazards*). Barring the restored dune areas, approximately 950,000 cy of sand would be added to the coastline over the life of the Project. Gradually, this sand would erode into the Santa Monica littoral system. This represents a 17 percent increase in sand supply contribution over roughly 26 miles of coastline between the Broad Beach area and the breakwaters of Marina Del Rey.

Sand does not move uniformly under normal marine conditions. There are enumerable pocket beaches that may catch and hold sand before longshore transport occurs. Additionally, the increased supply may contribute to indirect nourishment of sand starved beaches down coast from the Broad Beach area. Over the long-term and under shifting seasonal coastal processes, sand deposition at Broad Beach may incrementally increase the volume of sand within existing rocky intertidal areas down coast. However, the 17 percent increase in sand supply at Broad Beach is expected to mimic the existing natural cycle, where ebbs and flows would pulse sand down coast gradually, rather than suddenly and en masse. Unlike the initial and follow-up nourishment activities, which involve a massive of sand deposition event within beach and intertidal areas that may bury marine biological resources at unsustainable depths, the transport of sand down coast would only potentially bury intertidal at shallow and nominal depths where marine biological resources would adapt to the gradual change. Additionally, the addition of sand to Broad Beach may reflect past conditions when more sand was available for transport to down coast beaches. As such, this gradual increase would be minor and the resulting impact would negligible.

Impact MB-8: Conflicts with Malibu Local Coastal Program and California Coastal Act Policies

Project impacts to ESHAs, relative to public access and use of public trust lands, would potentially conflict with the California Coastal Act policies (Major Adverse Effect, Class Mj).

<u>Impact Discussion (MB-8)</u>

Policy 3.3 of the Malibu LCP defines any State MPA as an Environmentally Sensitive Habitat Area (ESHA); therefore, the waters offshore Broad Beach are considered ESHAs. ESHAs include habitat areas that are recognized as rare and/or important to wildlife, particularly to sensitive species. Within the Public Trust Impact Area, the sand dune habitat and the Trancas Lagoon are categorized as ESHAs. Based on a review of Coastal Act policies, Project implementation would potentially be in conflict with several provisions of the Coastal Act, for the reasons listed below.

Initially, Project implementation would be consistent with Coastal Act and LCP goals and policies regarding public access; however, after both the initial and subsequent proposed nourishment event, these benefits would immediately begin to diminish as coastal processes cause the beach to retreat. Long-term benefits would be eliminated without continued major renourishment, and public access on public trust lands and easements along the shoreline would be again severely impeded by the emergency revetment.

The offshore ESHA could also be adversely affected as sensitive marine biological resources within the Public Trust Impact Area, including surfgrass beds and rocky intertidal habitat, would be smothered or could be adversely affected by imported sand. Project construction is conservatively estimated to result in direct burial of approximately 5 acres of rocky intertidal habitat, including approximately 1 acre of surfgrass supported by lower intertidal rocky habitat that may be directly or indirectly impacted by sand placement in Lechuza Cove. Further, the Project may also affect more than 3 acres of subtidal rock reef habitat. Impacts of burial of such habitats would be extended and exacerbated by backpassing and would be generally repeated in an estimated 10 years with the single planned major renourishment event. Rocky intertidal and surfgrass potentially impacted are located within the SMCA and are therefore considered ESHA.

<u>Avoidance and Minimization Measures</u>

The following AMMs would apply to this impact:

AMM MB-2b Multi-Agency Collaboration for Sensitive Marine Habitat Impacts.

AMM MB-2c Sand Placement Footprint Limitation.

AMM MB-3 Monitoring for Grunion.

AMM MB-5a Backpassing Management Plan.

AMM MB-5c Beach Habitat Management Plan.

<u>Rationale for Avoidance and Minimization Measures</u>

Implementation of these measures would minimize impacts to existing marine biological resources and offset unavoidable impacts associated with the project to the maximum extent feasible.

3.3.5 Summary of Marine Biological Resource Impacts

Impact	Class	AMMs
MB-1: Revetment and Sand Bag Placement Impacts to Sandy Intertidal Habitat and Organisms	Mi	**AMM TBIO-3a:** Biologist and Biological Monitors for Backpassing Activities **AMM TBIO-3b:** Avoidance of Sensitive Resource Zones and Vegetation **AMM TBIO-3c:** Sensitive Biological Resources Report **AMM REC-4a:** Requirement of Additional Nourishment
MB-2: Sand Placement Impacts to Rocky Intertidal Habitat and Organisms	Mj	**AMM MB-2a:** Compliance with Existing Laws **AMM MB-2b:** Multi-Agency Collaboration for Sensitive Marine Habitat Impacts **AMM MB-2c:** Sand Placement Footprint Limitation
MB-3: Sand Placement Impacts to Sandy Intertidal Habitats and Organisms	Mi	**AMM MB-3:** Monitoring for Grunion **AMM MB-5a:** Backpassing Management Plan
MB-4: Sand Placement Impacts to Subtidal Habitats and Organisms	Mj	**AMM MB-2a:** Compliance with Existing Laws **AMM MB 2b:** Multi-Agency Collaboration for Sensitive Marine Habitat Impacts
MB-5: Backpassing Impacts to Marine Resources	Mi	**AMM MB-5a:** Backpassing Management Plan **AMM MB-5b:** Annual Backpassing Plans **AMM MB-5c:** Beach Habitat Management Plan **AMM MB-3:** Monitoring for Grunion
MB-6: Impacts to Marine Resources from Potential Fuel or Oil Release	Mi	**AAM TBIO-4a:** Emergency Action Plan Measures Regarding Protection of Biological Resources
MB-7: Sand Placement Impacts to Down Coast Marine Biological Resources	N	No AMMs recommended
MB-8: Conflicts with Malibu Local Coastal Program and California Coastal Act Policies	Mj	**AMM MB-2b:** Multi-Agency Collaboration for Sensitive Marine Habitat Impacts **AMM MB-2c:** Sand Placement Footprint Limitation **AMM MB-3:** Monitoring for Grunion **AMM MB-5a:** Backpassing Management Plan **AMM MB-5c:** Beach Habitat Management Plan