4.5 Marine Biological Resources

This section analyzes the potential for the Monterey Peninsula Water Supply Project (MPWSP or proposed project), which includes 10 slant wells at CEMEX, to affect marine habitats and associated marine biological resources. The marine biological resources study area encompasses the nearshore waters (within 5 miles from shore) of Monterey Bay and extends from the Salinas River southward to the northern limits of Sand City. This area encompasses the ocean waters adjacent to the proposed subsurface slant wells site at the CEMEX sand mining facility and surrounding the Monterey Regional Water Pollution Control Agency's (MRWPCA) existing ocean outfall, which CalAm proposes to use to discharge the brine produced during the desalination process (see **Figure 4.5-1**). This area also includes the waters of Monterey Bay National Marine Sanctuary, and impacts associated with the federal proposed action, which includes the permitting and authorization of those project components that may affect sanctuary resources, including the brine discharge. This analysis considers construction and operational impacts associated with the subsurface slant wells and operational impacts associated with brine discharge because they are the only proposed actions that affect marine biological resources. The analysis of brine discharge impacts on marine biological resources relies on water quality information and analysis presented in Section 4.3, Surface Water Hydrology and Water Quality. Section 4.3 also discusses the indirect impacts on Marine Biological Resources resulting from the implementation of water quality mitigation. Marine birds, anadromous fish, and inland fish are addressed in Section 4.6, Terrestrial Biological Resources.

The CPUC received several comments pertaining to marine biological resources during the public review period for the April 2015 Draft EIR. Comments requested revision of the description of National Marine Sanctuary Program Regulations; and expansion of the discussion of state regulations to provide a more complete description of the Marine Life Protection Act and the Marine Life Management Act, as well as management plans for nearshore fishes and market squid. These comments have been addressed in Section 4.5.2, Regulatory Framework. Other comments include suggested revisions to the analysis approach and significance thresholds for analysis brine discharge impacts. Accordingly, the approach and significance thresholds have been revised and are presented in Sections 4.5.4 and 4.5.5. Comments received on the April 2015 Draft EIR expressed concerns over the potential for hypoxia[1] to occur near the seabed as a result of proposed MPWSP operational discharges. Specifically, there was concern that high salinity discharges from the MRWPCA outfall would restrict oxygen supply near the seabed and result in stress or mortality to benthic organisms and other marine biological resources. These issues are addressed in detail in Chapter 4.3, Water Quality, specifically Section 4.3.5.2 under Impact 4.3-4 and Impact 4.3-5, and a summary of this analysis is repeated in 4.5. Some commenters requested more quantitative analysis of shear stress effects on plankton associated with brine discharges and consideration of brine discharge impacts on squid. These issues are addressed under Impacts 4.5-4, 4.5-5, and 4.5-6. Finally, a concern was expressed regarding the presence of cold water offshore seeps. Although cold water seeps are one of the more unique and sensitive benthic habitats that occurs within Monterey Bay, they are located at depths greater than 3,000 feet (1,000 meters). There are no known cold water seeps within the study area and this topic is not further discussed.

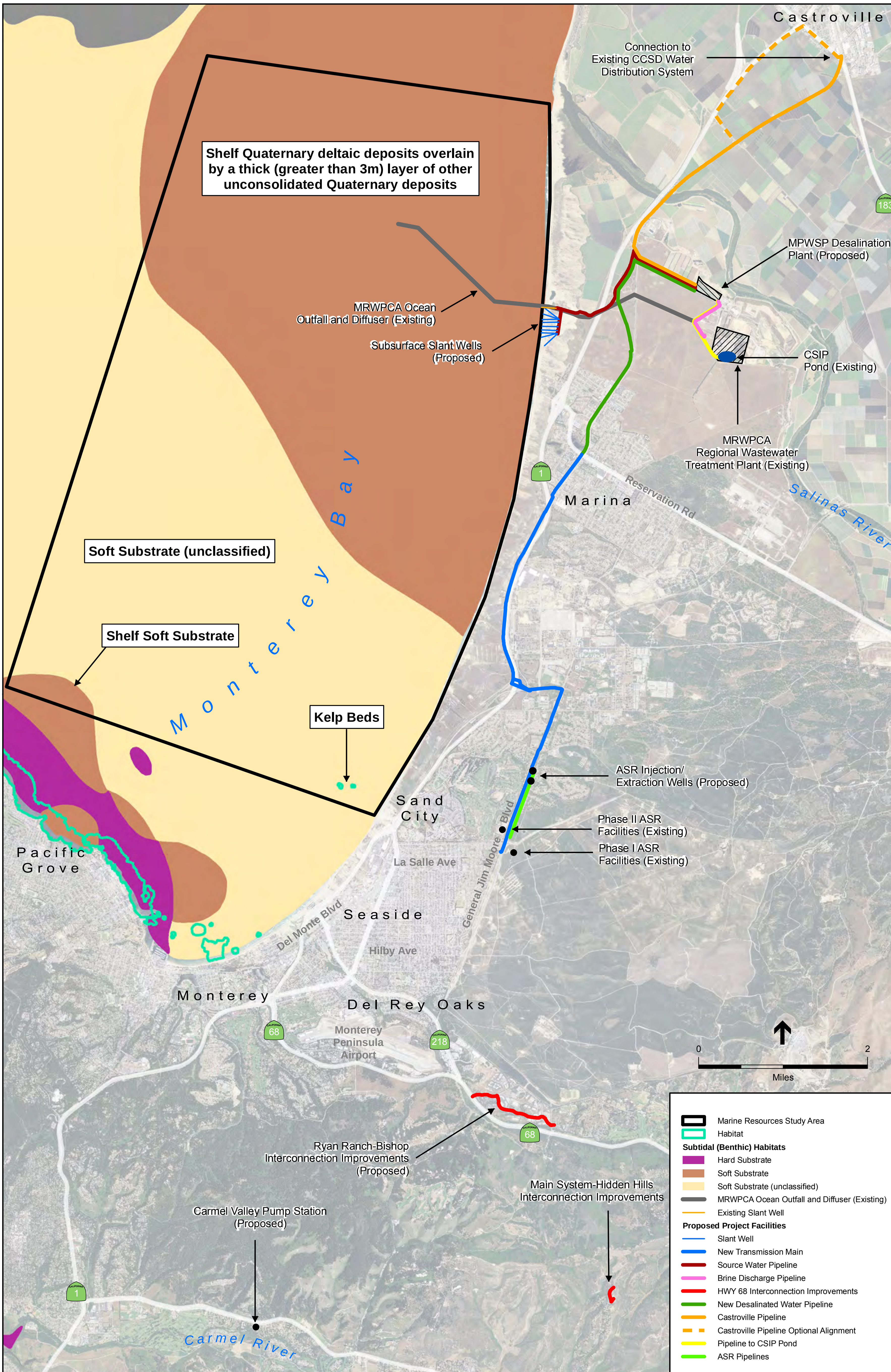
As a result of comments received on the January 2017 Draft EIR/EIS, revisions have been made to this Final EIR/EIS section. Those changes include:

- *The addition of California Division of Fish and Wildlife "Fully Protected" as a category of Special Status Marine Species; and*
- *The inclusion of additional brine discharge dilution modeling scenarios from Section 4.3, Surface Water Hydrology and Water Quality.*

4.5.1 Setting/Affected Environment

This setting section describes the regional oceanographic conditions and marine biological resources of Monterey Bay within Monterey Bay National Marine Sanctuary (MBNMS), and provides more specific information on habitats and resources in the study area. The impact analysis presented in Section 4.5.5, below, focuses on those resources located within the marine biological resources study area (**Figure 4.5-1**). The information on marine communities, plant and animal species, and sensitive biological resources used in the preparation of this section was obtained from regional databases including information available from MBNMS (MBNMS, 2013; 2015a, b; 2016a, b, c, d, e) environmental impact assessments prepared for other regional projects (MCRMA, 2014, SWCA/MBNMS, 2014), and scientific publication articles relevant to

[1] Hypoxia, or oxygen depletion, is an environmental phenomenon where the concentration of dissolved oxygen in the water column decreases to a level that can no longer support living aquatic organisms. The impacts of hypoxia are often described as creating a so-called "dead zone" in the marine environment.



SOURCE: CSUM; NOAA

205335.01 Monterey Peninsula Water Supply Project

Figure 4.5-1
Identified Seafloor Habitats in Study Area

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the proposed project, and reconnaissance-level surveys of the project area. A survey of marine plankton was performed on May 5, 2016 (AMS, 2016).

The study area is located in the nearshore coastal area of MBNMS, which was designated as a federally protected area in 1992. MBNMS is managed by the National Oceanographic and Atmospheric Administration (NOAA), Office of National Marine Sanctuaries (ONMS) and includes coastal waters from Marin to Cambria. MBNMS includes 276 statute miles of shoreline, extends an average distance of 30 miles from shore (MHWL) and encompasses 4,601 square nautical miles of ocean (MBNMS, 2015a). It was established for the purposes of research and monitoring, education and outreach, public use and resource protection, and includes a variety of habitats that support highly productive biological communities.

MBNMS resources include a variety of habitats that support extensive marine life, including 36 species of marine mammals, over 180 species of seabirds and shorebirds, at least 525 fish species, four sea turtle species, 31 different invertebrate phyla, and over 450 species of marine algae. Its natural resources include central California's largest contiguous kelp forest, one of North America's largest underwater canyons, and the closest-to-shore deep ocean environment off the continental United States. Its productive biological communities host one of the highest levels of marine biodiversity in the world, including 27 federally listed threatened and endangered species.

4.5.1.1 Existing Oceanographic Conditions

Monterey Bay has three ocean climate seasons: upwelling, oceanic, and Davidson current (Pennington and Chavez, 2000). The upwelling period, typically occurs mid-February through November, and is characterized by higher nutrient concentrations at the surface, where sunlight and stratification of the water column often lead to high primary production and chlorophyll values (see the discussion of pelagic habitat, below, for more details). MBNMS represents one of four major coastal upwelling regions worldwide. The seasonal upwelling makes Monterey Bay extremely productive in terms of being able to support a variety of species, including some whales and small schooling fish (e.g., sardine, herring).

During the oceanic period, which usually begins in mid-August and continues through mid-October, phytoplankton blooms are intermittent and primarily composed of small phytoplankton. Phytoplankton productivity is lowest in winter months and during the Davidson current period. Section 4.3, Surface Water Hydrology and Water Quality, provides more detail about the hydrology and water quality of Monterey Bay.

4.5.1.2 Existing Marine Habitats and Communities

The study area includes a variety of habitats that can be broadly divided into nearshore, pelagic (open water), and benthic (seafloor) habitats, as described in the following subsections.

Intertidal & Nearshore Habitats

The intertidal zone is located between the highest and lowest tide elevations. Intertidal zones along the central California coast include rocky shores, sandy beaches, coastal marshes, and tidal flats located within estuaries and lagoons. The intertidal zone adjacent to the project area is characterized by sandy beaches.

Sand and gravel beach communities are structured in part by grain size, slope of the beach, and wave energy. Intertidal beach communities are also subject to daily tidal changes that result in highly fluctuating physical regimes in temperature, salinity, and moisture content of the sand.

Various invertebrate animals live in the sand and in wracks of decaying seaweed and other detritus. These include crustaceans, cirolanid isopods, and mole crabs (Oakden and Nybakken, 1977). Polychaete worms, bivalves (i.e. clams, mussels, and scallops) are also regularly present, though typically in low abundances. In addition, there are numerous species of shorebirds that use the sandy beaches in the project area to feed at the water's edge, such as sanderling, marbled godwit, and willet. Western snowy plover is a protected species that nest on these same beaches. Marine mammals, including California sea lions, harbor seals, and elephant seals, haul out on isolated beaches and sands spits. Southern sea otters (*Enhydra lutris nereis*) forage for crustaceans and bivalves in the surf zone during high tide. Sand dollars, worms, clams, crabs, and a variety of fish, including multiple species of surfperch, flatfish, rays, and sharks, inhabit or utilize the surf zone.

Pelagic (Open Water) Habitat

The pelagic habitat supports planktonic organisms that float or swim in the water, as well as fish, marine birds, and marine mammals. Monterey Bay has a high level of phytoplankton primary production[2] due to annual seasonal upwelling. Phytoplankton, the primary producers in the marine pelagic food web, are consumed by many species of zooplankton. In turn, the zooplankton supports a variety of species, such as small schooling fish (e.g., sardine, herring) and baleen whales (*Mysticeti*).

Seasonal blooms of phytoplankton regularly occur in Monterey Bay (Pennington and Chavez, 2000) when optimal conditions for each species (e.g. temperature, nutrient concentrations, salinity) develop. Some phytoplankton species, such as the dinoflagellate (*Cochlodinium*), produce toxins and can cause harmful algal blooms when they reproduce to very high densities (Kudela et al., 2008; Shahraki et al, 2013). A diatom (*Pseudo-nitzschia*) produces domoic acid, a neurotoxin that can bioaccumulate in the food chain and result in mortality in marine mammals, birds, and humans. This diatom is regularly associated with harmful algal blooms in Monterey Bay (Armstrong-Howard et al, 2007; Kudela et al, 2005).

Common zooplankton in Monterey Bay include small shrimp-like invertebrates (crustaceans) of the order Euphausiacea commonly known as krill. Large aggregations of euphausiids often precede the arrival of blue whales that come to feed on crustaceans at the edge of the Monterey Bay Submarine Canyon. Euphausiids feed on phytoplankton that grow after nutrient rich water has upwelled to the surface. Euphausiid species typically present in these groups are *Euphausia pacifica, Thyanoessa spinifera,* and *Nyctiphanes simplex* (Croll et al., 2005).

2 Phytoplankton primary production refers to the growth rate of the phytoplankton community.

Small zooplankton was sampled near the MRWPCA outfall in the spring of 2016, to provide an example of the assemblages that could be affected by the proposed discharge of desalination brine (AMS, 2016). Three oblique tows (at the diffuser, 0.3 mile [0.5 kilometer] north of the diffuser, and 0.3 mile [0.5 kilometer] south of the diffuser) were made perpendicular to shore to bracket the water depth of the diffuser using a net with a 1-meter opening and net mesh of 202 µm. Calanoid copepods and euphausiid crustaceans were the most abundant organisms observed in sorted subsamples (see **Table 4.5-1**). Various crustacean, polychaete, and molluscan larvae and other small zooplankton were also observed. When total counts were normalized to volume, abundances ranged from 77 to 176 individuals per cubic foot (or 2,702 to 6,202 individuals per cubic meter), with an overall average of 123 individuals per cubic foot (4,357 individuals per cubic meter).

TABLE 4.5-1
ZOOPLANKTON COLLECTED NEAR THE MRWPCA OUTFALL IN MAY 2016

Station	CALAM-1 North of Diffuser	CALAM-2 Over the Diffuser	CALAM-3 South of Diffuser	Overall
Date	**14 May 2016**	**14 May 2016**	**14 May 2016**	
Time	**10:05**	**10:59**	**11:39**	
Wire out (m)	**99**	**100**	**62**	
Taxonomic Group (#/m^3)				**Mean #/m^3**
Copepod_unid	88.47	0.00	12.72	33.73
Calanoid	3,025.59	1,918.70	4,213.87	3,052.72
Oithona_sp	253.61	207.32	648.61	369.85
Corycaeus_sp	5.90	81.05	105.98	64.31
Copepod_nauplii	76.67	3.77	152.61	77.69
Euphausiid_nauplii	23.59	5.65	12.72	13.99
Euphausiid_Calyptopis	837.49	275.18	729.16	613.94
Euphausiid_furcilia	117.96	65.97	55.11	79.68
Cirripedia_nauplii	11.80	16.96	12.72	13.83
Cladocera_podon	0.00	0.00	8.48	2.83
Salp	159.24	45.23	33.91	79.46
Appendicularia_unid	41.28	5.65	127.18	58.04
Oikopleura_unid	23.59	9.42	8.48	13.83
Chaetognath_unid	23.59	35.81	29.68	29.69
Polychaete_unid	0.00	5.65	8.48	1.97
Polychaete_trocophore	0.00	3.77	4.24	4.71
Gastropod_larvae	0.00	5.65	4.24	2.67
Bivalve_veliger	0.00	3.77	8.48	4.40
Siphonophore	0.00	0.00	21.20	3.30
Hydromedusa	0.00	0.00	4.24	4.08
Sum	4,706.47	2,702.76	6,202.10	4,357.11

SOURCE: AMS, 2016

The nearshore phytoplankton and zooplankton communities of Monterey Bay support a diverse group (over 80 species) of fishes, sharks, and rays. These include flatfish such as halibut, sanddab, flounder, turbot, and sole that are closely associated with sandy habitats, as well as surfperch, rockfish, goby, and sculpin, which are normally associated with rocky habitats. Pelagic schooling fishes include Northern Anchovy (Engraulis mordax), Pacific Herring (Clupea pallasii), smelts (Osmeridae), Pacific Sardine (Sardinops sagax), and New World silversides (Atherinopsidae). The close proximity of the Monterey Bay Submarine Canyon to the shoreline means that certain fish, sharks, and marine mammals that would normally exist predominantly in deeper offshore waters can also be frequent inhabitants of the nearshore pelagic environment.

Market squid *(Doryteuthis (Loligo) opalescens*) inhabit the pelagic habitat in Monterey Bay and supports a major commercial fishery in the area, as well as providing a key food source for marine mammals, birds, and fish. Between 2009 and 2014, commercial landings of market squid in Monterey Bay ranged between 2.3 million and 90.4 million pounds annually with an average annual landing of 43.1 million pounds (CDFW, 2016a).

Market squid adults typically inhabit deeper offshore waters but return to shallower nearshore areas to spawn on sand and mud seafloor habitats. Peak spawning in Monterey Bay occurs in April. Squid larvae and juveniles inhabit the nearshore coastal waters of the study area (Porzio and Brady, 2006).

Monterey Bay has one of the most diverse and abundant marine mammal assemblages in the world with up to six species of seals and sea lions, 20 species of whales, dolphins, and porpoises, and one species of sea otter potentially occurring within the study area (MBNMS, 2016a). The most common seals and sea lions observed in the study area include the Pacific harbor seal (*Phoca vitulina*), California sea lion (*Zalophus californianus*), and the northern elephant seal (*Mirounga angustirostris*). Although any of these species can haul out on the sandy beaches or rocky intertidal breakwalls at Moss Landing Harbor, there are no known haul out areas for these species within the study area (MBNMS, 2016a).

The most commonly observed cetaceans (whales) within the study area include the humpback whale (*Megaptera novaengliae*), California gray whale (*Eschrichtius robustus*), the blue whale (*Balaenoptera musculus*), and occasionally the Minke whale (*Balaenoptera acutorostrata*). Other whale species that occur within Monterey Bay but are rarely or infrequently observed in the nearshore waters of the study area include the fin, sperm, North Pacific right, Sei, killer, and Baird's beaked whales. The most commonly observed dolphins and porpoises in the study area of Monterey Bay include the common dolphin (*Delphinus spp*.), bottlenose dolphin (*Tursiops truncates*), Pacific white-sided dolphin (*Lagenorhynchus obliguidens*), and Risso's dolphin (*Grampus griseus*). Additionally, while harbor porpoises (*Phocena phocena*) are frequently observed in the nearshore waters adjacent to Sunset Beach to the north of the study area, they are infrequently observed in the study area. Other dolphin and porpoise species present in the study area do not utilize nearshore waters or occur very infrequently; these include Dall's porpoise, Northern right whale dolphin, and striped dolphin. Southern sea otter (*Enhydra lutris nereis*) inhabits the nearshore waters of Monterey Bay and the study area using Elkhorn Slough in Elkhorn Slough National Estuarine Research Reserve as a pupping area (MBNMS, 2016a).

Benthic (Seafloor) Habitats

Two seafloor or benthic habitat types occur in the study area (see **Figure 4.5-1**): soft substrate and hard substrate, which comprise the benthic habitat or submerged lands of MBNMS.

Soft Substrate (Mud & Sand) Habitat

The soft substrate habitat in the study area has been characterized as a flat featureless plain with a gently sloping sandy seafloor (Eittreim et al., 1997). This soft substrate habitat consists primarily of deltaic deposits from the Salinas River and other unclassified soft substrate. Physical processes, such as waves and currents, sort the sediment particles roughly by grain size so that there are onshore-offshore gradients in the fineness of sediments, with coarser sand deposits closer to shore grading to muddy areas farther offshore (Edwards et al., 1997). The seafloor habitat located within the high-energy surf zone is characterized by coarse, mobile sands and contains a limited range and abundance of species commonly including flatfish, rays, shrimp, crabs, sand dollars, amphipods, clams, and large polychaete worms (Edwards et al., 1997). Offshore, the seafloor sediment gradually changes to a finer mud composition with increasing percentages of silts and clays, as a result of decreasing wind-driven wave energy. As a result of the increased organic and silt/clay composition of the seafloor sediments, and decreased energy, the associated invertebrate and fish communities commonly inhabiting these areas increase substantially over the nearshore surf zone. The infaunal marine community typically consists of multiple species of polychaete and oligochaete worms, amphipods, cumaceans, isopods, ostracods, mollusks, decapods, gastropods, and ophiuroides. Common megabenthic epifauna include anemones, crabs, shrimp, gastropod snails, echinoderm sea stars, and sea pens. Many different fish species spend all or part of their life cycle in association with the seafloor. These species include flatfish, gobies, poachers, eelpouts, and sculpins, which all live in close association with the benthos during their subadult and adult life. Others, such as salmon, steelhead, smelt, sturgeon and other fish species, use the benthos for foraging.

This habitat area typically extends throughout most of the Monterey Bay with associated species composition and abundance changing gradually with depth. This habitat is not as physically dynamic as the nearshore sandy habitat and is normally not subject to large fluctuations in water quality parameters like salinity and temperature. However, this region is still subject to wave and current action, which sorts bottom sediments and removes organic material.

Hard Substrate Habitat

Rocky areas along the central California coast provide habitat for a diverse group of organisms. More than 660 marine algae and kelp species are present in the rocky habitats of central California (Abbott and Hollenberg, 1976). Kelp forests occur in rocky subtidal areas and provide abundant microhabitats by virtue of their vertical structure. Kelp forests are capable of providing sufficient primary productivity (rate of formation of energy-rich organic compounds) to sustain the entire ecosystem. The growth requirements for kelp include light, relatively cool water, and high nutrients (primarily nitrates, phosphates, and some metals). In addition to macrophytes like giant kelp (*Macrocystis pyrifera*) and bull kelp (*Nereocystis* spp.) that anchor on hard substrate, highly diverse invertebrate and fish assemblages also inhabit rocky areas. These include multiple species of bryozoans, anemones, shrimp, ectoprocts, solitary and branching corals, hydrocorals, sponges, scallops, crabs, tubeworms, tunicates, and fish, including rockfish (*Sebastes*), sculpins, lingcod, and greenlings.

NOAA, as part of their coastal marine resource mapping efforts (NOAA, 2014a), indicates on one of their sensitivity index maps the potential presence of a small area of rocky subtidal habitat supporting kelp at the very southern end of the study area (see **Figure 4.5-1**). Additionally, hard substrate subtidal habitat has been identified (MBNMS, 2016d) that coincides with the ballast rock that is used to secure the MRWPCA outfall on the seabed (see **Figure 4.5-2**). As described above, the majority of the study area is soft bottom substrate and there are no SESAs in the study area. Video obtained during a recent inspection of the MRWPCA outfall revealed a rich hard-substrate assemblage on the ballast rock. Numerous species of rockfishes, sea cucumbers, anemones, solitary cup corals, and sponges were observed (Ballard Marine Construction, LLC, 2014).

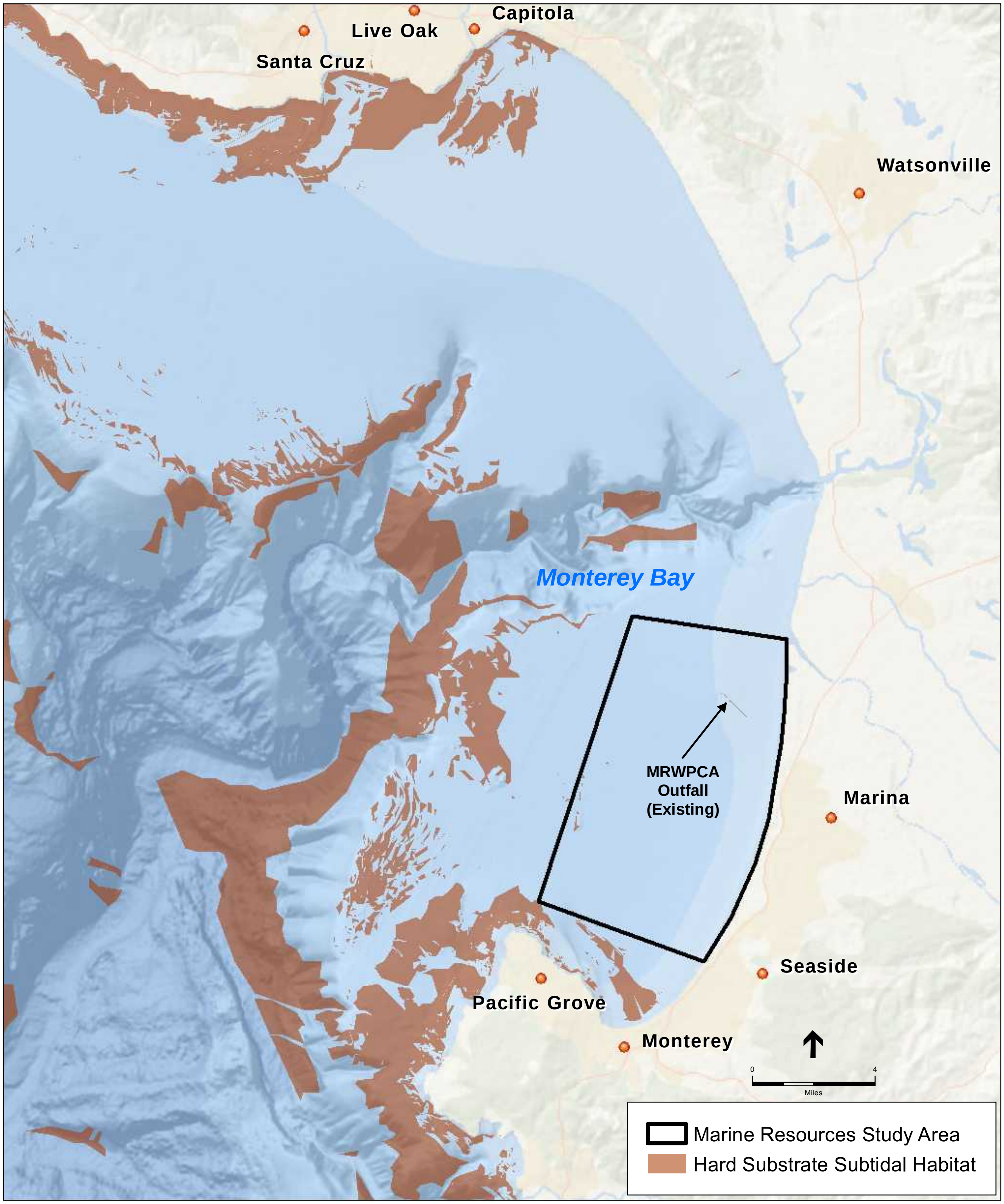
Submarine Canyons

A major feature of Monterey Bay is the system of submarine canyons that incise the coastal shelf. Monterey Canyon, whose head is close to shore near Moss Landing, is similar in size to the Grand Canyon (MBNMS, 2016f) with a maximum rim to floor relief greater than 5,500 feet. Soquel Canyon, much smaller than Monterey Canyon, begins offshore of Soquel and intersects with the northern rim of Monterey Canyon. The canyon walls are a mixture of soft substrate and rocky outcrops and support a very diverse biota of benthic organisms, such as corals, sea pens, tunicates, sponges, and crinoids, and fishes. Krill, a major prey item for many cetaceans, also exist in high concentrations along canyon walls and near canyon heads. None of the canyons in Monterey Bay are located within the study area.

4.5.1.3 Special-Status Marine Species

The high phytoplankton productivity of Monterey Bay and Elkhorn Slough supports numerous special-status mammals, birds, turtles, and fish. Special-status species include those species that are listed as federal or state endangered, threatened, proposed, and candidate species; and state or local species of concern. For the purposes of this analysis, special-status marine species include:

- Marine species that are listed or proposed or are candidate species for listing as Threatened or Endangered by the USFWS and NMFS pursuant to the Federal Endangered Species Act (FESA);
- Marine species listed as Rare, Threatened, or Endangered by CDFW pursuant to the California Endangered Species Act (CESA);
- Marine species managed and regulated under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act or MSA);
- Marine species protected under the Marine Mammals Protection Act (MMPA);
- Marine species managed and regulated by CDFW under the Nearshore Fisheries Management Plan and the Market Squid Fisheries Management Plan;



SOURCE: NOAA, 2016

205335.01 Monterey Peninsula Water Supply Project

Figure 4.5-2
Hard Substrate Subtidal Habitat in Monterey Bay

- Marine species designated by CDFW as California Species of Concern and Fully Protected; and
- Marine species not currently protected by statute or regulation but considered rare, threatened, or endangered under CEQA (Guidelines Section 15380).

Table 4.5-2 presents the FESA, CESA, and MMPA marine species in Monterey Bay and their potential to occur within the study area. The special-status marine species that have the highest risk of being adversely affected by project construction and operational activities because of their presence within the study area are discussed below. **Table 4.5-3** presents marine fish and invertebrate species that are managed and regulated under the MSA and **Table 4.5-4** presents marine fish and invertebrates that are managed under the California Nearshore Fisheries Management Plan (NFMP) and the California Market Squid Fisheries Management Plan (MSFMP), that occur within the study area.

FESA, CESA, and MMPA Species

Mammals

The special-status marine mammals that are most likely to be present within the resource study area, within MBNMS, identified in **Table 4.5-2**, include the southern sea otter, humpback whale, California gray whale, common long-beak dolphin, bottlenose dolphin, California sea lion, and Pacific harbor seal. Southern sea otter predominantly inhabits nearshore environments, where it dives to the seafloor to forage on predominantly marine invertebrates such as sea urchins, mollusks, crustaceans, and fish. Humpback and blue whales are found throughout Monterey Bay and tend to concentrate in areas with abundant krill or anchovies where they can be observed feeding. Bottlenose and the common long-beak dolphin are the two most frequently observed marine mammals in the shallower coastal waters of the study area. They are year-round inhabitants often observed in moderate-sized groups. Harbor porpoise are shy and harder to observe, yet they also have resident populations in the area. Harbor seals and California sea lions are also routinely observed within the study area, although usually as single individuals. No haul outs for either species are known to occur within the study area, although individuals can and do haul out temporarily on the beaches within the study area. The California gray whale, although no longer a federal and State-listed species, is one of the most commonly observed whales in Monterey Bay. Similarly, the federally endangered humpback whale has become a common sight within Monterey Bay between April and December when migrating through the region.

Additional species of marine mammals are known to be present in Monterey Bay either year-round or seasonally, but are not likely to occur or rarely occur in the study area.

Birds

One special-status marine bird occurs in the study area. The California western snowy plover (*Charadrius alexandrinus nivosus*) and other marine and terrestrial birds potentially inhabiting the study area are discussed in Section 4.6, Terrestrial Biological Resources.

TABLE 4.5-2
SPECIAL-STATUS MARINE SPECIES AND THEIR POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Common Name	Scientific Name	Listing Status	Habitat	Regional Occurrence	Potential to Occur in Study Area
Marine Mammals					
Southern Sea Otter	*Enhydra lutris nereis*	FT, P, FP	A top carnivore in its coastal range and a keystone species of the nearshore coastal zone. Frequent inhabitor in kelp forests.	Year-round-Common	**High.** Otters are commonly found in Monterey Bay and the nearshore waters within the study area.
California Sea Lion	*Zalophus californianus*	P	Coastal waters of Monterey Bay are used for foraging with haul-out sites near Fishermen's Wharf; most abundant pinniped in MBNMS.	Seasonal-Common	**Moderate.** Main haul-out sites are located south of the study area; however, foraging can be expected to occur over the entire continental shelf.1
Steller Sea Lion	*Eumetopias jubatus*	FT, P	Occasional visitor in fall and winter utilizing the coastal waters of Monterey Bay for foraging, usually found among the California sea lions on the Coast Guard jetty in Monterey harbor.	Seasonal-Occasional	**Not Expected.** A small population breeds on Año Nuevo Island, just north of Monterey Bay and occasional individuals transit through MBNMS waters but no sightings within the study area have been reported.[1]
Harbor Seal	*Phoca vitulina richardii*	P	Most commonly observed pinniped along MBNMS coastline. Use the offshore waters of Monterey Bay for foraging and beaches for resting. Occur on offshore rocks, on sand and mudflats in estuaries and bays, and on some isolated beaches.[1]	Year-round-Common	**High.** Residents of MBNMS throughout the year, occurring mainly close to shore.
Northern Fur Seal	*Callorhinus ursinus*	FD	Usually come ashore in California only when debilitated, however, few individuals observed on Año Nuevo Island. Occur off of central California during winter following migration from northern breeding grounds.	Seasonal-Very Rare	**Not Expected.** Usually 18-28 km from shore in California, however, they have been observed within 5 km of Point Pinos to the south of the study area.[1]
Northern Elephant Seal	*Mirounga angustirostris*	FP, P	Usually observed offshore swimming and foraging and only come ashore in Monterey Bay when debilitated or at one of the established rookeries. Three rookeries are on mainland beaches in MBNMS at Pt. Piedras Blancas, Cape San Martin/Gorda, and Año Nuevo State Park.	Year-round, Common	**Low.** Northern elephant seals are widely distributed in MBNMS but have a low probability of occurring in the study area. They are sighted regularly over shelf, shelf-break, and slope habitats and they are also present in deep ocean habitats seaward of the 2000 m isobaths. Rookeries are located to the north and south of the study area.
Guadalupe Fur Seal	*Arctocephalus townsendi*	CT, FT, FD, FP	Breed along the eastern coast of Guadalupe Island, approximately 200 Kilometers west of Baja California. In addition, individuals have been sighted in the southern California Channel Islands, including two males who established territories on San Nicolas Island. Guadalupe fur seals have been reported on other southern California islands, and the Farallon Islands off northern California with increasing regularity since the 1980s and only occasional observed foraging and swimming in the waters of Monterey bay.	Seasonal-Very Rare	**Not Expected to Low.** This species is not known to regularly haul out or breed in the study area, but occasionally individuals have been sighted in MBNMS waters or have stranded on beaches located within the study area.[1]

TABLE 4.5-2 (Continued)
SPECIAL-STATUS MARINE SPECIES AND THEIR POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Common Name	Scientific Name	Listing Status	Habitat	Regional Occurrence	Potential to Occur in Study Area
Marine Mammals (cont.)					
Harbor Porpoise	*Phocoena phocoena*	P	Observed in shallow sandy bottom areas of the Monterey Bay Shelf where they forage.	Year-round-Common	**Low.** Although the main population is located offshore Sunset Beach State Park to the north of the study area, individuals have been reported in the nearshore waters adjacent to the former Fort Ord military base.[2]
Risso's Dolphin	*Grampus griseus*	P	Generally found in waters greater than 1,000m in depth and seaward of the continental shelf and slopes.	Year-round-Very Rare	**Not Expected.** An increase in the number of Risso's dolphins in MBNMS has occurred since 1973; however, they generally occur in deeper waters offshore of the study area.[3]
Common Dolphin – Long-beaked	*Delphinus capensis*	P	Found relatively close to shore swimming and foraging.	Year-round-Common	**High.** The common dolphin is the most abundant cetacean found in the coastal waters of California, and the abundance within MBNMS has increased in recent years.[3]
Common Dolphin – Short-beaked	*Delphinus delphis*	P	A more pelagic species than the long-beaked common dolphin, they utilize Monterey Bay for foraging.[3]	Year-round-Rare	**Not Expected.** Generally found offshore of the study area.
Dall's Porpoise	*Phocoenoides dalli*	P	The most pelagic of the porpoises in MBNMS, they utilize Monterey bay for foraging.	Year-round-Rare	**Not Expected.** Most frequently seen off of Point Pinos and over the Monterey Canyon, both of which are outside of the study area.[3]
Bottlenose Dolphin	*Tursiops truncatus*	FD	Includes coastal and offshore populations. Both species use the waters of Monterey Bay for foraging.	Year-round-Common	**Moderate.** More than 45 individuals have been sighted during one recent survey. This species is now considered a resident of Monterey Bay, and is confined to occur within one km of shore.[3]
Pacific White-sided Dolphin	*Lagenorhynchus obliquidens*	P	Commonly seen near the shelf break in the offshore waters of Monterey Bay.	Year-round Common	**Not Expected - Low.** This had been the most frequently seen dolphin in Monterey Bay but has recently been replaced by the common dolphin. Occurs primarily within 15km west of Carmel Bay to the south of the study area and within 25km southwest of Santa Cruz to the north of the study area.[3]
Northern Right Whale Dolphin	*Lissodelphis borealis*	P	Deep, cold temperate waters over the continental shelf and slope in offshore Monterey Bay.	Year-round-Rare	**Low.** Most frequently seen south of MBNMS. Abundance of this species appears to have increased since 1973.[3]
Minke Whale	*Balaenoptera acutorostrata*	P	Can be in coastal/inshore and oceanic/offshore areas of Monterey bay.	Year-round-	**Low-Moderate**. Numerous sightings in the nearshore waters of Monterey Bay. Sightings are usually of single individuals.[3]

TABLE 4.5-2 (Continued)
SPECIAL-STATUS MARINE SPECIES AND THEIR POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Common Name	Scientific Name	Listing Status	Habitat	Regional Occurrence	Potential to Occur in Study Area
Marine Mammals (cont.)					
Blue Whale	*Balaenoptera musculus*	FE, FD	In Monterey Bay, blue whales often occur near the edges of the submarine canyon where krill tends to concentrate. Blue whales feed only on krill and are in Monterey Bay between June and October, during times of high krill abundance. Blue whales begin to migrate south during November.	Seasonal-Common	**Low.** Regularly observed in Monterey Bay but mostly in deeper waters.
Humpback Whale	*Megaptera novaeangeliae*	FE, FD	Central California population of humpback whales migrates from their winter calving and mating areas off Mexico to their summer and fall feeding areas off coastal California. Humpback whales occur in Monterey Bay from late April to early December.	Seasonal-Common	**Moderate.** Observed throughout Monterey Bay.
Fin Whale	*Balaenoptera physalus*	FE, FD	More common farther from shore; occasionally encountered during the summer and fall in Monterey Bay.	Seasonal-Common	**Not Expected.** Due to their occurrence mainly farther offshore in deeper waters, it is not likely they would be seen in the study area.
Sperm Whale	*Physeter macrocephalus*	FE, FD	Occur in many open oceans; live at the surface of the ocean but dive deeply to catch giant squid.	Seasonal-Rare	**Not Expected.** Offshore but mostly in deeper waters.
Gray Whale	*Eschrichtus robustus*	FDL, P	Predominantly occur within the nearshore coastal waters of Monterey Bay. This species has been delisted under FESA but remains protected under MMPA.	Seasonal-Common	**High.** Occurring in coastal waters during late fall-winter southward migration and again late winter to early summer during their northward migration.
Killer Whale	*Orcinus orca*	P	Transient species observed throughout coastal California waters. Presence and occurrence can be common but unpredictable.	Seasonal-Common	**Low.** Most common during April, May, and June as they feed on northbound migrating gray whales. Generally observed in the deeper waters offshore of the study area.
North Pacific Right Whale	*Eubalaena glacialis*	FE, FD, FP	Seasonally migratory; inhabit colder waters for feeding, and then migrate to warmer waters for breeding and calving. Although they may move far out to sea during their feeding seasons, right whales give birth in coastal areas.	Seasonal-Very Rare	**Not Expected.** Sightings in MBNMS are very rare.[4]
Sei Whale	*Balaenoptera borealis*	FE, FD	Sighted in offshore waters throughout the latitudinal range of MBNMS, though usually occur seaward of the sanctuary's western boundary. Observed generally in deep water habitats including along the edge of the continental shelf, over the continental slope, and in the open ocean.	Seasonal-Very Rare	**Not Expected.** Sightings have become rare in MBNMS since the 1980s.[5]
Short-finned Pilot Whale	*Globicephala macrorhynchus*	P	Found primarily in deep waters in warmer tropical and temperate waters. Forage in areas with high densities of squid.	Year-round-Very Rare	**Not Expected.** Generally found in deeper water than that in the study area.
Baird's Beaked Whale	*Berardius bairdii*	FD	Inhabit deep offshore waters in the North Pacific.	Seasonal-Very Rare	**Not Expected.** Sightings in the fall in Monterey Bay and in deeper waters than the study area.

TABLE 4.5-2 (Continued)
SPECIAL-STATUS MARINE SPECIES AND THEIR POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Common Name	Scientific Name	Listing Status	Habitat	Regional Occurrence	Potential to Occur in Study Area
Marine Mammals (cont.)					
Cuvier's Beaked Whale	*Ziphius cavirostris*	P	Deep pelagic waters (usually greater than 1,000m deep) of the continental shelf and slope. Seasonality and migration patterns are unknown.[6]	Seasonality unknown-Very Rare	**Not Expected.** Generally occur in the deeper waters west of the study area. Infrequent strandings in Monterey Bay.
Marine Turtles					
Leatherback Sea Turtle	*Dermochelys coriacea*	FE	Offshore pelagic environment.	Seasonal-Occasional	**Low.** Leatherback sea turtles are most commonly seen between July and October, when the surface water temperature warms to 15-16° C and large jellyfish, the primary prey of the turtles, are seasonally abundant offshore.
Green Sea Turtle	*Chelonia mydas*	FE	Primarily use three types of habitat: oceanic beaches (for nesting), convergence zones in the open ocean, and benthic feeding grounds in coastal areas.	Seasonal-Rare	**Low.** In the eastern Pacific, green turtles have been sighted from Baja California to southern Alaska but most commonly occur from San Diego south.
Olive Ridley Sea Turtle	*Lepidochelys olivacea*	FT	Mainly a "pelagic" sea turtle, but has been known to inhabit coastal areas, including bays and estuaries.	Seasonal-Very Rare	**Not Expected.** In the eastern Pacific, the range of the Olive Ridley turtle extends from southern California to northern Chile.
Loggerhead Sea Turtle	*Caretta caretta*	FT	Occupy three different ecosystems during their lives: the terrestrial zone, the oceanic zone (> 100 fathoms water depth), and the neritic one (< 100 fathoms water depth).	Seasonal-Very Rare	**Low.** In the U.S., most recorded sightings are of juveniles off the coast of California but occasional sightings are reported along the coasts of Washington and Oregon.
Fish					
Chinook Salmon (winter-run)	*Oncorhynchus tshawytscha*	CE, FE	Anadromous and semelparous. This means that as adults, they migrate from a marine environment into the fresh water streams and rivers of their birth (anadromous) where they spawn and die (semelparous).	Seasonal	**Moderate.** Chinook salmon are normally entering the Sacramento River from November to June and spawning from late-April to mid-August, with a peak from May to June. They inhabit nearshore coastal waters of Central California throughout the year, but especially during migration time.
Chinook Salmon (Central California Evolutionary Significant Unit)	*Oncorhynchus tshawytscha*	FT, CSC	Juveniles may spend from 3 months to 2 years in freshwater before migrating to estuarine areas as smolts and then into the ocean to feed and mature. They prefer streams that are deeper and larger than those used by other Pacific salmon species.	Seasonal	**Low.** Historically, the range extended from Oregon to the Ventura River in California, but presently does not appear to extend very far south of San Francisco Bay but into Monterey Bay. Chinook salmon in this ESU exhibit an ocean-type life history and use Monterey Bay waters for foraging.

TABLE 4.5-2 (Continued)
SPECIAL-STATUS MARINE SPECIES AND THEIR POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Common Name	Scientific Name	Listing Status	Habitat	Regional Occurrence	Potential to Occur in Study Area
Fish (cont.)					
Coho Salmon (Central California Evolutionary Significant Unit)	*Oncorhynchus kisutch*	CT, FT	Spend approximately the first half of their life cycle rearing and feeding in streams and small freshwater tributaries. Spawning habitat is small streams with stable gravel substrates. The remainder of the life cycle is spent foraging in estuarine and marine waters of the Pacific Ocean.	Seasonal	**Low to Moderate.** Historically, there was a run in the Pajaro and Salinas Rivers but not since the 1990s. Current runs exist in Waddell Creek, Scott Creek, San Lorenzo River, Soquel Creek, and Aptos Creek. In Monterey County, the only runs are two small runs in the Carmel and Big Sur Rivers.
Steelhead (South Central California Coast Distinct Population Segment)	*Onchorhynchus mykiss*	FT, CSC	Steelhead are anadromous and can spend up to 7 years in fresh water prior to smoltification, and then spend up to 3 years in salt water prior to first spawning.	Seasonal	**Low to Moderate.** This DPS occupies rivers from the Pajaro River in Santa Cruz County to (but not including) the Santa Maria River in Santa Barbara County.
Tidewater Goby	*Eucycloglobius newberryi*	FE	Despite the common name, this goby inhabits lagoons formed by streams running into the sea. The lagoons are blocked from the Pacific Ocean by sandbars, admitting salt water only during particular seasons, and so their water is brackish and cool. The tidewater goby prefers salinities of less than 10 parts per thousand (ppt) (less than a third of the salinity found in the ocean) and is thus more often found in the upper parts of the lagoons, near their inflow.	Seasonal	**Low.** Seasonally present in Elkhorn Slough, Bennet Slough, and Salinas River, all of which are outside of the study area.
Western River Lamprey	*Lampetra ayresi*	CSC	Rivers for spawning and rearing; nearshore marine and estuarine habitat as adults. Adult river lampreys enter the ocean in late spring, spending 3-4 months in salt water where they exhibit rapid growth.[8,9]	Seasonal-Very Rare	**Not Expected to Low.** Uncommon in California and potentially in decline.
North American green sturgeon, Southern Distinct Population Segment (DPS)	*Acipenser medirostris*	FT	Within the marine environment, the Southern DPS occupies coastal bays and estuaries from Monterey Bay to Puget Sound in Washington. Individuals occasionally enter coastal estuaries to forage. All of Monterey Bay is designated Critical Habitat for green sturgeon.	Seasonal	**Low.** There are very few data on green sturgeon presence in coastal waters. This species may forage in or near the project area but its distribution in ocean waters is essentially unknown. Spawning occurs in the upper Sacramento River for the southern DPS and fish are known to frequent coastal waters < 110 meters.[16] In 2006, an individual was entrained at the Moss Landing Power Plant intake. No other sightings or reported presence in other entrainment and fish studies have indicated a more than occasional presence.

TABLE 4.5-2 (Continued)
SPECIAL-STATUS MARINE SPECIES AND THEIR POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Common Name	Scientific Name	Listing Status	Habitat	Regional Occurrence	Potential to Occur in Study Area
Fish (cont.)					
White sharks	*Carcharodon carcharias*	CSC	In California, important white shark habitat occurs around Monterey Bay and Greater Farallones, national marine sanctuaries. White shark populations are impacted by purposeful and incidental capture by fisheries, marine pollution, and coastal habitat degradation	Year-round	**Moderate to High.** Present in coastal waters throughout the State and juveniles and adults are known to frequent the nearshore coastal waters along Monterey Bay coastline.
Eulachon	*Thaleichthys pacificus*	FT	Spawning and rearing in estuarine river habitat; migrate to saltwater where they spend three years and then return to river spawning locations.	Seasonal-Very Rare	**Low.** Monterey Bay is at the southernmost limit of this species distribution, and the population is in decline.[10]
White Sturgeon	*Acipenser transmontanus*	CSC	Live in estuaries of large rivers, but migrate to spawn in freshwater and often travel long distances between river systems.	Seasonal-Very Rare	**Low.** Exist in salt water from the Gulf of Alaska south to Ensenada, Mexico, but spawning only occurs in a few large rivers from the Sacramento-San Joaquin system northward. Self-sustaining spawning populations are currently only known in the Fraser (British Columbia), Columbia (Washington), and Sacramento (California) rivers.[11]
Longfin Smelt	*Spirinchus thaleichthys*	CT	Spend the majority of their life cycle in brackish to marine waters and migrates upstream to freshwater to spawn. A pelagic species.	Seasonal-Very Rare	**Not Expected.** A single longfin smelt collected from the Monterey Bay area was reported by Eschmeyer et al. (1983) but the San Francisco Bay-Delta population is considered to be the southernmost population for the species (Moyle 2002).[12]
Cowcod	*Sebastes levis*	CSC	Juveniles recruit to fine sediment habitat in Monterey Bay in late summer. They have been observed at depths between 40 and 100m. Young cowcod move to deeper habitat within their first year.[13,14]	Seasonal-Common	**Moderate.** Juveniles documented on soft-bottom habitat in study area.
Basking Shark	*Cetorhinus maximus*	CSC	This species movements and migrations are poorly understood. Usually sighted from British Columbia to Baja California in the winter and spring months; where they go once they leave coastal areas is unknown.	Seasonal-Very Rare	**Low.** Basking shark populations were severely depleted by commercial fisheries of the 1950s, and they have never fully recovered due to slow growth and low fecundity.[15]

TABLE 4.5-2 (Continued)
SPECIAL-STATUS MARINE SPECIES AND THEIR POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Common Name	Scientific Name	Listing Status	Habitat	Regional Occurrence	Potential to Occur in Study Area
Marine Invertebrates					
Black Abalone	*Haliotis cracherodii*	FE	Coastal and offshore island intertidal habitats on exposed rocky shores where bedrock provides deep, protective crevices for shelter.	Year-round-Very Rare	**Not Expected.** Study area is not designated as critical habitat due to the lack of preferred habitat (rocky intertidal vs. fine- to medium-grained sand beaches of Monterey Bay).[7] Could be present on hard substrate areas to the north and south of the study area.

NOTES:

FESA = Federal Endangered Species Act
MMPA = Marine Mammal Protection Act
CESA = California Endangered Species Act

Potential for Species Occurrence Rankings:
Not Expected - Suitable foraging or spawning habitat is not known to be present and the species has not been documented to occur
Low - Suitable foraging or spawning habitat is present, but the species has either not been documented to be present or if present, the presence is infrequent
Moderate - Suitable foraging or spawning habitat is present and the species has been documented to be present for part of the year
High - Suitable foraging or spawning habitat is present and the species has been documented to be present throughout the year and/or in substantial numbers

STATUS CODES:

Federal: National Oceanographic and Atmospheric Administration (NOAA); MMPA
FD = Depleted Population
P = Federally Protected

Federal: U.S. Fish and Wildlife Service (USFWS), NOAA National Marine Fisheries Service (NMFS); FESA
FDL = Delisted
FE = Listed as "endangered" (in danger of extinction) under FESA
FT = Listed as "threatened" (likely to become Endangered within the foreseeable future) under FESA
FC = Candidate to become a proposed species
FSC = Former "federal species of concern". The USFWS no longer lists Species of Concern but recommends that species considered to be at potential risk by a number of organizations and agencies be addressed during project environmental review. *NMFS still lists "Species of Concern".

State: California Department of Fish and Game (CDFG); CESA
CE = Listed as "endangered" under the CESA
CT = Listed as "threatened" under the CESA
FP = State fully protected species
CSC = CDFW designated "species of special concern"

SOURCES: KLI, 2005; CDFG, 2001; MBNMS, 2015a; NOAA, 2014a; CSUMB, 2014. [1]Monterey Bay National Marine Sanctuary (MBNMS), 2016a; [2]Sanctuary Integrated Monitoring Network (SIMoN), 2016a; [3]MBNMS, 2016b; [4]SIMoN, 2016b; [5]SIMoN, 2016c; [6]National Oceanic and Atmospheric Administration (NOAA), 2016a; [7]NOAA, 2011b; [8]California Department of Fish & Wildlife (CDFW), 2015a; [9]Burton & Lea, 2013; [10]Gustafson, RG, 2016; [11]CDFW, 2015b; [12]The Bay Institute (TBI) et al., 2007; [13]Love & Yoklavich 2008; [14]Johnson et al., 2001; [15]PSRF, 2016.

TABLE 4.5-3
FISH SPECIES PRESENT IN MONTEREY BAY MANAGED UNDER MAGNUSON-STEVENS ACT

Fisheries Management Plan	Common Name	Scientific Name	Life Stages Present	Potential to Occur in Study Area
Coastal Pelagic	Northern anchovy	*Engraulis mordax*	L, J, A[1]	High
	Pacific sardine	*Sardinops sagax*	L, J, A[1]	Moderate-High
	Jack mackerel	*Trachurus symmetricus*	J, A[1]	Moderate-High
	Pacific mackerel	*Scomber japonicus*	L, J, A[1]	Moderate-High
	Pacific herring	*Clupea pallasi*	L, J, A	Moderate-High
	Market squid	*Doryteuthis (Loligo) opalescens*	L, J, A[1]	Moderate-High, when in season
Pacific Groundfish	English sole	*Parophrys vetulus*	L, J, A[2]	High
	Sand sole	*Psettichthys melanostictus*	L, J, A[1]	Moderate-High
	Rock sole	*Pleruonectes bilineatus*	J, A	Moderate-High
	Butter sole	*Pleuronectes isolepsis*	J, A	Moderate-High
	Pacific sanddab	*Citharichthys sordidus*	L, J, A[1]	Moderate-High
	Starry flounder	*Platichthys stellatus*	L, J, A[3]	Low-Moderate
	Diamond turbot	*Hypsopsetta guttulata*	A	Moderate-High
	Ratfish	*Hydrolagus colliei*	J, A	Moderate-High
	Lingcod	*Ophiodon elongatus*	L, J, A[4]	Low-Moderate
	Brown rockfish	*Sebastes auriculatus*	L, J, A[5]	Low-Moderate
	Kelp rockfish	*Sebastes atrovirens*	L, J, A	Low-Moderate
	Aurora rockfish	*Sebastes aurora*	L	Moderate-High
	Gopher rockfish	*Sebastes carnatus*	L, J, A	Low-Moderate
	Splitnose rockfish	*Sebastes diploproa*	L, J[6]	Low-Moderate
	Yellowtail rockfish	*Sebastes flavidus*	A	Moderate-High
	Shortbelly rockfish	*Sebastes jordani*	L, J[7]	Low-Moderate
	Black rockfish	*Sebastes melanops*	L, J, A[8]	Low-Moderate
	Black and yellow rockfish	*Sebastes chrysomelas*	L, J, A[9]	Very Low
	Blue rockfish	*Sebastes mystinus*	L, J, A[10]	Low
	Boccacio	*Sebastes paucispinis*	L, J, A	Low
	Grass rockfish	*Sebastes rastrelliger*	L, J, A[11]	Low
	Stripetail rockfish	*Sebastes saxicola*	L, J	Low-Moderate
	Juvenile & larval rockfish	*Sebastes spp.*	J, L	Low-Moderate
	Leopard shark	*Triakis semifasciata*	J, A[1]	Low-Moderate, when in season
	Spiny dogfish	*Squalus acanthias*	A, J,	Moderate-High
	Soupfin shark	*Galeorhinus zyopterus*	J, A	Low-Moderate
	Big skate	*Raja binoculata*	J, A	Low-Moderate
	California skate	*Raja inornata*	J, A	Low-Moderate
	Longnose skate	*Raja rhina*	J, A	Low-Moderate[12]
	Cabezon	*Scorpaenichthys marmoratus*	L, J, A	Moderate-High
Pacific Coast Salmon	Chinook salmon	*Oncorhynchus tshawytscha*	J, A	Moderate-High, when in season
	Coho salmon	*Oncorhynchus kisutch*	J, A	Moderate-High, when in season
Highly Migratory Species	Common thresher shark	*Alopias vulpinus*	J, A	Low-Moderate
	Shortfin mako shark	*Isurus oxyrinchus*	J, A	Rare, Present in waters deeper than 600 feet
	Albacore tuna	*Thunnus alalunga*	J, A	Moderate-High
	Northern bluefin tuna	*Thunnus orientalis*	J	Rare, Present in waters deeper than 600 feet

NOTES:
Life Stages- A = Adult, J = Juvenile, L = Larvae

SOURCES: [1]Tenera, 2014; [2]Boehlert & Mundy, 1987; [3]PFMC, 2005; [4]Allen, 2014; [5]NOAA, 2014b; [6]NOAA, 2016b; [7]Lenarz, 1980; [8]Miller & Shanks, 2004; [9]SIMoN, 2016d; [10]CDFG, 2001; [11]ODFW, 2016; [12]Driscoll, 2014.

TABLE 4.5-4
SPECIES MANAGED UNDER THE MAGNUSON-STEVENS FISHERIES MANAGEMENT PLAN AND CALIFORNIA NEARSHORE FISHERIES MANAGEMENT PLAN AND THEIR POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Common Name	Scientific Name	Habitat	Regional Occurrence	Potential to Occur in Study Area
Market Squid	*Doryteuthis opalescens*	Pelagic. Adults migrate inshore to spawn over sand habitats and larvae generally occur inshore.	Year-round-Common	**Moderate.** The range of market squid is from the southern tip of Baja California, Mexico to southeastern Alaska. In central California spawning activity starts around April and ends in October. Adults occur in the upper 100m of the water column at night.[1]
Black Rockfish	*Sebastes melanops*	Occur in loose schools 10-20 ft above shallow, rocky reefs, but individuals may also be found resting on rocky bottoms or schooling in mid-water over deeper reefs. Larvae are pelagic, Young-of-year (YOY)[3] settle nearshore in shallower portions of kelp beds, and adults inhabit mid-water and pelagic areas over high relief rocky reefs.	Year-round-Rare	**Low.** Not common south of Santa Cruz.[2]
Black-and-Yellow Rockfish	*Sebastes chrysomelas*	Bottom-dwelling, generally in water less than 60 ft. Inhabit kelp beds and rocky reefs. Larvae and young juveniles are pelagic, but juveniles eventually settle on nearshore rocky areas or in kelp forests.	Year-round-Common	**Moderate.** Distributed from Eureka, California to Isla San Natividad, Baja California, but they are less common south of San Diego.[2]
Blue Rockfish	*Sebastes mystinus*	Larvae are pelagic. In spring, YOY appear in the kelp canopy, shallow rocky areas, and nearshore sand-rock interfaces. Adults inhabit the mid-water and pelagic areas around high-relief rocky reefs, the kelp canopy, and artificial reefs.	Year-round-Common	**High.** Distributed from the Bering Sea to Punta Banda, Baja California, from surface waters to a maximum depth of 1,800 ft. Most abundant rockfish in central California kelp beds.[2]
Brown Rockfish	*Sebastes auriculatus*	YOY migrate into bays and estuaries, which they use as nursery habitat (primarily in waters less than 175 ft deep). They may remain in higher salinity areas of bays for 1 to 2 years before returning to the open coast. Typically associated with sand-rock interfaces, rocky bottoms of artificial or natural reefs, and in eelgrass beds. In shallow areas they are associated with rocky areas and kelp beds, while in deeper water they stay near the rocky bottom.	Year-round-Common	**Moderate.** Distributed from southeast Alaska to Hipolito Bay, central Baja California. San Francisco Bay appears to be an important habitat.[2]
Cabezon	*Scorpaenichthys marmoratus*	Typically occur nearshore from the intertidal to 335 ft. As they get older and larger they tend to move to deeper water. Found in subtidal habitats in or around rocky reefs, under kelp beds, and in shallow tide pools.	Year-round-Common	**Moderate.** Distributed from Point Abreojos, Baja California to Sitka, Alaska.[2]

3 YOY – Young of Year. i.e., newly hatched juveniles.

TABLE 4.5-4 (Continued)
SPECIES MANAGED UNDER THE MAGNUSON-STEVENS FISHERIES MANAGEMENT PLAN AND CALIFORNIA NEARSHORE FISHERIES MANAGEMENT PLAN AND THEIR POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Common Name	Scientific Name	Habitat	Regional Occurrence	Potential to Occur in Study Area
Calico Rockfish	*Sebastes dallii*	Found in areas of soft sand-silt sediment and on artificial reefs, from 60 to 840 ft deep. Adults inhabit rocky shelf areas where there is a mud-rock or sand-mud interface with fine sediments. Associated with areas of high and low relief.	Year-round-Common	**Moderate.** Distributed from Sebastian Viscaino Bay, Baja California to San Francisco.[2]
China Rockfish	*Sebastes nebulosus*	Larvae and early juveniles are pelagic, but larger juveniles and adults settle on rocky reefs or cobble substrate, generally at depths between 30 and 300 ft.	Year-round-Rare	**Low.** Distributed from Kachemak Bay, northern Gulf of Alaska to Redondo Beach and San Miguel Island in southern California, but are most abundant from southeastern Alaska to Sonoma County, California.[2]
Copper Rockfish	*Sebastes caurinus*	Found in the shallow subtidal to 600 ft. New recruits associate with surface-forming kelp. Juveniles settle to the bottom on rocky reefs and well as sandy areas. Adults are commonly found in kelp bed areas but also occur on deeper rocky reefs.	Year-round-Common	**Moderate.** Distributed from the northern Gulf of Alaska to central Baja California.[2]
Gopher Rockfish	*Sebastes carnatus*	Larvae and juveniles are pelagic, but as juveniles mature they settle on rocky reefs or into the kelp canopy. Adults are residential and bottom-dwelling, associated with kelp beds, rocky reefs, or sandy areas near reefs, from the intertidal to about 260 ft.	Year-round-Common	**Moderate.** Distributed from Eureka, California to San Roque, central Baja California, but are most common from Mendocino County, California to Santa Monica Bay.[2]
Grass Rockfish	*Sebastes restrelliger*	Shallow-water species, commonly found from the intertidal to 20 ft. Juveniles are pelagic, but adults are associated with kelp beds and reefs. Usually only juveniles are found in tide pools.	Year-round-Common	**Moderate.** Distributed from Yaquina Bay, Oregon to Bahia Playa Maria, central Baja California, although they are most commonly found from northern California south.[2]
Kelp Greenling	*Hexagrammos decagrammus*	Found in the intertidal to 500 ft, but are most common at depths of 150 ft or less. Found in subtidal habitats in or around rocky reef areas and under kelp beds. Juveniles and adults are common on any rocky bottom area with dense algal growth.	Year-round-Common	**Moderate.** Distributed from La Jolla, California to the Aleutian Islands in Alaska.[2]
Rock Greenling	*Hexagrammos lagocephalus*	Juveniles and adults are found in subtidal habitats in or around rocky reef areas and in kelp beds.	Year-round-Common	**Low.** Distributed from the Bering Sea to Point Conception. In California, this species is infrequently observed south of San Francisco.[2]
Kelp Rockfish	*Sebastes atrovirens*	Occur in rocky reef and artificial reef areas, but most commonly found in kelp beds, drifting within the kelp blades. Occur at depths up to 150 ft, but most often found at depths between 15 and 50 ft.	Year-round-Common	**High.** Distributed from Timber Cove, northern California to Punta San Pablo, central Baja California. Most abundant between northern Baja and central California.
Monkeyface Prickleback	*Cebidichthys violaceus*	Rocky areas with crevices, including high and low intertidal tide pools, jetties and breakwaters, and relatively shallow subtidal areas, particularly kelp beds. Juveniles are well adapted for high-intertidal areas. Occur from the intertidal to 80 ft in depth.	Year-round-Common	**Moderate.** Distributed from San Quintin Bay, Baja California to southern Oregon.[2]

TABLE 4.5-4 (Continued)
SPECIES MANAGED UNDER THE MAGNUSON-STEVENS FISHERIES MANAGEMENT PLAN AND CALIFORNIA NEARSHORE FISHERIES MANAGEMENT PLAN AND THEIR POTENTIAL TO OCCUR WITHIN THE STUDY AREA

Common Name	Scientific Name	Habitat	Regional Occurrence	Potential to Occur in Study Area
Olive Rockfish	*Sebastes serranoides*	Larvae and planktonic. YOY settle out of the plankton onto kelp beds, oil platforms, surfgrass. Occur from surface waters to about 396 ft.	Year-round-Common	**Moderate.** Distributed from southern Oregon to Islas San Benitos, central Baja California. Common from Cape Mendocino to Santa Barbara.[2]
Quillback Rockfish	*Sebastes maliger*	Larvae are planktonic. YOY settle out of the plankton onto shallow, low-relief rocky substrate and shallow, vegetated habitats such as kelp and eelgrass beds. Juveniles also inhabit the very nearshore seafloor and are found over both low- and high-relief rocky substrate. Adults are found in deeper water in close association with the bottom, perched on rocks or taking shelter in crevices.	Year-round-Rare	**Low.** Distributed from the Gulf of Alaska to San Miguel Island in southern California. Common between southeast Alaska and northern California.[2]
California Scorpionfish	*Scorpaena guttata*	Live in tide pools and to depths of about 600 ft. Very young scorpionfish live in shallow water in habitats with dense algae and bottom-encrusting organisms. Juveniles and adults are common on hard bottom such as rocky and artificial reefs.	Year-round-Rare	**Low.** Distributed from Santa Cruz, California south along the coast of Baja California and into the Gulf of California. Common as far north as Santa Barbara.[2]
California Sheephead	*Semicossyphus pulcher*	Inhabit nearshore rocky reefs, kelp beds, and surfgrass beds. Appear to prefer areas of high and low relief but have also been observed foraging over sandy bottom habitat. Use rock crevices and holes to sleep.	Year-round-Rare	**Low.** Distributed form Monterey Bay, California south into the Gulf of California. Not common north of Point Conception.[2]
Treefish	*Sebastes serriceps*	Found drifting in mats of kelp in areas of high rocky relief and on artificial reefs. Adult treefish are found on rock reefs, often in caves and crevices. Occur in shallow habitats to 150 ft in depth.	Year-round-Common	**Moderate.** Distributed from Cedros Island, Baja California to San Francisco.[2]

NOTES

[a] STATUS:
FE=Federally Endangered, SE= State Endangered, FT=Federally Threatened, ST=State Threatened, SSC= Species of Special Concern, FDL=Federally Delisted

[b] POTENTIAL TO OCCUR:
Not Expected = Not expected to occur. No suitable habitat within marine biological resources study area; study area outside currently known distribution or elevation range; no nearby documented occurrences or nearby documented occurrences are historical only.
Low = Low potential to occur: Potentially suitable habitat highly limited and/or of marginal quality; potentially suitable habitat present but species not documented nearby.
Moderate = Moderate potential to occur: Low to moderate quality habitat present; species documented in the study area.
High = High potential to occur: High quality suitable habitat present within study area; species documented in the project vicinity.

SOURCES: [1]CDFG. 2005, [2]CDFG. 2002.

Turtles

Special-status marine turtles that have a very low probability of occurring seasonally in the study area include the leatherback sea turtle (*Dermochelys coriacea*), green sea turtle (*Chelonia mydas*), olive ridley sea turtle (*Lepidochelys olivacea*), and loggerhead sea turtle (*Caretta caretta*). Leatherback sea turtles are federally endangered and most commonly seen in Monterey Bay from July to October. Green sea turtles, olive ridley sea turtles, and loggerhead sea turtles are federally threatened species rarely seen in Monterey Bay. NOAA has designated all of Monterey Bay as leatherback sea turtle critical habitat (NOAA, 2016c). The leatherback, green and loggerhead turtles have a low potential to occur within the study area; and the olive ridley turtle is not expected to occur within the study area.

Fish

The special-status fish with the highest probability of occurring in the study area are Chinook salmon (*Oncorhynchus tshawytscha*), Coho salmon (*Onchorhynchus kisutch*), Steelhead (*Onchorhynchus mykiss*), Cowcod (*Sebastes levis)*, green sturgeon (*Acipenser medirostris*), and white shark (*Carcharodon carcharias*). Chinook salmon, depending on the run, is State endangered or threatened, federally endangered or threatened and has a low to moderate potential to occur in the study area. Coho salmon is a State and federally threatened species that has a low to moderate potential to occur in the study area. South-Central California Coast Steelhead Distinct Population Segment is a federally threatened species and a State species of special concern that has a low to moderate potential to occur in the study area. Green sturgeon is a federal threatened species and State species of concern that has a low potential to occur in the study area.

The tidewater goby (*Eucyclogobius newberryi*) is federally endangered and occurs seasonally in Elkhorn Slough and can be flushed out into the ocean during tidal events. Juvenile cowcod rockfish, a California species of special concern, are known to inhabit the shallower waters of the study area. Historically, due to pressures of fisheries mortality, loss of prey due to overharvesting, disease, predation, and habitat degradation linked to contaminants, white shark numbers had declined in the Northern Pacific. In 2013, NMFS[4] determined that recent information is consistent with a stable or increasing white shark population. In 2014, CDFW determined that based on the best available science, listing the Northeastern Pacific population of white shark as a threatened or endangered species is not warranted, yet take of white shark is still prohibited in the recreational and commercial fisheries.

Managed Fish Species

Under the Magnuson-Stevens Conservation and Management Act (discussed in Section 4.5.2, Regulatory Framework, below), NMFS, the Fishery Management Councils, and all federal agencies are required to cooperatively protect "essential fish habitat" for commercially important fish species such as Pacific coast groundfish, three species of salmon, and five species of coastal pelagic fish and squid. Essential Fish Habitat includes waters and substrates that support fish spawning, breeding, feeding, and maturation. Fish species found in the coastal waters of Monterey Bay and in Elkhorn Slough are protected by Federal Fishery Management Plans prepared by regional Fishery

4 NMFS, 2013

Management Councils under the Magnuson-Stevens Act are listed in **Table 4.5-3**. All of the coastal waters of Central California and Monterey Bay are identified as Essential Fish Habitat for fish identified in the Pacific coast groundfish, salmon and coastal pelagic fisheries management plans under MSA. **Figures 4.5-3** Rockfish Conservation Area and **4.5-4** Essential Fish Habitat illustrate areas designated by NOAA as MSA managed groundfish and essential fish habitat for rockfish, respectively.

Commercial landings in the Monterey Bay ports (Monterey, Moss Landing, and Santa Cruz) indicate that in 2012 the major fish and invertebrates commercially harvested in Monterey Bay include northern anchovy, grenadier, California halibut, Pacific mackerel, assorted rockfish including blackgill, splitnose, and chillipepper, sablefish, Chinook salmon, white seabass, Pacific sardine, staghorn sculpin, sanddab, longnose skate, Dover sole, petrale sole, longspine thornyhead, shortspine thornyhead, albacore tuna, Dungeness crab, spot prawn, and squid (CDFW, 2013).

The most commonly landed recreational sport fishes in 2013 in central California and Monterey Bay were barred surfperch, assorted rockfish, including brown, black, copper, kelp, gopher, vermillion, yellowtail, and blue, calico surfperch, California lizardfish, Chinook salmon, Pacific mackerel, jacksmelt, northern anchovy, Pacific sanddab, silver surfperch, striped seaperch, walleye surfperch, sharks, and Dungeness crab (RECFIN, 2014).

4.5.1.4 Existing Marine Environment at the Proposed Intake and Outfall Locations

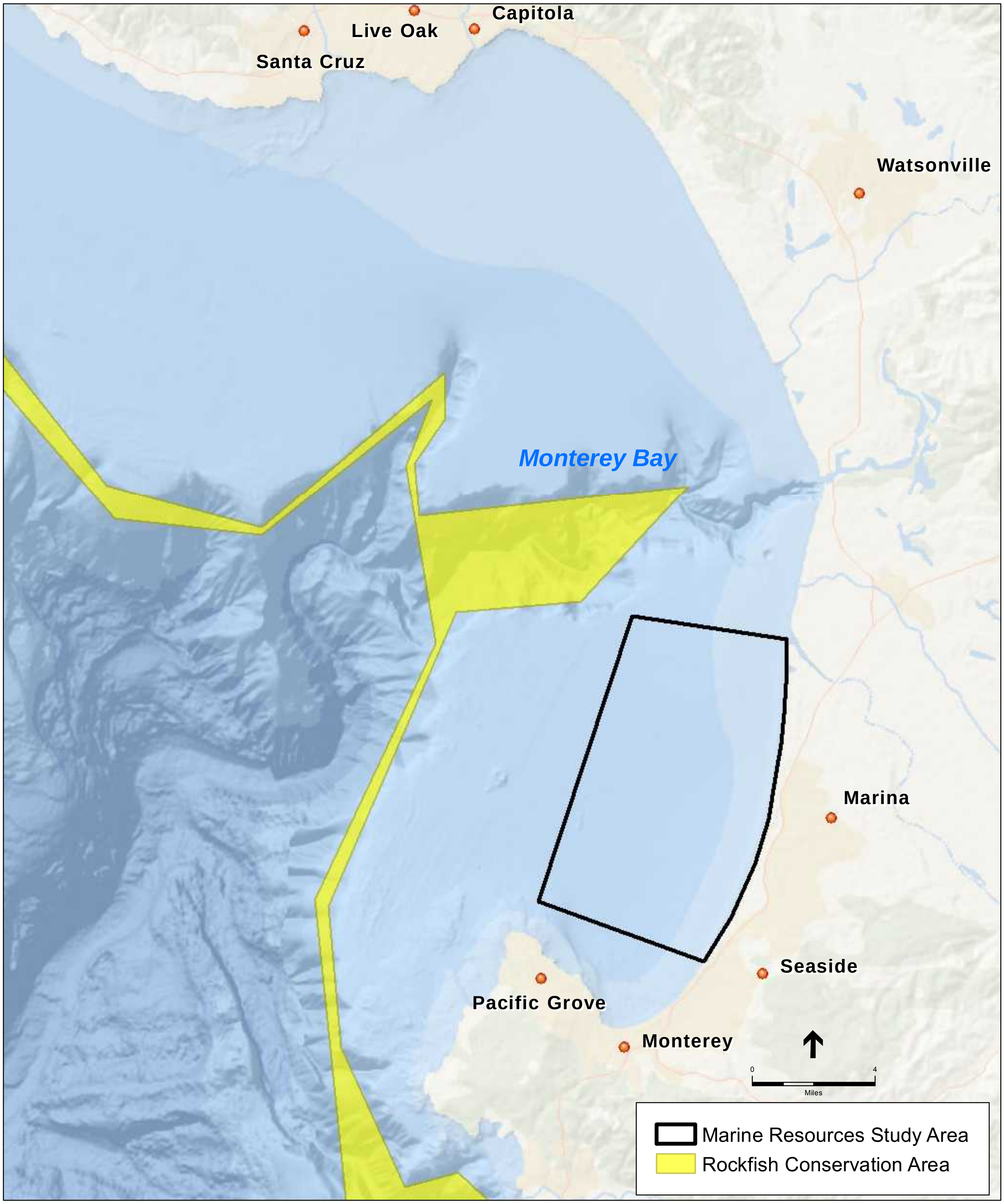
Many marine organisms inhabit either the surface (i.e., epifaunal) or reside within (i.e., infaunal) seafloor sediments. In particular, two communities are organized along a gradient of wave-induced substrate motion that is observed from San Diego to Washington:

- **Crustacean zone:** this shallower zone, characterized by strong water motion and sandy sediments, is occupied by small, mobile, deposit-feeding crustaceans, including sand-burrowing amphipods and surface-active cumaceans and ostracods. All can burrow into the loosely consolidated superficial sediments and flourish in wave-disturbed sand bottoms.
- **Polychaete zone:** characterized by more stable, fine sand with a significant amount of mud, this deeper zone is dominated by polychaete worms living in relatively permanent tubes and burrows. Many other relatively sessile[5] and suspension-feeding groups are also common here.[6]

The width and depth limits of these two zones vary, depending on the strength of wave activity. Benthic fishes are less abundant in the crustacean zone than the polychaete zone. Fish diversity on the sandy seafloor is relatively low compared to adjacent hard substrate areas.

The subsurface slant wells would terminate within the crustacean zone. The MRWPCA's existing ocean outfall and diffuser are in the polychaete zone. The marine communities inhabiting these zones are discussed in more detail below.

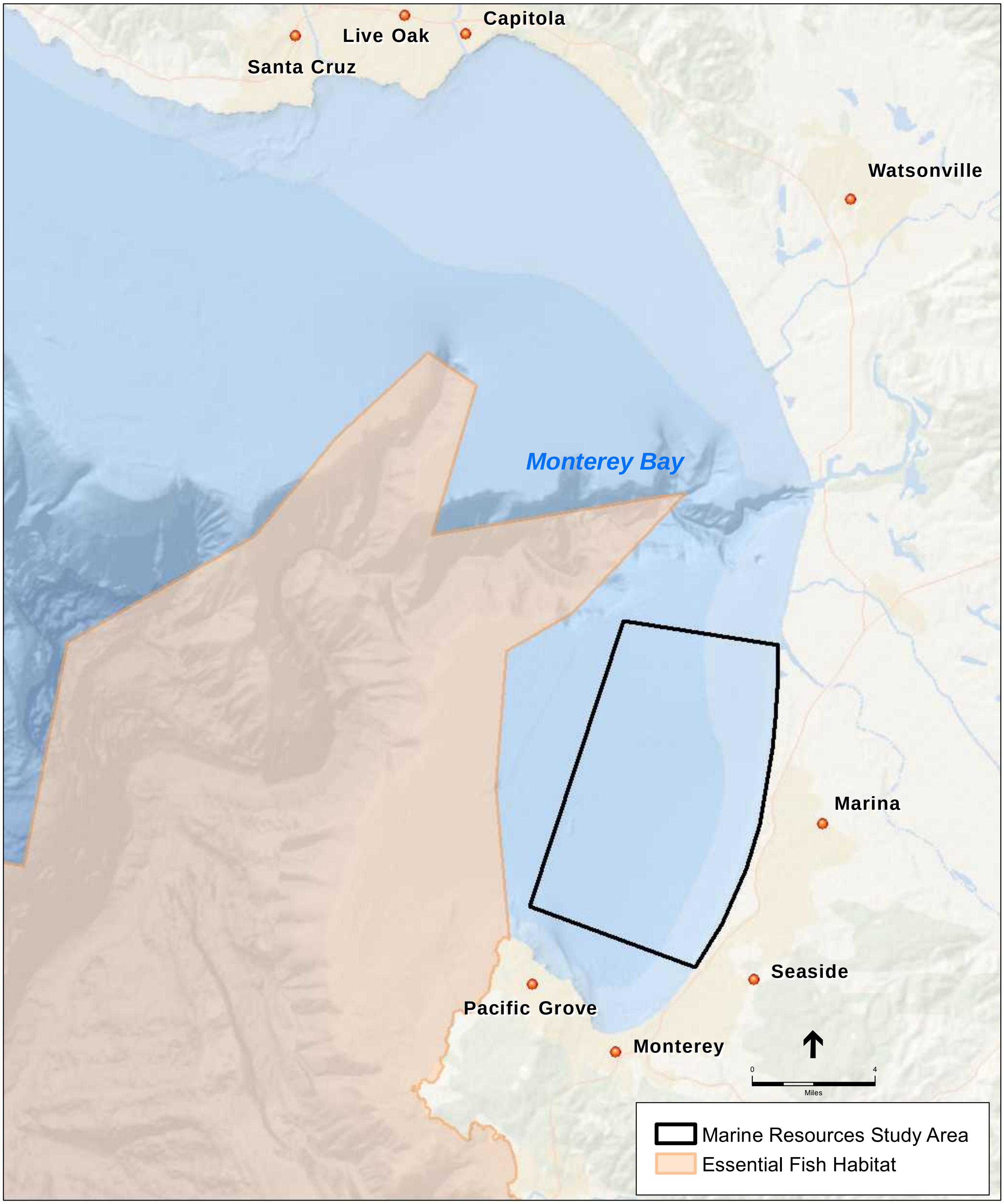
5 Sessile = of an organism, e.g., a barnacle, fixed in one place; immobile.
6 Zone descriptions from MBNMS, 2016g.



SOURCE: NOAA, 2016

205335.01 Monterey Peninsula Water Supply Project

Figure 4.5-3
Rockfish Conservation Areas Designated in MBNMS under Federal Regulations



SOURCE: NOAA, 2016

205335.01 Monterey Peninsula Water Supply Project

Figure 4.5-4
Essential Fish Habitat Designated in MBNMS under Federal Regulations

Proposed Subsurface Slant Wells

The subsurface slant wells would be drilled from roughly 900 feet inland of the shore and would extend beneath the coastal dunes and sandy beach, terminating 161 to 356 feet seaward of the MHW line, within the submerged lands of MBNMS, (except #8, which would not extend past the MHW line) in the nearshore zone at an estimated depth of 200 to 220 feet below MHW (190 to 210 feet beneath the seafloor).

Coastal dune habitat is described in detail in Section 4.6, Terrestrial Biological Resources. The intertidal beach area adjacent to the slant well locations is inhabited by crustaceans, cirolanid isopods, and mole crabs (Oakden and Nybakken, 1977). Polychaete worms, and bivalves (i.e. clams, mussels, and scallops) are also regularly present, though typically in low abundances. In addition, there are numerous species of shorebirds that use these beaches such as sanderling, marbled godwit, and willet that feed at the water's edge, and western snowy plover, a protected species that nest on these same beaches.

The high-energy surf zone is predominantly populated by sand dollars, polychaete worms, shrimp and other arthropods, clams, crabs, and a variety of fish, including multiple species of surfperch, flatfish, rays, and sharks. Marine mammals that may utilize the waters of the surf zone include California sea lions and Pacific harbor seals. Southern sea otters also forage for crustaceans and bivalves in the surf zone during high tide.

Existing MRWPCA Ocean Outfall for Brine Discharges

The habitat surrounding the existing MRWPCA ocean outfall and diffuser is a high-energy sand and mud soft-substrate, as illustrated in Figure 4.5-1. The existing 2.1-mile-long MRWPCA outfall ends approximately 1.5 miles offshore with a 1,100-foot-long underwater diffuser that sits on ballast rock at approximately 90 to 110 feet below sea level, within the waters of MBNMS. The outfall and diffuser are located approximately 3.5 miles southwest of the mouth of the Salinas River, within the area affected by the sediment plume from the river. A long-term monitoring study of the ocean outfall (ABA Consultants, 1999) reported no effects from the outfall discharge on benthic communities, or biological accumulation of contaminants in tissue. No effects were observed on the physical and chemical properties of the sediments and water column except adjacent to the outfall. The increased sediment stability provided by the physical structure of outfall pipe and accompanying ballast rock has allowed a community of tubiculous polychaetes (*Diopatra ornata*) to become established in a distinct band within 6–7 feet of the south side of the outfall. This occurrence increased the diversity and abundance of organisms near the outfall. The monitoring program also reported that the benthic community structure in the vicinity of the outfall shifted over time with a general increase in mobile epifauna and opportunistic species and a decrease in sessile species and their predators, which was consistent with patterns seen in other parts of Monterey Bay and not linked to the outfall (ABA Consultants, 1999). Video of the MRWPCA outfall taken during routine maintenance (Ballard Marine Construction, LLC 2014) revealed a rich assemblage of hard-substrate organisms inhabiting the ballast rock covering the outfall.

4.5.1.5 Non-native Invasive Aquatic Species

The introduction of non-native invasive aquatic species is one of the greatest threats to MBNMS subtidal and intertidal habitats. The introduction of non-native species into coastal Monterey Bay or estuarine ecosystems (Elkhorn Slough) can result in large-scale changes to aquatic communities. California's estuaries, in particular, have become home to many non-native or introduced species that have dominated local intertidal and subtidal marine communities. Elkhorn Slough has been reported to contain approximately 40 non-native, invasive species and a smaller number has been reported for the coastal waters of MBNMS (MBNMS 2016c).

Although the effects of introduced aquatic species on habitats they colonize is often unknown, some clearly have had serious negative influences. Impacts include decreasing abundance and even local extinction of native species, alteration of habitat structure, and extensive economic costs due to heavy organism and algal growths on vessel bottoms and navigation, scientific, and weather buoys. Historically, the principal mechanism of introduction to California coastal waters and estuaries has been fouling, boring, and release of ballast-dwelling organisms. Introduced species include snails, shrimp, plankton, crabs, and algae (MBNMS 2016c).

There are no known or reported occurrences of non-native aquatic species in the study area or more specifically the areas that will be affected by the proposed project.

The two documented non-native species occurring within coastal waters of MBNMS are the seaweed *Undaria pinnatifida* and the European green crab *Carcinus maenas*. Both species are normally associated with hard substrate habitat (SIMoN, 2016e).

4.5.2 Regulatory Framework

This section summarizes federal and state environmental laws, policies, plans, regulations, and/or guidelines (hereafter referred to generally as "regulatory requirements") pertaining to marine biological resources and indicates the project's consistency with those regulatory requirements. There are no such local requirements related to marine biological resources that would apply to the MPWSP. The consistency findings are based on the project, as proposed, without mitigation. Where the proposed project would be consistent with the applicable regulatory requirement, no further discussion of project consistency with that regulatory requirement is provided. Where the proposed project would be potentially inconsistent with the applicable regulatory requirement, the reader is referred to the specific impact discussion in Section 4.5.5, Direct and Indirect Effects of the Project, below, where the potential inconsistency is addressed in more detail. Where applicable, the discussion in Section 4.5.5 includes identification of feasible mitigation that would resolve or minimize the potential inconsistency.

4.5.2.1 Federal Regulations

Federal Endangered Species Act

Under the Federal Endangered Species Act (FESA), the Secretary of the Interior and the Secretary of Commerce jointly have the authority to list a species as threatened or endangered and to designate critical habitat for those species (16 United States Code [USC] 1533). Multiple species of fish and marine mammals are listed by the USFWS and NMFS under FESA, as discussed in Section 4.5.1.3. Once a species is listed and critical habitat is designated, a federal agency undertaking, authorizing or carrying out an activity must ensure, in consultation with NMFS and/or USFWS, that the activity is not like to jeopardize listed species or destroy or adversely modify critical habitat (16 USC 1536(a)(2)). The statute also prohibits the "take" of a federally listed species (16 USC 1533(d), 1538(a)). "Take" is defined by the FESA as an action that harasses, harms, pursues, hunts, shoots, wounds, kills, traps, captures, or collects, or to attempt to engage in any such conduct." MBNMS will be consulting with NMFS and USFWS pursuant to section 7 of the FESA to assess the level of potential effects from the project and minimize those effects, wherever appropriate, to ensure consistency with the statute. Additional discussion of MPWSP effects related to FESA and the terrestrial environment is provided in Section 4.6, Terrestrial Biological Resources.

Federal Regulation of Wetlands and Other Waters

The United States Army Corps of Engineers (USACE) and the United States Environmental Protection Agency (USEPA) regulate the discharge of dredged or fill material into waters of the United States, including wetlands, under Sections 404 and 401 of the Federal Clean Water Act. Projects that would result in the placement of dredged or fill material into waters of the United States require a Section 404 permit from the USACE. Section 401 of the Federal Clean Water Act requires every applicant for a federal permit or license for any activity that may result in a discharge to a water body to obtain State Water Quality Certification (Certification) that the proposed activity will comply with state water quality standards. Some classes of fill activities may be authorized under General or Nationwide Permits if specific conditions are met. Nationwide permits do not authorize activities that are likely to jeopardize the existence of a threatened or endangered species listed or proposed for listing under the Federal Endangered Species Act. In addition to conditions outlined under each Nationwide Permit, project-specific conditions can be required by the USACE as part of the Section 404 permitting process. When a project's activities do not meet the conditions for a Nationwide Permit, an Individual Permit may be issued.

The federal government also supports a policy of minimizing "the destruction, loss, or degradation of wetlands." Executive Order 11990 (May 24, 1977) requires that each federal agency take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.

The MPWSP components proposed for the marine environment would be consistent with Sections 404 of the Federal Clean Water Act, and Executive Order 11990 because their construction would not include dredging or drilling in the territorial or federal waters; slant well drilling would begin approximately 900 feet inland of the shoreline and drill into and under the submerged lands of the Pacific Ocean, in State waters. Additional discussion of MPWSP effects related to wetlands and other waters of the terrestrial environment is provided in Section 4.6, Terrestrial Biological Resources.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act or MSA) (16 U.S.C. Sections 1801−1884) of 1976, as amended in 1996 and reauthorized in 2007, is intended to protect fisheries resources and fishing activities within 200 miles of shore. Conservation and management of U.S. fisheries, development of domestic fisheries, and phasing out of foreign fishing activities are the main objectives of the MSA. The MSA provided NOAA Fisheries with legislative authority to regulate U.S. fisheries in the area between 3 miles and 200 miles offshore and established eight regional fishery management councils that manage the harvest of the fish and shellfish resources in these waters.

The MSA defines "essential fish habitat" as those waters and substrate that support fish spawning, breeding, feeding, or maturation. The MSA requires that NOAA Fisheries, the regional fishery management councils, and federal agencies that take an action that may have an effect on managed fish species under MSA, identify essential fish habitat and protect important marine and anadromous fish habitat. The regional fishery management councils, with assistance from NOAA Fisheries, are required to develop and implement Fishery Management Plans. Fishery Management Plans delineate essential fish habitat and management goals for all managed fish species, including some fish species that are not protected under the MSA. Federal agency actions that fund, permit, or carry out activities that may adversely affect essential fish habitat are required under Section 305(b) of the MSA, in conjunction with required Section 7 consultation under FESA, to consult with NOAA Fisheries regarding potential adverse effects of their actions on essential fish habitat and to respond in writing to NOAA Fisheries' recommendations.

Monterey Bay is designated as essential fish habitat under four Fishery Management Plans (see **Figure 4.5-4**). These plans provide protection for Pacific groundfish, coastal pelagic species, highly migratory species, and Pacific coast salmon (i.e. Chinook salmon and Coho salmon). A total of 37 commercially important fish and shark species are managed through these four Fishery Management Plans. Within the study area, coastal pelagic species, some groundfish species, thresher sharks, and occasionally salmon are known to be present (**Table 4.5-2**). The MPWSP would be consistent with the MSA because the construction and operational impacts of the proposed project are not expected to result in any degradation of essential fish habitat within Monterey Bay.

Rivers and Harbors Appropriations Act of 1899

Section 10 of the Federal Rivers and Harbors Appropriations Act of 1899 (30 Stat. 1151, codified at 33 U.S.C. §§401, 403) prohibits the unauthorized obstruction or alteration of any navigable water (33 U.S.C. §§403). Navigable waters under the Rivers and Harbors Appropriations Act are tidally influenced waters that are presently used, have been used in the past, or could be used in the future to transport interstate or foreign commerce (33 C.F.R. 3294). Activities that commonly require Section 10 permits include construction of piers, wharves, bulkheads, marinas, ramps, floats, intake structures, cable and pipeline crossings, and dredging and excavation.

The MPWSP components proposed for the marine environment would be consistent with Section 10 of the Rivers and Harbors Appropriations Act of 1899, because their construction would occur onshore and would not obstruct or alter navigable waters. Additional discussion of MPWSP effects related to navigable waters of the terrestrial environment is provided in Section 4.6, Terrestrial Biological Resources.

Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972 (MMPA), as amended in 1981, 1982, 1984, and 1995, establishes a federal responsibility for the protection and conservation of marine mammal species by prohibiting the "take" of any marine mammal. The MMPA defines "take" as the act of hunting, killing, capture, and/or harassment of any marine mammal, or the attempt at such. The Act also imposes a moratorium on the import, export, or sale of any marine mammals, parts, or products within the U.S. These prohibitions apply to any person in U.S. waters and to any U.S. citizen in international waters.

The primary authority for implementing the act belongs to the USFWS and NMFS. The USFWS is responsible for the protection of sea otters, and NMFS is responsible for protecting pinnipeds (seals and sea lions) and cetaceans (whales and dolphins).

The MMPA, as amended, provides that a citizen may request an authorization for taking of small numbers of marine mammals incidental to a specified activity (e.g. dredging, marine construction, marine transport) within a specified region. Authorizations may only be allowed if the activity would have a negligible impact on marine mammal species, or stock (a regional population under the MMPA), and would not have an unmitigable adverse impact on subsistence uses.

The MPWSP would be consistent with the MMPA because incidental take is not likely to occur from the construction and operation of the proposed project, and project activities are not expected to result in take or harassment of any marine mammals as discussed further in Section 4.5.5.

Coastal Zone Management Act

The Coastal Zone Management Act (CZMA), enacted by Congress in 1972, is administered by NOAA's Office for Coastal Management. The CZMA provides for management of the nation's coastal resources, including the Great Lakes, and balances economic development with environmental conservation. The CZMA outlines two national programs: the National Coastal Zone Management Program and the National Estuarine Research Reserve System. Thirty-four states have approved coastal management programs. The 34 coastal programs aim to balance competing land and water issues in the coastal zone, while estuarine reserves serve as field laboratories to provide a greater understanding of estuaries and how humans impact them. The overall program objectives of CZMA remain balanced to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone." The MPWSP would be located in a unique area that encompasses both a national marine sanctuary (MBNMS) and a national estuary (Elkhorn Slough National Estuarine Research Reserve).

Under Section 307 of the CZMA (16 USC 1456), activities that may affect coastal uses or resources that are undertaken by federal agencies, require a federal license or permit, or receive federal funding must be consistent with a State's federally approved coastal management program. The primary authorities of California's federally approved coastal management program are the California Coastal Act, the McAteer-Petris Act, and the Suisun Marsh Protection Act. The California Coastal Commission (CCC) implements the California Coastal Act and the federal consistency provisions of the CZMA for activities affecting California coastal uses and resources outside of San Francisco Bay.

The MPWSP components proposed for marine environments would be fully consistent with the enforceable policies of CCC's coastal management program. See additional discussion of consistency with CCC's coastal management program under Section 4.5.2.2., State Regulations, below. Additional discussion of MPWSP consistency with the enforceable policies of CCC's coastal management program concerning terrestrial biological resources of the coastal zone is provided in Section 4.6, Terrestrial Biological Resources.

Clean Water Act

The Clean Water Act is described in Section 4.3, Surface Water Hydrology and Water Quality. Under the Clean Water Act, the USEPA seeks to restore and maintain the chemical, physical, and biological integrity of the nation's waters by implementing water quality regulations. Section 4.3, Surface Water Hydrology and Water Quality, summarizes Sections 303(d) and 402(p) of the Clean Water Act. Section 303(d) requires states to identify impaired water bodies (i.e., 303(d) List of Impaired Water Bodies). In the study area, impaired water bodies that eventually drain into Monterey Bay include Elkhorn Slough, Moro Cojo Slough, Salinas Reclamation Canal, Tembladero Slough, Old Salinas River estuary, Salinas River, and Moss Landing Harbor. In addition, the nearshore waters of northern Monterey Bay are on the 303(d) list. Section 402(p) requires National Pollutant Discharge Elimination System (NPDES) permits to control discharges of waste into waters of the United States and prevent the impairment of the receiving water for beneficial uses, which includes harm to marine biota. The USEPA has delegated authority of issuing NPDES permits in California to the SWRCB, which has nine regional boards. The Central Coast Regional Water Quality Control Board (RWQCB) regulates water quality in the project area. Discussion of the NPDES program and relevant permits is provided in Section 4.3, Surface Water Hydrology and Water Quality, Subsection 4.3.2.2. Determinations of consistency of the proposed MPWSP with specific applicable SWRCB regulations, plans and policies are also provided in Section 4.3.2.2.

National Marine Sanctuaries Act, MBNMS Regulations and Desalination Guidelines

Pursuant to the National Marine Sanctuaries Act (NMSA), originally referred to as the Marine Protection, Research, and Sanctuaries Act of 1972, the primary purpose of the NMSA is to identify, designate and manage areas of the marine environment of special national significance due to their conservation, recreational, ecological, historical, research, educational, or aesthetic qualities. Under the NMSA, it is unlawful for any person to destroy, cause the loss of, or injure any sanctuary resource managed under law or regulations for that sanctuary. NMSA general regulations define sanctuary resource as any living or non-living resource that contributes to the conservation, recreational, ecological, historical, research, educational or aesthetic value of the sanctuary, including any algae and other marine plants, marine invertebrates, brine-seep biota, phytoplankton, zooplankton, fish, seabirds, sea turtles, and marine mammals.

MBNMS was designated in 1992 in recognition that the area provides a highly productive ecosystem and a wide variety of marine habitat, including outstanding concentrations of pinnipeds, whales, otters, and seabirds, abundant fish stocks, a variety of crustaceans, and other invertebrates.

MBNMS regulations that are relevant to the construction and operation of desalination plants include restrictions on discharging material or other matter into the sanctuary and restrictions on activities that alter the submerged lands (aka seabed) as a result of the installation of desalination facility structures on or beneath the ocean floor (e.g. an intake or outfall pipeline). Each of these activities first requires MBNMS approval. In particular, MPWSP activities that would be subject to MBNMS approval include disturbance of the submerged lands due to installation of the seawater intake below the ocean floor, and the discharge of brine into sanctuary waters from an existing ocean outfall, approximately 2 miles off shore and 90-110 feet below sea level. Any actions that have the potential to alter the seabed would require an MBNMS Authorization of a Coastal Development permit issued by the CCC. Operational discharges into sanctuary waters would require MBNMS authorization of an NPDES permit issued by the RWQCB (see Section 1.3.2 for additional information). NOAA may also issue Special Use Permits to establish conditions of access to, and use of, any sanctuary resource or to promote public use and understanding of a sanctuary resource. Special Use Permits may only be authorized if that activity is compatible with the purposes for which the sanctuary is designated and with protection of sanctuary resources; and that activities carried out under the permit be conducted in a manner that does not destroy, cause the loss of, or injure sanctuary resources. NOAA recently approved a new category of Special Use Permit for the continued presence of a pipeline transporting seawater to or from a desalination facility in MBNMS (see Section 1.3.2.2).

On May 15, 2015, new federal regulations regarding introduced species became effective within MBNMS. These regulations prohibit introducing or otherwise releasing from within or into the Sanctuary an introduced species, except striped bass (*Morone saxatilis*) released during catch and release fishing activity. Federal regulation (15 CFR 922.132(a)(12)) prohibits the release of introduced species (including any biological matter capable of propagation from such species and genetically altered species).

Guidelines for Desalination Plants in MBNMS

In 2010, MBNMS in collaboration with the CCC, RWQCB, and NMFS, published a report titled *Guidelines for Desalination Plants in Monterey Bay National Marine Sanctuary* (MBNMS, 2010), which implements the desalination action plan included in the MBNMS Final Management Plan (described above). The report includes non-regulatory guidelines that were developed to help ensure that any future desalination plants in the sanctuary would be sited, designed, and operated in a manner that results in minimal impacts on the marine environment. The Guidelines address numerous issues associated with desalination including site selection, construction and operational impacts, monitoring and reporting, plant discharges, and intake systems.

The following Guidelines are pertinent to the analysis in Section 4.5.

Guidelines for Construction

- Identify potential impacts from the construction process on the marine and coastal environment.
- Best Management Practices should be developed and adhered to in order to avoid or minimize impacts on the marine environment during construction and the use of materials and practices that minimize disturbances to the environment to the maximum extent practicable should be included.

Guidelines for Brine Discharge

- All desalination plants should be designed to minimize impacts from the discharge. Desalination project proponents should investigate the feasibility of diluting brine effluent by blending it with other existing discharges. The proponent should evaluate the use of measures to minimize the impacts from desalination plant discharges including discharging to an area with greater circulation or at a greater depth, increasing in the number of diffusers, increasing the velocity while minimizing the volume at each outlet, diluting the brine with seawater or another discharge, or use of a subsurface discharge structure. The project proponent should provide a detailed evaluation of the projected short-term and long-term impacts of the brine plume on marine organisms based on a variety of operational scenarios and oceanographic conditions.
- A continuous monitoring program should be implemented to verify the actual extent of the brine plume, when deemed necessary (see Monitoring on page 4.3-13) and to determine if the plume is impacting EFH, critical habitat, or sanctuary resources. If it is, then mitigation for the EFH impact will be required.

Guidelines for Entrainment and Impingement

- All desalination plants should be designed and sited to avoid and minimize impingement and entrainment to the extent feasible.

Guidelines for Plant Site Selection

- Desalination plant intakes should be sited to avoid sensitive habitats.
- Desalination plant discharges should not be located in or near ecologically sensitive areas, including Areas of Special Biological Significance as designated by the State Water Resources Control Board, EFH Habitat Areas of Particular Concern as designated by the Pacific Fishery Management Council, and Marine Protected Areas designated under the Marine Life Protection Act.

Guidelines for Monitoring

For all desalination projects, an ongoing monitoring program must be developed to evaluate the extent of impacts from the plant's intake and discharge operations on marine biological resources. The monitoring program should:

- Develop a statistically acceptable baseline for the project area,
- Monitor source water for potential contaminants that may require additional treatment,
- Monitor the effluent prior to discharge to ensure it is in compliance with the California Ocean Plan

- Monitor the effects of the effluent on marine organisms within the plume,
- Monitor any required mitigation for unavoidable impacts to ensure the mitigation is performing as intended.

The issues discussed in the Guidelines relating to siting, constructing, and operating a desalination facility within MBNMS and the recommendations for reducing, avoiding, and minimizing impacts on sanctuary resources are reflected in the requirements of the California Ocean Plan (described in detail under State Regulations in Section 4.5.2.2, below). The Ocean Plan was recently amended (effective January, 2016) to specifically control potential adverse impacts on marine life associated with desalination facility intakes using seawater as source water and brine discharges. Further, the Ocean Plan includes specific enforceable numeric water quality objectives and other requirements pertaining to siting, constructing, and operating a desalination facility that are consistent with the Guidelines. The requirements set forth in the Ocean Plan were informed by the SWRCB collaborating with the Southern California Coastal Water Research Project to evaluate methods of brine disposal and monitoring strategies. Additionally, the amendments to the Ocean Plan were assessed in a SWRCB staff report analyzing desalination facility intakes and brine discharges which provides the rationale for how implementing such measures reduce potential environmental impacts from desalination facilities (SWRCB, 2015). To reflect this evolution of regulatory requirements supported by evidence based research, the Ocean Plan requirements are used, in part, as key thresholds of significance in the evaluation criteria for assessing impacts. The Ocean Plan requirements are generally more stringent and have more specificity regarding assessment and monitoring requirements than the Guidelines. As such, the Ocean Plan requirements are substantially consistent with the Guidelines. Impacts on sanctuary resources from brine discharges are discussed in detail in **Impact 4.3-4** and **Impact 4.3-5** as well as in Section 4.5, Marine Biological Resources. Section 6.4 includes a comprehensive list of Guideline recommendations and summarizes the proposed project's consistency with those guidelines.

NOAA (MBNMS) Memorandum of Agreement with State and Federal Agencies

NOAA (MBNMS) entered into a Memorandum of Agreement (MBNMS et al., 2015c) with the State of California, USEPA, and the Association of Monterey Bay Area Governments, which addresses the process for implementing the following water quality regulations applicable to State waters within the MBNMS:

- NPDES permits issued by the State of California under Section 13377 of the California Water Code; and
- Waste Discharge Requirements issued by the State of California under Section 13263 of the California Water Code.

The Memorandum of Agreement specifies how the review process for applications for leases, licenses, permits, approvals, or other authorizations will be administered within State waters in the MBNMS in coordination between the State and the Sanctuary's permit programs. The MBNMS Superintendent develops and follows a management plan that ensures protection of these resources, provides for research and education, and facilitates recreational and commercial uses, which are compatible with the primary goal of resource protection. MBNMS also implements the Water Quality Protection Program to enhance and protect the chemical, physical, and biological integrity of the sanctuary. The program is a partnership of many local, state, and federal government agencies and calls for education, funding, monitoring, and development of treatment facilities and assessment programs to protect water quality (MBNMS et al., 2015c).

The discharge of brine effluent to the Sanctuary is a prohibited activity and has the potential to injure sanctuary resources, and as such, the proposed project is potentially inconsistent with the NMSA. Effects of discharges are discussed in Impact 4.5-4.

MBNMS has also partnered with research and management agencies to establish Sanctuary Ecologically Significant Areas in MBNMS (see **Figure 4.5-5**). These areas have been demonstrated to have "remarkable, representative and/or sensitive marine habitats, communities and ecological processes" (MBNMS, 2016d).

National Invasive Species Act

Under the National Invasive Species Act of 1996, the United States Coast Guard (USCG) established national voluntary ballast water guidelines. The USCG published regulations on June 14, 2004, establishing a national ballast water management program with mandatory requirements for all vessels equipped with ballast water tanks that enter or operate in U.S. waters. The regulations carry mandatory reporting requirements to aid in the USCG's responsibility, under the National Invasive Species Act, to determine patterns of ballast water movement. The regulations also require ships to maintain and implement vessel-specific ballast water management plans.

The MPWSP would be consistent with the National Invasive Species Act because the construction and operational impacts of the proposed project do not involve the use of vessels or other potential vectors for the introduction or transplantation of non-native, invasive species. Any maintenance of the existing MRWPCA outfall would be similar to or less than currently occurring maintenance and would utilize local vessels.

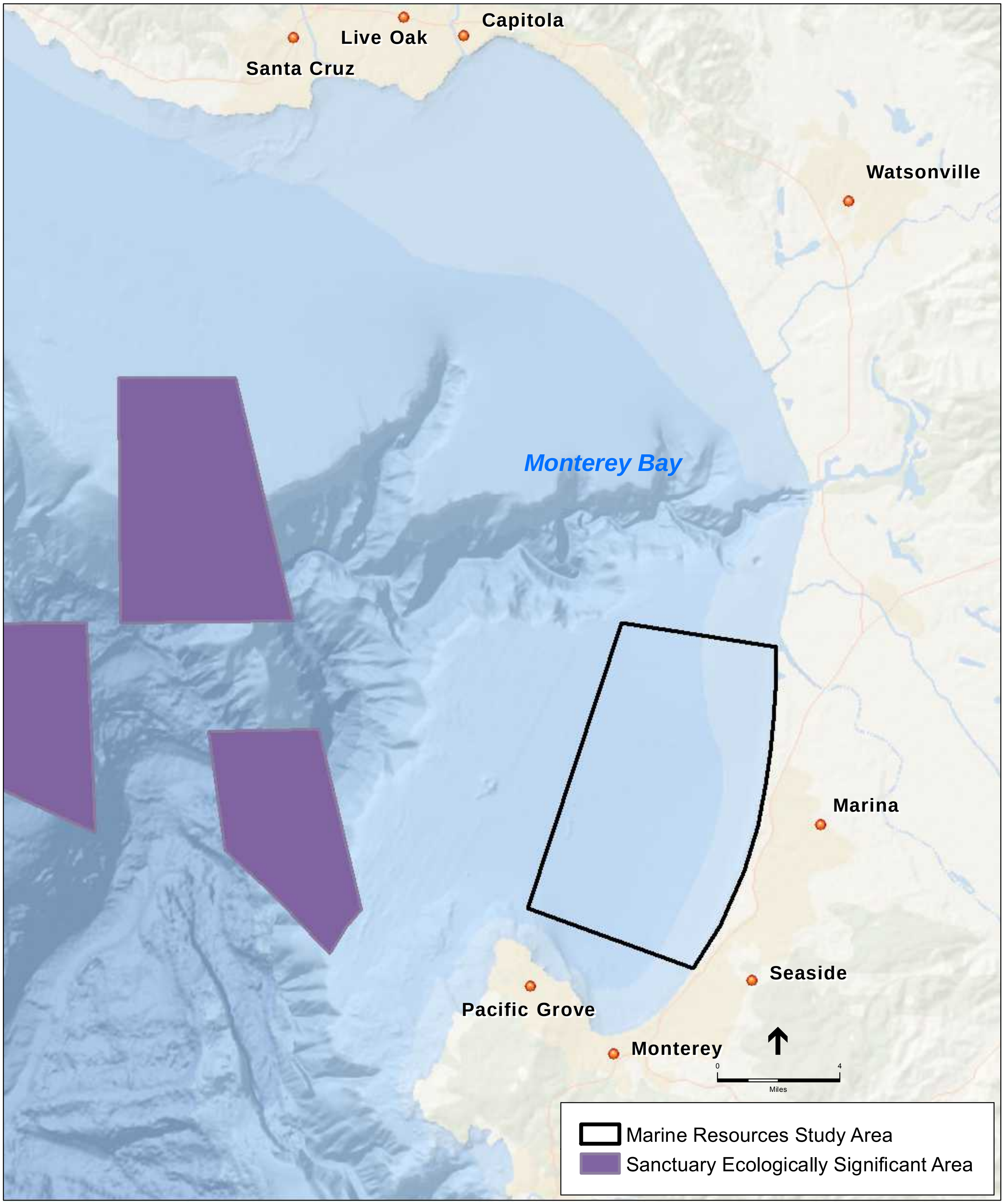
4.5.2.2 State Regulations

California Endangered Species Act

Under CESA, CDFW maintains lists of threatened and endangered species, candidate species, species of special concern and fully protected species. Marine species that are protected by CESA and have the potential to occur in the study area are listed in **Table 4.5-2**. The MPWSP components proposed for the marine environment would be consistent with CESA because their construction and operation are not expected to result in the take of any State protected species. Additional discussion of MPWSP effects related to CESA and the terrestrial environment is provided in Section 4.6, Terrestrial Biological Resources.

Fish and Game Code Sections 3503, 3511, 4700, 5050, and 5515

CESA-listed endangered and threatened species may not be taken or possessed at any time without a permit from CDFW (Fish and Game Code Section 3511 Birds, Section 4700 Mammals, Section 5050 Reptiles and Amphibians, and Section 5515 Fish). The MPWSP components



SOURCE: NOAA, 2016

205335.01 Monterey Peninsula Water Supply Project

Figure 4.5-5
Sanctuary Ecologically Significant Areas Designated in MBNMS

proposed for the marine environment would be consistent with Fish and Game Code Sections 3503, 3511, 4700, 5050, and 5515 because their construction and operation are not expected to result in the take or possession of any State protected species. Additional discussion of MPWSP effects on CESA-listed species of the terrestrial environment is provided in Section 4.6, Terrestrial Biological Resources.

Marine Life Protection Act

The objective of the Marine Life Protection Act (MLPA) is protection of ecosystem structure and function. Specific mandates of the MLPA are to sustain, conserve, and rebuild depleted populations. The MLPA works in concert with the Marine Life Management Act. Within California, most of the legislative authority over fisheries management is enacted within the MLPA. This law directs CDFW and the Fish and Game Commission to issue sport and commercial harvesting licenses, as well as license aquaculture operations. CDFW, through the commission, is the State's lead biological resource agency and is responsible for enforcement of the State endangered species regulations and the protection and management of all State biological resources. A very important part of MLPA enactment has been the establishment of State Marine Protected Areas (MPAs) along the California coast. Fishing and other consumptive activities are strictly regulated in State MPAs in order to provide refuges within which healthy stocks can be maintained to ensure propagation along the entire coast. See **Figure 4.5-6**.

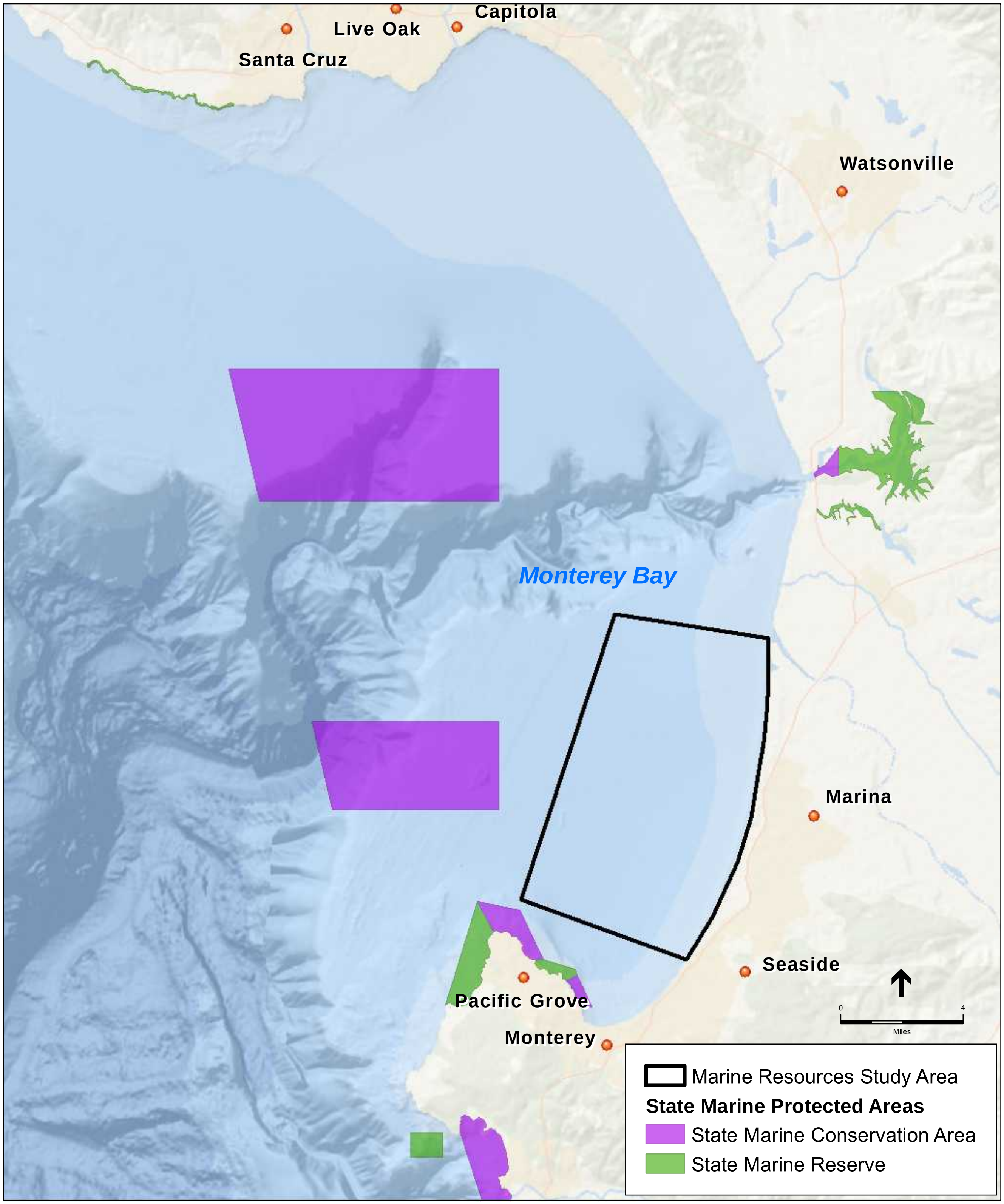
The MPWSP would be consistent with the MLPA because the construction and operational impacts of the proposed project are not expected to result in any degradation of ecosystem structure and function within Monterey Bay or to reduce the efficacy of MPAs within the Bay.

Marine Life Management Act

The Marine Life Management Act works in concert with the MLPA by advancing fishery management as an important element of ecosystem integrity and sustainability. Under the MLMA, implementation of the California Nearshore Fisheries Management Plan (NFMP) and the California Market Squid Fisheries Management Plan (MSFMP) affect species found in Monterey Bay (see **Table 4.5-4**).

Nearshore Fisheries Management Plan

The five goals of the Nearshore Fishery Management Plan (NFMP) are to ensure long-term resource conservation and sustainability, to employ science-based decision-making, to increase constituent involvement in management, to balance and enhance socio-economic benefits, and to identify implementation costs and sources of funding. The following measures are employed to meet the primary goal of sustainability: a fishery control rule including size limits, time/area closures, or gear restrictions, regional management tailored to conditions specific to each of four regions, marine protected areas, restricted fishery access, and allocation of total allowable catch (CDFG, 2002). All of the species regulated by the NMFP are primarily associated with rocky substrate.



SOURCE: NOAA, 2016

205335.01 Monterey Peninsula Water Supply Project

Figure 4.5-6

Marine Protected Areas along the California Coast

Market Squid Fisheries Management Plan

The Market Squid Fishery Management Plan (MSFMP) establishes a management program for California's market squid (*Doryteuthis opalescens*) resource. The goals of the MSFMP are to manage the market squid resource to ensure long term resource conservation and sustainability, reduce the potential for overfishing, and institute a framework for management in light of potential environmental and socioeconomic changes. The tools implemented to accomplish these goals include fishery control rules (e.g., seasonal catch limits, weekend closures), creation of a restricted access program, and establishment of a seabird closure restricting the use of attracting lights for commercial purposes (CDFG, 2005).

The MPWSP would be consistent with the MLMA because the construction and operational impacts of the proposed project are not expected to substantially affect rocky substrate habitat or interfere with management of the nearshore or market squid fisheries.

California Ocean Plan

The California Ocean Plan (Ocean Plan) is described in Section 4.3, Surface Water Hydrology and Water Quality. The Ocean Plan establishes water quality objectives and beneficial uses for waters of the Pacific Ocean within 3 miles of the California Coast (SWRCB, 2012). NPDES waste discharge permits set discharge limits that are required to prevent exceedances of the water quality objectives in the Ocean Plan. The proposed project would discharge into Monterey Bay and therefore is subject to all Ocean Plan water quality objectives and NPDES requirements. The most relevant water quality objectives include:

- Marine communities, including vertebrate, invertebrate, and plant species shall not be degraded;
- Waste management systems that discharge into the ocean must be designed and operated in a manner that will maintain the indigenous marine life and a healthy and diverse marine community; and
- Waste discharged to the ocean must be essentially free of substances that will accumulate to toxic levels in marine waters, sediments or organisms.

The basis for water quality objectives established in the Ocean Plan is the protection of beneficial uses designated for each section of coastline by Regional Water Quality Control Boards (see **Table 4.3-3** in Section 4.3, Surface Water Hydrology and Water Quality). The designated beneficial uses relevant to marine biological resources in the study area are as follows:

- **Marine Habitat** – Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).
- **Shellfish Harvesting** – Uses of water that support habitats suitable for the collection of filter- feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sport purposes. This includes waters that have in the past, or may in the future, contain significant shellfisheries.

- **Commercial and Sport Fishing** – Uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

Another relevant beneficial use is as follows:

- **Rare, Threatened, Endangered or Protected Species** – Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, endangered or protected.

While not having been designated for coastal waters between Salinas River and Monterey Harbor, this beneficial use requires consideration here because it is known that Southern sea otters forage in the study area.

Operational discharges resulting from implementation of the MPWSP may be inconsistent with provisions of the California Ocean Plan. This issue is discussed further in Section 4.3, Surface Water Quality and Hydrology, Subsection 4.3.2.2 and Impact 4.3-5.

Marine Invasive Species Act

All shipping operations that involve major marine vessels are subject to the Marine Invasive Species Act of 2003 (Public Resources Code Sections 71200 through 71271), which revised and expanded the California Ballast Water Management for Control of Non-indigenous Species Act of 1999 (AB 703). This act is administered by the California State Lands Commission. The act regulates the handling of ballast water from marine vessels arriving at California ports in order to prevent or minimize the introduction of invasive species from other regions.

The MPWSP would be consistent with the Marine Invasive Species Act because the construction and operational impacts of the proposed project would not involve the use of vessels or other potential vectors that could introduce or transplant non-native invasive species. Any maintenance of the existing MRWPCA outfall would utilize local vessels and would be similar to or less than what is already occurring.

California Coastal Act

The California Coastal Act (Public Resources Code Section 30000 et seq.) provides for the long-term management of lands within California’s coastal zone boundary. Of primary relevance to marine biological resources are Coastal Act policies concerning: preservation and maintenance of marine biological resources; protection of the productivity and quality of coastal waters; prevention of oil and hazardous substance spills; minimization of continued movement of sediment and nutrients, and protection of recreational and commercial fisheries. A preliminary assessment of project consistency with this priority is provided here, however, a consistency certification will be provided to CCC as required by the Coastal Zone Management Act and its federal consistency regulations. The CCC will make the final decision as to whether the project is fully consistent.

With respect to preservation and maintenance of marine biological resources, construction and operation of the subsurface slant wells would have no effect. Sound generated by drilling operations would be greatly attenuated before reaching the water and the velocity of seawater pumped in through the intake wells would be so low that organisms would not be impinged on the seafloor. Operation of the brine discharge through the MRWPCA outfall would be managed to ensure that salinity, temperature and concentrations of other contaminants would remain within regulatory objectives and at levels known to be protective of marine organisms.

Concerning the productivity and quality of coastal waters, the MPWSP would not release any drilling fluids or other human-made materials during drilling or operation of the subsurface slant wells; nor would drilling affect natural water clarity. The discharge of brine and associated contaminants through the MRWPCA outfall would include only organic and inorganic constituents present in the source ocean water. While the brine discharge would increase salinities within the Zone of Initial Dilution around the diffuser, management of the brine discharge would ensure that salinities outside the Zone of Initial Dilution would not exceed 2 ppt above ambient salinities, in accordance with the Ocean Plan.

As for oil and hazardous substance spills, the MPWSP would be required to prepare and implement Hazardous Materials Business Plan and a Storm Water Pollution Prevention Plan and comply with the California Fire Code, as discussed more fully in Section 4.7, Hazards and Hazardous Materials. These measures would ensure that any spills would be contained onshore in the immediate vicinity of spillage. Operation of the Reverse Osmosis system would also ensure that any spills of petroleum or hazardous materials would be prevented from entering the brine discharge stream.

Regarding minimization of continued movement of sediment and nutrients, the drilling and operation of the subsurface slant wells would not alter the contour or character of the seafloor or shoreline environment. Onshore construction on the beach could temporarily re-suspend local beach sand but such an effect would be temporary and the beach contour would be returned to normal when construction is completed. Accordingly, drilling and operation of the subsurface slant wells would not restrict the movement of sediments or nutrients. The discharge of brine through the MRWPCA outfall and diffuser would also have no effect on the movement or character of sediments or nutrients beyond that which might already occur due to the physical structure of the outfall.

With respect to protection of recreational and commercial fisheries, the construction and operation of the subsurface slant wells would involve no changes to seafloor topography or overlying water quality. This means the project would produce no physical obstructions to fishing gear and have no effect on fish stocks. The concentrations of salts and contaminants in the brine discharge would be kept below those currently allowed for desalination systems and the existing MRWPCA municipal wastewater discharge, which would ensure no anticipated adverse effects on fish stocks.

For these reasons the project would not conflict with Coastal Act policies related to marine biological resources.

4.5.3 Evaluation Criteria

Impacts on marine biological resources would occur as a result of alterations to, or deterioration of marine aquatic habitats, which in turn would result in direct or indirect effects on marine taxa, communities, and food webs. Direct and indirect impacts on marine and aquatic taxa (i.e., plankton, fish, marine mammals, etc.) would not discriminate, and would affect all marine and aquatic taxa in the study area regardless of its species, whether it is listed as sensitive or not, or with which agency. The evaluation criteria therefore, consider the potential effects of the proposed project on habitat, special status species, and species considered in local, regional or federal resource management plans.

Implementation of the proposed project would have a significant impact on marine biological resources if it would:

- Have a substantial adverse effect, either directly or indirectly through habitat modifications, including direct disturbance, removal, filling, hydrological interruption, or discharge, on any species, natural community, or habitat, including candidate, sensitive, or special-status species identified in local or regional plans, policies, regulations or conservation plans (including protected wetlands or waters, critical habitat, essential fish habitat (EFH)); or as identified by the CDFW, USFWS, or NMFS; or
- Threaten to eliminate a marine plant or animal wildlife community or cause a fish or marine wildlife population to drop below self-sustaining levels; or cause modification of breeding, feeding or sheltering behavior; or
- Interfere substantially with the movement of any native resident or migratory fish or marine wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native marine wildlife nursery sites.

Based on the location and nature of the proposed project, the following criteria are not considered in the impact analyses in Sections 4.5.5.1 and 4.5.5.2 for the reasons described below.

- ***Introduce or spread an invasive non-native species***. Implementation of the MPSWP would not involve any construction or operational activities that would require the use of ocean vessels, and would not involve the temporary or permanent placement of any facilities in the Monterey Bay or adjacent harbors. Therefore, implementation of the proposed project would not have a means of introducing or relocating non-native invasive marine species. This criterion is not applicable to the proposed project and is not discussed further.

4.5.4 Approach to Analysis

Three aspects of the proposed project have the potential to adversely affect marine biological resources: (1) noise from the construction of the subsurface slant wells; (2) operation of the subsurface slant wells as it relates to impingement; and (3) operational discharges of brine generated by the MPWSP desalination plant via the MRWPCA existing ocean outfall. As discussed in Chapter 3, Description of the Proposed Project, the proposed slant wells would be located approximately 2 miles south of the Salinas River in the CEMEX active mining area in northern Marina. Nine new permanent slant wells would be installed from the shore using a dual rotary drilling rig. The slant wells would extend beneath the coastal dunes, sandy beach, and sandy subtidal (surf zone)[7] habitats of Monterey Bay, terminating up to 350 feet seaward of mean high water (MHW) at a depth of 190 to 210 feet below the seafloor in the submerged lands of MBNMS.

The desalination process would generate an average of approximately 14 mgd of brine that would be discharged through the existing MRWPCA ocean outfall. The outfall currently is and would continue to be used to discharge treated wastewater effluent from the MRWPCA Regional Wastewater Treatment Plant. The outfall terminates at an underwater diffuser located approximately 2 miles offshore (relative to MHW) at 90 to 110 feet below mean sea level where a soft mud substrate predominates.

The evaluation of whether the proposed project would result in substantial adverse effects considers three principal factors:

- Magnitude and duration of the impact (e.g., substantial/not substantial);
- Rarity of the affected resource; and
- Susceptibility of the affected resource to disturbance.

The evaluation of significance must also consider the interrelationship of these three factors. For example, a relatively small magnitude effect on a state or federally listed species could be considered significant if the species is rare and highly susceptible to potential disturbances resulting from the proposed project. Conversely, for a natural community that is not considered rare or particularly sensitive to disturbance, such as soft substrate benthos, an impact of much larger magnitude and/or longer duration would be required to result in a significant impact determination.

Underwater noise generated during slant well construction could result in impacts on marine biological resources. The potential underwater noise impacts on marine biological resources from slant well drilling were evaluated based upon reported sensitivities of marine organisms to frequency (pitch) and amplitude (decibel) and the reported disturbances from other similar operations, compared to underwater noise that would be generated by the proposed project.

Impacts on marine biological resources arising from slant well operations due to potential impingement of marine organisms and particulate material were evaluated using reports on the speeds of wave-induced and ambient ocean currents, and the velocity of water being drawn through the seafloor to the slant wells. Ocean current and organism swimming speeds were compared to the anticipated velocity of the subsurface slant wells at the seafloor to determine the probability of impingement of organisms and particulate material against the seafloor.

[7] a high wave energy environment

Impacts from elevated salinity and shear stress on marine biological resources due to brine discharge were also evaluated. Predicted discharge salinities were evaluated against Ocean Plan (SWRCB, 2015) thresholds (salinity no more than 2 ppt above background at the edge of the BMZ) and the results of toxicity tests and other experiments, as well as the recommendations of various commissions and working groups convened to set guidelines for desalination facilities. Elevations in ocean salinities above ambient salinity levels due to the discharge of brine from the proposed project were evaluated using several models that predicted salinity at the edge of the Zone of Initial Dilution (ZID) and at the Brine Mixing Zone (BMZ) during three oceanographic seasons (Davidson, upwelling and oceanic) under generally prevailing water temperatures and salinities. See also Section 4.3, Surface Water Hydrology and Water Quality, for the complete discussion on the approach to this analysis, and the effects of the brine discharge on ocean water quality resulting from the proposed project. These modeled salinities were compared to studies on the effects of elevated salinity on marine organisms. Potential impacts on marine organisms due to shear stress associated with the brine discharge through the MRWPCA outfall were also evaluated based upon the hydrodynamics of the current and proposed discharge scenarios (see Appendix D1).

Potential impacts on marine taxa from exposure to elevated concentrations of other select constituents in the effluent estimated at the edge of the ZID, are based on published toxicity data and the Ocean Plan water quality objectives that specify concentrations above which marine life could be at risk. In cases where the estimated concentrations of the constituents in the discharge could be near or above Ocean Plan objectives, actual toxicity data were obtained from available sources. Conservative estimates of contaminant concentrations were made using a combination of ocean water data obtained from the Central Coast Long-term Environmental Assessment Network (CCLEAN) and high-volume samples collected from the test slant well on the CEMEX property. Estimates based on CCLEAN data assumed the entire mass of contaminants in seawater drawn into the MPWSP Desalination Plant would be concentrated and returned to the ocean in the brine.

4.5.5 Direct and Indirect Effects of the Proposed Project

Direct and indirect effects of the proposed project are considered in the following sections. Consideration is given to those project elements that would have an effect on marine biological resources, marine habitats, and MBNMS resources as a result of the intake of desalination source water or the discharge of brine from the desalination process. Accordingly, drilling of the slant wells is the only construction activity that is considered here. The operational aspects considered are the operation of the wells and the discharge of brine. Impacts on marine biological resources that could result from implementation of water quality mitigation, such as retrofitting discharge diffuser ports to improve dilution, are discussed in Section 4.3, Surface Water Hydrology and Water Quality.

A summary of project impacts on marine biological resources is provided in **Table 4.5-5**.

TABLE 4.5-5
SUMMARY OF IMPACTS – MARINE BIOLOGICAL RESOURCES

Impacts	Significance Determinations
Impact 4.5-1: Result in a substantial adverse effect, either directly or through habitat modifications, including direct disturbance, removal, filling, hydrological interruption, or discharge, on any marine species, natural community, or habitat, including candidate, sensitive, or special-status species identified in local or regional plans, policies, regulations or conservation plans (including protected wetlands or waters, critical habitat, essential fish habitat (EFH); or as identified by the CDFW, USFWS, and/or NMFS during construction.	LS
Impact 4.5-2: Threaten to eliminate a marine plant or animal wildlife community or cause a fish or marine wildlife population to drop below self-sustaining levels during construction; or cause modification of breeding, feeding or sheltering behavior.	LS
Impact 4.5-3: Interfere substantially with the movement of any native marine resident or migratory fish or marine wildlife species or with established native resident or migratory marine wildlife corridors, or impede the use of native marine wildlife nursery sites during construction.	LS
Impact 4.5-4: Result in a substantial adverse effect, either directly or through habitat modifications, including direct disturbance, removal, filling, hydrological interruption, or discharge, on any marine species, natural community, or habitat, including candidate, sensitive, or special-status species identified in local or regional plans, policies, regulations or conservation plans (including protected wetlands or waters, critical habitat, essential fish habitat (EFH); or as identified by the CDFW, USFWS, and/or NMFS during operations.	LS
Impact 4.5-5: Threaten to eliminate a marine plant or animal wildlife community or cause a fish or marine wildlife population to drop below self-sustaining levels during operations.	LS
Impact 4.5-6: Interfere substantially with the movement of any native marine resident or migratory fish or marine wildlife species or with established native resident or migratory marine wildlife corridors, or impede the use of native marine wildlife nursery sites during operations.	LS
Impact 4.5-C: Cumulative impacts on marine biological resources.	LS

NOTES:
LS = Less than Significant

4.5.5.1 Construction Impacts

The subsurface slant wells are the only project components that would involve construction in or near the marine biological resources study area (see Figure 4.5-1). Since none of the other project facilities would require construction in the marine biological resources study area, construction of the other project facilities would not directly or indirectly affect marine biological resources and are not discussed below. Marine birds, anadromous fish, and inland fish are addressed in Section 4.6, Terrestrial Biological Resources.

Impact 4.5-1: Result in a substantial adverse effect, either directly or through habitat modifications, including direct disturbance, removal, filling, hydrological interruption, or discharge, on any marine species, natural community, or habitat, including candidate, sensitive, or special-status species identified in local or regional plans, policies, regulations or conservation plans (including protected wetlands or waters, critical habitat, essential fish habitat (EFH); or as identified by the CDFW, USFWS, and/or NMFS during construction. (*Less than Significant*)

Underwater noise from the drilling operation itself, the potential accidental release of drilling fluid, and the possible discharge of clarified[8] groundwater recovered during drilling operations are the only possible construction activities that could affect marine biological resources and habitats.

The directional drilling of the slant wells would generate some subterranean noise that would transmit into seafloor sediments, including into the submerged lands of the MBNMS. What little underground drilling or tunneling noise data that is available is for tunnel boring machines (TBM), which are used to dig large-diameter transportation and water conveyance tunnels and would not be used for slant well construction. TBM equipment is fully located within the borehole or tunnel and all noise generating equipment, including drilling motors, cutter heads, drilling fluid recirculating pumps, etc. are located within the tunnel as well. As discussed in Chapter 3, Description of the Proposed Project, Section 3.3.2.1, all construction activities associated with the subsurface slant wells would occur several hundred feet inland of the maximum high-tide elevation, in previously disturbed areas. Most of the slant well noise-generating equipment would be located on the land surface outside of MBNMS, and the only down hole noise source during the 24-month construction period would be the cutter head and drilling fluid recirculating pump. As a result, the noise generated from TBM operations can be expected to be substantially higher than that generated by the cutter head for the proposed subsurface slant wells.

The San Francisco Public Utilities Commission drilled a 5-mile-long, 9-foot-diameter tunnel under San Francisco Bay. A TBM was used to drill the tunnel located approximately 125 feet below the San Francisco Bay seafloor. Wilson, Ihrig, and Associates calculated noise levels generated by normal cutting operations from the TBM inside the tunnel to range between 122 to 129 decibels (dB) root-mean-square,[9] at a frequency of 30 to120 hertz (Hz), with occasional peak levels at 134 dB at the bottom of the bay (Wilson Ihrig, and Associates, et al 2009).

The thickness of overlying sediments for the proposed project is greater than for the TBM operations under San Francisco Bay (i.e., 195 to 200 feet versus 125 feet in San Francisco Bay), and would act to further muffle transmitted underwater noise. Underwater noise attenuates through water-saturated sediments in proportion to the frequency of the sound waves (Hefner and Williams, 2004). Assuming a worst-case noise level equal to the noise generated by TBM (129 dB at 30 Hz) is emitted in a slant well, the drilling noise would attenuate at the rate of approximately 2.5 dB per meter (per 3.28 feet), potentially resulting in 144 dB of sound being attenuated through 190 feet (approximately 58 meters) and reaching zero by the time it reaches the seafloor surface. Measurements by Wilson et al (1997) found that underwater surf noise offshore of the former Fort Ord area in Monterey Bay, near the proposed slant well site, averaged 138 dB at 50 Hz and Farber and Wilson (1997).

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8 Clarified Water: Water that has been processed to remove suspended sediments and is therefore "clear" and when discharged to the ocean will not result in increased turbidity.

9 Root-mean-square: The square root of the average over a period of time of the square of the amplitude. The root-mean-square level is often used to correlate the effects of sound and vibration on humans and mammals. Decibels reported in this section are hydroacoustic (underwater) decibels. Unlike airborne decibels used in the analysis of Section 4.12, Noise and Vibration, which are referenced to 20 micro Pascals, all underwater sound levels are referenced to 1 micro Pascal. Consequently, underwater sound levels are typically 26 dB higher than airborne levels because of the different reference levels as well as an additional 34 A-weighted decibels (dBA) higher due to the higher impedance of water.

In the event that some underwater noise reaches the seafloor surface, scientific investigations on the potential effect of underwater noise on fish indicate that sound levels below 183 to 187 dB do not appear to result in any acute physical damage or mortality to fish (barotraumas) depending on their size (Dalen and Knutsen, 1986; Caltrans, 2009). A startle response in salmon has been documented to occur at underwater sound levels of 140 to 160 dB (San Luis and Delta Mendota Water Authority and C.H. Hanson, 1996). Additionally, underwater noise levels greater than 160 dB are presumed to result in behavioral effects, temporary hearing loss, or permanent hearing loss depending on the species and the nature of the source (NMFS, 2016). **Table 4.5-6** provides a summary of some known acute and sub-lethal effects of underwater noise on fish and marine mammals. **Table 4.5-7** presents underwater noise levels at which NOAA has determined that both acute and sub-lethal effects occur for different groupings of marine mammals. Any of the drilling noise reaching overlying ocean waters is expected to be below background underwater noise levels and would have no effect on any marine organisms including special-status species.

The degradation of water quality resulting from the discharge of water produced during well drilling and well development is addressed in Impact 4.3-2, in Section 4.3, Surface Water Hydrology and Water Quality. Drilling of the subsurface slant wells would involve the use of water, bentonite mud, and/or the use of environmentally inert biodegradable additives to push the drill rig through the uppermost layer of dry dune sands as described in Section 3.3.2.1. Once the drill bit reaches groundwater, the mud slurry from the upper 100 feet of drilling would be pumped out and put it in a storage container for offsite hauling and disposal. Beyond this point only the water already present in the sand and potable water would be used to circulate the drill cuttings. Once the borehole and the casing and gravel pack have been installed, potable water would be circulated through the well casing to develop the well. The effluent produced during well development, which may contain soil cuttings and formation water (water present at depth in geologic materials), would be pumped to baker tanks to allow sediment to settle out. The clarified effluent would then either be conveyed to the existing discharge pipeline for the test slant well and discharged to the ocean via the MRWPCA ocean pipeline and outfall in or percolated into the ground at the CEMEX active mining area. The discharge of any clarified waters from slant well drilling through the MRWPCA outfall would be in compliance with the existing NPDES permit and Ocean Plan water quality objectives for turbidity and would not cause any impact on marine biological resources or habitats, including special status species and sanctuary resources in MBNMS.

The potential for the inadvertent release of drilling fluids into ocean waters during drilling of the slant wells would be very low, because these environmentally inert, biodegradable drilling additives or sand-bentonite mud slurry would only be used while drilling the initial 100 feet of loose dry sand, above the water table. After that point in the HDD bore, only potable water would be used to circulate and remove drill cuttings. Since the risk of accidentally discharging drilling fluids to the marine environment from HDD slant wells would be very low and the use of these additives is common practice, the potential impact from HDD slant well drilling and circulation fluids would be less than significant. Moreover, the bentonite slurry would be contained and properly disposed of offsite, as discussed in Section 4.3, Surface Water Hydrology and Water Quality.

TABLE 4.5-6
POTENTIAL EFFECTS OF VARYING UNDERWATER NOISE LEVELS ON FISH

Taxa	Sound Level (dB)	Effect	Reference
Fish			
All fish > 2 grams in size	206 peak 187 (SEL)	Acute Barotraumas	Fisheries Hydroacoustic Working Group, 2008 (Caltrans, 2009)
All fish < 2 grams	186 (SEL)	Acute Barotraumas	Fisheries Hydroacoustic Working Group, 2008 (Caltrans, 2009)
Pacific Herring	180-186	Avoidance behavior	Dalen and Knutsen, 1986
Salmon, steelhead	166	Avoidance behavior	Loeffelman et al., 1991
Salmon, Steelhead	140-160	Startle response	San Luis and Delta Mendota Water Authority and C.H. Hanson, 1996

TABLE 4.5-7
SUMMARY OF NOAA ESTABLISHED PERMANENT THRESHOLD SHIFT (PTS)[1] AND TEMPORARY THRESHOLD SHIFT (TTS)[2] SOUND LEVELS[3] FROM UNDERWATER NOISE LEVELS FOR MARINE MAMMALS

Hearing Group	Impulsive[4]	Non-impulsive[5]
Low-Frequency (LF) Cetaceans (Baleen whales)	$L_{pk,\ flat}$: 219 dB $L_{E,}L_{F,24H:}$ 183 dB	$L_{E,}L_{F,24H:}$ 199 dB
Mid-Frequency (MF) Cetaceans (Dolphins, toothed whales, beaked whales, bottlenose dolphins)	$L_{pk,\ flat}$: 230 dB $L_{E,}L_{F,24H:}$ 185 dB	$L_{E,}L_{F,24H:}$ 198 dB
High-Frequency (HF) Cetaceans (True porpoises, Kogia, river dolphins, cephalohynchid, Lageniorhynchus cruciger, and L. asustralis)	$L_{pk,\ flat}$: 202 dB $L_{E,}L_{F,24H:}$ 155 dB	$L_{E,}L_{F,24H:}$ 173 dB
Phocid Pinnipeds (True Seals) (Underwater)	$L_{pk,\ flat}$: 218 dB $L_{E,}L_{F,24H:}$ 185 dB	$L_{E,}L_{F,24H:}$ 201dB
Otariid Pinnipeds (Sea lions and fur seals) (Underwater)	$L_{pk,\ flat}$: 232 dB $L_{E,}L_{F,24H:}$ 203 dB	$L_{E,}L_{F,24H:}$ 219 dB

NOTES:
1 Permanent Threshold Shift is when a permanent reduction in hearing occurs or the frequencies at which sound can be detected is permanently reduced.
2 Temporary Threshold Shift is when a short-term (temporary) reduction in hearing or the frequency at which sound can be detected occurs.
3 Peak sound pressure (*L*pk) has a reference value of 1 µPa, and cumulative sound exposure level (*L*E) has a reference value of 1µPa^{2}s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.
4 Impulsive noise is a category of noise which includes unwanted, almost instantaneous sharp sounds.
5 All noise not included in the definition of impulsive noise

SOURCE: NMFS, 2016

Impact Conclusion

Underwater noise generated during slant well drilling would be attenuated to zero at the seafloor and would have no impact during construction on marine biological resources in MBNMS. Additionally, because the drilling operation would be set back approximately 900 feet from MHW and the construction contractor would manage drilling muds and potential discharges of clarified groundwater in accordance with regulatory requirements, the potential for an accidental release of any hazardous drilling fluids into waters of MBNMS, or increased turbidity in Monterey Bay during slant well construction, would be less than significant. No impacts would occur from the construction of any other proposed facility because none occur within the marine biological resources study area. Therefore, this impact is considered to be less than significant.

Mitigation Measures

None proposed.

Impact 4.5-2: Threaten to eliminate a marine plant or animal wildlife community or cause a fish or marine wildlife population to drop below self-sustaining levels during construction; or cause modification of breeding, feeding or sheltering behavior. *(Less than Significant)*

As discussed for Impact 4.5-1, the potential for underwater noise, ocean discharge of clarified groundwater, or the accidental release of well drilling fluids to result in effects on marine biological resources or habitats would be less than significant. These activities are not expected to cause a fish or marine wildlife population to drop below self-sustaining levels or cause modification of their breeding, feeding or sheltering behavior. Therefore, the evaluation of impacts from drilling fluids, discharge of clarified ground water, and noise on marine species in MBNMS would be the same as for Impact 4.5-1; less than significant.

Mitigation Measures

None proposed.

Impact 4.5-3: Interfere substantially with the movement of any native marine resident or migratory fish or marine wildlife species or with established native resident or migratory marine wildlife corridors, or impede the use of native marine wildlife nursery sites during construction. *(Less than Significant)*

As discussed for Impact 4.5-1, there is little to no potential for underwater noise, ocean discharge of clarified groundwater, or the accidental release of well drilling fluids to interfere with the movement of any native marine resident or migratory fish or marine wildlife species in MBNMS because the drilling activities would occur onshore and extend under the seafloor. Therefore, the impact would be less than significant.

Mitigation Measures

None proposed.

4.5.5.2 Operational and Facility Siting Impacts

Potential operational impacts on marine biological resources would be limited to adverse effects associated with operation of the subsurface slant wells and the discharge of brine generated at the proposed MPWSP desalination plant. Because none of the other project facilities would affect marine biological resources, none of the other facilities are discussed.

Impact 4.5-4: Result in a substantial adverse effect, either directly or through habitat modifications, including direct disturbance, removal, filling, hydrological interruption, or discharge, on any marine species, natural community, or habitat, including candidate, sensitive, or special-status species identified in local or regional plans, policies, regulations or conservation plans (including protected wetlands or waters, critical habitat, essential fish habitat (EFH); or as identified by the CDFW, USFWS, and/or NMFS during operations. (*Less than Significant*)

Impacts on marine species during MPWSP operations as a result of the impingement of organisms or through the accumulation of fine particulate material on the seafloor, from elevated salinity or other constituents in the brine, or from shear stress[10] on plankton from discharged brine were evaluated. The risk was also assessed for indirect impacts caused by loss of foraging habitat and prey species on protected species such as marine mammals (for example, the Southern sea otter and California gray whale), seabirds, and other species, should the benthic infauna and macrofauna populations decline.

Impingement of Marine Organisms on the Seafloor

A key and fundamental concern about desalination facilities is the potential for the impingement[11] and entrainment[12] of marine organisms during the intake of seawater. The MPWSP would utilize subsurface slant wells that would terminate 190 to 210 feet below the seafloor, eliminating the need for an open ocean intake. Subsurface intakes are thought to eliminate impingement impacts on marine biota by utilizing a broad surface of seafloor through which seawater is drawn at a slow rate (Foster et al, 2013). A Draft Staff Report prepared by the SWRCB in support of the proposed Ocean Plan amendment addressing desalination facilities notes:

> Subsurface intakes collect water through sand sediment, which acts as a natural barrier to organisms and thus eliminates impingement and entrainment (MWDOC 2010; Missimer et al. 2013; Hogan 2008; Pankratz 2004; Water Research Foundation 2011). This gives subsurface intakes a significant environmental advantage over surface (or open) water

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[10] Shear stress is a strain in the structure of a substance produced by pressure, when its layers are laterally shifted in relation to each other.
[11] Impingement occurs when organisms are trapped by the force of the flowing source water.
[12] Entrainment occurs when marine organisms enter the desalination plant intake, are drawn into the intake system, and pass through to the treatment facilities.

> intakes because mitigation for surface intake entrainment will have to occur throughout the operational lifetime of the facility. (SWRCB, 2015)

The vertical infiltration rate at the seafloor for the proposed MPWSP was estimated by assuming the entire 24.1 mgd (3,222,000 cubic feet/day) of seawater required to operate the MPWSP plant would be drawn through the seafloor located directly above the screened segment of the slant wells. The length of shoreline spanned by intake slant wells would be approximately 2,000 feet. If the seafloor area of water intake extended 500 feet offshore, the area of seafloor through which seawater would be taken into the wells would be approximately 1,000,000 square feet. Through this area of seafloor, a maximum of 3,222,000 cubic feet (24.1 million gallons x 0.1337 cubic feet per gallon) of water would be pumped each day. The vertical infiltration rate through the seafloor would have to be 3.222 feet/day or 0.0000373 ft/sec (approximately 0.011 mm/sec). This calculation is very similar to the 0.000051 ft/sec (approximately 0.016 mm/sec) peak vertical infiltration rates estimated by Williams (2010) for the South Orange Coastal Desalination Project. In comparison, an open ocean intake equipped with a wedgewire screen would draw water in at a rate of 0.5 ft/sec (152.4 mm/sec). For the purposes of this assessment, it is assumed that the infiltration flow rate of seawater through seafloor sediments and into the slant wells would be approximately 0.011 to 0.016 mm/sec.

A review of published swimming speeds for plankton, larval invertebrates, and larval fish reveals that it is highly unlikely these small organisms would be impinged against the seafloor by vertical infiltration of seawater during operation of the subsurface slant wells. Studies of invertebrate plankton have found swimming speeds substantially exceed the estimated vertical infiltration rate for the MPWSP slant wells (see **Table 4.5-8**) by several orders of magnitude. Because squid spawning typically occurs on sand and mud seafloor habitats at depths much deeper than the intertidal zone where slant wells would be located, potential impacts on market squid eggs from slant well pumping would not occur. Therefore, no impingement from slant well operations is expected to occur.

TABLE 4.5-8
SWIMMING SPEEDS OF PLANKTON, INVERTEBRATES, AND LARVAL FISH

Source	Organism	Swimming Speed[a]
Franks (1992)	Phytoplankton and Protozoa	M = 0.2 mm/sec
Buskey et al (2002)	Pelagic copepod	M = 500 mm/sec
Browman et al (2011)	Pelagic copepod	M = 48.9mm/sec A = 34.3 mm/sec
Gallager et al (2004)	Pelagic copepods and protozoa	M = 12.9 mm/sec
Torres and Childress (1983)	Euphausiid	R = 2.2 – 15.8 mm/sec
Chan et al (2013)	Gastropod larvae	R = 0.5 – 3.5 mm/sec
Paris et al (2013)	Reef fish larvae	A = 14.5 mm/sec
Humphrey (2011)	Larval lake trout	M = 150 – 250 mm/sec
Fisher (2005)	Larval reef fishes	R = 200 – 600 mm/sec

NOTES:
[a] = M = Maximum reported swimming speed, A = Average reported swimming speed, R = Range of reported swimming speeds

Impingement of Organic Material on the Seafloor

Even though impingement of plankton and larval fish is not expected to occur from the intake of ocean water into the slant wells, the operation of the slants wells could impinge fine organic matter against the seafloor, cause a build-up and change the normal distribution of sediment grain size. The settlement of sediment particles is controlled by the size and density of the particles and the median grain size of ambient sediments is roughly proportional to local current speeds (Van Rijn, 2007; McCave, 2008). At infiltration rates greater than 30 cm/sec (0.98 ft/sec), seafloor sediments are very mobile and typically do not retain fine particle fractions (McCave, 2008). Various studies have documented that nearshore currents at the seafloor are dominated by the orbital velocities of waves. Graham et al (1997) reported estimated orbital velocities of ocean waters due to surface waves at three nearshore kelp forest sites around the Monterey Peninsula ranging between 500 cm/sec (16.4 ft/sec) and 280 cm/sec (9.2 ft/sec). Additionally, wave orbital velocities attenuate due to friction against the seafloor as the waves near the shore. Weltmer (2003) measured orbital velocities near the seafloor in the surf zone near Sand City between 250 cm/sec (8.2 ft/sec) and 600 cm/sec (19.7 ft/sec). Consequently, normal wave generated water velocities at the seafloor locations of the slant wells is predicted to be 8 to 20 times greater than that required for fine-grained material to accumulate on the seafloor over the subsurface slant wells. As a result, there would be no potential for the impingement of fine organic matter on the seafloor or changes to soft substrate habitat.

Potential Effects of Elevated Salinity

The desalination process would generate approximately 14 mgd of brine that would be discharged via the MRWPCA ocean outfall into the waters of MBNMS. The outfall is currently used to discharge secondary treated wastewater from the MRWPCA Regional Wastewater Treatment Plant. The comingling and discharge of this brine could have an effect on special-status species that frequent the study area (see **Table 4.5-1**), especially bottom dwelling or foraging fish, including MSA and state-managed commercial fish species (see **Table 4.5-4**) and marine mammals such as the Southern sea otter and California gray whale, that feed on benthic organisms. The discharged brine, if concentrated enough, could also result in the loss of foraging habitat if the benthic infauna and macrofauna populations decline. Additionally, comments received on the April 2015 Draft EIR expressed concerns over the potential for hypoxia[13] to occur near the seabed as a result of proposed MPWSP operational discharges. Specifically, there was concern that high salinity discharges from the MRWPCA outfall would restrict oxygen supply near the seabed and result in stress or mortality to benthic organisms and other marine biological resources. This issue is discussed in detail in Section 4.3, Surface Water Hydrology and Water Quality, and a summary of the impact conclusions is provided below.

As explained in detail in Section 4.3, the seawater in Monterey Bay is a mixture of water masses from different parts of the Pacific Ocean with warmer, saltier water from the equatorial zone and colder, fresher water from the arctic regions. Near-shore surface salinities vary from 33.2 practical salinity units (psu) to 34.0 psu when upwelling is strong. Streams and rivers can locally

[13] Hypoxia, or oxygen depletion, is an environmental phenomenon where the concentration of dissolved oxygen in the water column decreases to a level that can no longer support living aquatic organisms. The impacts of hypoxia are often described as creating a so-called "dead zone" in the marine environment.

affect salinity, but even during flood conditions, when fresh water inputs to Monterey Bay peak, the salinity of Monterey Bay surface waters does not fall below 31 psu (MBNMS, 2013). Bograd and Lynn (2003) compared near-shore salinity and temperatures in Monterey Bay during two periods: 1950-1976 and 1977-1999, and found very little variation. The difference in near-shore salinities between the periods was approximately 0.2 parts per thousand (ppt) or psu and the difference in near-shore temperatures was approximately 1.4 °F. As such, the reported seasonal salinity and temperature is provided here as representative of baseline conditions. The 2015 Ocean Plan amendment established an allowable salinity increase of less than 2 ppt at the BMZ boundary (SWRCB, 2015). Exceeding this standard could result in a significant impact on fish and marine biota.

Dissolved Oxygen (DO) is typically used as a general index for the health of receiving waters (such as in the *Water Quality Control Plan for Ocean Waters of California* or Ocean Plan, discussed in Section 4.3.2.2). Adequate DO is vital for aquatic life and higher concentrations are generally considered to be desirable. Dissolved oxygen content in water is, in part, a function of water temperature and salinity, which affect the point at which water becomes saturated with DO. However, DO varies according to many other factors, including photosynthesis and biological and chemical oxygen demand associated with decomposition of organic material. Monterey Bay is a dynamic environment that includes variable concentrations of DO. Ambient DO levels in Monterey Bay at a depth of approximately 100 feet have ranged from 4.25 milligrams per liter (mg/L) to 8.00 mg/L (KLI, 1998, 1999); typically, DO in the range of 5 to 8 mg/L is considered protective of fish and marine biota depending on the species and life-stage. The Ocean Plan limits dissolved oxygen decreases as a result of operational discharges to no more than 10 percent from that which occurs naturally. Exceeding this standard for dissolved oxygen could result in a significant impact on fish and marine biota.

Elevated salinity and subsequent degradation of the marine environment are among the major concerns associated with coastal desalination projects (Damitz et al, 2006). Numerous studies have been performed to evaluate the effects of elevated salinity on marine organisms found within and outside of the study area in MBNMS, which have used different methods to test the sensitivity of various species. These studies have demonstrated that salinity effects are species-specific (see **Table 4.5-9**). Review of published results from field surveys and laboratory experiments (Roberts et al, 2010) indicate no studies have examined the impacts from the small range of salinity increases anticipated from the MPWSP desalination plant. As analyzed in detail in Section 4.3, except for the area adjacent to the discharge ports, the predicted salinity increase due to the MPWSP would be less than 2 ppt above ambient (increasing salinity up to 36.8 ppt) and the other studies tested organisms at much higher salinities. Moreover, there were apparent contradictions among different studies. For example, one field experiment cited by Roberts et al (2010) indicated reduced survival, shoot production, and vigor of seagrass transplants at salinities at or above 39.2 ppt (4 percent above ambient), whereas a laboratory experiment found another species of seagrass to have greatest growth and production at a salinity of 42.5 ppt. Although seagrass is not found in the study area, these conflicting results exemplify the limited applicability of data from other areas. A study of salinity effects based on approved marine organism toxicity test protocols (Phillips et al, 2012) reported median effect concentrations (EC50) ranging from 36.8 ppt to 61.9 ppt on various physiological processes (see **Table 4.5-10**).

TABLE 4.5-9
RESULTS FROM STUDIES ON THE EFFECTS OF ELEVATED SALINITY ON MARINE ORGANISMS

Author, Year	Species	Salinity Tested	Results	Comments
Pantell, 1993	*Menidia beryllina* (inland silverside)	23:1 SF Bay water:Brine 20:1 POTW Effluent:Brine	Mortality observed at greater brine concentrations	Freshwater species, dilutions of ambient samples tested without absolute salinities reported
	Skeletonema costatum (diatom)	23:1 SF Bay water:Brine 20:1 POTW Effluent:Brine	Growth effects observed at greater brine concentrations	Marine species, test salinities not reported
	Bivalve larvae	23:1 SF Bay water:Brine 20:1 POTW Effluent:Brine	Development effects observed at greater brine concentrations	Species not specified, dilutions of ambient samples tested without absolute salinities reported
	Citharichthys stigmaeus (sand dab)	23:1 SF Bay water:Brine 20:1 POTW Effluent:Brine	Mortality observed at greater brine concentrations	Local sand bottom species, dilutions of ambient samples tested without absolute salinities reported
Gross, 1957	*Pachygrapsus* (rock crab)	61 ppt 56 ppt	Lethal in 2 hours Survived > 72 hours	Locally found, but only in rocky habitats
	Emerita analoga (sand crab)	50 ppt 44 ppt	Lethal in 2 hours Survived > 24 hours	Local sand bottom species
	Olivella pycna (olive snail)	33 to 48 ppt	Not lethal	Local sand-bottom species, report unavailable for this evaluation
Iso et al, 1994	*Venrupis philippinarum* (little neck clams)	Various up 70 ppt	Survived and behaved normally at 50 ppt, lethal at 60 ppt after 48 hours and at 70 ppt after 24 hours	Grown commercially in California
	Pagrus major (sea bream)	Various up 70 ppt	Survived well in 45 ppt, behaved normally at 40 ppt, > 70 ppt lethal in 1 hour	Not found locally
	Pseudopleuronectes yokohamae (marbled flounder)	Various up 70 ppt	Egg hatching delayed but successful up to 60 ppt, larvae survived up to 50 ppt, 55 ppt lethal after 140 hours	Not found locally
McMillan and Mosely, 1967	Seagrass	Up to 74 ppt	Four species grew	No seagrasses in vicinity of proposed project, reference unavailable for this review
Pillard et al, 1999	*Mysidopsis bahia*	43 ppt	LC50 = 48 hours	Estuarine species
	Cyrpinidon variegates	70 ppt	LC50 = 48 hours	Estuarine species
	Menidia beryllina	44 ppt	LC50 = 48 hours	Estuarine species
Voutchkov, 2006	*Dendraster excentricus* (sand dollar)	37 to 40 ppt	Survived for 5.5 months, no effects on growth or fertility	Local sand-bottom species, reference unavailable for this review
	Strongylocentrotus purpuratus (purple urchin)	37 to 40 ppt	Survived for 5.5 months, no effects on growth or fertility	Local, but only in rocky habitats, reference unavailable for this review
	Haliotus rufescens (red abalone)	37 to 40 ppt	Survived for 5.5 months, no effects on growth or fertility	Rare locally, only found in rock habitats, reference unavailable for this review

TABLE 4.5-9 (Continued)
RESULTS FROM STUDIES ON THE EFFECTS OF ELEVATED SALINITY ON MARINE ORGANISMS

Author, Year	Species	Salinity Tested	Results	Comments
Reynolds et al, 1976	*Leuresthes tenuis* (California grunion prolarvae)	41 ppt	LC50 = 24 hours	Southern California species
	Leuresthes tenuis (larvae)	40 ppt	LC50 = 18 hours	Southern California species
SCCWRP, 1993	*Macrocystis pyrifera* spores (giant kelp)	43 ppt	Germination and growth not affected	Locally found, but not found for miles around the proposed project
	Rhepoxynius abronius (amphipod)	38.5 ppt	Survived 10 days	Local
	Strongylocentrotus purpuratus (purple urchin)	90:10 Seawater:Brine	No effect on fertilization	Local, but only in rocky habitats, test salinities not reported
Thessen et al, 2005	*Pseudo-nitzschia* spp. (diatom)	Up to 45 ppt	7 clones of 3 species grew up to 45 ppt	Local, species of *Pseudo-nitzschia* cause domoic acid poisoning

SOURCE: Pantell, 1993; Gross, 1957; Iso et al, 1994; McMillan and Moseley, 1967; Pillard et al, 1999; Voutchkov, 2006; Reynolds et al, 1976; SCCWRP, 1993; Thessen et al, 2005.

TABLE 4.5-10
TOXICITY TEST RESULTS AND MEAN EFFECTIVE CONCENTRATIONS OF SALINITY TOXICITY

Protocol	Physiological Process Measured	Test	Measured Test Solution Salinities	EC50[a]
Red Abalone	Development	1 2	34, 35, 36, 37, 38, 39, 40 34, 35, 36, 37, 38, 39, 40	36.8
Purple Urchin	Fertilization	1 2	34, 36, 38, 39, 41, 43, 45, 46, 48 34, 38, 41, 42, 43, 44, 45, 46, 47	44.2
Purple Urchin	Development	1 2	34, 35, 36, 37, 38, 39, 40, 41, 42 34, 35, 36, 37, 38, 39, 40, 41, 42	38.1
Sand Dollar	Fertilization	1 2	35, 38, 39, 41, 43, 45, 47, 48, 50 34, 36, 38, 40, 41, 43, 45, 46, 48	40.3
Sand Dollar	Development	1 2	34, 35, 36, 37, 38, 39, 40, 41, 42 34, 35, 36, 37, 38, 39, 40, 41, 42	39.6
Mussel	Development	1 2	34, 40, 41, 42, 43, 44, 45, 46, 47 35, 40, 41, 42, 44, 45, 46, 47, 48	43.3
Mysid Shrimp	Survival	1 2	35, 41, 45, 50, 56, 61 37, 42, 45, 49, 53, 56	47.8
Mysid Shrimp	Growth	1 2	35, 41, 45, 50, 56, 61 37, 42, 45, 49, 53, 56	> 49.7
Giant Kelp	Germination	1 2	34, 45, 49, 54, 59, 64 35, 44, 49, 54, 59, 65	55.5
Giant Kelp	Growth	1 2	34, 45, 49, 54, 59, 64 35, 44, 49, 54, 59, 65	47.3
Topsmelt	Survival	1 2	35, 45, 50, 55, 60, 65, 70 35, 44, 50, 54, 60, 65, 70	61.9
Topsmelt	Biomass	1 2	35, 45, 50, 55, 60, 65, 70 35, 44, 50, 54, 60, 65, 70	59.3

NOTE:
[a] EC50 = median salinity at which an effect was observed

SOURCE: Phillips et al 2012

Studies of salinity tolerances of organisms not within the context of toxicity tests also inform this analysis of potential impacts associated with brine discharge. In particular, market squid, *Doryteuthis (Loligo) opalescens* must be considered because their egg masses rest on the seafloor. A review by Vidal and Boletzky (2014) recommends a salinity range of 34 to 38 ppt for successful laboratory culture of the market squid. In an earlier publication, Boletzky (2004) suggested an ideal range of 32 to 38 ppt for most cephalopods. Thus, market squid appear to have a broad tolerance to salinity. Other species of concern (see Table 4.5-2) are motile and would be able to avoid areas of elevated salinity in the immediate vicinity of the brine discharge.

The 2015 Ocean Plan amendment established an allowable salinity increase of less than 2 ppt at the BMZ boundary (SWRCB, 2015); this is comparable to other international regulatory guidelines (see **Table 4.5-11**). This incremental salinity increase limit, however, is a conservative threshold for marine organisms, as none of the studies reviewed in the discussion above (see **Table 4.5-9**) found adverse effects on survival, growth, or behavior at salinities as low as the Ocean Plan objective. For this analysis, salinity levels both within the ZID (located between 3 to 11.9 meters or 10 to 39 feet from the diffuser depending on operating scenario; Table 4.5-12) and the BMZ (100 meters or 328 feet from the diffuser), as well as at the edge of these zones were evaluated for potential impacts on marine biological resources.

As presented in Section 4.3, Surface Water Hydrology and Water Quality, the highest anticipated ambient salinity of 33.89 ppt is expected to occur during the upwelling season (see **Table 4.3-1**). This peak ambient salinity would also coincide with the proposed project's maximum concentrated brine discharge stream, when the brine would not be combined with treated wastewater effluent from the MRWPCA regional wastewater treatment plant, resulting in the maximum salinity at the edge of the ZID of any scenario analyzed under Impact 4.3-4. Under this brine-only discharge scenario, the maximum increase in salinity at the edge of the ZID would be 1.6 ppt above ambient (see Scenario 2 and Scenario 15 in **Table 4.5-12**). This maximum anticipated salinity at the edge of the ZID due to the brine discharge is less than the lowest mean effective salinity reported by Phillips et al (2012) (i.e., 36.8 ppt; see **Table 4.5-10**). It should be noted that this mean effective salinity was for the embryonic development of red abalone, which occurs only on rocky substrate associated with kelp miles from the edge of the ZID. Moreover, none of the modeling results based upon a continuous discharge suggest a re-concentration of salinity in the discharged brine along the seafloor. Elevated salinities in the discharge plumes will never exceed 2 ppt above ambient at the point of contact with the seafloor and those maximum salinities will continue to dilute through mixing and diffusion as they flow across the seafloor.

Due to the fact that the recommended salinity range for culturing squid is 34 to 38 ppt, and the salinity at the edge of the ZID and the BMZ would not exceed 35.49 ppt and 35.23 ppt, respectively, the area outside the ZID and within the BMZ would continue to be suitable for squid spawning.

An area within the ZID, however, could be unsuitable for squid spawning. The most straightforward way of estimating the impact is to compare the area within the ZID to the entire area of suitable spawning habitat in Monterey Bay south of Monterey Submarine Canyon, which is the greatest focus of commercial fishing activities associated with spawning. The shelf area south of the Monterey Submarine Canyon is approximately 16 km (10 miles) long. The depth

TABLE 4.5-11
SUMMARY OF DOMESTIC AND INTERNATIONAL BRINE LIMITS

Region/Authority	Salinity Limit	Compliance Point	Source
USEPA	Increment ≤ 4 ppt	NA	NA
Carlsbad, CA	Absolute ≤ 40 ppt	1,000 feet	San Diego Regional Water Quality Control Board 2006
Huntington Beach, CA	Absolute ≤ 40 pt salinity (expressed as discharge dilution ratio of 7.5:1)	1,000 feet	Santa Ana Regional Water Quality Control Board 2012
Western Australia guidelines	Increment ≤ 5 ppt	NA	NA
Oakajee Port, Western Australia	Increment ≤ 1 ppt	NA	The Waters of Victoria State Environment Protection Policy
Perth, Australia/ Western Australia EPA	Increment ≤ 1.2 ppt and ≤ 0.8 ppt	50 m and 1,000 m	Wec 2002
Sydney, Australia	Increment ≤ 1 ppt	50 to 75 m	ANZECC 2000
Gold Coast, Australia	Increment ≤ 2 ppt	120 m	GCD Alliance 2006
Okinawa, Japan	Increment ≤ 1 ppt	Mixing zone boundary	Okinawa Bureau for Enterprises
Abu Dhabi	Increment ≤ 5 ppt	Mixing zone boundary	Kastner 2008
Oman	Increment ≤ 2 ppt	300 m	Sultanate of Oman 2005

SOURCE: Jenkins et al, 2012

TABLE 4.5-12
DILUTION MODEL RESULTS FOR DENSE DISCHARGE SCENARIOS

Scenario No.	Scenario	Predictions			At impact (ZID)		At BMZ	
		SEA	VP					
		Dilution	Dilution	Distance (ft)	Dilution[a]	Salinity increment (ppt)	Dilution	Salinity increment (ppt)
Typical Discharge Scenarios								
1	SE Only	-	-	-	-	-	-	-
2	Brine only	15.4	16.2	10.2	15.4	1.61	18.5	1.34
3	Brine + Low (1) SE	16.0	16.1	10.4	16.0	1.31	19.2	1.09
4	Brine + Low (2) SE	16.8	17.6	11.6	16.8	1.05	20.1	0.88
5	Brine + Low (3) SE	17.7	18.5	12.7	17.7	0.83	21.2	0.69
6	Brine + Low (4) SE	18.8	19.5	13.8	18.8	0.64	22.5	0.54
7	Brine + Mod (5) SE	20.1	20.9	15.3	20.1	0.48	24.2	0.40
8	Brine + Mod (6) SE	21.9	22.2	16.8	21.9	0.35	26.3	0.29
9	Brine + Mod (7) SE	24.8	24.9	19.2	24.8	0.23	29.7	0.19
10	Brine + Mod (8) SE	28.2	27.5	21.9	27.5	0.15	33.0	0.12
11	Brine + Mod (9) SE	34.2	27.7	22.3	27.7	0.09	33.2	0.07
12	Brine + High (10) SE	46.7	39.2	33.0	39.2	0.02	47.0	0.02
13	Brine + High (15) SE	-	-	-	-	-	-	-
14	Brine + High (19.78) SE	-	-	-	-	-	-	-
High Brine Discharge Scenarios (post-shutdown operations)								
15	High Brine only	15.5	16.3	10.5	15.5	1.60	18.6	1.33
16	High Brine + Low (1) SE	16.1	16.9	11.3	16.1	1.34	19.3	1.11
17	High Brine + Low (2) SE	16.7	17.5	12.1	16.7	1.11	20.1	0.92
18	High Brine + Low (3) SE	17.5	18.4	13.1	17.5	0.91	21.0	0.76
19	High Brine + Low (4) SE	18.6	19.3	14.2	18.6	0.73	22.3	0.61
20	High Brine + Mod (5) SE	19.6	20.4	15.4	19.6	0.58	23.6	0.48
21	High Brine + Mod (6) SE	22.1	21.4	16.6	21.4	0.42	25.7	0.35
22	High Brine + Mod (7) SE	22.8	22.8	18.1	22.8	0.34	27.4	0.28
23	High Brine + Mod (8) SE	25.0	24.5	19.8	24.5	0.24	29.4	0.20
24	High Brine + Mod (9) SE	28.2	27.2	22.3	27.2	0.16	32.6	0.14
25	High Brine + High (10) SE	32.5	30.2	25.3	30.2	0.10	36.2	0.08
26	High Brine + High (12) SE	58.6	44.9	39.0	44.9	0.01	53.9	0.01
27	High Brine + High (14) SE	-	-	-	-	-	-	-
28	High Brine + High (16) SE	-	-	-	-	-	-	-

NOTES:

[a] The lowest dilution value was selected from the two model (SEA and VP) analysis results to calculate incremental salinity increases at the edge of the ZID and BMZ to provide the most conservative assessment of potential salinity increases.

SE = secondary effluent (MRWPCA wastewater)

SOURCE: Roberts, 2017 (Appendix D1)

ranges for squid spawning (18 to 55 meters or 59 to 180 feet) spans approximately 3 km (1.8 miles) from shoreward to seaward edge, which covers 48 square kilometers (18 square miles). If the area between the diffuser port and the edge of the ZID on both sides of the outfall (i.e., 3 to 11.9 meters ([10 to 39 feet] wide by 335 meters [1,100 feet] long; on two sides) were to settle on the seafloor (which model results indicate it would not), approximately 2,010 to 7,800 square meters of seafloor (21,635 to 85,800 square feet) would be unsuitable for squid spawning. This area represents approximately 0.0042 to 0.0163 percent of the suitable spawning area on the seafloor south of Monterey Submarine Canyon.

There could be unanticipated effects on benthic and pelagic communities in the vicinity of the discharge. As discussed in Section 4.3, Surface Water Hydrology and Water Quality, the water-column salinity at the point of discharge would exceed 2 ppt within a very small volume of ocean water at each of the 129 open diffuser ports. For the worst-case brine-only discharge scenario, the volume of discharge with a salinity greater than 2 ppt above ambient would be approximately 2 feet in maximum diameter tapering at each end, and approximately 8 feet long, with a corresponding volume of 8.5 cubic feet of water mass at each of the open diffuser ports (see **Figure 4.3-10** in Section 4.3, Surface Water Hydrology and Water Quality). Extrapolation to all 129 open diffuser ports indicates a total volume of 1,100 cubic feet of water could exceed 2 ppt. The small volume of water that would be greater than 2 ppt above ambient salinity would not come into contact with any hard-substrate organisms inhabiting the ballast rock anchoring the outfall or benthic fauna located on the seafloor. Consequently, benthic communities near the outfall would not be affected by the increased salinity brine discharge. Compared to the total volume of water surrounding the diffuser to a height of 4 feet off the bottom (i.e., 3 to 11.9 meters ([10 to 39 feet] wide by 335 meters [1,100 feet] long by 1.2 meters [4 feet] high; on two sides = or 2,412 to 9,568 cubic meters or 88,000 to 343,200 cubic feet), this impact would involve 0.3 to 1.25 percent of the near-seafloor water in the vicinity of the discharge and contain approximately 8.2 to 41.4 million planktonic organisms. While mortality of small organisms could occur if they were entrained for more than a few seconds in the discharge plumes, the impact on pelagic organisms would result in a less-than-significant impact because of the small percentage of total habitat involved.

The Ocean Plan establishes receiving water salinity limitations for brine discharges from desalination facilities to protect the quality of ocean waters for beneficial uses, such as providing aquatic habitat. The impact analysis at 4.3.5.2 Operational and Facility Siting Impacts Impact 4.3-4, uses the Ocean Plan’s receiving water salinity limitations as significance thresholds. The impact analysis estimates salinity levels within the BMZ, where salinity may exceed 2.0 ppt above natural background salinity, to determine the potential frequency and intensity of impacts on marine biological resources and beneficial uses. The impact analysis evaluates the salinity and dilution dynamics of a number of scenarios of operational discharges within the BMZ by determining the ZID for each discharge scenario and describes areas where salinity would exceed 2 ppt. Additionally, the analysis addresses the fate and travel path of the discharge plume beyond the BMZ and the potential for hypoxia to occur near the seabed.

The analysis of salinity levels indicates that for all discharge scenarios, and assuming a continuous discharge stream, the MPWSP brine and combined discharges would meet Ocean

Plan salinity and dissolved oxygen standards and are not likely to result in hypoxia on the ocean floor. Specifically, the discharge would result in salinity less than 2 ppt above ambient salinity at the edge of the ZID, which means that salinity levels would not exceed 2 ppt above ambient salinity at the edge of the BMZ (328 feet) since the edge of the ZID is well within the BMZ under all scenarios. The proposed project would therefore not exceed or violate the Ocean Plan salinity standards or degrade water quality in terms of salinity. For all discharge scenarios involving dense, negatively buoyant plumes (worst case scenarios), the Ocean Plan salinity limit is met at the edge of the ZID, which ranges from 10 feet to 39 feet depending on discharge scenario. As the plumes discharged from each of the 129 outfall diffuser jets travel away from the ZID, they continue to dilute (further reducing salinity levels) and ultimately merge within the BMZ boundary. Salinity levels would exceed 2 ppt in a relatively small area, 8.5 cubic feet, adjacent to each of the 129 diffuser ports and above the seafloor, after which the discharge plumes would attenuate rapidly with distance from each port. The combined area of exceedances of 2 ppt is not likely to adversely impact the marine environment because it is a relatively small volume in the water column when considered in the context of the total volumes of Monterey Bay. Also, the salinity increases presented in the analysis represent conservative values and would occur only along the seabed. Modelling demonstrates that salinity plumes are not likely to travel, or become trapped, along the seafloor due to the Coanda effect. Hypoxia from salinity near the seafloor was demonstrated to be unlikely based on a mass-balance analysis, which demonstrated that the amount of oxygen supplied to the discharged plume by ambient seawater entrained during turbulent mixing and dilution is more than 30 times greater than that consumed by the sediments. As such, the concentration of dissolved oxygen in receiving ocean waters would not become depressed by more than 10 percent from that which occurs natural. For the majority of the water column, incremental salinities would be much lower than the reported values. Additionally, the analysis assumed zero ocean current; however, under actual ocean conditions, waves, tidal forces, and seasonal currents would increase mixing and dilution, thus reducing these assessed salinity levels. Therefore, operational discharges from the MPWSP would not increase salinity levels or impact DO in a manner that violates water quality objectives or waste discharge requirements or otherwise degrades the quality of receiving waters in Monterey Bay and MBNMS, and impacts on sanctuary marine biological resources would be less than significant.

Potential Effects of Other Brine Discharge Contaminants

In the irrigation season, brine-only would be discharged through the MRWPCA outfall. In the non-irrigation season, the brine would be combined with varying flows of secondary treated wastewater that would typically be buoyant when released into the ocean. But because the brine is denser than the wastewater flow, the brine could cause the wastewater to be less buoyant and various constituents in the wastewater may not adequately dilute as they do now.

To determine if exceedances of contaminants would occur in the discharge, the concentrations of constituents regulated under the Ocean Plan (**Table 4.3-4**) were calculated at the edge of the ZID using the modeled dilutions of various brine and brine-with-wastewater scenarios, and compared against the Ocean Plan water quality objectives (see Section 4.3 and Appendices D1-D3).

As discussed in detail in Section 4.3 (see Impact 4.3-5), the estimated concentrations for the full suite of Ocean Plan constituents are presented as concentrations at the edge of the ZID and as a percentage of the Ocean Plan numeric water quality objective in **Table A1** and **Table A2** in **Appendix D3** for the discharge scenarios assessed for the MPWSP (**Tables 4.3-13 and 4.3-14**). As summarized in **Tables A1** and **A2** (**Appendix D3**), out of 80 constituents assessed for compliance with Ocean Plan numeric water quality objectives, the proposed project would comply with 65 objectives under all assessed operational discharge scenarios. Two constituents, cyanide and ammonia, were identified as having the potential to exceed the Ocean Plan objectives under certain operational scenarios. Potential issues for cyanide and ammonia compliance were identified to occur when there would only be low volumes of secondary effluent flow mixed with desalination brine. These two constituents may exceed the Ocean Plan objective, or come close to exceeding the objective, and are shown at their estimated concentration at the edge of the ZID and as a percentage of the Ocean Plan numeric water quality objective at the edge of the ZID, in **Tables 4.3-15 and 4.3-16**, respectively. Ten constituents[14] were not detected in any of the source waters (desalination brine or wastewater) and results for these ten constituents are summarized in **Tables A1** and **A2** (**Appendix D3**). However, for these ten constituents, the analytical Method Reporting Limit[15] (MRL) achieved by the testing laboratory was higher than the Ocean Plan numeric objective (see Section 4.3, Surface Water Hydrology and Water Quality, for detailed discussion). Three additional constituents—acrylonitrile, beryllium, and TCDD equivalents—were detected in either the desalination brine or wastewater, but not in both. However, there is not enough information to assess the concentrations for these three constituents in the combined discharge of wastewater and brine due to differences in MRLs applied in the brine source waters as compared to the MRWPCA wastewater.

Based on a conservative assessment methodology (see Section 4.3), implementation of the MPWSP could potentially cause exceedances of Ocean Plan water quality objectives for the measurable constituents ammonia and cyanide. For an additional thirteen constituents, there is not enough information to assess concentrations at the edge of the ZID. Therefore, it is conservatively concluded that Ocean Plan water quality objectives could potentially be exceeded during operations for some operational discharge scenarios, resulting in a significant impact. **Mitigation Measure 4.3-5** (**Implement Protocols to Avoid Exceeding Water Quality Objectives**) would require CalAm to perform an extensive water quality assessment prior to implementation of the MPWSP. Operational discharges that cannot be demonstrated to conform to the Ocean Plan water quality objectives, incorporated as performance standards, may only be released following implementation of additional design features, engineering solutions, and/or operational measures that ensure compliance with objectives. With implementation of the proposed mitigation, the impact would be less than significant.

The modeled dilution factors for various scenarios of negatively buoyant plumes range from approximately 15:1 (seawater: effluent) to 59:1 at the edge of the ZID (Table 4.5-12).

[14] Chlorinated phenolics, 2,4-dinitrophenol, tributyltin, aldrin, benzidine, bis(2-chloroethyl)ether, 3,3-dichlorobenzidine, 1,2-diphenylhydrazine, heptachlor, 2,4,6-trichlorophenol.

[15] The lowest amount of an analyte in a sample that can be quantitatively determined with acceptable precision and accuracy under stated analytical conditions (i.e., the lower limit of quantitation).

Concentrations within the ZID (the area in the plume between its contact with the seafloor and the diffuser port) would be gradually higher than at the edge of the ZID. While mortality of small organisms could occur if they were entrained in the higher concentration discharge, the impact on pelagic organisms would result in a less-than-significant impact because of the small percentage of total habitat involved and the limited exposure duration. Discharged contaminants also would have less than significant impacts on benthic organisms due to acute toxicity because the area affected by the discharge plumes would be very small. Using the diameter of the discharge plumes cited above (i.e., 1.5 feet; see **Figure 4.3-10** in Section 4.3, Surface Water Hydrology and Water Quality), each plume would affect 1.77 square feet of seafloor at the point of contact. The total area affected would be 1.77 square feet x 129 open diffuser ports = 228 square feet. This area is less than 1 percent of the total area within the ZID (i.e., 1,100 feet long x 21 feet wide = 23,100 square feet). Transfer of bioaccumulated contaminants from benthic infauna to higher trophic levels also would be limited by the very small area of seafloor affected. Transfer to predators in higher trophic levels would be proportional to the relative consumption of prey from within and outside of the affected seafloor area.

As discussed in Section 4.3, the implementation of **Mitigation Measure 4.3-4** (**Operational Discharge Monitoring**, **Analysis, Reporting**, **and Compliance**), would further ensure that brine constituents are discharged at concentrations below Ocean Plan requirements and further ensure compliance with the monitoring requirements and regulatory standards that are protective of the beneficial uses (including aquatic wildlife and habitat) of Monterey Bay. Mitigation Measure 4.3-4 requires CalAm to implement a comprehensive Monitoring and Reporting Plan (Plan), following review and approval by the RWQCB and MBNMS, that is consistent with the requirements of the Ocean Plan and that incorporates, at a minimum (but not limited to), monitoring guidelines detailed in the Ocean Plan. The monitoring program would ensure that adequate water quality and marine resource data are gathered to determine baseline conditions and compliance with Ocean Plan water quality limitations. The Plan includes, at a minimum, appropriate performance standards, as well as corrective actions to be implemented (detailed in **Mitigation Measure 4.3-5, Implement Protocols to Avoid Exceeding Water Quality Objectives)**, such as retrofitting the existing outfall to increase dilution, additional pre-treatment of source water to the Desalination Plant, treatment of discharge, and/or flow augmentation, that would be required if the acquired data indicated non-compliance with Ocean Plan water quality objectives (or NPDES permit conditions) resulting from operational discharges. Impacts due to the discharge of other brine contaminants would be less than significant.

Potential Effects of Brine Discharge Shear Stress

Concern has been expressed that the jet velocities associated with brine discharges could cause damage in the discharge environment (SWRCB, 2014). Impacts due to shear stress caused by the brine discharge would be limited to plankton, because motile organisms would be able to avoid turbulence in the immediate vicinity of the brine discharge. Some laboratory studies have reported impacts on very small marine organisms caused by experimentally induced shear stress (Foster et al, 2013). In the case of the proposed MPWSP, such damage is highly unlikely. Modeling performed in support of a report submitted to the SWRCB that examined entrainment effects from desalination projects (Foster et al, 2013) provided formulae for determining the spatial scales of turbulent eddies that occur at different discharge velocities.[16] The minimum and maximum discharge velocities (7.4 ft/sec (2.26 m/sec) and 14.8 ft/sec (4.51 m/sec)) modeled across all scenarios for the proposed MPWSP (see Appendix D1) closely approximate the discharge velocities calculated by Foster. Foster (2013) concludes that, at these very small eddy scales: "Overall, the area of high shear impacted by the diffusers is relatively small and transit times through this region relatively short. Thus, it seems reasonable to expect that, while the larvae that experience the highest shear will most likely experience lethal damage, the overall increase in mortality integrated over the larger area will be low."

Plankton samples collected near the MRWPCA outfall (see **Table 4.5-1**) were used in a hydrodynamic model to provide a quantitative estimate of the effects of shear stress from the brine discharge on plankton (**Appendix D1**). The analysis found that a very small percentage of water passing over all of the outfall diffusers is entrained (i.e., 1.7 to 6.4 percent). The greatest shear gradients occur in very small turbulent eddies such that effects of shear stress would be concentrated on plankton smaller than 1.0 mm. Assuming that 50 percent of entrained organisms below 1 mm are killed by shear stress, roughly 0.23 to 0.86 percent of total numbers of plankton flowing over the diffuser could be killed by shear stress, estimated to be roughly 892 million organisms per day. This number seems substantial, but is a tiny fraction of the estimated total plankton abundances at any point in time in Monterey Bay.

The total area around the edge of Monterey Bay at the depth of the MRWPCA diffuser is approximately 215 square kilometers and the average depth is 35 meters. By applying the average number of planktonic organisms per cubic meter observed in the plankton tows (see Table 4.5-1; 4,357 organisms per cubic meter), the total number of organisms in the nearshore area of Monterey Bay would be 3.41×10^{13} at any given time. The percentage of total nearshore plankton killed in Monterey Bay by shear stress associated with the discharge of brine from the MPWSP project each day would be 0.00261 percent. The amount of annual organism productivity represented by this percentage can only be approximated because the numbers present on any given day, as indicated by the plankton samples, are the result of production minus predation and natural mortality, which are unknown. Nevertheless, a rough approximation is possible. Calanoid copepods, which were the most abundant organisms in the plankton samples (see Table 4.5-1), typically have annual lifecycles (Atkinson, 1998). If it can be assumed that all calanoids begin and end their lifecycles at the same time, a mortality of 0.00261 percent per day would result in a maximum annual loss of less than 1 percent. Moreover, because the baseline condition involves wastewater without brine, the higher wastewater flow in the non-irrigation season means that the water entrained over the ZID is greater and potential plankton mortality is greater with these higher flows than would be the case with the proposed project.

16 Foster concludes that higher strain rates and shear stresses are contained in smaller eddies. A discharge velocity of 2.9 m/sec (9.5 ft/sec) resulted in small eddies ranging from 0.03 mm (0.002 in) to 0.56 mm (0.02 in) at various locations in the discharge plume, from the diffuser port to the edge of the ZID. A discharge velocity of 4.6 m/sec (15.1 ft/sec) resulted in small eddies ranging from 0.02 mm (0.0008 in) to 0.63 mm (0.025 in).

Impact Conclusion

Impacts on marine biological resources, including MBNMS resources, during operations of the proposed MPWSP would be less than significant. Impingement of plankton, larval fish and other organic matter on the seafloor from the operation of the slant wells is not likely because of the low intake velocities. The increased salinity and other constituents in the brine discharge are expected to meet Ocean Plan water quality objectives at the edge of the ZID and are therefore, not expected to cause any impairments to marine biological resources including special status species. Brine discharges also are not expected to significantly affect marine habitat by reducing dissolved oxygen content (hypoxia). Nevertheless, and as discussed in Section 4.3, Surface Water Hydrology and Water Quality, the implementation of **Mitigation Measure 4.3-4** would further ensure the brine is discharged at concentrations below Ocean Plan water quality objectives and further ensure compliance with the monitoring requirements and regulatory standards that are protective of the beneficial uses (including aquatic wildlife and habitat) of Monterey Bay.

Impacts due to shear stress caused by the brine discharge would be limited to plankton, because motile organisms would be able to avoid turbulence in the immediate vicinity of the brine discharge and the impact would be less than significant because of the small percentage of plankton abundances potentially affected. Moreover, the Ocean Plan Provisions for Desalination Facilities require modeling and estimating of potential mortality due to shear stress entrainment, and require periodic re-evaluation to ensure the operational procedures employed result in acceptable plankton mortality (SWRCB, 2016).

Because there is little risk that benthic infauna and macrofauna populations will decline due to impingement, shear stress, and increased salinity, impacts are not anticipated on fish, marine mammals (such as the Southern sea otter and California gray whale), seabirds, and other species. Transfer of bioaccumulated contaminants from benthic infauna to higher trophic levels also would be limited by the very small area of seafloor potentially affected. Transfer to predators in higher trophic levels would be proportional (e.g., very limited) to the relative consumption of prey from within and outside of the affected seafloor area. Therefore, the indirect impacts on fish, marine mammals, sea birds, and other species are also determined to be less than significant.

Mitigation Measures

None proposed.

Impact 4.5-5: Threaten to eliminate a marine plant or animal wildlife community or cause a fish or marine wildlife population to drop below self-sustaining levels during operations. (*Less than Significant)*

As discussed for Impact 4.5-4, there are no anticipated occurrences of impingement of plankton and larval fish on the seafloor or a potential for deterioration of seafloor sediments and soft substrate benthic habitat from the operation of the MPWSP slant wells. Additionally, the discharge of elevated salinity brine is not expected to threaten to eliminate a marine plant or animal wildlife community or cause a marine population to drop below self-sustaining levels. Therefore, the evaluation of impacts from MPWSP operations, including slant well and brine discharge operations, would be the same as for Impact 4.5-4; the impact would be less than significant.

Mitigation Measures

None proposed.

Impact 4.5-6: Interfere substantially with the movement of any native marine resident or migratory fish or marine wildlife species or with established native resident or migratory marine wildlife corridors, or impede the use of native marine wildlife nursery sites during operations. (*Less Than Significant)*

As discussed for Impact 4.5-4, there are no anticipated occurrences of impingement of plankton and larval fish on the seafloor or a potential for deterioration of seafloor sediments and soft substrate benthic habitat from the operation of the MPWSP slant wells. The analysis of impacts on the movement of native resident or migratory fish or marine wildlife species, including market squid, or interference with established native resident or migratory wildlife corridors or native marine wildlife nursery sites is identical to the analysis presented for **Impact 4.5-4**.

Additionally, the discharge of brine is not expected to interfere with the movement of native resident or migratory fish or marine wildlife species. Therefore, the evaluation of impacts from MPWSP operations, including slant well and brine discharge operations, would be the same as for Impact 4.5-4; the impact would be less than significant.

Mitigation Measures

None proposed.

4.5.6 Cumulative Effects of the Proposed Project

Impact 4.5-C: Cumulative impacts on marine biological resources. (*Less than Significant*)

The geographic scope for the cumulative analysis of impacts on marine biological resources encompasses the nearshore waters (within 5 miles from shore) of Monterey Bay and extends from north of Moss Landing Harbor southward to the northern limits of Sand City, including the subtidal and intertidal habitats contained therein, and all marine biological communities. Beyond this area, other projects would be too distant from the MPWSP to result in any combined salinity or elevated brine constituent plumes, or to combine in any other way that may cause a cumulative effect on marine biological resources.

As discussed in Section 4.3.6, MBNMS was notified on Saturday, January 20, 2018, of a sewage spill into MBNMS from the Monterey Regional Water Pollution Control Agency (MRWPCA) wastewater treatment facility. MRWPCA reported that the spill resulted in the release of approximately 2.8 million gallons of untreated sewage entered Monterey Bay. While sampling and information collection regarding the extent and potential impacts of the spill is ongoing, there have been no reported impacts on marine organisms or habitats. If any impacts are found, those would likely be localized and the incident therefore, is not anticipated to have any long-term residual impact on the marine biological resources in Monterey Bay in the year 2021 that would affect or change the EIR/EIS conclusion of impacts on marine biological resources resulting from implementation of the proposed project.

The cumulative projects listed in **Table 4.1-2** that are located within the geographic scope and whose impacts could overlap with those of the MPWSP include Test Slant Well (No. 47), RUWAP Desalination Element (No. 31), and RUWAP Recycled Water Element (No. 35). In addition, it is expected that either the DeepWater Desal Project (No. 34) or The People's Moss Landing Desal Project (No. 57), but not both, would be constructed and operated in the reasonably foreseeable future. With the exception of DeepWater Desal and People's Project, all of these projects are either built (No. 47), not reasonably foreseeable in its current configuration (No. 31), or projected to have very localized construction impacts.

The test slant well (No. 47) was considered in the evaluation of the proposed project. The RUWAP Recycled Water Element (No. 35) would reduce wastewater flows to the MRWPCA ocean outfall. The impacts that would result from a range of brine with wastewater flows were evaluated for the proposed project under Impact 4.5-4 (see Table 4.5-12). Therefore, the cumulative scenario that would result from the RUWAP Recycled Water Element in combination with the proposed project would be within the range of brine with wastewater flows analyzed under Impact 4.5-4; that impact was determined to be less than significant.

Both the DeepWater Desal and People's Project propose to use new ocean water intakes and new brine discharge outfalls equipped with diffuser jets. The proposed intake and outfall pipes for both projects would be located offshore of Moss Landing Harbor. As proposed by its applicant, the People's Project would develop supplemental water supplies to serve customers in CalAm's Monterey District service area. Since the People's Project and the MPWSP would not both be implemented to serve the same customers, this EIR/EIS assumes the People's Moss Landing Project is an alternative to the MPWSP (see Chapter 5). Therefore, it is not a reasonably foreseeable project in the cumulative scenario relevant to the MPWSP. It would also not be a reasonably foreseeable project in the cumulative scenario for any of the alternatives aimed at meeting the objectives of the MPWSP. Therefore, although acknowledged here as a reasonably foreseeable alternative to the proposed project (as described in Chapter 5), this project's contributions to cumulative impacts are not considered as part of the cumulative scenario relevant to the proposed project or another alternative. In contrast, DeepWater Desal Project is considered in the cumulative impacts analysis for the MPWSP because the project proponent has indicated that it intends to proceed even if another desalination plant is selected to serve the Monterey Bay region. DeepWater Desal would include the construction and operation of a seawater desalination facility and co-located data center to provide up to 25,000 afy of potable water and data transmission and storage services. DeepWater Desal would be developed to meet a regional need for water, and CalAm would be one of several customers of the supply. As such, DeepWater Desal is considered in the cumulative effects scenario for the MPWSP. See Section 4.1 for additional details on the cumulative scenario and the basis for this determination.[17]

Construction Impacts

The proposed MPWSP would use subsurface slant wells in-lieu of an open ocean intake. As a result, there are no anticipated or proposed construction activities within the coastal waters of the MPWSP project area that are expected to result in disturbance or effects on marine biological resources. As discussed in Impact 4.5-1, potential impacts from construction-related underwater noise, the discharge of clarified water produced during well drilling and well development into the ocean, and the potential accidental release of drilling fluids would result in less-than-significant impacts on marine biological resources and habitats. Because any drilling noise reaching ocean waters overlying the slant wells is expected to be below background underwater noise levels, the lack of noise generated by slant well drilling could not combine with other sources of underwater noise generated by projects in the cumulative scenario to result in increased noise above ambient levels. The Deepwater Desal project would also involve offshore construction, but the Deepwater Desal intake and discharge facilities would be constructed approximately 6.5 miles to the north, and possibly years later than the MPWSP; therefore, noise would not accumulate with the proposed project's construction noise. The discharge of any clarified water to the ocean would be in compliance with Ocean Plan Water Quality standards for turbidity as stipulated in the revised NPDES permit. The NPDES permit requirements are themselves measures based, in part, on the consideration of cumulative effects on receiving waters; therefore, discharges of the proposed project when combined with discharges from the DeepWater Desal project would be within parameters considered not to result in a cumulatively significant effect on water quality.

Impingement of Marine Organisms and Organic Material on the Seafloor

While Deepwater Desal is expected to have a high impingement risk due to its open water intake design, the MPWSP's impingement risk is low and is not likely to incrementally increase the impingement risks caused by Deepwater Desal. As discussed under Impact 4.5-4, no impingement or entrainment of fish or invertebrate species would occur during MPWSP operations because the use of slant wells would result in a vertical infiltration rate that would be well below the swimming speeds of larval invertebrates and larval fish. Similarly, the low infiltration rate of the slant wells would not result in an accumulation of fine-grained organic materials on the seafloor. Therefore, the MPWSP could not contribute to any cumulative impacts related to the impingement or entrainment of fish or invertebrate species, or the impingement of fine organic matter.

Discharge of Brine and Other Brine-Associated Constituents

As discussed in Impact 4.5-4, the MPWSP would discharge a brine solution with an elevated salinity concentration as well as potentially elevated concentrations of contaminants to the ocean through the existing MRWPCA ocean outfall. Based on a conservative assessment methodology (see Section 4.3), implementation of the MPWSP could potentially cause exceedances of Ocean

[17] As explained in Section 4.1, the MPWSP assumes that GWR would not be operational, and as such, GWR is not considered in the cumulative impacts scenario.

Plan water quality objectives for the measurable constituents ammonia and cyanide. For an additional thirteen constituents, there is not enough information to assess concentrations at the edge of the ZID. The constitution of the brine that would be discharged from the DeepWater Desal project is currently unknown but this analysis assumes that, at a minimum, contaminants detected in the ocean water (CCLEAN, 2015) that currently exceed Ocean Plan water quality objectives (PCBs) would in all likelihood also exceed Ocean Plan water quality objectives at the edge of the DeepWater Desal ZID. If there are no operational actions available for dilution of the brine from the DeepWater Desal project, or feasible mitigation actions to reduce potential increased PCB concentrations, and therein reduce the potential impact on pelagic marine biological resources, then the potential impact on marine biological resources inhabiting pelagic habitat within the ZID of the DeepWater Desal project would be significant and unavoidable.

The DeepWater Desal project, in order to be viable and permitted, would have to implement operational actions that ensure its brine discharges also achieve the Ocean Plan water quality objectives. The distance between the DeepWater Desal proposed outfall and the existing outfall proposed for use by the MPWSP (i.e., 31,511 feet; 9,605 meters; 5.96 miles) leads to the determination that there is no expectation of the two BMZs reaching each other or intermixing discharge waters. The area within the BMZ for the MPWSP that could exceed 2 ppt is estimated at a total volume of approximately 31 cubic meters (1,100 cubic feet) of pelagic habitat and associated marine taxa, including special status fish, invertebrate, and marine mammal species. Since the DeepWater Desal project proposes to discharge more brine than the MPWSP, its BMZ would be larger than that of the MPWSP. Depending on operating conditions, the DeepWater Desal project could result in approximately 150 to 1,500 cubic meters (5,300 to 53,000 cubic feet) of pelagic habitat exceeding 2 ppt around the diffuser structure. Thus, the potential cumulative area of coastal Monterey Bay pelagic habitat affected by salinity exceeding 2 ppt could be up to approximately 1,532 cubic meters (54,100 cubic feet) depending on operating conditions, which it is an infinitesimally small amount of water when compared to the volume of nearshore pelagic habitat in the study area (i.e., 215 square kilometers x 35 meters average depth = 7.5 billion cubic meters or 265 billion cubic feet). Therefore, based on the comparative scale of the volume of pelagic habitat that could exceed 2 ppt salinity as compared to the nearshore pelagic habitat available in Monterey Bay, there would be no significant cumulative impacts in Monterey Bay regardless of other external stressors. Monterey Bay in MBNMS is resource rich (not resource constrained) and most special status fish, invertebrates, and marine mammal species that would encounter the increased area of salinity are motile, they would behaviorally avoid the area and would find other areas to inhabit. Therefore, the cumulative effect of the two projects from increased salinity concentrations in their brine discharges on marine biological resources, including special status fish, invertebrates, and marine mammal species, would be less than significant.

However, the proposed MPWSP discharge could be out of compliance with the Ocean Plan for cyanide and ammonia and for an additional thirteen constituents, there is not enough information to assess concentrations at the edge of the ZID. The implementation of **Mitigation Measure 4.3-4 (Operational Discharge Monitoring, Analysis, Reporting, and Compliance)** would ensure that brine constituents from the MPWSP, such as cyanide and ammonia, are discharged at concentrations below Ocean Plan requirements and would result in a less than significant contribution to a cumulative impact related to cyanide and ammonia. Since the MPWSP would be using subsurface intakes, the PCBs drawn into the source water through the ocean floor would be less than ambient ocean water and would not exceed Ocean Plan objectives at the edge of the ZID. Thus, the MPWSP would have a less than significant contribution to a cumulative impact related to PCB concentrations.

Brine Discharge Shear Stress

As discussed in Impact 4.5-4, impacts on marine organisms caused by shear stress would be concentrated on plankton smaller than 1.0 mm and would be less than significant (0.00261 percent of nearshore planktonic organisms killed). At present, only a preliminary assessment of potential shear stress impacts on planktonic organisms has been performed for the DeepWater Desal project. However, the assessment of potential brine discharge effects on planktonic organisms relative to the volume of the MPWSP brine discharge (Impact 4.5-4) can be used as a basis for estimating similar impacts from the DeepWater Desal project. If the MPWSP and DeepWater Desal were both built and operated, DeepWater Desal is estimated to have a brine discharge of approximately 27 mgd, in comparison to the MPWSP's 14 mgd brine discharge. Assuming that the DeepWater Desal diffuser jets would cause no greater shear impact than the diffusers used on the MRWPCA outfall, DeepWater Desal brine discharges are estimated to cause plankton mortality rates of approximately 447 million individuals per day, assuming plankton densities similar to those measured at the MRWPCA outfall (see Table 4.5-1). As a result, the estimated potential cumulative effect of brine discharge shear stress on planktonic organisms less than 1 mm in size would be approximately 3.8 billion planktonic organisms per day or 0.011 percent of the potential nearshore plankton in Monterey Bay, a small fraction of the plankton less than 1 mm in size inhabiting the nearshore waters near the ocean outfalls. Additionally, the Ocean Plan water quality objectives for brine discharges require modeling and estimating of potential mortality due to shear stress entrainment and require periodic re-evaluation to ensure the operational procedures employed result in acceptable plankton mortality (SWRCB, 2016). No significant cumulative impact from brine discharge shear stress would occur as a result of the MPWSP and DeepWater Desal project.

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