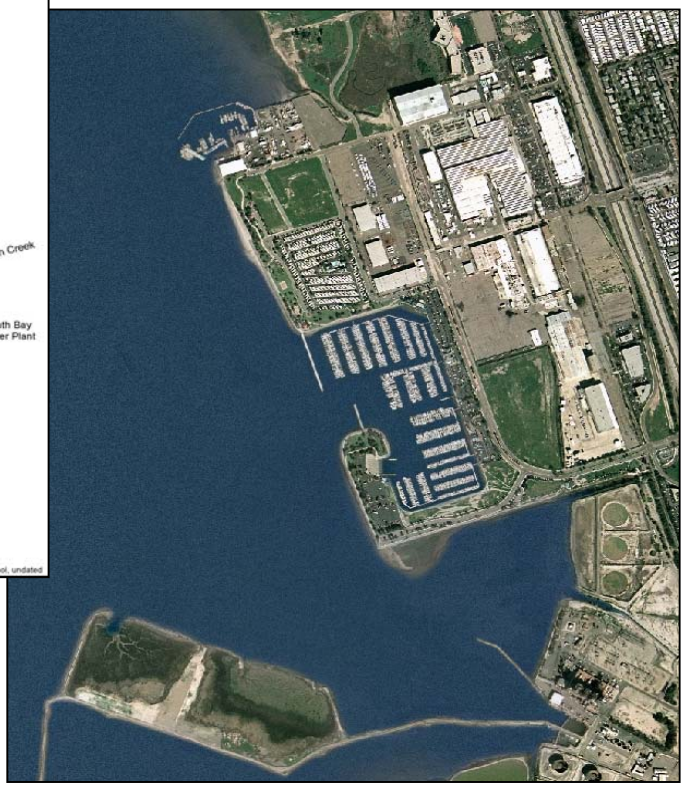
Appendix 4.9-1

CVBMP Marine Bio, June 2006

BIOLOGICAL ASSESSMENT OF MARINE RESOURCES IN THE VICINITY OF THE CHULA VISTA MARINA CHULA VISTA, CALIFORNIA

June 2006



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BIOLOGICAL ASSESSMENT OF MARINE RESOURCES IN THE VICINITY OF THE CHULA VISTA MARINA CHULA VISTA, CALIFORNIA

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BIOLOGICAL ASSESSMENT OF MARINE RESOURCES IN THE VICINITY OF THE CHULA VISTA MARINA

INTRODUCTION TO THE AFFECTED ENVIRONMENT

Following preliminary review of the proposed project, the San Diego Unified Port District has determined that the construction and operation of the proposed project is subject to the guidelines and regulations of the California Environmental Quality Act (CEQA). This study addresses the potential direct, indirect, and cumulative environmental effects on local marine resources associated with the proposed project.

A marine biological assessment was conducted of Chula Vista Marina and the approach channels to the marina, located in Chula Vista, California, in preparation for a proposed marina redevelopment and bulkhead reconstruction. The purpose of this investigation was to identify the existing marine resources within the proposed project site.

As part of the project, MBC Applied Environmental Sciences (MBC) surveyed the marine communities of intertidal and subtidal habitats in Chula Vista Marina (MBC 2005). Habitats examined included riprap, bulkheads, boat docks, pilings, seafloor, and the shoreline of the property proposed for redevelopment. In addition, MBC conducted a literature search for relevant information on the subtidal habitats in the approach channels. This baseline survey will provide a basis for impact assessment of the proposed project on intertidal and subtidal marine resources in the project area.

Figure 1. Survey locations in Chula Vista Marina, Chula Vista, California. 2 March 2005.

SETTING

Project Location and Description

The study area is located in San Diego Bay, the largest naturally occurring embayment between San Francisco and Scammon's Lagoon, Baja California. The Chula Vista Marina project site is located at the south end of San Diego Bay. It is a private marina with a boat launch and slips (Figure 1).

San Diego Bay originated from the alluvial plains of the Otay, San Diego, and Sweetwater Rivers. In 1853, the construction of a dike diverted the San Diego River into what is now Mission Bay, decreasing freshwater input into San Diego Bay. The first known dredging activities in the bay occurred in 1888, making way for the larger steam-powered ships. Dredging has continued periodically to the present day to make way for large container/cargo ships and naval vessels.

Primary habitat types include deep subtidal (channel areas), shallow subtidal (-2 to -12 ft Mean Lower Low Water [MLLW]), and upland transition (those terrestrial habitats skirting the margins of the bay). There are approximately 45 miles of artificial substrate, including riprap, seawall, piers, and wharves, out of approximately 64 miles of shoreline, equivalent to 74% armored shoreline. The South Bay is dominated by salt marsh habitat, though it is estimated that 88% of bay salt marsh has been lost. Other habitat types include moderately deep subtidal (-12 to -20 ft MLLW), vegetated and unvegetated shallow subtidal, intertidal, riparian, freshwater marsh, and salt works.

Bottom sediments throughout the Chula Vista Marina are primarily fine and unconsolidated. Depths in the entrance basin range from -16 to -18 ft MLLW, decreasing to -8 to -11 ft MLLW in the inner marina. Outside of the marina in the approach channels, sediments consist of unconsolidated fines. The depths of the approach channels range from -5 to -18 ft MLLW and support epibenthic and infaunal communities on and in the sediments. In shallower areas (-2 to -6 ft MLLW) eelgrass (*Zostera marina*) communities thrive.

EXISTING HABITATS AND COMMUNITIES

Rocky Intertidal Epibiota

Most hard substrate habitats in San Diego Bay are artificial structures associated with vessel docking and protecting developed areas along the bay (USDN 1999). Hard structures include pier pilings, bulkheads, riprap, floating docks, sea walls, buoys and vessels. While all of these man-made structures can support marine communities, some provide more valuable habitat. Greater surface area, more niches and complexity of rocky riprap, for example, generally provides better habitat for intertidal and subtidal communities than the smooth surface and vertical habitat of bulkheads or sea walls. In the project area, riprap and bulkheads that line the existing marina dominate the man-made habitat structure.

Riprap armors most of the intertidal throughout the Chula Vista Marina, extending down into the subtidal. Along the northern and portions of the west edges of the marina, the riprap extends to the marina bottom at a depth of about -5 to -7 ft MLLW. Elsewhere, riprap extends into the subtidal area to a depth of about -2 ft MLLW, below which metal sheet piling drops vertically to the marina bottom. The shoreline of the study area consists of intertidal and shallow subtidal riprap of medium boulders and concrete bulkheads. This hard substrate, along with wood and concrete pier pilings, provides intertidal and subtidal habitats for both attached and motile invertebrates. These habitats, in turn, provide food and shelter for numerous fish species. Visible resident intertidal/subtidal epibiota on riprap and pier pilings in the study area include bay mussel (*Mytilus galloprovencialis*), barnacles (*Balanus* sp and *Chthamalus* sp), and limpets. Abundance on riprap and pier pilings in the proposed project area in the south bay is comparable with similar locations, but is somewhat less diverse than noted at sites in about mid-bay such as the Convair Lagoon site near the Coast Guard Station. At Convair Lagoon, on the northern shore of San Diego Bay, intertidal species on hard substrates included limpets (*Collisella scabra*), barnacles (*Chthamalus dalli* and *Balanus* sp), lined shore crab (*Pachygrapsus crassipes*), the tubicolous snail *Serpulorbis squamigerus*, and the brown algas *Colpomenia sinuosa* and *Sargassum* sp (Ogden 1993). Results from Convair Lagoon correspond somewhat with data from Los Angeles-Long Beach Harbors. Though rocky intertidal epibiota in San Diego Bay have not been subjected to much analysis, the rocky intertidal community in Los Angeles-Long Beach Harbors has been closely monitored for several years (EQA/MBC 1978; MBC 1986, 1988, 1990-1992, 1993b, 1994a, 1997-1998, USDN 1999).

The intertidal community on the riprap and pilings, as on most rocky shores, exhibits vertical zonation. The upper splash zone is inhabited sparsely by species that are well adapted to the environmental extremes of temperature and desiccation, such as the periwinkle *Littorina keenae* and the small brown acorn barnacle (*Chthamalus* sp) (Rickets and Calvin 1968, Doty 1946, MBC 1984, Dailey et al. 1993). The high tide zone, extending down to Mean Lower Low Water, supports a more abundant and diverse group of species, which includes the brown acorn barnacle, and white acorn barnacle (*Balanus glandula*), and several limpets (*Collisella* sp) and turban snails (*Tegula* sp) that are motile grazers. In the middle tide zone, down to Mean Lower Low tide, the brown acorn barnacle is replaced by the red acorn barnacle (*Tetraclita rubescens*), and bay mussel and additional grazers appear. Encrusting algae (such as *Ralfsia* sp) and bryozoans and coralline (*Corallina* sp), other algae (*Gelidium pusillum* and *Colpomenia sinuosa*), and colonial anemones *(Anthopleura elegantissima*) may also occur as major constituents of the community. The organisms in the mid-tidal zone may be so abundant as to completely cover all available substrate. In the low intertidal zone, down to Extreme Low Water, the dominant species are less well adapted to environmental extremes, as they are seldom exposed to air. However, the community can be extremely diverse, with considerable algal cover *(Egregia menziesii* and *Sargassum muticum*), tunicates, sea urchins (*Strongylocentrotus* sp), sea stars (*Pisaster* sp), nudibranchs, octopus, and predatory snails (*Roperia poulsoni*, *Acanthina spirata*, and *Pteropurpura festiva*). Where there is wave action, zonation is not distinct, but where the water is calm and the only movement is tidal, the zones form distinct, narrow horizontal bands (MEC 1988, MBC 1994b).

Dominant overstory organisms provide protection for a greater variety of small, cryptic understory organisms (Tsuchiya and Nishihira 1985, MBC 1984). The larger sessile animals, such as bay mussels and foliose algae, create shade and retain moisture in the interstices that prevent desiccation during low tide. They also provide hiding places from predators. Total numbers of individuals in the community may reach over 10,000 per square meter in the mid-tidal zone and more than ten times that in the low-tide zone (MBC 1984). Biomass may exceed 1,000 g per square meter in the mid-intertidal and 7,000 g per square meter in the low intertidal. Mussels typically contribute most of the biomass of the community, followed by barnacles, algal turf, and other large animals. The understory cryptofauna generally contributes very little to overall biomass.

Most of the dominant overstory organisms in the intertidal community are filter feeders, consuming particles and small organisms from the surrounding water. These organisms can only feed when they are submerged. Other dominant trophic types are primary producers, such as photosynthetic algae, and herbivores, animals that graze or feed on the algae. Less abundant are predators, which attack and consume other animals, and scavengers, which eat dead or moribund animals. Many of the intertidal organisms reproduce by dispersing their eggs, spores, or larvae into the water, providing food for benthic and water column fishes and invertebrates.

The total intertidal community abundance at a still-water site (resembling the project area in San Diego Bay) may reach 3,000 individuals per square meter at the mid-tide level, and a little over twice that at the low-tide level (MEC 1988). At Cabrillo Marina (Los Angeles County, California), abundance averaged about 32% cover, with 5,000 individuals per square meter and about six species, while further in the bay, cover averaged less than 41% with eight dominant species. Surveys of pilings have found that the community can vary on different sides of pilings and with composition of the pilings, which can be cement, wood, or plastic-wrapped wood (MEC 1988). In general, communities on concrete pilings are more diverse than those on wood pilings due to the toxic nature of creosote (Dailey et al. 1993).

The community can vary with time, both on a long-term scale and with season. Several studies have shown that the intertidal community is more abundant and diverse in summer than in winter (Widdowson 1971, Sousa 1979, MEC 1988, MBC 2004). The entire community can be eliminated from the substrate, usually in small patches, as when mats of large mussels on steep slopes are sloughed off when the byssal threads are not strong enough to hold the accumulated weight (MEC 1988, MBC 1991). This is most likely to occur from wave action during severe winter storms or following an episode of reduced dissolved oxygen or salinity, which can weaken byssal threads (Reish and Ayers 1968). These small-scale disturbances open up space which is thought to be necessary for the maintenance of diversity (Sousa 1979). The community which recolonizes the newly-exposed substrate is usually the same as the previous one, but occasional changes occur which may result from recruit availability or modification of environmental conditions (MBC 1984). Long-term changes also occur, the reasons for which are often unclear (EQA/MBC 1978, MEC 1988, MBC 2004).

In the south bay, inshore marine environments support more than 300 invertebrate species (USFW 1998). The intertidal communities on the pier pilings at the project site were briefly examined and found to be typical for embayments. These communities re-establish themselves following disturbance by settlement of planktonic larvae of sessile organisms (barnacles, mussels, algae, tunicates, and bryozoans), migration of motile animals (limpets, chitons, slippersnails, and large mussels) and expansion and growth from adjacent areas (colonial anemones) (MEC 1988). The rate of recovery can depend on tidal height and location. Following complete removal of organisms at a location in Long Beach Harbor, the low tide level recovered faster than the mid-tide level, taking about one year for the community dominants to regain their previous diversity and abundance (MBC 1984). The mid-tide dominants took about two years to recover. However, complete recovery, with the previous species richness and diversity, was estimated to require about two years at the low tide level and three years at the mid-tide level.

A total of 5,420 ft of riprap currently armors the Chula Vista Marina. The intertidal habit on the riprap, pilings, boat docks, and mud flat of Chula Vista Marina were examined on 2 March 2005 by MBC (MBC2005). The riprap supported the intertidal marine algae Enteromorpha spp and sea lettuce (*Ulva* sp) with a few invertebrates, primarily acorn barnacles (*Balanus amphitrite*) and California horn snails (*Cerithidea californica*) (Table 1). Algae and invertebrate fouling organisms were found on pier pilings and docks in the

marina. Intertidal locations were surveyed at two tidal heights (+1 ft and +3 ft MLLW) in each of five areas of the marina (Figure 1). Four of these sites (Areas 1through 4) were rock riprap and one was a mud flat (Figure 1). All biota were counted or percent coverage estimated in quadrats taken at two tidal levels at each of the five intertidal locations.

In total, 18 algal and marine invertebrate species were observed on the intertidal rocky riprap and mud flats during the site visit (Table 1). At the +1ft and the +3 ft tide levels, the riprap was dominated by acorn barnacles with California horn snails, the mud clams Pacific littleneck (*Prothaca staminea*), smooth chione (*Chione fluctifrage*), and California chione (*Chione californiensis*), and a hard substrate oyster (*Ostrea conchaphilia*) and bay mussel (*Mytilus galloprovencialis*).

The +1ft MLLW tidal level was more productive than the +3ft level. Seventeen species, 12 animal species with a mean abundance of 295 individuals per quadrat (2,362 per m^2), and five algal species with a mean coverage of 41.2% were found at the +1ft level (Table 1). At the +3ft MLLW level, six species were found: five animal species including acorn barnacles, California horn snail, the solitary ascidian *Styela montereyensis*, small yellow shore crabs, and small tube worms in the family Spirobibae with mean abundance of 49.4 individuals per quadrat (395 per m^2) and one alga species that covered 7% of the area. Acorn barnacles accounted for 91.5% and California horn snail 7.7% of the total abundance at the +1ft MLLW level; at the +3 ft MLLW level, acorn barnacles contributed 52.6% and California horn snails 46.9% of the total abundance.

Intertidal Flats

Intertidal flats in San Diego Bay include mudflats, sand flats and salt flats (USDN 1999). Intertidal flats in the south bay occur in the tidal zone above the level of eelgrass beds and below the level where marsh plant species can grow. In these environments combinations of physical and chemical stresses limit the biological diversity, and community structure is dominated by species adapted to these stressful conditions (MBC 1988). Species common in these areas include algae such as *Enteromorpha* and *Ulva*, which can form dense, mats in the upper intertidal, larger burrowing clam and crab species and snails and smaller infaunal species including polychaete worms and small crustaceans. Intertidal and shallow invertebrate species often act as a food source for fish and bird species in wetlands communities, with abundant and diverse invertebrate assemblages likely to support a more diverse collection of those species that feed on them. The most extensive intertidal flats in San Diego Bay occur in the south bay, including the northern shore of the salt works, along the shoreline of south bay and along the barrier edge of the power plant channel (USDN 1999).

Sampling conducted in 2003 identified 113 invertebrate taxa in intertidal infaunal grab samples collected near the South Bay Power Plant and offshore of the Chula Vista Marina (Tenera and Merkel 2004). Intertidal samples collected outside of the marina and along the Chula Vista Wildlife Island were dominated by small crustaceans including the tanaid *Leptochelia dubia* and the ostracod *Euphilomedes carcarodonta*, the polychaete *Fabricinuda limnicola*, and unidentified nematods. Together these four taxa accounted for 66% of the total abundance. Six of the ten most abundant taxa were crustaceans.

A small mudflat of about 1,200 ft^2 (0.03 acres) is located within the project, along the northwest corner of Chula Vista Marina (Figure 1, Area 5). A site visit conducted on 2 March 2005 found that California horn snails and the green algae *Enteromorpha* and *Ulva* dominated the mudflat at the +1ft level (Table 1, MBC 2005). In addition, several Pacific littleneck clams and molts of yellow shore crabs (*Hemigrapsus oregonensis*) were found.

Table 1. Number of individuals and percent cover per 0.125 m^2 of the intertidal biota by level at areas within Chula Vista Marina, Chula Vista, California, 2 March 2005.

Level + 1 ft MLLW

		Area						
Phylum	**Species**	**1**	**2**	**3**	**4**	**5**	**Total**	**Mean**
Abundance (# counted individuals)								
AR	*Balanus amphitrite*	400	400	250	300	-	1350	270.0
MO	*Cerithidea californica*	3	2	6	3	100	114	22.8
MO	*Ostrea conchaphila*	-	1	1	1	-	3	0.6
MO	*Protothaca staminea*	-	+	-	-	3	3	0.8
MO	*Mytilus galloprovincialis*	-	1	-	1	-	2	0.4
AR	*Hemigrapsus oregonensis*	1	-	-	-	^	1	0.3
MO	*Chione californiensis*	-	1	-	-	-	1	0.2
MO	*Chione fluctifraga*	1	-	-	-	-	1	0.2
MO	*Crepidula* sp	1	-	-	-	-	1	0.2
AR	Thallassinidea	+	-	-	-	-	+	-
AN	Spirorbidae	+	+	+	-	-	+	-
CN	Anthozoa, unid.	+	-	-	-	-	+	-
	Number of individuals per 0.125 m^2	406	405	257	305	103	1476	295.2
	Number of species	8	7	4	4	3	12	5.2
	Diversity (H')	0.10	0.08	0.14	0.10	0.13	0.00	0.11
Percent Cover								
CH	*Enteromorpha* spp	25	5	5	5	75	115	23.0
CH	*Ulva* sp	-	5	5	5	75	90	18.0
RH	*Gracilaria* sp	-	1	-	-	-	1	0.2
PH	*Sargassum* sp	+	+	-	-	-	+	-
ZO	*Zostera marina*	-	-	+	-	-	+	-
	Percent cover	25.0	11.0	10.0	10.0	150.0	206	41.2
	Number of species	2	4	3	2	2	5	2.6
	Diversity (H')	0.00	0.93	0.69	0.69	0.69	0.71	0.60
	Total number of species	10	11	7	6	5	17	7.8

Level + 3 ft MLLW

		Area						
Phylum	**Species**	**1**	**2**	**3**	**4**	**5**	**Total**	**Mean**
Abundance (# counted individuals)								
AR	*Balanus amphitrite*	10	100	10	10	-	130	26.0
MO	*Cerithidea californica*	1	15	-	-	100	116	23.2
CO	*Styela montereyensis*	-	1	-	-	-	1	0.2
AR	*Hemigrapsus oregonensis*	-	-	-	-	^	^	-
AN	Spirorbidae	+	-	-	-	-	+	-
	Number of individuals per 0.125 m^2	11	116	10	10	100	247	49.4
	Number of species	3	3	1	1	1	5	1.8
	Diversity (H')	0.30	0.43	0.00	0.00	0.00	0.00	0.15
Percent Cover								
CH	*Enteromorpha* spp	25	5	5	-	-	35	7.0
	Percent cover	25.0	5.0	5.0	-	-	35	7.0
	Number of species	1	1	1	0	0	1	0.6
	Diversity (H')	0.00	0.00	0.00	0.00	0.00	-	-
	Total number of species	4	4	2	1	1	6	2.4

Note: + = present in area but not in quadrat; ^ = Patchy distribution of shed molts.
Note: Pickleweed observed in Areas 1 and 5. Area 1 is located on and above the riprap at +4 to +7. Area 5 is a mudflat.

Rocky Subtidal Epibiota

The rocky substrate of San Diego Bay consists of riprap, bulkheads, pilings, and wharves which are suitable habitat for a diverse epibiotic assemblage, providing foraging resources for shorebirds in the intertidal and for fish in the subtidal. Similar to the rocky intertidal epibiota, rocky subtidal organisms in San Diego Bay have not been subjected to much analysis. Ford et al. (1975) reported sponges, cnidarians, bryozoans, polychaete annelids, crustaceans, mollusks, and tunicates to be the dominant organisms associated with pier pilings in 1972 and 1973. During a December 1999 site survey, sparse patches of *Sargassum* sp were observed in the shallow subtidal areas on the north side of the basin adjacent to the project site. The Sargassum was attached to rocks and scrap metal covering the bottom sediments. The rocky subtidal community in Los Angeles-Long Beach Harbors has been closely monitored for several years (EQA/MBC 1978; MBC 1986, 1988, 1990-1992, 1993b, 1994a, 1997-1998). In these surveys, it was determined that the relative condition of the rocky subtidal assemblages is highly dependent on the degree of tidal water movement and the depth to which the riprap extends.

Long-term studies of the riprap epibiota at stations adjacent to the Long Beach Generating Station were conducted at frequent intervals from 1974 to 2004 (EQA/MBC 1978;MBC 1981, 1986, 1988, 1990-1994a, 1997-2004). Results from these studies indicated that area coverage by the epibiota averaged less in winter than in summer. Seasonal differences in coverage such as these do not indicate an unstable community, but that there is short-term temporal variation influenced by winter-summer turnover of some species, mainly primary producers. Studies conducted on pier pilings in Los Angeles Harbor showed that pilings also support a diverse epibiotic community (MBC 1974). Mussels, slipper shells (*Crepidula* sp), polychaetes, sea anemones, and tunicates contributed most to biomass during that survey.

The previously-mentioned subtidal epibiota surveys, along with two other surveys conducted in the Los Angeles-Long Beach Harbor complex (LBHC 1976, Reish 1982), provide relatively accurate predictions of the probable composition of the assemblages on the riprap, pier pilings, and other hard substrate in San Diego Bay. These studies have illustrated vertical zonation of species on the hard substrate and that the assemblages vary within the harbor; the harbor assemblage is a combination of those assemblages seen in a typical estuary and a natural coastal rocky subtidal substrate.

Subtidal epifauna recolonization studies have been conducted in Los Angeles and Long Beach Harbors (MBC 1984, MEC 1988). Recovery in Long Beach Harbor at sites moderately exposed to currents and wave action was estimated to take two years in the shallow subtidal mussel zone. Although results were highly variable, the 1986-1987 survey in Los Angeles Harbor suggested a similar recovery period of about 22 months in the subtidal zone.

Riprap armors the subtidal in Chula Vista Marina, extending down from the intertidal. Along the northern and portions of the west edges of the marina, the riprap extends to the marina bottom at a depth of about -5 to -7 ft MLLW. Elsewhere, riprap extends only into the intertidal area to a depth of about -2 ft MLLW, below which metal sheet piling drops vertically to the marina bottom in the subtidal zone. Very little subtidal rocky habitat exists in these portions of the harbor, with most of the subtidal hard substrate consisting of metal bulkheads.

Marine biological field surveys were conducted of Chula Vista Marina on 2 March 2005 by MBC (MBC 2005). Several species of plants and invertebrates common in San Diego Bay were observed on the bulkheads and subtidal riprap at the -3 ft MLLW level. Five species were counted as individuals within the quadrats. These included an unidentified anemone (Anthozoa), an oyster, solitary ascidians (*Styela plicata*), and two worm tube species (Table 2). Six other species were recorded as a percent coverage within the quadrats. These included unidentified red alga turf (Rhodophyta), a brown alga (Dictyota flabellata), compound ascidians *(Botryllus* spp and *Botrylloides* spp), unidentified sponges (Porifera), and the green alga *Enteromorpha* sp. Additional species were observed outside of the quantified quadrats, but well within the project area, including the solitary ascidian *Styela montereyensis* and bay mussel.

Table 2. Number of individuals and percent cover per 0.125 m^2 of the subtidal biota by level at two areas within Chula Vista Marina, Chula Vista, California, 2 March 2005.

Depth in ft (MLLW): -3

		Area			
Phylum	**Species**	**1**	**2**	**Total**	**Mean**
Abundance (# of counted individuals)					
CN	Anthozoa, unid.	1	20	21	11
CO	*Styela plicata*	6	6	12	6
MO	*Ostrea conchaphila*	4	8	12	6
AN	Spirorbidae	2	-	2	1
AN	*Myxicola infundibulum*	1	-	1	1
	Number of individuals per 0.125 m^2	14	34	48	24
	Number of species	5	3	5	4
	Diversity (H')	1	1	1	1
Percent Cover					
RH	Rhodophyta	15	10	25	13
PH	*Dictyota flabellata*	10	-	10	5
CO	*Botryllus* spp.	3	3	6	3
PO	*Porifera,* unid.	1	1	2	1
CH	*Enteromorpha* spp	1	-	1	1
CO	*Botrylloides* spp.	1	3	4.0	2.0
	Percent cover	31	17	48.0	24.0
	Number of species	6	4	6.0	5.0
	Diversity (H')	1.27	1.09	1.35	1.18
Total number of species		11	7	11	9.0

All 11 subtidal species observed within the quadrats occurred along the metal bulkhead at Area 1, where 14 individuals were observed, with *Styela plicata* most abundant. Additionally, an average of 31% of the quadrat was covered by encrusting species, primarily red algal turf and *Dictyota flabellata* (Table 2). At Area 2 along the subtidal riprap, seven species occurred, with an unidentified anemone very abundant with 20 individuals in the quadrat and red algal turf covering 10% of the quadrat. The tunicate *Styela plicata*, oysters, red algal turf, and compound ascidians were similarly abundant on both subtidal habitat types.

Benthic Infauna

Benthic infauna are the macroscopic animals that live in the top layers of sediment of the ocean floor. Their distribution depends on interacting sediment and environmental variability. Of primary importance are sediment characteristics, which influence the abundance and composition of benthic communities (Gray 1974, Rhoades 1974). Grain size of the sediment, for example, determines a variety of infaunal habitat characteristics, including abrasion, amount of interstitial water, ease of burrowing, and materials for tube or burrow construction.

Sediment and benthic infaunal samples were collected at several sites throughout San Diego Bay in 1998 as part of Southern California Coastal Water Research Project's Bight 1998 Regional Marine Monitoring Survey. Grab samples were collected at 46 stations in San Diego Bay in which 341 invertebrate taxa were identified (Ranasinghe et al. 2003). Similar to other bays in southern California, the benthic infauna was dominated by polychaete annelids, crustaceans, and bivalve and gastropod mollusks, however in addition to species found commonly in bays throughout southern California the assemblage of San Diego Bay was found to include several dominant species not found in high abundances in more northern areas such as Long Beach and Los Angeles Harbors (Ford et al. 1975; EQA/MBC 1978; MBC 1981, 1986, 1988, 1990-1992, 1993b, 1994a, 1997-2004; Reish 1982; Fairey et al. 1996; Ranasinghe et al. 2003). This distinctive southern bay assemblage included the mussel *Musculista senhousia*, and the polychaetes *Euchone limnicola*, *Pseudopolydora paucibranchiata*, and *Prionospio* (*Prionospio*) *heterobranchia*. *Musculista senhousia* and *Pseudopolydora paucibranchiata* are the two most abundant non-native infaunal species in the Southern California Bight (Ranasinghe et al. 2003).

In Convair Lagoon, on the north shore of San Diego Bay, the polychaete *Pseudopolydora paucibranchiata* was described as the most abundant infaunal organism during a site survey (Ogden 1993). *P. paucibranchiata* is a non-native species which was probably introduced to the west coast of America with Japanese oyster imports and is usually found in bays and estuaries (Smith and Carlton 1975). Other observed organisms included the sea slug *Navanax inermis*, the moon snail (*Polinices* sp), the polychaete *Nephtys caecoides*, and solitary tunicates (*Styela* sp).

In studies designed to determine potential impacts of pollutants in San Diego Bay benthic habitats around the bay were classified as degraded, undegraded, or transitional based on species diversity, composition, and other assemblage characteristics combined with data from chemical testing and toxicity studies (Fairey et al. 1996). Twenty-three stations (31%) in San Diego Bay were undegraded, 43 (57%) were degraded and nine (12%) were in a transitional condition. Of 15 stations sampled in South Bay, eight, including three in Chula Vista Marina, were classified as degraded, two were in a transitional condition, and five stations on the west side of the bay were undegraded (Fairey et al. 1996, USDN 1999, Tenera and Merkel 2004).

Sampling conducted in 2003 identified 166 invertebrate taxa in infaunal grab samples collected near the South Bay Power Plant and offshore of the Chula Vista Marina (Tenera and Merkel 2004). Infaunal samples collected offshore of the marina were dominated by small worms, including polychaete annelids such as *Mediomastus* sp and *Leitoscoloplos puggetensis*, unidentified nematodes and oligochaetes, and the caprellid amphipod *Mayerella acanthopoda*. Together these five taxa accounted nearly 50% of the individuals taken, with *Mediomastus* sp alone contributing 24% to the total abundance.

During a survey conducted by MBC on 2 March 2005, the subtidal soft bottom of the Chula Vista Marina and approach channels consisted primarily of unconsolidated silt and clay sediments (MBC 2005). This habitat supports a community of organisms that live on the surface of or within the sediments. Invertebrates incidentally observed by divers at depths between -2 ft and -14 ft MLLW included the cerianthid anemone *Pachycerianthus fimbriatus*, and terebellid polychaete worms.

Eelgrass

Eelgrass is a wide-ranging plant species that occurs along the Pacific coast of North America from the Bering Strait south to lower Baja California and around to the Gulf of California. Eelgrass *(Zostera marina*) is a marine flowering plant (angiosperm) that forms meadows in mud and sand sediments of bays and harbors. It forms an important biological habitat for invertebrates and fishes. In San Diego Bay, eelgrass grows in the lower intertidal and the shallow subtidal substrates at depths between 0.0 and -5 m MLLW, although in the south bay eelgrass is most abundant at depths less than -2.1 m MLLW (Merkel 2000). San Diego Bay's remaining eelgrass beds cover over 655 ha (1,621 acres), which is the largest eelgrass habitat in California. About 404 ha are found in the south bay ecoregion (USDN 2004). Although general distribution patterns remain stable, the coverage of eelgrass in the south bay varies seasonally and from year to year in response to El Niño or La Niña events.

Eelgrass beds support diverse benthic infaunal and fish communities. Fish observed in eelgrass beds in San Diego Bay include barred sand bass (*Paralabrax nebulifer*) and spotted sand bass *(Paralabrax maculatofasciatus*), kelp bass (*Paralabrax clathratus*), topsmelt, bat ray (*Myliobatis californica*), round stingray (*Urobatis halleri*), California halibut (*Paralichthys californicus*), diamond turbot (*Hypsopsetta guttulata*), spotted turbot (*Pleuronichthys ritteri*), striped mullet (*Mugil cephalus*), black perch (*Embiotoca jacksoni*), white seaperch (*Phanerodon furcatus*), garibaldi (*Hysypops rubicundus*), bay goby (*Lepidogobius lepidus*), and opaleye (MBC 1993a, 1999b). Eelgrass also provides forage for green sea turtles in the area and is a resource for seabirds and other migrating waterfowl. Brant (*Branta bernicla*) feeds on eelgrass in the bay during its annual migrations (Merkel 2000). Although eelgrass is very common outside of the Chula Vista Marina in south San Diego Bay, it occurred only in small isolated patches within the Chula Vista Marina (MBC 2005).

During a survey on 2 March 2005, MBC investigated all areas of the Chula Vista Marina for the presence of eelgrass (MBC 2005). Eelgrass was found to be restricted to shallower areas with sandy sediments and relatively clear water. Throughout most of the marina, sediments were very soft and

unconsolidated, with poor clarity in the water above these sediments. Most of the eelgrass in the Chula Vista Marina was found at depths of -1 to -1.5 m MLLW and none was found growing deeper than -2 m MLLW.

The eelgrass in the marina was found in a patchy band along the north side of the harbor between the base of the riprap and the first set of floating docks. Eelgrass occurred in small (0.1 m^2) to medium (2 to 3 m^2) patches in a narrow band from the middle of the north shore, extending several hundred meters towards the bayfront restaurants and shops (eelgrass in this area amounted to a total of about 70 m^2). Several small patches (0.05 m^2) of ditchgrass (*Ruppia* sp), another flowering plant, were also noted in this area, totaling about 1 m^2 all together. An additional 2 m^2 of eelgrass was found in the marina adjacent to the boat launch ramp inside the south entrance breakwater. Where found, eelgrass in the Chula Vista Marina was sparse. Turion (individual shoots) counts in 10 replicate quadrats averaged 62 turions/m^2 (MBC 2005).

The subtidal area included in the proposed marina expansion outside of the Chula Vista Marina breakwater was also investigated to confirm the continued presence of eelgrass noted in previous mapping of South San Diego Bay (Merkel 2000, Tenera and Merkel 2004). Eelgrass was noted outside of the Chula Vista Marina during the survey (Figure 1). No further estimates of eelgrass cover in this area were made during the survey. No eelgrass was found to occur in the South Bay Boatyard commercial harbor north of the Chula Vista Marina when that site was investigated.

Caulerpa

Caulerpa is the genus for a group of algae that form entangling mats on the bottom substrate. As an invasive species, it out competes other algal or plant species and can exclude them from an area ecosystem. *Caulerpa* has caused extensive damage in the Mediterranean Sea covering thousands of acres of bottom. It has been found in two lagoons in southern California and is a species of concern due to its ability to potentially smother existing ecosystems.

MBC conducted an underwater survey on 2 March 2005 to assess the area for the presence of *Caulerpa taxifolia* or other *Caulerpa* species in the marina and other selected areas (MBC 2005). Sonar was used to determine areas of the marina shallower than -6 m MLLW that might support the invasive species *Caulerpa*. At locations with the potential for *Caulerpa* (shallower than -6 m MLLW), biologist-divers swam survey transects, looking for *Caulerpa*. No *Caulerpa* was observed during the survey.

Salt Marsh

Salt marsh habitat in San Diego Bay has been drastically reduced due to development and is now only found in the south bay. Currently about 386 acres (156 ha) of salt marsh habitat remains in South San Diego Bay (USDN 1999). Salt marsh is the driest of the intertidal habitats in the bay. Salt marsh habitat provides food and protection for fish and invertebrate species as well many species of birds that feed, nest and seek protection in marshes. The artificial habitat of dikes and ponds interspersed with mudflats and marsh found at the Salt Works is utilized by many shorebirds, seabirds and waterfowl. This area is one of the few large feeding, roosting and nesting areas left along the southern California coast.

Southern California salt marshes can be divided into distinctive zones based on vegetation patterns. The lower marsh is characterized by cordgrass (*Spartina foliosa*) which may grow partly submerged grading into pickleweed (*Salicornia virginica* and *S. bigelovii*), which is typically inundated only on the highest tides (USDN 1999). California cordgrass supports nesting of a sensitive bird species, the light-footed clapper rail (*Rallus longirostris levipes*, state and federal endangered), while pickleweed is the preferred nesting habitat for Belding's savannah sparrow, (*Passerculus sandwichensis beldingi*, state endangered species), which also feeds on the plant. The midmarsh is characterized by saltwort, (*Batis maritima*), pickleweed, sea blight (*Suaeda* spp) and arrow grass (*Triglochin concinna*) (USDN 1999). The upper marsh, typified by golden bush (*Isocama* spp), prickly-pear (*Opuntia* spp), glasswort (*Salcornia subterminalis*), box thorn *(Lycium californicum*), salt grass (*Distichlis spicata*) and shore grass (*Monanthocholoe littoralis*), is also the habitat of the state and federal endangered plant species salt marsh bird's beak (*Cordylanthus maritimus maritimus*). Above the upper marsh an upland marsh zone is typified by transitional species, including saltbush (*Atriplex* spp), buckwheat (*Eriogonum* spp), lemonadeberry (*Rhus integrifolia*), Salvia and sagebrush (*Artemisia* spp).

During investigations at Chula Vista Marina conducted on 2 March 2005 pickleweed was found growing in a narrow band along the southern perimeter riprap between the +4 ft and +7 ft levels. Pickleweed was also found at Area 5 (Figure 1) on the upper mudflat at the base of the riprap. The pickleweed on the mudflat was sparse, with a total coverage of less than 5 m^2. No other marsh plant species were noted in Chula Vista Marina during the survey.

Shallow Open-water Habitat

Shallow open-water areas, those less than -12 ft MLLW (USDN 1999), support infaunal invertebrate and demersal fish species that are distinct from other bay habitats. The benthic invertebrates serve as food sources for demersal fish, including juvenile California halibut an important commercial and recreational species, flatfish, rays, sharks, and perch. Fish and invertebrates that feed on benthic species in turn are prey for larger fish and aquatic birds. Bird densities and diversity in shallow, nearshore waters are greater than other open water areas of the bay. Many thousands of resident and migratory birds utilize this habitat for feeding and resting throughout the year.

Depth in the Chula Vista Marina was found to generally range from about 8 to 12 ft deep during the 2 March 2005 survey. Shallower areas were found near the edges of the marina, while the entrance was about 18 ft deep. Currently water area of the Chula Vista Marina is about 51 ac, but with docks and piers, about 38 ac of the marina water is open.

Fish

San Diego Bay provides several habitat types that support a large diversity of fish species. Numerous studies, including some recent, comprehensive work done by Allen (2002) have helped characterize the diverse fish fauna residing and visiting the bay. Allen's surveys from 1994 to 1999 represented the first comprehensive studies of fish populations in the entire bay. In reference to the recent studies performed by Allen, the current project area is located in what is defined as the South Ecoregion. Habitat types in the project area include shallow water, open water, soft bottom (consisting of sand, silt, clay, or mud), rocky (riprap), mudflats, and salt marsh habitats.

From 1994 to 1998, Allen (2002) collected 497,344 fish representing 78 species throughout San Diego Bay. Of the at least 51 species and more than 50,000 fish collected in the area encompassing the current project site (South Ecoregion), slough anchovy (*Anchoa delicatissima*) was by far the most abundant (66%), followed by topsmelt (*Atherinops affinis*) (14%), and arrow goby (*Clevelandia ios*) and round stingray, each with 3% of the total, combined comprising 86% of total abundance. These four species are all either schooling species or bottom dwelling species common in southern California nearshore waters and embayments (Miller and Lea 1972, Fitch and Lavenberg 1971, 1975). Slough anchovy are filter feeders that feed on small crustaceans and plankton (Fitch and Lavenberg 1971, Love 1996). Topsmelt feed on planktonic crustaceans and larvae (Fitch and Lavenberg 1975, Love 1996). The arrow goby lives in burrows of other species and feeds on benthic copepods and amphipods (Eschmeyer et al. 1983). Round stingray buries itself in bottom sediments and feeds on benthic invertebrates, clams, and small fishes while smaller round stingray feed on worms, shrimp, crabs, and amphipods (Eschmeyer et al 1983, Love 1996). They also contributed most to total biomass in the surveys by Allen in the south bay (Allen 2002). Other than the round stingray that have no known predators in San Diego Bay, the other three species are important prey items for shorebirds, sea lions, and other fish. These species are likely to be found throughout the waters adjacent to the current project site. Other nearshore schoolers collected in the south bay by Allen include Pacific sardine (*Sardinops sagax*), California grunion (*Leuresthes tenuis*), deepbody anchovy (*Anchoa compressa*), and Pacific (or chub) mackerel (*Scomber japonicus*). While species richness (number of species) was greatest in the north bay near the mouth, species diversity (which measures the evenness of the populations abundance) was highest in the south (Allen 2002).

Other bottom-dwellers common to the area include California halibut, diamond turbot, and spotted turbot. California halibut, an important fishery species in coastal southern California, requires protected areas such as bays and harbors for nursery grounds (Allen 1988).

The riprap, bulkheads, piers, and other structures in the waters adjacent to the project site provide habitat for several fish species, including spotted sand bass, barred sand bass, and black perch. In the surveys conducted by Allen (2002), spotted sand bass was more abundant than barred sand bass in the south region encompassing the current project site and contributed much more to overall fish biomass, indicating larger fish. These two species are sought by sportfishers throughout the bay.

Another important group of fishes common in the region are the gobies. Cheekspot goby *(Ilypnus gilberti*), arrow goby (*Clevelandia ios*), and shadow goby (*Quietula y-cauda*) are shallow water fishes associated with artificial habitats in San Diego Bay (Allen 2002). These small fish are common in bays and estuaries. Several fish species are closely associated with mudflat habitats and are preyed upon by terns and a variety of probing shorebirds. These species include the California killifish (*Fundulus parvipinnis)* and a goby, the longjaw mudsucker *(Gillichthys mirabilis)*, which are highly tolerant to temperature and salinity.

Fish incidentally observed in Chula Vista Marina during surveys for eelgrass in 2005 included California halibut, spotted sand bass, kelp bass, round stingray, and unidentified gobies (Morris pers. obser. 2005).

Water-Associated Birds

San Diego Bay is an important habitat for millions of birds. It is part of the Pacific Flyway, the corridor for birds flying between breeding grounds to the north and wintering sites to the south. The majority of birds found in the Bay are migrants, and use the Bay as a resting or feeding area, whereas others are winter visitors or migrants. Overall, bird abundance and biomass are generally higher in winter, when large numbers of northern migrants are present.

Three surveys conducted in 1993 and 1994 provide valuable information on the abundance, distribution, and diversity of bird populations utilizing San Diego Bay (Odgen 1994; USFWS 1994, 1995). Overall bird abundance during these surveys was highest in December and lowest in June.

Waterfowl are common residents of bay waters. Most waterfowl seen in the Bay are temporary visitors from the north, stopping in the area on their southern journey. Abundant waterfowl in the bay area include surf scoter (*Melanitta perspicillata*), eared grebe (*Podiceps nigricollis*) and Western grebe *(Aechmophorus occidentalis*), lesser scaup (*Aythya affinis*) and greater scaup (*A. marila*)), bufflehead (*Bucephala albeola*), and brant (Ogden 1994; USFWS 1994, 1995). Surf scoters were observed in high numbers utilizing the nearshore areas, as well as some deep-water areas not commonly used by other waterfowl. This species feeds alongside other seabirds, and in southern California they are more abundant near the Channel Islands than near the mainland (Dailey et al. 1993). Numerous grebes were seen feeding in the waters adjacent to the project area during a site visit in December 1999.

Shorebirds in southern California are present mainly in winter months, with many feeding in intertidal habitats, especially estuaries and beaches (Dailey et al. 1993). Shorebirds abundant in San Diego Bay include Western sandpipers (*Calidris mauri*) and least sandpipers (*C. minutilla*), red-necked phalaropes *(Phalaropus lobatus*), marbled godwit (*Limosa fedoa*), willet (*Catoptrophorus semipalmatus*) , black-bellied plover *(Pluvialis squatarola*), long-billed dowitchers (*Limnodromus scolopaceus*) and short-billed dowitchers (*L. griseus*) (Ogden 1994; USFWS 1994, 1995). Browning et al. (1973) reported over 26 species of shorebirds were utilizing the south bay for a wintering ground. In the bay, peak abundance of shorebirds is in August, during the fall migration (USFWS 1994).

Seabirds are those birds that reside, or spend portions of their life cycle, on or near offshore waters. Seabirds abundant in San Diego Bay include California brown pelican (*Pelecanus occidentalis californicus*), elegant tern (*Sterna elegans*) and Forster's tern (*S. forsteri*), Heermann's gull (*Larus heermanni*) and western gull (*L. occidentalis*), double-crested cormorant (*Phalacrocorax auritus*) and Brandt's cormorant (*P. penicillatus*) and black skimmer (*Rynchops niger*) (Ogden 1994; USFWS 1994, 1995). These species are important upper trophic level members, responsible for removing 14 to 29% of various fish stocks (Dailey et al. 1993).

Four species of marsh birds were observed during the three San Diego Bay surveys in 1993 and 1994; great blue heron (*Ardea herodias*), snowy egret (*Egretta thula*), great egret (*Ardea alba*), and black-crowned night heron (*Nycticorax nycticorax*) (Ogden 1994; USFWS 1994, 1995). In general, egrets and herons feed on fish, shrimp, insects, and other prey items. Black-crowned night herons are common in harbors, perching on masts and piers as hunting and/or roosting platforms. Great blue heron feeds in shallow waters, on wetland shorelines, and on tide flats and sandbars (Dailey et al. 1993).

Open-water areas in the south bay provide an important food source for protected bird species including the California brown pelican (state- and federal endangered), the California least tern *(Sterna antillarum browni*, state- and federal endangered) and other tern species. Local intertidal flats provide a food source for shorebirds, including western snowy plover (*Charadrius alexandrinus nivosus*, federally-listed threatened species), which also nest on the dikes in the south bay area. In addition, Belding's savannah sparrow and light-footed clapper rail are known to nest in South San Diego Bay marshes, and several species of terns including California least tern and black skimmers nest on dikes and protected beaches in the south bay area (Cooper 2004). Black skimmers are known to forage in San Diego Bay south of the Chula Vista Marina mouth, adjacent to the project area (Peugh 2005 pers. comm.) The USFWS reported 67 species of birds during surveys of the mudflat and salt pond habitats (USFWS 1998).

Overall, many birds prefer the shallower nearshore waters compared to deeper channel waters, likely the result of higher fish concentrations nearshore (Ogden 1994). Water-oriented birds in Chula Vista Marina use the bulkhead, docks, and boats as resting or foraging habitat when there is limited human activity (MBC 2005). Species noted in the vicinity of the marina during a survey on 2 March 2005 included mallards *(Anas platyrhynchos*), unidentified gulls (*Larus* sp), willets, godwits (*Limosa fedoa*), American coot (*Fulica americana*), and California brown pelicans (Table 3). One great blue heron noted flying through the area appeared to be nesting in a tree in the parking lot adjacent to Area 3 (Figure 1).

Table 3. Birds observed during the survey at Chula Vista Marina, Chula Vista, California. 2 March 2005.

	Area					
Common name	**1**	**2**	**3**	**4**	**5**	**Total**
American coot	-	2	-	2	-	4
California brown pelican	3	2	2	3	2	12
Godwits	2	-	-	-	-	2
Great blue heron	-	-	1	-	-	1
Gulls, unid.	4	3	3	5	5	20
Mallard	-	-	-	3	-	3
Willet	1	-	-	-	-	1
Total number of species	4	3	3	4	2	8

Marine Mammals

Two pinnipeds, California sea lion (*Zalophus californianus*) and the Pacific harbor seal *(Phoca vitulina*), are abundant along the southern California coast. While both species are found in San Diego Bay, the California sea lion is more ubiquitous, whereas the harbor seal is considered to be more of a frequent visitor. Sea lions are commonly seen "hauling out" on hard substrates, such as piers and buoys, but are infrequent visitors to the south bay and rarely are sighted in the project vicinity, but are the most common marine mammal species occurring in San Diego Bay. No marine mammals were noted during the survey of the Chula Vista Marina and approaches on 2 March 2005.

Coastal bottlenose dolphin (*Tursiops truncatus*) is widely distributed, occurring in warm, temperate waters worldwide. This cetacean has been frequently observed in the Bay, especially in the northern portion, and has been reported from the south bay (USFWS 1998). Another cetacean occasionally observed in the Bay is the gray whale (*Eschrichtius robustus*). This species passes San Diego Bay twice each year during its migration from the Bering Sea to Baja California and back and only infrequently enters the Bay. There is no evidence that San Diego Bay is critical for these animals as a breeding or feeding area.

Sea Turtles

The green sea turtle (*Chelonia mydas*) has established a population in San Diego Bay. This species, which has an affinity for warm, tropical waters, resides near the South Bay Power Plant discharge channel and is the northernmost habitat for turtles known on the west coast of the United States (Eckert 1993). During the day, the reptiles have been observed in and around the discharge channel of the power plant, while at

night they feed on eelgrass beds in the south bay (Stinson 1984). Green sea turtles are herbivores, feeding primarily on algae and eelgrass. Leatherback (*Dermochelys coriacea sechlegeli*), loggerhead *(Caretta caretta*), and Olive ridley (*Lepidochelys olivacea*) sea turtles are not known to occur in the bay. Green sea turtles are federally-listed endangered. Other than this unique population sustained by the warm waters of the discharge, this species would be considered uncommon to rare offshore, as it is more common in tropical and subtropical waters. No turtles were noted during the survey of the Chula Vista Marina and approaches on 2 March 2005 (MBC 2005).

Endangered, Threatened, and Other Species of Special Concern

Sensitive species known to occur in the vicinity of the project area and their status are listed in Table 4.

Table 4. Sensitive species potentially occurring at the proposed project area in South San Diego Bay. (Modified from USDN 1999).

Common Name Scientific Name	Status	Potential in Project Area	Common Name Scientific Name	Status	Potential in Project Area
Birds			Birds, continued		
California least tern	FE, SE	H	long-billed curlew	CSC	M
Sterna antillarum browni			*Numenius americanus*		
California brown pelican	FE, SE	P	double-crested cormorant	CSC	H
Pelecanus occidentalis californicus			*Phalacrocorax auritus*		
light-footed clapper rail	FE, SE	M	short-eared owl	CSC	L
Rallus longirostris levipes			*Asio flammeus flammeus*		
Belding's savannah sparrow	SE	M	gull-billed tern	FSC, CSC	M
Ammodramus sandwichensis beldingi			*Sterna niloctica vanrossemi*		
elegant tern	FSC, CSC	M	black-crowned night heron		M
Sterna elegans			*Nycticorax nycticorax*		
loggerhead shrike	FSC, CSC	M	Reptiles		
Lanius ludovicianus			green sea turtle	FE	H
western snowy plover	FT, CSC	M	*Chelonia mydas*		
Charadrius alexandrinus nivosus			Plants		
black skimmer	CSC	H	salt marsh bird's beak	FE, SE	M
Rhynchops niger			Cordylanthus maritimus maritimus		
California gull	CSC	H	Palmer's frankenia	CNPS 2	M
Larus californicus			*Frankenia palmeri*		
common loon	CSC	M			
Gavia immer					

Status
- FE = Listed as endangered species by the federal government
- SE = State listed as an endangered species
- FT = Listed as a threatened species by the federal government
- ST = State listed as a threatened species
- FSC = Listed as a species of concern by the federal government
- CSC = California Dept. of Fish and Game Species of Special Concern
- CNPS 2 = California Native Plant Society List 2

Potential for species to occur on project site
- L = Low potential to occur within the project area
- M = Moderate potential to occur within the project area
- H = High potential to occur within the project area
- P = Species observed in project area during site visits

California Least Tern (federal and state endangered). California least terns nest colonially on sandy beaches and prefer to forage in quiet bays and lagoons, although they also forage on the open coast. They migrate to southern California from Central and South America to breed between April and September. This species is endangered primarily because of human disturbance of its nesting habitat. Since their listing as an endangered species in 1970, their numbers have increased dramatically, though population estimates still fluctuate from year to year.

California least terns feed exclusively on small fish such as northern anchovy, topsmelt, jacksmelt, and California grunion (Atwood and Kelly 1984). Eelgrass beds are known habitat for these prey species. The size of the fish captured to feed chicks is smaller than that which adults eat. California least terns are known to nest at several locations adjacent to San Diego Bay (USDN 1999). It is likely California least terns could use the marina and entrance waterways at the project site for foraging.

California Brown Pelican (federal and state endangered). The California brown pelican was originally listed as endangered because of its low reproductive success, attributed to eggshell thinning as a consequence of pesticide contamination. Following the ban on the use of DDT, the population has undergone a major recovery. Ongoing problems with botulism at the Salton Sea continue to affect the population resulting in their continued listing. Brown pelicans nest on some of the offshore islands and in Mexico. They are found along the California coast all year, but numbers greatly increase with the influx of post-breeding birds in summer.

Brown pelicans are plunge divers, feeding on fish primarily in the open waters of harbors. Northern anchovy contribute a significant portion of their diet. Studies of this species have not been conducted in the current project area, though several were seen in or near the marina project site. It is likely they use the marina for resting and foraging, and possibly use the piers and other artificial structures in the area for roosting.

Light-footed Clapper Rail (federal and state endangered). The light-footed clapper rail lives and forages in salt marsh habitat. The population of light-footed clapper rails has declined as a result of loss of salt marsh habitat. In 1996, only 325 pairs in 14 wetlands were known to nest in California (USDN 1999). Sweetwater Marsh, north of the project area is an important habitat for this species (Dailey et al. 1993, USDN 1999). Although Sweetwater Marsh and other nesting areas are known to occur nearby, specific habitat requirements for this species are not found in the project area.

Belding's Savannah Sparrow (state endangered). This state-listed endangered species is found in salt marshes bordering estuaries. It is a year-round resident of the salt marsh, mainly in pickleweed, the preferred nesting habitat. The bird feeds on insects throughout the marsh and mudflats but will also occasionally feed on pickleweed. The patches of salt marsh throughout South San Diego Bay support about 100 pairs of Belding's savannah sparrow (Robinson 1988, USDN 1999, Cooper 2004). While small patches of pickleweed occur in Chula Vista Marina it is unlikely that they would nest in the marina, although the species may occasionally forage on insects in the project area.

Elegant Tern (federal and state species of special concern). Nesting populations of elegant tern (*Sterna elegans*) have increased at several southern California coastal sites in recent years. It prefers habitat somewhat similar to that of the California least tern, so they could potentially nest together. This species is fairly abundant in the bay (Ogden 1994; USFWS 1994, 1995), and could potentially forage in the project area.

Loggerhead Shrike (federal and state species of special concern). Loggerhead shrike *(Lanius ludovicianus*) is not likely to find suitable habitat in the current project area, though it could potentially forage there. Loggerhead shrikes feed on small reptiles and insects.

Western Snowy Plover (federal threatened and state species of special concern). Western snowy plovers feed and nest on coastal sandy beaches and the shores of salt ponds and alkaline lakes from Washington to Mexico (Cogswell 1977, Page et al. 1991). Population declines are attributed to human disturbance and raking of beaches. Unlike least terns, western snowy plovers feed on invertebrate species.

Snowy plovers prefer the same type of nesting habitat as least terns, and nests have been observed on beaches in the bay area and on the salt works levees in the south bay. This species could potentially occur in the project area.

Black Skimmer (state species of special concern). Black skimmers are increasing in southern California as nesting colonies have been re-established at various locations. They are often seen flying inches above the water with their beaks in the water, foraging for prey. Their occurrence in the bay will probably increase as the population continues to grow. Black skimmers are known to forage in San Diego Bay south of the Chula Vista Marina mouth, adjacent to the project area (Peugh 2005 pers. comm.)

California Gull (state species of special concern). Though the western gull (*Larus occidentalis*) is the only resident breeder in the bay, several other gulls, including the California gull (*Larus californicus*) are likely to be found in the project area. Concern for this species is based on impacts to the Mono Lake

nesting colony, which is the main contributor to the California population. In spring, this gull migrates to inland nesting grounds (Dailey et al. 1993).

Common Loon (state species of special concern). Common loons (*Gavia immer*) winter in southern California coastal lagoons and nearshore waters in small numbers. They dive for fish in relatively deep but protected waters. Numbers of this species have declined due to disturbance in its breeding range to the north (Ehrlich et al. 1992). This bird feeds in shallow waters, usually by itself. There is the potential for common loons to utilize the waters adjacent to the project area.

Long-billed Curlew (federal and state species of special concern). Long-billed curlew (*Numenius americanus*) is a winter visitor species preferring coastal estuaries with pickleweed (*Salicornia*) vegetation. Long-billed curlews are most commonly observed in the marshes and mudflat in the south bay area and potentially could occur in the vicinity of the project.

Double-crested Cormorant (state species of special concern). Similar to the brown pelican population, double-crested cormorants have increased in abundance since the early 1970s (MEC 1988). This species swims underwater to capture fish, and prefers open water areas of the bay for foraging. They can be found resting on the water or on buoys and artificial structures. They are unlikely to use the marina, but could potentially use the adjacent waterways of the project area for foraging, and could use the piers and artificial structures for roosting.

Short-eared Owl (state species of special concern). Short-eared owl (*Asio flammeus*) is found in salt marshes and adjacent wetlands. While this species is known to occur in the San Diego Bay area, habitat requirements are probably not present in the project area.

Gull-billed Tern (federal and state species of special concern). Gull-billed terns *(Sterna nilotica*) are one of the several tern species known to nest in the Salt Works area of South San Diego Bay (USDN 1999). The recently formed colony is known to host 8-30 nests, and is one of only a few known breeding areas for the subspecies (Cooper 2004). These birds may occasionally be seen in the project area and it is probable that they use the water ways adjacent to the project site for foraging.

Black-crowned Night Heron (regionally rare resource). Although black-crowned night herons are resident throughout southern California, rookeries such as those occurring at Point Loma are considered a rare resource (CDFG 1991; Hayes [USFWS], pers. comm., in Chambers 1994). Black-crowned night herons forage at dusk and at night along the shoreline and roost during the day in trees and other dense foliage (Cogswell 1977). They feed on a variety of fish, crustaceans, amphibians, reptiles, and rarely, young birds. This species is extremely adaptable, and nests in large colonies in trees or other dense vegetation, even in urban areas. It is possible this species could utilize the project area for foraging, although known nesting colonies are some distance away (Naval Air Station North Island, Naval Station, and Submarine Base).

Salt Marsh Bird's Beak (federal and state endangered). Salt marsh bird's beak is an endangered species found in the upper zones of coastal salt marshes. This species is hemiparasitic, depending on the roots of host plants to derive water and nutrition (USDN 1999). Abundance can vary year-to-year, and success depends on availability of suitable hosts, proper salinity, open canopies and other variable habitat characteristics. Salt marsh bird's beak is known to occur in Sweetwater marsh north of the project area.

Palmer's Frankenia (California Native Plant Society List 2). This low-growing shrub naturally occurs on the edge of salt marshes, making it susceptible to development along marsh margins (Reiser 1994). The only known U.S. population occurs on distinctive mounds that rise above the remaining grade in Sweetwater marsh north of the project area.

Significant Ecological Areas

Southern Coastal Salt Marsh (California-ranked S2.1). Southern Coastal Salt Marsh is characterized by vegetation that occupies intertidal areas and is periodically inundated by rising tides. In southern California, coastal salt marshes are typified by a pickleweed community. Other common community species may include cordgrass, alkali heath salt grass, or saltwort. Salt marsh habitat in San Diego Bay has

been drastically reduced due to development and is now only found in the south bay. Currently about 386 acres (156 ha) of salt marsh habitat remains in South San Diego Bay (USDN 1999). The state ranking identifies that this community has been reduced to between 2,000 and 10,000 acres and that the habitat is very threatened (CNDDB 2005).

Eelgrass. Eelgrass is protected by the State and Federal Government. San Diego Bay's remaining eelgrass beds cover over 655 ha (1,621 ac), which is the largest eelgrass habitat in California. About 404ha are found in the south bay ecoregion (USDN 2004). Although general distribution patterns remain stable, the coverage of eelgrass in the south bay varies seasonally and from year to year in response to El Niño or La Niña events. Eelgrass beds support diverse benthic infaunal and fish communities as well as providing forage for green sea turtles and migrating waterfowl.

National Wildlife Refuges. The South San Diego Bay National Wildlife Refuge incorporates the former Salt Works as well as adjacent marsh, intertidal and shallow subtidal habitats. Dikes separating the evaporation ponds support significant nesting colonies of western snowy plover, Belding's savannah sparrow, black skimmer Forster's tern, gull-billed tern, California least tern, royal tern, and elegant. The dikes and ponds of the Salt Works also provide resting and feeding areas for a variety of shorebirds and waterfowl, and gulls, terns, black skimmers and pelicans roost on the dikes at night.

The Sweetwater Marsh National Wildlife Refuge is north of the proposed project area, however this area provides habitat for most of the same species as the South Bay Refuge, including many listed and sensitive species. Light-footed clapper rails nest in the marsh near the mouth of the Otay River, and two sensitive salt marsh plant species, salt marsh bird's beak and Palmer's frankenia are know to occur in the marsh.

Chula Vista Wildlife Reserve. The Chula Vista Wildlife Reserve is a 34-acre salt marsh area constructed of dredged materials in 1987. Like naturally occurring marshes in the area, the Chula Vista Wildlife Reserve provides food and protection to many species. California least terns have nested at the reserve, and habitat improvements have been made to encourage further least tern nesting. Green sea turtles are year-round residents in a channel adjacent to the reserve to the north. The channel water is warmed by the thermal discharge of nearby power plant.

South Bay Marine Biological Study Area. The South Bay Marine Biology Study Area is part of the U.S. Naval Radio Facility and adjacent to the South San Diego Bay National Wildlife Refuge. Light-footed clapper rails and Belding's savannah sparrow nest in the Emory Cove marsh area.

REGULATORY SETTING

Biological resources are regulated by several federal, state, and local agencies. Principal authority for these resources rests with the local jurisdictions. However, other agencies share jurisdiction over a number of habitats and resources. Trustee agencies have jurisdiction over certain resources held in trust for the people of California, but do not have legal authority over approving or carrying out a specific project (CEQA Guidelines, Section 15386). Under the California Environmental Quality Act (CEQA), the California Department of Fish and Game (CDFG) is a trustee agency with regard to fish and wildlife, rare or endangered native plants, game refuges, ecological reserves, and other areas administered by the department. The CDFG also has authority over species and habitats listed under the California Endangered Species Act of 1970, while the U.S. Fish and Wildlife Service has regulatory authority over federally endangered species pursuant to the Endangered Species Act of 1973. The U.S. Army Corps of Engineers has regulatory authority pursuant to Section 404 of the Federal Clean Water Act of 1977, which not only• pertains to dredging and filling projects in U.S. waters, but expands the Corps jurisdiction to include isolated wetlands and habitats used by migratory birds and endangered species.

Special-status species are those plants and animals afforded protection by the California Endangered Species Act and/or the Endangered Species Act, but may also include those species that fall in one or more of the following categories:

- Species proposed for listing as threatened or endangered under the state or federal Endangered Species Acts,
- Plants protected under California Fish and Game Code, Section 1900 et seq.,
- Animals fully protected under California Fish and Game Code, and
- Plant and animal species designated by the California Department of Fish and Game as being "of special concern".

In addition, certain habitats may be protected if they meet certain criteria, including their support of sensitive species or their relatively limited occurrence.

Applicable Regulations

Clean Water Act. The Clean Water Act (CWA) of 1972 was designed to restore and maintain the physical, chemical, and biological integrity of the nation's waters. Sections of the CWA control the discharge of wastes and pollutants into aquatic environments. Section 404 of the CWA established a program to regulate dredging and/or filling in U.S. waters. Under Section 404, the U.S. Army Corps of Engineers (COE) can issue two types of permits: a general permit or an individual permit. The general permit is a type of permit issued to the public at large on a regional or national basis, and is only issued when the activities would cause only minimal direct or cumulative impacts. An individual permit is required for an applicant that wishes to conduct activities not already allowed under a general permit.

Rivers and Harbors Appropriations Act of 1899. The Rivers and Harbors Appropriations Act of 1899 authorizes the COE to exercise control over all construction projects in U.S. navigable waters. The Rivers and Harbors Act was originally designed with the intent to protect navigation and navigable capacity. These objectives were later expanded to include environmental protection. The key provision to this Act is Section 13, which makes it a crime to discharge refuse into any navigable water without the permission of the COE.

Federal Endangered Species Act. The Federal Endangered Species Act (ESA) of 1973 prohibits direct harm to species that have been designated by the Environmental Protection Agency (EPA) as threatened or endangered. The ESA provides protection to protected species as well as their habitats. Section 7 of the ESA requires that consultation regarding protection of such species be conducted with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) prior to project implementation.

Magnuson-Stevens Fishery Conservation and Management Act. The Magnuson-Stevens Fishery Conservation and Management Act (MSA) was authorized in 1996 and requires the NMFS to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a federal fisheries management plan. Essential Fish Habitat is defined as the waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Specifically, the MSA requires: (1) Federal agencies to consult with NMFS on all actions or proposed actions authorized, funded, or undertaken by the agency that could adversely affect EFH; (2) NMFS to provide conservation recommendations for any federal or state action that could adversely affect EFH; and (3) Federal agencies to provide a detailed response in writing to NMFS within 30 days of receiving EFH conservation recommendations.

The proposed project is located within an area designated as EFH for both the Coastal Pelagics and Pacific Groundfish Management Plans.

Migratory Bird Treaty Act. The Migratory Bird Treaty Act states "it is unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill…any migratory bird, any part, nest, or eggs of any such bird…included in the terms of the conventions between the United States and Great Britain for the protection of migratory birds concluded August 16, 1916 (39 Stat. 1702), the United States and the United Mexican States for the protection of migratory birds and game mammals

concluded February 7, 1936, and the United States and the Government of Japan for the protection of migratory birds and birds in danger of extinction, and their environment concluded March 4, 1972."

California Fish and Game Code, Section 1700. Section 1700 of the Fish and Game Code encourages the conservation, utilization, and maintenance of oceanic biological resources for the benefit of the public. The state will promote the development of local and distant-water fisheries in California under international law. Objectives include the maintenance of populations of all species of aquatic organisms to ensure their continued existence and support reasonable use.

California Endangered Species Act. Similar to the Federal ESA, the California ESA provides protection to species considered threatened or endangered by the State of California. The California ESA recognizes the importance of threatened and endangered fish, wildlife, and plant species and their habitats, and prohibits the taking of any endangered, threatened, or rare plant and/or animal species unless specifically permitted for education or management purposes.

Marine Mammals. Marine mammals are protected by the Marine Mammal Protection Act of 1972 and, for those species listed as endangered or threatened, by the Endangered Species Act of 1973. National Marine Resources Agency is the federal agency charged with the responsibility of enforcing the provisions of the Act. The Marine Mammal Protection Act forbids the taking (including harassment, disturbance, capture, and death) of any marine mammals except as set forth in the act. Therefore none of the construction activities should disturb marine mammals or disrupt their activities or behavior in known migration routes, feeding areas, or breeding areas.

Sea Turtles. All sea turtles are protected under the Endangered Species Act of 1973 and are listed as either endangered or threatened. National Marine Resources Agency is the federal agency charged with the responsibility of enforcing the provisions of the Act. The Marine Mammal Protection Act forbids the taking (including harassment, disturbance, capture, and death) of any sea turtles except as set forth in the act. Therefore none of the operational activities should disturb sea turtles or disrupt their activities or behavior in known migration routes, feeding areas, or breeding areas.

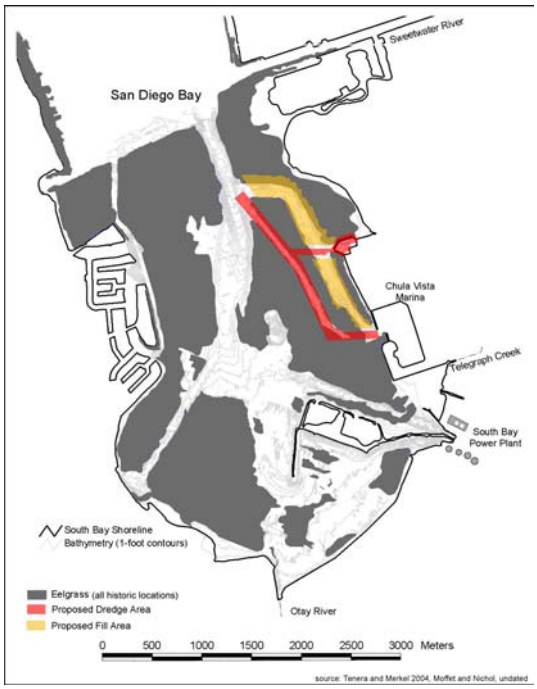

Figure 2. Historic eelgrass occurrence and proposed dredge and fill locations in south San Diego Bay.

Eelgrass. Eelgrass is protected by the State and Federal Government. Recognizing that projects might be necessary that impact this protected resource, the resource agencies have derived a mitigation policy to ensure there is no net loss of eelgrass in Southern California. The Southern California Eelgrass Mitigation Policy (SCEMP) was promulgated on 31 July 1991 by the National Marine Fisheries Services. It was last updated on 30 August 2005, Revision 11.

PROPOSED ALTERNATIVES

Two harbor reconfigurations are being considered to facilitate the creation of a new active commercial marina in the Chula Vista area. Both reconfigurations would maintain the existing number of boat slips currently in the Chula Vista Marina. Both options include reconfiguration of the existing South Bay Boatyard commercial harbor north of the Chula Vista Marina into an approximately 200-slip marina.

The redevelopment project for the Chula Vista Marina would require dredging the entrance channel and realignment of the access channel to the north San Diego Bay. Much of the proposed access channel is too shallow for navigation, which would require dredging of the new channel and filling of the existing channel. An estimated 83

acres of the existing navigation channel will be filled from about -15 MLLW to -3 to -5.5 ft MLLW. The proposed navigation channel alignment overlays an existing channel though the south bay (Figure 2).

Option 1. This proposed harbor reconfiguration would expand the harbor size to enclose all of the existing floating docks and approximately 900 boat slips (Figure 3). This configuration would require excavating the riprap walls and additional areas surrounding the harbor, reconfiguring the southern arm, and relocating the boat launch to increase the water area and improve boat navigability.

Option 2. This option proposes a configuration more similar to the existing marina, which could include some bulkheading of the existing riprap edge but would not require reconfiguring the southern arm or relocating the boat launch (Figure 4). Option 2 proposes approximately 500 boat slips within the harbor footprint and approximately 375 boat slips outside the harbor footprint adjacent to existing entrance to the Chula Vista Marina. The primary difference between the two reconfigurations is the placement of boat slips outside of the harbor in Option 2.

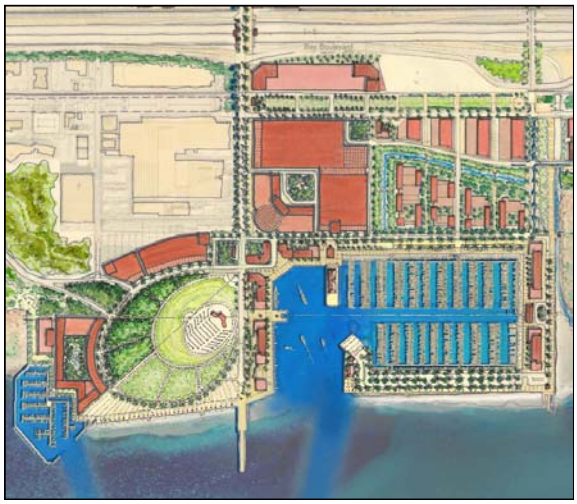

Figure 3. Chula Vista Marina reconfiguration Option 1. Source: SDUPD 2005.

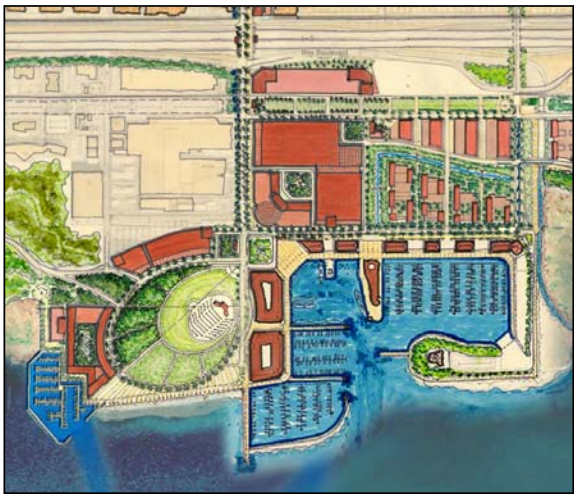

Figure 4 Chula Vista Marina reconfiguration Option 2. Source: SDUPD 2005.

IMPACT ANALYSIS

Impact Significance Criteria

Impacts of the project on biological resources would be significant if endangered, rare, or threatened species or their habitat is substantially affected or movement of any resident or migratory wildlife species is affected, or if the habitat for any species would be substantially reduced. The U.S. Fish and Wildlife Services (Service) has stated that any impacts to intertidal habitat (because of ongoing losses over the last century) would be considered significant (letter to Leisa Lukes, City of Chula Vista and Ralph Hicks, Unified Port District of San Diego dated 22 April 2004). They also mention that any loss of shallow water habitat (-2.2 to -12 ft MLLW) including eelgrass and unvegetated areas would be considered significant because of their importance to the birds of the south bay. The Service is also concerned about the coverage of open water habitat by docks, piers, and wharfs and has a policy of no net loss of habitat.

Permanent Impacts

The reconfiguration of the South Bay Boatyard commercial harbor north of the Chula Vista Marina into a 200-slip marina will not modify the existing harbor boundaries and not result in the permanent loss of hard substrate intertidal or subtidal habitat. Dredging in the area will result in a temporary loss of the subtidal benthic habitat. The benthic community will rapidly recolonize the area following dredging and will not result

in a permanent loss. This harbor is about 16 ft deep, and no areas shallower than 11.5 ft deep were found in a recent survey of the area (MBC 2005). This is too deep to support eelgrass in the area and none was found during the survey, so dredging or shading will not result in the loss of eelgrass habitat. The harbor modification will result in the loss of moderately deep open-water habitat by increasing the area of docks in the area. This area may be lost as foraging habitat for some birds such as terns and pelicans, but will increase foraging opportunities for other species such as black-crowned night herons. This impact is potentially significant based on the U.S. Fish and Wildlife Service policy of no net loss of habitat. Loss of moderately deep open-water habitat in the boatyard harbor will be mitigated by an increase in shallow open-water habitat in South San Diego Bay as a result of fill of the existing navigation channel.

The redevelopment project for the Chula Vista Marina would require realignment of the access channel to the north San Diego Bay. This realignment would include dredging of a new navigation channel through South San Diego Bay and filling of the existing channel. The proposed navigation channel alignment overlays an existing channel though the south bay. This channel was created as a result of boaters cutting across the area instead using the navigation channel (Figure 2). Dredging will be required to widen and deepen this channel for navigation safety. The proposed dredge project would impact approximately 67 acres of soft subtidal habitat. More than one-half of this area is unvegetated, but as much as 31 acres of eelgrass and shallow-water habitat could be lost to dredging, based on the cumulative maximum extent of eelgrass found in the project area in surveys conducted in 1993, 1999, 2003 and 2004 (Merkel 2000, Tenera and Merkel 2004, USDN 2004). Prior to project activities a pre-construction eelgrass survey will be required to determine the actual impact at the time of dredging and fill operations.

The loss of eelgrass habitat must be mitigated at a 1.2 to 1 ratio as described in the Southern California Eelgrass Mitigation Policy (SCEMP) (NMFS 1991, Revision 11). Based on previous mapping, the total area of required eelgrass restoration would be approximately 37.2 acres. An estimated 83 acres of the existing navigation channel will be filled to -3 to -5.5 ft MLLW. The fill would modify deep and moderately deep open-water habitat to create approximately 83 acres of shallow-water habitat. This area would provide enough transplantable habitat at a depth ideal for eelgrass in this section of the bay to mitigate for the loss of eelgrass from the channel realignment and other project aspects.

Option 1. Option 1 will increase the size of the existing Chula Vista Marina by expansion into land parcels. Existing shoreline armoring will be removed in this option and the harbor expanded to the north, east and south of the existing boundaries, while the southern arm will be reconfigured and extended (Figure 3). The marina will be reconfigured to increase density of slips in the southern area, while the northern area will be configured to improve boat launching and navigation.

The southern area shoreline will be riprap lined, with an approximate increase in length of about 411 ft for a total of 5,831 ft, or 7% over the existing riprap (Table 5). The northern area will be bulkhead lined, for an additional length of 2,045 ft of hard intertidal and subtidal substrate. While short-term loss of hard substrate intertidal and subtidal communities are expected, the area of this habitat will be increased as a result of the project, and the communities will become reestablished following construction activities. No long-term impacts to hard substrate intertidal or subtidal communities are expected.

In Option 1, size of the marina will be increased from the existing 51.4 acres to 56.5 acres (Table 5). Open-water area covered by docks and piers will also increase from 15.6 acres to 17.5 acres. As a result, an additional 3.2 acres of open-water habitat will be created in Option 1. In addition, the new configuration will create an open area on the northern side of the marina larger than any open area in the existing marina and more likely to be utilized for foraging by birds. No long-term impacts as a result of loss of open water habitat are expected.

Dredging in the area will result in a temporary loss of the subtidal benthic habitat. The benthic community will rapidly recolonize the area following dredging and will not result in a permanent loss.

Dredging and harbor expansion will result in the loss of approximately 72 m^2 of eelgrass habitat and 1 m^2 of ditchgrass (*Ruppia* sp) in the marina. The loss of eelgrass habitat must be mitigated at a 1.2 to 1 ratio as described in the SCEMP (NMFS 1991, Revision 11). *Ruppia* habitat is similar to eelgrass and will be

mitigated by transplantation of eelgrass. Sufficient habitat to mitigate for the loss of eelgrass and *Ruppia* will be available in the channel realignment fill area.

Dredging and harbor expansion will result in the loss of about 1,200 ft^2 (0.03 ac) of intertidal flat inside the Chula Vista Marina. This loss will be mitigated by an increase of intertidal flat along the San Diego Bay side of the southern arm extension. No long-term impacts as a result of loss of intertidal flat habitat are expected.

Harbor expansion will result in the loss of approximately 5 m^2 of pickleweed in the existing marina. The existing pickleweed in the Chula Vista Marina is sparse and unlikely to be utilized by Belding's savannah sparrows. Loss of pickleweed in the marina is considered less than significant because of the small area affected.

Option 2. Option 2 will increase the size of the existing Chula Vista Marina by construction of an additional harbor adjacent to existing entrance to the Chula Vista Marina. This Option proposes a configuration more similar to existing conditions in the marina, which could include some bulkheading of the existing riprap edge (Figure 4). In this option approximately 14.5 acres of existing shallow subtidal habitat outside of the marina in San Diego Bay will be dredged to navigable depth, and the area surrounded by a riprap armor breakwater to protect the new marina extension with 375 boat slips. Most of the existing marina shoreline will not be modified, although slips within the marina will be reconfigured.

Including the new riprap breakwater, this option will increase the riprap total length by about 1,075 ft for a total of approximately 6,500 ft, or 20% over the existing riprap (Table 5). In addition, the northern shoreline of the marina will be bulkhead lined, for an additional length of 2,026 ft of hard intertidal and subtidal substrate in this option. While short-term loss of hard substrate intertidal and subtidal communities are expected, this habitat will be increased as a result of the project, and the communities will become reestablished following construction activities. No long-term impacts to hard substrate intertidal or subtidal communities are expected.

In Option 2, the marina will be increased from the existing 51.4 acres to 63.4 acres by expanding into the marina into San Diego Bay. Open-water area covered by docks and piers in the marina is similar to existing in Option 2. While open-water area in the marina will expand by 12 acres, open-water habitat in the bay will be reduced by 14.5 acres (Table 5). Open-water bay habitats are more likely to be used for foraging by terns, pelicans and skimmers than similar areas in the marina. This option will result in the net loss of 2.5 acres of open-water habitat and the reduction of foraging area. This impact is potentially significant based on the U.S. Fish and Wildlife Service policy of no net loss of habitat. This loss is relatively small and may be mitigated by an increase in shallow open-water habitat in South San Diego Bay as a result of fill of the existing navigation channel.

Table 5. Changes in amounts of various habitats in the Chula Vista Marina from Option 1 and Option 2.

	Riprap Linear Ft.	Bulkhead Linear Ft.	Water Surface Acres	Dock Area Acres	Open Water Acres	Expansion Area Acres
Existing	5,420	-	51.36	15.58	35.78	
Option 1	5,831	2,045	56.49	17.47	39.02	Land
Net Change	+411	+2,045	+5.13	+1.89	+3.24	-5.13
Option 2	6,500	2,026	63.41	15.41	48.00	San Diego Bay/ Land
Net Change	+1,080	+2,026	+12.05	-0.17	+12.22	-14.53 / +2.48

Dredging in the area will result in a temporary loss of the subtidal benthic habitat. The benthic community will rapidly recolonize the area following dredging, however dredging will also deepen the area, reducing shallow-subtidal habitat while increasing moderately-deep subtidal habitat. Breakwater construction Option 2 will also reduce benthic habitat in the expansion area, while increasing subtidal hard substrate. The depth increase and loss of benthic habitat and community is relatively small and considered less than significant.

Dredging and harbor expansion may result in the loss of up to 14.5 acres (the projected dredge area of the harbor extension) of eelgrass habitat in South San Diego Bay. Actual area of loss will need to be determined prior to construction. The loss of eelgrass habitat must be mitigated at a 1.2 to 1 ratio as described in the SCEMP (NMFS 1991, Revision 11). Sufficient habitat to mitigate for the loss of eelgrass will be available in the channel realignment fill area.

Bulkhead placement on the northern side of the Chula Vista Marina will result in the loss of about 1,200 ft^2 (0.03 ac) of intertidal mudflat inside the marina. This loss will be mitigated by an increase of intertidal flat along the San Diego Bay side of new harbor extension. No long-term impacts as a result of loss of intertidal flat habitat are expected.

Bulkhead placement on the northern side of the Chula Vista Marina will result will result in the loss of approximately 5 m^2 of pickleweed in the existing marina. The existing pickleweed in the Chula Vista Marina is sparse and unlikely to be utilized by Belding's savannah sparrows. Loss of pickleweed in the marina is considered less than significant because of the small area affected.

Temporary Impacts

The reconfiguration of the existing South Bay Boatyard commercial harbor north of the Chula Vista Marina into a 200-slip marina will require dredging of the area. Dredging will result in a temporary loss of the subtidal benthic habitat. The benthic community will rapidly recolonize the area following dredging and will not result in a permanent loss. Other temporary impacts associated with construction include physical disturbance, noise and releases of excavated sediments and water into the local environment. No physical disturbance of local resources other than the benthic habitat is anticipated. Noise is most likely to impact bird use in the construction area. These impacts will be temporary, lasting only the duration of project construction. Temporary impacts to water quality and marine resources could occur through the unintentional release of excavated sediments and water into the local environment. Implementation of BMPs will be required for all construction phases to minimize impacts.

The realignment of the navigation channel would include dredging in the area of the new channel and fill in the area of the existing channel. Dredge and fill activities will result in a temporary loss of the subtidal eelgrass and benthic habitat, while fill will bury moderately deep habitat. The benthic communities in the dredge and fill areas will rapidly recolonize and will not result in a permanent loss. Eelgrass loss will need to be mitigated at a 1.2 to 1 ratio as described in the SCEMP (NMFS 1991, Revision 11). Other temporary impacts associated with construction include physical disturbance, noise and releases of excavated sediments and water into the local environment. No physical disturbance of local resources other than the benthic habitat is anticipated. Noise and construction activities are most likely to impact bird use in the construction area. These impacts should be minimized during California least tern, nesting season from March through September to reduce impacts to breeding birds. Impacts will be temporary, lasting only the duration of project construction. Temporary impacts to water quality and marine resources could occur through the unintentional release of excavated sediments and water into the local environment. Implementation of BMPs will be required for all construction phases to minimize impacts.

Option 1. Short-term impacts from dredging will result in a temporary loss of the subtidal benthic habitat. The benthic community will rapidly recolonize the area following dredging and will not result in a permanent loss. Marina expansion will require the removal of riprap which provides hard substrate for intertidal and subtidal communities in the marina. While short-term loss of hard substrate intertidal and subtidal communities will occur during marina expansion, this habitat will be increased as a result of the project, and the communities will become reestablished following construction activities. Turbid water from dredging can interfere with filter-feeding subtidal organisms, and introduced contaminants could potentially affect subtidal organisms. Use of Best Management Practices (BMPs) and stringent source control measures will reduce potential impacts. Other temporary impacts associated with construction include physical disturbance, noise and releases of excavated sediments and water into the local environment. Noise and construction activities are most likely to impact bird use in the construction area. These impacts should be minimized during nesting season to reduce impacts to breeding birds. Impacts will be temporary, lasting only the duration of the construction. Temporary impacts to water quality and marine resources could occur

through the unintentional release of excavated sediments and water into the local environment. Implementation of BMPs will be required for all construction phases to minimize impacts.

Option 2. Temporary impacts from dredging will result in a temporary loss of the subtidal benthic habitat. The benthic community will rapidly recolonize the area following dredging and will not result in a permanent loss. The removal of some riprap will cause a short-term loss of hard substrate intertidal and subtidal communities in the area. This habitat will be increased as a result of the project, and the communities will become reestablished following construction activities. Turbid water from dredging can interfere with filter-feeding subtidal organisms, and introduced contaminants could potentially affect subtidal organisms. Use of BMPs and stringent source control measures will reduce potential impacts. Other temporary impacts associated with construction include physical disturbance, noise and releases of excavated sediments and water into the local environment. Noise and construction activities are most likely to impact bird use in the construction area. These impacts should be minimized during nesting season to reduce impacts to breeding birds. Impacts will be temporary, lasting only the duration of construction. Temporary impacts to water quality and marine resources could occur through the unintentional release of excavated sediments and water into the local environment. Implementation of BMPs will be required for all construction phases to minimize impacts.

Unavoidable Adverse Impacts

Management practices, including BMPs to control the unintentional release of excavated sediments and water into the local environment and operational procedures that minimize disturbance impacts to birds will reduce temporary impacts related to the proposed project. With mitigation, no permanent impacts to the eelgrass community in the project area will occur. Mitigation will initially increase the area of eelgrass in the south bay and is expected to fully recover to naturally occurring densities within five years of transplantation. No unavoidable adverse impacts to marine biological resources as a result of the project are expected.

Cumulative Impacts

No significant cumulative impacts have been identified to biota or habitats in the project area. There are no other known projects in the vicinity of the proposed project that, when considered together, would result in significant adverse impacts to the wildlife and habitats in the Chula Vista Marina area.

Mitigation

As per the SCEMP (NMFS 1991, Revision 11), the loss of eelgrass habitat must be mitigated at a 1.2 to 1 ratio. Therefore the total estimated area of required eelgrass restoration would be 37.2 acres for the navigation channel realignment and up to an additional 17.4 acres to mitigate for eelgrass loss in Option 2. Mitigation must be initiated within 135 days of project inception; projects requiring more than 135 days to complete may result in additional mitigation. A mitigation plan with schedule is required 30 days prior to any construction or dredge activities. The amount of mitigation necessary will be determined by the difference between a pre-construction and post-construction survey. The pre-construction survey must be conducted during the period of March through October and will be valid for a period of no more than 60 days, with the exception that surveys conducted in August through October will be valid until the following March 1. A post-construction survey conducted within 30 days of the cessation of construction activities will be required to determine the actual area of eelgrass affected for mitigation purposes. The project affecting eelgrass will be required to have a transplant report following construction (Initial Report) and monitoring reports conducted at 6, 12, 24, 36, 48, and 60 months post-transplant. Specific milestones and criteria for success are directed in the SCEMP along with guidelines for remedial actions if the success criteria are not met, which could (based on the absence of other mitigating environmental considerations) result in a Supplementary Transplant Area being constructed and monitored for an additional five years.

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