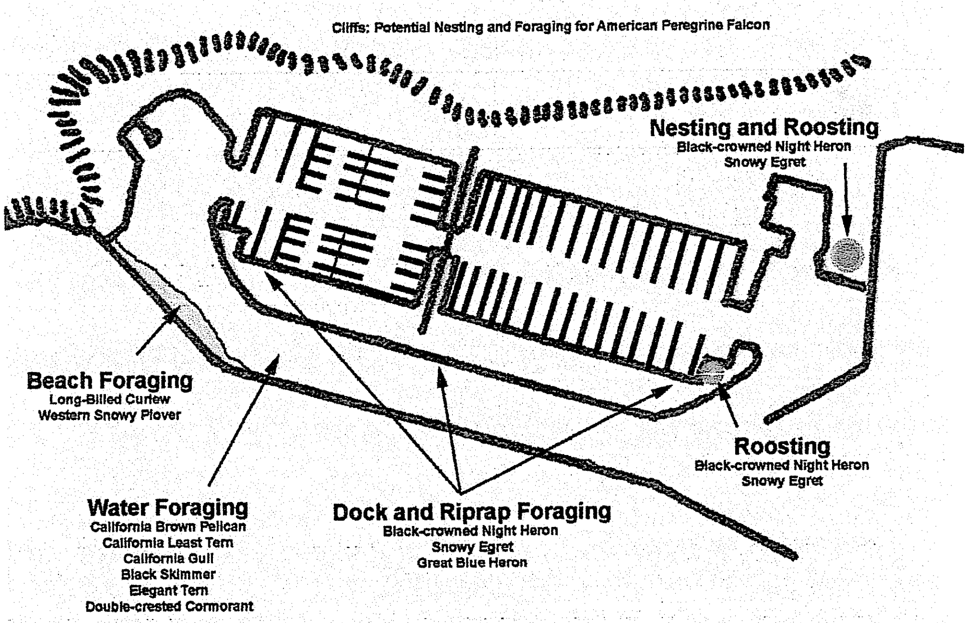
Appendix C
Marine Biological Resources

DANA POINT HARBOR
REVITALIZATION PLAN EIR

Marine Oceanographic and Biological Assessment



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DANA POINT HARBOR
REVITALIZATION PLAN EIR

Marine Oceanographic and Biological Assessment

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1.0 INTRODUCTION TO THE AFFECTED ENVIRONMENT

The Dana Point Harbor Revitalization Plan document proposes improvements to the harbor that will primarily revitalize the commercial core of Dana Point Harbor. Environmental consequences of the proposed revitalization are required to be evaluated by state laws as well as by the lead agency, the County of Orange and their Environmental Guidelines. The overall guidance for all state projects that may have adverse environmental impacts comes from the California Environmental Quality Act (CEQA) and requires that adverse impacts on the environment are avoided or mitigated and that environmental ramifications are evaluated prior to implementation of any project. Herein, we discuss direct, indirect, and cumulative effects on the Dana Point Harbor water quality and biota.

1.1 WATER QUALITY

Physiology

Dana Point Harbor was originally an open coastal area located south of the Dana Point headlands and north of the mouth of San Juan Creek. A breakwater was constructed and the harbor was dredged and completed by 1971. The present day configuration results in the biota of the harbor being influenced by coastal marine conditions. Oceanographic processes such as tides and currents moderately influence sediment depositional patterns in the channels and basins of the harbor complex and determine the biological character of the biota within the harbor.

The bottom topography and composition within Dana Point Harbor is relatively uniform. The bottom is generally covered by silt which exhibits variable chemical properties. The channels of the harbor are maintained to approximately 6 m (20 ft) by dredging, so that the bottom profile does not vary greatly.

Water Quality

Water quality in Dana Point Harbor is affected by combinations of hydrology, currents, storm water runoff, nuisance runoff, boat traffic, and dredging activities. In addition, climatological parameters such as solar radiation, humidity, and wind influence the condition of the water within the harbor. Industrial activities on the water include ship maintenance facilities that conduct repair, painting, bilge pumping, fueling, and periodic maintenance dredging is also performed. The adjacent stores, restaurants and parking lots are all potential sources of materials which may affect the quality of water and sediments in Dana Point Harbor.

Tides

Tides along the California coast are mixed semi-diurnal, with two unequal highs and two unequal lows during each 25-hr period. In the eastern North Pacific Ocean, the tide wave rotates in a counterclockwise direction. As a result, flood tide currents flow upcoast and ebb tide currents flow downcoast. In southern California, the average difference between mean higher high water (MHHW) and mean lower low water (MLLW) is approximately 1.7 m (5.6 ft).

Currents

Water in the northern Pacific Ocean is driven eastward by prevailing westerly winds until it impinges on the western coast of North America where it divides, flowing both north and south.

The southern component is the California Current, a diffuse and meandering water mass that generally flows to the southeast. No fixed western boundary to this current is defined, but more than 90% of the bulk water transport is within 725 km of the California coast.

South of Point Conception the California Current diverges; the branch which turns northward flows inshore of the Channel Islands as the Southern California Countercurrent. Surface speed in the countercurrent ranges from 3 to 6 m/min. The general flow is complicated by small eddies around the Channel Islands and fluctuates seasonally, being well developed in summer and autumn, and weak or even absent in winter and spring. Currents near the coast are strongly influenced by a combination of wind, tide and topography. When wind-driven currents are superimposed on the tidal motion, a strong diurnal component is usually apparent. Therefore, short-term observations of currents near the coast may often vary considerably in both direction and speed.

In Dana Point Harbor, local currents are determined by a combination of tide, wind, thermal structure, and bottom topography. The volume of water moving in and out of the harbor is based on tidal fluctuations, average depth, and harbor area. Although the volume of water in the harbor changes with each ebb and flood tidal cycle, it does not mean that the volume change consists entirely or, even largely, of open ocean water. A considerable portion of the water leaving the harbor on an ebb tide re-enters on the next flood tide.

An important consideration in analysis of surface currents is the presence or absence of a thermocline (a strong gradient of temperature with depth). The speed and direction of currents above the thermocline are usually controlled by wind, especially when the thermocline is strong. When wind blows across a body of water, surface currents are induced and have a direction similar to that of the wind. The magnitude of the current speed depends on wind velocity and duration, characteristics of the adjacent coastline, and the depth of the thermocline. When the thermocline is relatively shallow, surface waters may be accelerated rapidly by the wind. When a weak thermocline exists at relatively greater depth, the wind must move a greater volume of water, and the induced current speeds are slower. Under these conditions, the effects of tidal action are more evident above the thermocline, and surface and subsurface water masses tend to move more as a unit. Nearshore currents below the thermocline are governed primarily by tidal movement.

Temperature

Temperature variations of coastal waters are significantly greater than those of the open ocean because of the relative shallowness of the water, influence from land runoff, localized upwelling, and turbulence generated by current and wave action. Natural surface water temperatures may vary diurnally, approximately 1 to 2°C in summer and 0.3 to 1°C in winter on the average (EQA/MBC 1973). Factors contributing to rapid daytime warming of the sea surface are weak winds, clear skies, and warm air temperatures. Conversely, overcast skies, moderate air temperatures, and vertical mixing of the surface waters by winds and waves limit daily warming.

Normally there is very little difference between surface and bottom water during the winter months. During the summer, however, surface waters become warmer as a result of insolation, and a thermocline is often established between adjacent water layers of more uniform temperatures. A thermocline is formed when absorption of solar radiation penetrating the sea surface develops a stable stratification, thus separating the warmer surface layer from the cooler subsurface layer. Off southern California, a reasonably sharp thermocline exists during the summer months in the upper 30 m of the water column, while during winter, weakly defined thermoclines may appear. Natural surface water temperatures in southern California range from 10.5 to 25°C annually (EQA/MBC 1977).

Dissolved Oxygen

Dissolved oxygen (DO) is an important indicator of water quality. It is utilized by aquatic animals and plants in their metabolic processes and is replenished by photosynthesis and by gaseous exchange with the atmosphere. Surface water DO concentrations in Dana Point Harbor generally range from 4 to 12 mg/l. High concentrations result from active photosynthesis and low values from decomposition of organic material and vertical mixing of surface waters with oxygen-poor subsurface waters.

Salinity

Salinity, a measure of the concentration of dissolved salts, is relatively constant in the open ocean, but varies in coastal environments as a result of freshwater inputs from land runoff and rainfall. The usual range for southern California Harbors is 30.0 to 34.2 parts per thousand (ppt), with a mean salinity of 33.5 ppt (HEP 1976). The maximum values are typically recorded in summer and the minimum during winter storms.

Hydrogen Ion Concentration

The hydrogen ion concentration (pH) of surface seawater varies narrowly around a mean of approximately 8.0, although values as low as 7.0 and as high as 8.9 have been recorded in some southern California harbors (HEP 1980). A positive correlation between pH and dissolved oxygen concentration has been suggested, with highest pH found in the water column, decreasing to a minimum at the greatest depth (HEP 1976, 1980, USACE and LAHD 1992). Although pH has undoubtedly varied throughout the harbor since 1971, there is unlikely to be any discernable temporal or spatial patterns within a harbor as small as Dana Point Harbor.

Clarity

Water clarity (or transparency) defines the ability of water to transmit light. Clarity may be measured by the depth below the surface at which a Secchi disk fades from view, or by measuring the amount of suspended matter in the water with a nephelometer or transmissometer. Clarity can be affected by suspension of material from runoff, dredging, or boat operations, or by seasonal algal blooms. A decrease in transparency can reduce light penetration and limit phytoplankton production in the water column (Bechtel 1995, USACE and LAHD 1992). Transparency throughout Dana Point Harbor tends to be greater near the harbor entrance and less towards the reaches of the harbor.

Nutrients

Nutrients provide the mineral requirements that are essential to primary production by photosynthetic phytoplankton. Nitrogen, phosphorous, and silicate are considered the primary macronutrients required for organic production. Nitrogen in surface water is usually the limiting nutrient for phytoplankton production. In Dana Point Harbor, the major sources of nutrient chemicals are terrestrial runoff and the discharge of other wastes. High phytoplankton productivity and low runoff reduce nutrient concentrations during the summer, while reduced light and increased runoff cause the highest nutrient concentrations in Dana Point Harbor to occur during the winter. High levels of nutrients can lead to localized algal blooms known as red tides.

Nutrient concentrations throughout the harbor are typically higher than oceanic concentrations, where low nutrient concentrations often limit phytoplankton growth. This indicates that nutrients in the harbor are usually available in excess of the needs of the phytoplankton population (HEP 1980). In 1978 the nutrient concentration for nearby Los Angeles-Long Beach Harbor ranged from 0.12 to 119.28 mg/l for ammonia, 0.0 to 5.38 mg/l for nitrite, 0.0 to 82.97 mg/l for nitrate, and 0.17 to 12.39 mg/l for phosphate (USACE, LAHD and LBHD 1984).

Bacteria

Bacteriological monitoring programs in the area have found high concentrations of total coliforms, fecal coliforms, and enterococcus at sites within Dana Point Harbor and just outside the harbor, particularly during and following storms (Ford 2001). During 2000, the only bacteria samples that exceeded state (AB411) single-sample limits near the harbor entrance were collected during or immediately after storms. The Baby Beach portion of Dana Point Harbor has had an ongoing problem with bacterial contamination resulting in beach closures and postings. A study of the problem evaluating past data from sampling conducted between January 1997 and April 2002 determined that the contamination periods showed a strong correlation with rainy periods and that some of the increases noted were probably associated with increased bird abundance (SAIC 2003). There was no correlation with high boat usage periods. No definitive answers were found as the rainy periods and bird increased utilizations periods overlapped. There also was no apparent relationship with tidal periods, although this finding could have been due to the infrequent nature of the sampling program. Recommendations were for the continued use of dry season plugs in storm drains and to potentially divert the drains to sewer system. There were also recommendations to continue to discourage the birds usage of the beach by placing spikes in landing areas and netting under piers.

1.2 CONTAMINANTS TO WATER RESOURCES

Some metals, such as copper, iron, and zinc are required by aquatic organisms in small amounts to maintain biochemical functions, but are toxic to these same organisms in higher concentrations. Other metals, such as cadmium, mercury and lead may have toxic effects on marine organisms in low concentrations. Metal concentrations in Dana Point Harbor can become elevated from ship bottom paints and urban runoff.

Studies conducted in southern California harbors suggest that there is great variability in priority pollutant trace metals in seawater depending on the types of uses to which the receiving water has been subjected. Testing near the Pier J landfill project in Long Beach Harbor found values of 1.9 to 16 mg/l for copper (federal water quality criteria for copper is less than 2.9 mg/l), 0.21 to 0.26 mg/l for lead, 0.0 to 0.4 mg/l for nickel, 0.0 to 0.7 mg/l for silver, and 6.2 to 9.6 mg/l for zinc (Bechtel 1995, USACE and LAHD 1992). However, water samples from nearby Cerritos Channel collected from 1992 through 1994 contained no detectable concentrations of trace metals (SAIC 1995). Focused studies would be needed to spatially and temporally characterize metal concentrations in seawater in Dana Point Harbor.

Tributyltin (TBT) is an active biocide added to marine paints to reduce hull fouling by marine organisms. Toxic effects from TBT exposure in very low concentrations (parts per trillion) identify TBT as one of the most potent marine toxicants (NOAA 1991). The current California water quality objective for TBT is 1.4 ng/l (SWRCB 1997). Surface water TBT levels in Los Angeles and Long Beach Harbors were found to range from 3 to 119 ng/l in 1986 and from 17 to 140 ng/l in 1988 (USACE and LAHD 1992). Tributyltin is unlikely to be a problem in Dana Point Harbor because its use has been prohibited during much of the existence of Dana Point Harbor.

Sediments

Sediment transport requires an initial suspension of bottom sediments. Currents within Dana Point Harbor are not strong enough to mobilize bottom sediments, but can redistribute sediments otherwise suspended. Dredging activities and propeller wash from boats are the primary cause of sediment suspension in the area. Silt and fine sand particles settle more slowly than larger particles, and are more likely to be transported by currents.

Particle size in Dana Point Harbor is highly variable, from fine particles in depositional areas to coarse sands in open areas, especially in dredged areas. Samples were collected from three stations in the harbor during a bight-wide monitoring survey in 1998 (SCCWRP 2003). One station was located in the East Marina near the proposed project area. At that location, sediments were primarily composed of silt and clay, with a lesser amount of sand.

Areas under piers are the most depositional in the harbor, being composed of accumulated shell hash, detritus from mussel colonies on pier pilings, and fine surface particles which have settled out of the water column (Bechtel 1995). Metal concentrations have been found to be inversely proportional to the amount of surface area on sediment grains. Therefore, sediments consisting of finer particles (silt and clay) are expected to contain higher amounts of metals (de Groot et al. 1982, Ackerman 1980).

Sediment Contamination

Dana Point Harbor is not considered to be a highly contaminated site because of its relatively recent construction and because of stringent measures in place since the early 1970s. Results of ongoing monitoring programs suggest healthy bottom conditions withing the harbor (Ford 2001).

1.3 CONTAMINANTS IN DANA POINT HARBOR

There are relatively few industries bordering Dana Point Harbor which could potentially affect water quality within the harbor. Non-point sources of contaminants include surface runoff, ocean disposal, and boating activities. Three categories of identified sources of contamination in Dana Point Harbor include land-based discharges, boat-related discharges, and accidental spills. Land-based discharges in the harbor include storm water drainage and unmonitored drainage from various industrial areas and from runoff from vehicle and equipment washing. Boat-related sources result from boat maintenance and repair operations. Paint chips, as well as chemicals and solvents used in the maintenance of vessels, may directly contaminate the harbor. Waters of the harbor would be expected to have elevated levels of biochemical oxygen demand (BOD), total suspended solids, settleable solids, oil and grease, and fecal coliform, which is an indication of possible discharges of sanitary wastes. However, results of ongoing water quality monitoring studies within the harbor suggest water quality is good within Dana Point Harbor (Ford 2001).

1.4 BIOLOGICAL RESOURCES

Originally, Dana Point Harbor was an open coast mixed sand and rocky beach sandwiched between Dana Point and San Juan Creek. The area provided favorable habitat for fish and invertebrates, and the sand beach served as roosting and nesting habitat for shorebirds. Development of the harbor by creating an impoundment and then dredging has altered the local physiography to that of an embayment. Although, there is probably not significant year-round freshwater input to create salinity gradients in the harbor, the marine biota are probably as diverse, although altered, in the new embayment.

Harbor modifications have changed the type of habitat available for marine organisms. Because of dredging and filling, very little sandy beach and shallow-water habitats remain. Benthic habitat has also been altered. However, hard substrate for sessile and fouling organisms has been greatly increased through emplacement of bulkheads, riprap for shoreline breakwaters, and pier pilings, and deep-water habitat for fish has expanded. The breakwaters strongly affect water circulation and wave energy inside the harbor, influencing water quality and flushing. These modifications have created artificial habitats which support a high diversity of biological communities.

In addition to physical modification of the environment, recreational activities, which increased in the 1970s, have influenced the ecological conditions of the harbor. Factors such as temperature, light and nutrient levels permit a moderate amount of primary productivity, but water pollution, turbidity, noise and other environmental stresses prevent efficient utilization and accumulation of such energy, ie. secondary productivity, by consumer organisms. Much of the natural biological community persists, however. The riprap provides refuge and foraging habitat for fish and birds, and the protected, open waters of the harbor maintain a diverse fish community which in turn provides food for several species of birds.

1.4.1 Terrestrial Biota

Mammals, Birds and Reptiles

Common mammal species found in the harbor include cotton tail rabbits (*Sylvilagus audubonі*), Norway rats (*Rattus norvegicus*), and common house mouse (*Mus musculus*). Several urban-adapted native predator species are known or expected to be found in the harbor area. These species include striped skunk (*Mephitis mephitis*), opossum (*Didelphis marsupialis*) and racoon (*Procyon lotor*). These animals are most active at night, feeding primarily on trash, but will take small animals and eggs when available. In addition, a large population of feral cats (*Felis domesticus*) occurs in the harbor. People have set up cat feeding stations in the area, but the cats also subsist on refuse, rodents and other small animals, and carrion found along the shore.

Several urban-adapted birds utilize the harbor area, but are not considered water-associated birds. Most abundant are rock dove (*Columbia livia*), mourning dove (*Zenaida macroura*), American crow (*Corvus brachyrhynchos*), European starling (*Sturnus vulgaris*), English house sparrow (*Passer domesticus*), and house finch (*Carpodacus mexicanus*). Seasonally abundant or migrant species observed in the harbor area include blackbirds (Emberizidae, Icterinae), warblers (Emberizidae, Parulinae), swallows (Hirundinidae) and hummingbirds (Trochilidae). Most of these species utilize the large number of ornamental trees in the area for roosting and protection, and a few may nest in the area. Many of these species, particularly those that are abundant throughout the year, depend to a large extent on refuse left by people for their livelihood.

Western fence lizard (*Sceloporus occidentalis)* and side-blotched lizard (*Uta stansburiana*) are the most frequently observed reptile species observed in the Dana Point Harbor area. These lizards may occasionally be observed sunning on rocks, fences and walls in the harbor area.

1.4.2 Marine Resources

Marine Mammals

Cetaceans are often seen in the outer waters beyond the breakwaters and California gray whales (*Eschrichtius robustus*), which have only recently been removed from the Endangered category, pass by Dana Point Harbor twice each winter on their migration from the Bering Sea to Baja California and back. However, these visitors only infrequently enter into the nearshore area of the harbor. Although they could possibly enter the harbor, it is a unlikely occurrence. There is no evidence that the harbor has been or is critical to either breeding or as a feeding area. Other marine mammals seen near the harbors on an infrequent basis are the bottlenose dolphin (*Tursiops truncatus*), the common dolphin (*Delphinus delphis*), and the Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) (LAHD and BLM 1985).

Two pinnipeds, the California sea lion (*Zalophus californianus*) and the harbor seal (*Phoca vitulina*) are frequent visitors inside the harbor. Harbor seal populations were estimated to be 330,000 along the Pacific coast with approximately 40,000 in California while the California sea lion population was estimated to be 200,000 (SWRCB/CDFG/NMFS 1997). California sea lion populations are at or beyond carrying capacity, whereas harbor seal populations in California, although apparently increasing, are thought to be below optimum levels. Harbor seal levels elsewhere also appear to be below optimum and may be decreasing. Both harbor seals and California sea lions are found occasionally within the harbor, but the California sea lion is more ubiquitous, often hauling out on various hard substrate throughout the harbor, whereas the harbor seal apparently prefers the area around the breakwaters over that of the inner harbor waters.

Sea Turtles

Sea turtles are infrequently seen offshore of Dana Point Harbor or in the harbor confines. Most sightings off southern California have been of the green sea turtle (*Chelonia mydas*), but occasionally loggerhead (*Caretta*) or leatherback (*Dermochelys coriacea*) turtles are seen. At least one isolated, very small population of green sea turtles are known to exist in southern California. Most nearshore sightings appear to be associated with electric generating station warm water discharges.

Water-associated Birds

Distribution of bird species depends on the availability of suitable harbor in the area. In Dana Point Harbor, large ornamental trees and bushes, rip rap boulders, sand and mudflat beaches, calm, shallow waterways and low docks provide habitats for birds with a wide variety of preferences for feeding, resting, and nesting. The harbor supports a population of year-round residents as well as seasonal visitors that may overwinter in the area or use the harbor for resting and foraging during migrations (Figure 1). A limited number of migratory nesters may also occur. The harbor avifauna is characterized by a large seasonal fluctuation in number of species and individuals, with the greatest diversity and numbers generally occurring during spring and fall migrations.

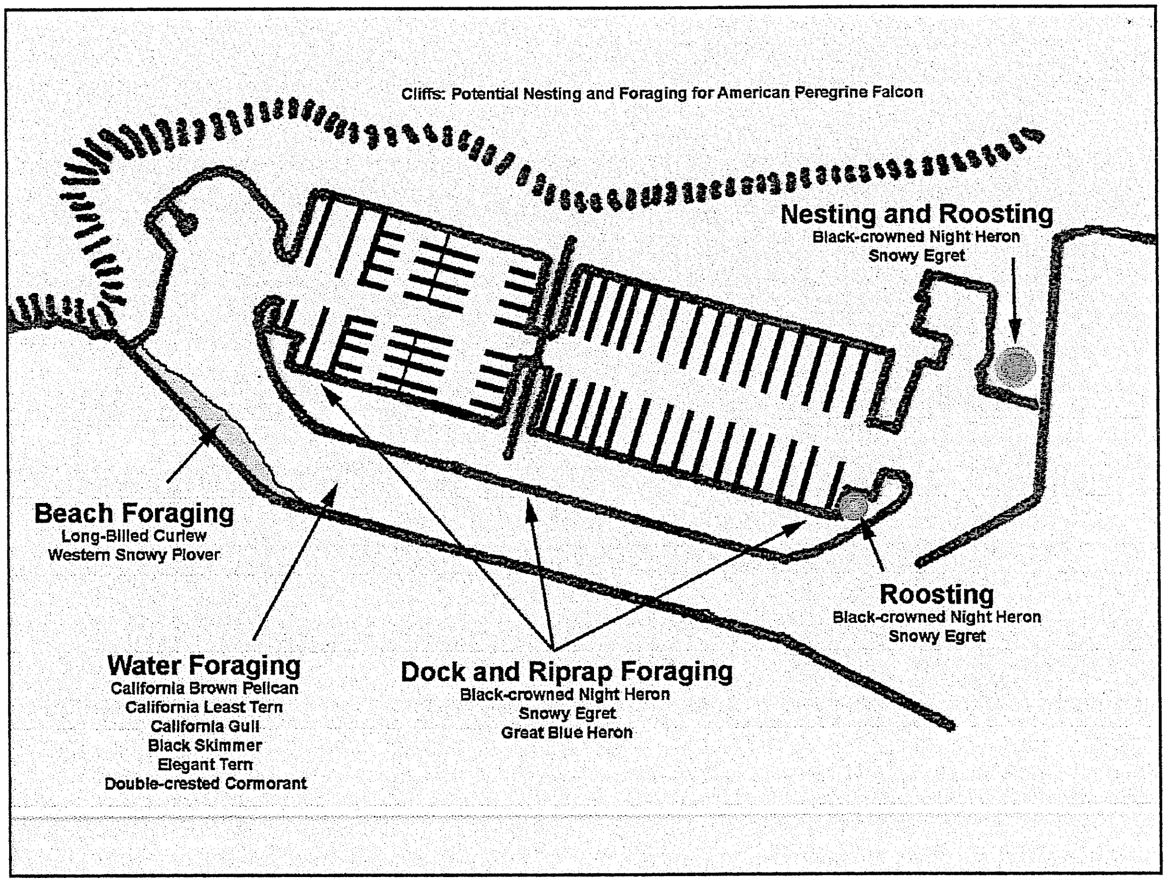

Figure 1. Map identifying sensitive bird species roosting, nesting, and foraging areas in Dana Point Harbor.

Although a variety of birds occur in Dana Point Harbor area, harbor area bird faunas are distinctive because of the occurrence of water-associated bird species, those that are dependent on the marine habitat for food and other essentials. A March 2003 survey of the birds of Dana Point Harbor area found that almost half of the species observed were marine water-associated birds (Table 1, Appendix A). Herons and egrets were the most diverse group of water-associated birds in the harbor, while gulls were the most abundant. Other water-associated bird groups observed included pelicans and sandpipers. Although not observed during the March 2003 survey, ducks are seasonally diverse and numerous in the harbor. Water-associated birds species commonly observed at Dana Point Harbor include gulls (*Larus* spp), California brown pelican (*Pelecanus occidentalis californicus*), surf scoter (*Melanitta perspicillata*), black-crowned night heron (*Nycticorax nycticorax*), and cormorants (*Phalacrocorax* spp).

Table 1. Birds found 10 March 2003 at Dana Point Harbor, Dana Point, California.

Group Common Name	Scientific Name	Native	Resident	Marine
Pelicans				
California brown pelican	*Pelecanus occidentalis californicus*	X	X	X
Cormorants				
double-crested cormorant	*Phalacrocorax auritus*	X	X	X
Herons and Egrets				
black-crowned night heron (BCNH)	*Nycticorax nycticorax*	X	X	X
great blue heron (GBH)	*Ardea herodias*	X	X	X
snowy egret	*Egretta thula*	X	X	X
great egret	*Ardea alba*	X	X	X
Sandpipers				
willet	*Catoptrophorus semipalmatus*	X		X
Gulls				
Western gull	*Larus occidentalis*	X	X	X
Heermann's gull	*Larus heermanni*	X		X
California gull	*Larus californicus*	X		X
Doves				
rock dove	*Columba livia*		X	
mourning dove	*Zenaida macroura*	X	X	
Hummingbirds				
Allen's hummingbird	*Selasphorus sasin*	X		
Swallows				
barn swallow	*Hirundo rustica*	X	X	
Crows				
American crow	*Corvus brachyrhynchos*	X	X	
Waxwings				
cedar waxwing	*Bombycilla cedrorum*	X		
Starlings				
European starling	*Sturnus vulgaris*		X	
Warblers				
yellow-rumped (Audubon's) warbler	*Dendroica coronata auduboni*	X		
Blackbirds				
Brewer's blackbird	*Euphagus cyanocephalus*	X		
brown-headed cowbird	*Molothrus ater*	X	X	
Weavers				
English house sparrow	*Passer domesticus*		X	
Finches				
house finch	*Carpodacus mexicanus*	X	X	

In southern California harbors, gulls are common year-round residents. Frequently observed species include western gull (*Larus occidentalis*), Heermann's gull (*Larus heermanni*), ring-billed gull (*Larus delawarensis*), and California gull (*Larus californicus*) (Garrett and Dunn 1981, MBC 1984, MEC 1988). Gulls are not known to nest in the Dana Point Harbor area, generally preferring to nest on offshore islands or inland, depending on the species, although western gull nesting has been observed in Long Beach Harbor (Cogswell 1977, MBC 1994a). Other common year-round harbor residents that nest outside the area include California brown pelican, double-crested cormorant (*Phalacrocorax auritus,* which nest locally near inland lakes), Brant's cormorant (*Phalacrocorax penicillatus*), and pelagic cormorant (*Phalacrocorax pelagicus*), often seen resting on the outer breakwaters, and willet (*Catoptrophorus semipalmatus*), western sandpiper (*Calidris mauri*), and other shorebirds feeding in the shallow sand and mudflat areas. Of the year-round resident water-associated birds, only some herons and egrets are known to nest in the Dana Point Harbor area. Black-crowned night herons and snowy egrets (*Egretta thula*) nest in large trees within the traffic circle at the end of Puerto Place on the east side of the harbor (MBC 2002a). Black-crowned night heron nests have also been observed in trees near the boat yard and Doheny Beach parking lots and in trees at Doheny State Park. Although nesting seems likely, great blue heron (*Ardea herodias*) nests have not been observed in the area. Herons and egrets are often seen wading in shallow areas seeking small fish and invertebrates. Black-crowned night herons are the most abundant of these in the area, although they may be seen only infrequently during the day. These birds feed along the docks and shallow areas of the harbor at night and roost in trees throughout the harbor during the day (Appendix A).

Seasonally abundant bird species in southern California harbors include surf scoter, black-bellied plover (*Pluvialis squatarola*), sanderling (*Calidris alba*) and other shorebirds, loons, grebes, and ducks in fall and winter (Collins and Bender 1982, MBC 1984, MEC 1988). Some year-round residents such as pelicans, gulls and cormorants are also more common in fall and winter. During spring and summer, California least tern (*Sterna antillarum browni*), Forster's tern (*Sterna forsteri*), elegant tern (*Sterna elegans*), Caspian tern (*Sterna caspia*) and black skimmer (*Rynchops niger*) may be seen in local harbors. These species overwinter to the south, but nest in coastal and bay areas of southern California. These species do not nest in the Dana Point Harbor area, but may occasionally use the harbor for feeding and resting.

Fish

In southern California, harbors provide nearshore fish habitats that supplement, but do not adequately replace, the habitats of natural bays and estuaries (Cross and Allen 1993). Dana Point Harbor provides several habitat types for a large diversity of fish species. Embayments, due to their physiography and biological assemblages, are commonly considered nursery areas for several fish species. They also provides an abundant food supply of infaunal and epibenthic invertebrates in addition to prey species of fish such as northern anchovy. Within Dana Point Harbor are shallow-water, open water, soft bottom, and rocky shoreline (riprap) habitats. Pier pilings also provide areas where certain fish species dwell.

The abundance and distribution of fish within harbors varies both seasonally and by location. For example, species such as white croaker (*Genyonemus lineatus*) are thought to disperse in the winter, resulting in lower winter abundance in comparison to summer surveys (Love et al. 1986). Habitat type, temperature, and depth are likely the most influential factors causing spatial variation of species in Dana Point Harbor.

Several species within southern California harbors are common throughout nearshore, harbor, and estuarine habitats. White croaker (*Genyonemus lineatus*), queenfish (*Seriphus politus*), northern anchovy (*Engraulis mordax*), jacksmelt (*Atherinopsis californiensis*), and topsmelt (*Atherinops affinis*) are some of the common schooling fish that occur in large numbers in harbors and embayments (MBC 1997 and 1999). Bottom-dwelling species common in harbor environments include California halibut (*Paralichthys californicus*), specklefin midshipman (*Porichthys myriaster*), spotted turbot (*Pleuronichthys ritteri*), and diamond turbot (*Hypsopsetta guttulata*) (Love 1996). The riprap outlining the harbor provides a habitat for several fish species, including barred sand bass (*Paralabrax nebulifer*), perches, and cryptic species such as blennies and sculpins.

The fish population within the harbor represents numerous feeding types. Northern anchovy, for example, are filter feeders, straining plankton from the water as they swim (Fitch and Lavenberg

1971). Topsmelt are another example of planktivores. White croaker are omnivores, feeding on benthic and epibenthic organisms, such as crustaceans, clams, polychaetes, and even small fishes, such as northern anchovy (Love et al. 1984). Halibut and midshipmen, however, are ambushers, laying in wait and surprising their prey, which generally consist of zooplankton, squid, and smaller fish (Love 1996).

California halibut, an important species in coastal southern California, requires protected areas such as bays and harbors for nursery grounds (Allen 1988). California halibut spawn over sandy bottoms along the coast, and larvae generally settle to the bottom in bays and in shallower waters of the open coast (Allen 1990). After settling in bays, juveniles remain there for about two years until they emigrate to the coast.

Rocky Intertidal Epibiota

The Dana Point Harbor shorelines consist of intertidal and shallow subtidal riprap of medium to large boulders and concrete bulkheads. This hard substrate, as well as pier pilings, provides intertidal and subtidal habitats for both attached and motile invertebrates. These habitats, in turn, provide food and shelter for rocky shore fishes.

The intertidal community on the riprap and pilings, as on most rocky shores, exhibits vertical zonation. The upper splash zone, from Mean High Water to above Extreme High Water, is inhabited sparsely by species which are especially well-adapted to environmental extremes of temperature and desiccation, such as the periwinkle *Littorina keenae* and the small brown acorn barnacle *Chthamalus* spp. (Ricketts and Calvin 1968, Doty 1946, MBC 1984, 1994b, Dailey et. al 1993). The high tide zone, extending down to Mean Higher Low Water, supports a more abundant and diverse group of species, which includes both the brown acorn barnacle and the white acorn barnacle (*Balanus glandula*), and several limpets (*Collisella* spp.) and turban snails (*Tegula* spp.) which 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 mussels (*Mytilus galloprovencialis*) and additional grazers appear. Encrusting algae (such as *Ralfsia* sp.) and bryozoans (*Watersipora arcuata*) and coralline (*Corallina* spp.), 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 adapted to environmental extremes, as they are seldom exposed to air. However, the community can be extremely diverse, with considerable algal cover (*Egregia menziesii*, *Sargassum muticum*), tunicates, sea urchins (*Strongylocentrotus* spp.), sea stars (*Pisaster* spp.), nudibranchs, *Octopus* spp., and predatory snails (*Roperia poulsoni*, *Acanthina spirata*, and *Pteropurpura festiva*). Where there is wave action, the zones are not distinct, but where the water is calm and the only movement is tidal, the zones form distinct, narrow horizontal bands (MEC 1988, MBC 1994c). Vertical substrates, such as pilings and bulkheads, also typically have narrow zonation.

The dominant overstory in the intertidal provides 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 which prevent desiccation during low tide. They also provide hiding places from predators. Studies using techniques which sample the entire community have shown that the understory community exhibits the same abundance and diversity trends as the overstory, but is more diverse. For example, at a nearby harbor, the intertidal community averaged more than 100 species, but the overstory contributed only 12 species on average to the community total (LBHC 1976, MBC 1984). Total numbers of individuals in the community may reach over 10,000/m^2 in the mid-tidal zone and more than 10 times that in the low-tide zone (MBC 1984). Biomass may exceed 1,000 g/m^2 in the midintertidal and 7,000 g/m^2 in the low intertidal. Mussels contribute most of the biomass of the community (55% at a similar area in Long Beach Harbor), followed by barnacles (18%), algal turf (17%), and other large animals (5%). The understory cryptofauna typically comprises less than 3% of the biomass of the community.

Trophic or feeding type characterizes the usual means by which organisms obtain food. Most of the dominant overstory organisms in the intertidal community are filter feeders that consume particles and small organisms which they remove from the surrounding water. In one study of the mid- and low-tidal zones, 55% of the dominant species and 90% of the cover were filter feeders (MBC 1994b). A smaller portion, 26% of the species (but only 7% of the cover), were primary producers (plants, in this case, algae), meaning they are photosynthetic, capturing energy directly from the sun. The animals which feed, or graze, on the algae are called herbivores, and comprised 18% of the species (and only 3% of the cover). Primary producers were slightly more abundant in summer, and herbivores more abundant in winter. Predators, which attack and consume other animals, and scavengers, which eat dead or moribund animals, were far less frequent than the other groups, but may have had a considerable influence on the community. Filter feeders can feed only on high tide while they are submerged, while the other groups can feed at any time, although they may be restricted by environmental conditions (high temperatures and dry air) and the need to avoid predators. In turn, many of the intertidal organisms reproduce by dispersing eggs, spores, or larvae into the water, providing food for benthic and water-column fishes and invertebrates.

In Dana Point Harbor, composition and abundance of the intertidal community depends on location, exposure, and substrate. At Long Beach, the controlling variable for location was found not to be distance from the harbor entrance, but water movement and other unmeasured factors. The communities on the breakwaters are typically abundant and diverse, resembling those on exposed outer rocky coasts, because of the relatively clean water and almost continual water movement (LBHC 1976, Loi 1981, MBC 1984). More than 105 species were found on the Long Beach breakwater, with up to 21 dominant species, and total numbers of individuals can approach 90,000/m^2 and the index of species diversity may exceed 2.0. On exposed rocky shorelines, such as outside of the breakwaters, abundance and diversity are similar, but some species are replaced by other, such as bay mussels by California mussels (*Mytilus californianus*). Inside the harbor, the community is generally more sparse and less diverse with different community composition, probably because of greater temperature extremes and less wave action (MBC 1973, EQA/MBC 1978, MBC 1994c). For example, in Long Beach Harbor, the purple-striped acorn barnacle *Balanus amphitrite* replaces the brown acorn barnacle (and lower in the tidal zone, the red acorn barnacle) as the most abundant barnacle because of its greater tolerance for warmer water (Moore and Frue 1959, EQA/MBC 1978, MEC 1988). It also appears that some types of algae are susceptible to water and/or air pollution (Widdowson 1971). The total community abundance at a still-water site (resembling Dana Point Harbor) may reach only 3,000 individuals/m^2 at the mid-tide level, and a little over twice that at the low-tide level (MEC 1988). At Cabrillo Marina, abundance averaged about 32% cover, with 5,000 individuals/m^2 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).

The community can vary with time, both on a long-term scale and with season. Several studies have shown that the community is more abundant and diverse in summer than in winter (Widdowson 1971, Sousa 1979, MEC 1988, EQA/MBC 1978, MBC 1994b). The entire community is occasionally 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 (MBC 1991, MEC 1988). 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 the 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 eventually recolonizes the newly-exposed substrate is usually the same as the previous one, but occasionally changes occur which may result from recruit availability or modification of environmental conditions local conditions (MBC 1984). Long-term changes also occur, the reasons for which are often unclear (EQA/MBC 1978, MBC 1994b, MEC 1988).

A brief site visit to the Dana Point Harbor site was conducted on 22 November 1999 near the Ocean Institute to evaluate the intertidal community on the riprap, as no other known intertidal studies have been done within the harbor. The community was highly degraded with few species and low abundances. At the +3-ft level, only a few slipper shells and limpets were noted. In the high intertidal (+5 ft MLLW), abundance was low, with white acorn barnacle most abundant and bay mussels in crevices. Below that, brown acorn barnacle became more prominent, and overall coverage was greater. Below the +2-ft level, barnacles, limpets, and slipper shells were dominant. At the 0-ft level, some low lying algae was present, and in the subtidal, the brown alga *Sargassum muticum* was noted. The low diversity and abundance results from the location of the survey, at the rear most reach of the harbor where currents are much reduced and, therefore, water movement is reduced. The adjacent bottom is shallow allowing silt to be suspended and then settle on the nearby intertidal. Siltation smothers filter-feeding organisms, deters algae, especially low or encrusting types, from photosynthesizing, and prevents settlement of larval stages. In general, however, the community composition in Dana Point Harbor closely resemble those communities found in other southern harbors.

Intertidal communities on the pier pilings were also briefly examined and were 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 from adjacent areas (colonial anemones) (MEC 1988). However, the rate of recovery depends on tidal height and location. Following complete removal of organisms at locations in a nearby harbor, the low tide level recovered faster than the mid-tide level, taking about a year for the community dominants to regain their previous diversity and abundance (MBC 1984). The mid-tidal level 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. Recovery in the low intertidal appears to be less variable than in the mid- and high intertidal, probably because of the more consistent exposure to planktonic larvae (MEC 1988).

To some extent, the composition of the newly-developing community may depend on the larval species present when opportunities for settlement occurs (Haderlie 1974). Usually barnacles settle first, but brown barnacle and red barnacle larvae settle primarily in summer, while white barnacle and bay mussel larvae settle in winter (Moore and Reish 1969, Hines 1978, EQA/MBC 1978). Algae may also settle early, providing abundant attachment points for subsequent settlement by mussel larvae (Dayton 1971). As settlement continues and the community develops, competition results in displacement or reduction of some species. Substrate space has been shown to be the most important limiting resource, and after settling, the new recruits may be spatial competitors (Dayton 1971). The white barnacle outcompetes the brown barnacle because it grows faster (Dayton 1971, EQA/MBC 1978). Most white barnacle individuals live only about four months and 12 months is about the longest they live, reaching about 12 to 15 mm in diameter at the base (Haderlie 1974, EQA/MBC 1978). The brown barnacle lives only about three months and reaches about 5 mm in diameter. However, white barnacles grow more slowly in the higher intertidal than in the lower intertidal, probably because of lower activity rates, giving brown barnacles more of a competitive edge there (Cornelius 1972, Haderlie 1974). The purple-striped barnacle lives about eight months and reaches 12 mm in diameter. Competition may also occur from other activities. Limpets, because of their grazing activities, may destroy newly settled barnacle cyprids and consume most of the settling algal spores and sporelings, for example (Moore 1938, Connell 1961, Dayton 1971). Even among established communities, predators play a role in reducing the numbers of the dominant species. Predatory snails feed on adult barnacles and seastars feed primarily on mussels but also on barnacles (Connell 1961, Paine 1966). Experimental removal of grazers and predators has resulted in heavy growth of algae (in the case of limpet removal) and monopolization of the community by mussels (in the case of seastar removal) (Jones 1948, Lodge 1948, Paine 1966). These biological interactions are thought to increase diversity overall and perhaps explain the patchy distribution of some community dominants.

Larval settlement may depend on the available substrate. Barnacles cyprids (larvae) are rugophiles, preferring surfaces which are irregular (Newell 1972, EQA/MBC 1978). They also prefer substrates which previously were occupied by barnacles, apparently in response to species-specific chemical clues (Knight-Jones 1955).

Rocky Subtidal Epibiota

Marine plant and animal assemblages on rocky subtidal substrate are collectively known as epibiota. The rocky substrate of Dana Point Harbor consists of riprap, bulkheads, and piers which provide suitable habitat for a diverse intertidal-subtidal epibiotic assemblage. These have been described in an area near Dana Point harbor and would presumably have very similar biotic assemblages. Because of the commercialization of the area, several baseline and long-term studies have been conducted in San Pedro-Long Beach Harbor (EQA/MBC 1977; Setzer 1974; LBHC 1976; HEP 1976, 1980; MBC 1974, 1981, 1984, 1986, 1988, 1990, 1991-1994b,c; MEC 1988). The assemblage on the rocky substrate of the harbor provides foraging resources for shorebirds in the intertidal and for fish in the subtidal. Few of these studies utilized the same methodologies or collection techniques, often including or not including groups of species or, in some cases, lumping plants and animals that appear to utilize the same niche. Therefore, it is particularly difficult to compare the studies other than in generalities. Results from these studies, however, indicate that epibiotic assemblages within the harbor are generally less diverse than in unimpacted natural bays and estuaries and on hard substrate outside the harbors. The relative condition of these assemblages within the harbor is highly dependent on the degree of tidal water movement and the depth to which the riprap extends.

Although they do not mirror assemblages in natural bays and estuaries, the intertidal assemblages of harbors are more similar to those of bays and estuaries than open coastal environs primarily due to reduced water movement and the absence of wave-shock. However, subtidal assemblages, depending on their location in the harbor, are exposed to varying degrees of tidal water movement and siltation, resulting in a mixture of open coast and bay-estuarine habitat. A diversity gradient primarily due to the strength of tidal currents has been demonstrated at several locations in nearby harbors (EQA/MBC 1978, MBC 1994b, MEC 1988). This diversity gradient was noted in the Long Beach Harbors' West Basin for infaunal studies (Reish 1978). As no known sources of pollution were noted in the West Basin, Reish attributed this decrease in diversity in the inner reaches of the Naval Station to limited water movement as would be found in much of Dana Point Harbor.

Although, no site-specific studies have been made of assemblages along the Dana Point Harbor shoreline, several studies have been conducted at areas subject to similar conditions. Those studies provide a basis for comparison which may allow an assessment of the degree of the impact on the various subtidal assemblages within the affected portions of the harbor by the proposed project revitalization construction which may potentially impact the water quality of the harbor.

Studies of subtidal assemblages in the Los Angeles-Long Beach Harbor complex were conducted from 1971 to 1974 for the U. S. Army, Corps of Engineers by the Allan Hancock

Foundation as a series of reports for the Harbor Environmental Project (HEP 1974). The subtidal epibiota portions of those studies concentrated on the algal assemblages and, only incidentally, the faunal assemblages on the inside and outside of the breakwaters. Results from pairs of stations (one inside and one outside) along the breakwaters indicated that assemblages on the riprap inside the harbor were more depauperate than assemblages directly opposite those stations outside the harbor, indicating less than favorable conditions inside the harbor.

Long-term studies of the riprap epibiota at stations for Southern California Edison's Long Beach Generating Station were conducted at frequent intervals between 1974 and 2001 (EQA/MBC 1975, 1976, 1977, and MBC 1981, 1986, 1988, 1990-1994b, 1997-1998b). Long-term results from those studies indicated that area coverage by the epibiota was similar in the winter (53%) and in summer (57%). The seasonal differences in coverage were generally large from year-to-year indicating that there is a short-term temporal variation caused by a winter-summer turnover of mainly primary producers, whereas the long-term results indicate a community stability.

Studies were conducted on pier pilings for a survey of the epibiota in Los Angeles harbor (MBC 1974). These studies indicated that pier pilings in the harbor also provide a diverse habitat for the epibiota. Most of the biomass was found to be composed of mussels, slipper shells (*Crepidula* spp.), polychaetes, sea anemones, and tunicates

From these studies conducted in the Port of Long Beach and in the Port of Los Angeles, relatively accurate predictions can be made of the probable composition of the assemblages on the riprap, pier pilings, and other hard substrate in Dana Point Harbor (LBHC 1976; EQA/MBC 1975, 1976, 1977, 1978, and MBC 1981, 1984, 1986, 1988, 1990-1994b; Reish 1982; MEC 1988). These studies have shown that there is vertical zonation of species on the hard substrate and that these assemblages vary within the harbor and are a combination of those assemblages seen in a typical estuary and a natural coastal rocky subtidal substrate. The apparent reason for this variation is the degree of water movement to which the environment is subjected, with a decreasing gradient of diversity in the inner recesses of the harbor.

The shallow subtidal riprap at Dana Point Harbor was briefly surveyed on 29 November 1999 by MBC. At two locations, approximately 50 meters apart, percent cover of dominant organisms was estimated. Results from that survey indicated that the epibiota of the riprap of the shallow subtidal was relatively depauperate compared with that seen in Long Beach harbor. The probable cause is the decrease in tidal strength and increasing shallowness progressing into the inner portion of the basin, resulting in less water movement for filter feeders and increasing siltation which potentially smothers settling epibiota. The upper subtidal at the innermost site was dominated by *Mytilus* spp. and coralline algae, whereas at the other location, the upper subtidal was dominated by large brown algae, particularly *Sargassum muticum*.

Benthic Infauna

The benthic infauna is composed of a community of macroscopic animals which live in the top layers of sediment of the ocean floor. Infaunal communities are strongly influenced by the characteristics of the sediments in which they live (Gray 1974, Rhoads 1974). Sediment grain size is important as it affects features such as ease of burrowing, availability of suitable particles for constructing burrows and tubes, and the amount of organic food available. In harbors, reduced water movement allows for accumulation and deposition of fine grain sediment particles and organic detritus. Typically, in shallow subtidal locations, sediments with increased amounts of fine particles, such as those usually found in harbors, support communities with higher abundance and species richness (Barnard 1963, Knox 1977). Other environmental factors which may influence infaunal communities in harbors include fresh water input, wake turbulence, and contamination sources.

Infaunal organisms utilize a number of techniques for gathering food. Although some species are motile, many are tube-dwellers and must rely on mechanisms to gather food without leaving their tubes. Many species found within the harbor are deposit feeders. Subsurface deposit feeders move through and ingest sediments to digest the organic material in the sediments. Surface deposit feeders actively search surface sediments for organic material, or if sedentary, sweep the sediment surface with specialized appendages. Various polychaete and crustacean species are common deposit feeders in southern California harbors. Suspension feeders obtain material from the water column through filtration. They can live in fine sediments; however, when sediments are disturbed, the fine suspended material can clog the filtering mechanisms of these species. Soft-bottom suspension feeders include clams and tube-dwelling polychaetes. Carnivores actively seek prey, but are not necessarily restricted to live prey and will scavenge when the opportunity arises. Carnivorous species include snails and some polychaete species.

Benthic surveys in Dana Point Harbor found that the infauna community is dominated by small polychaete annelid and arthropod species, with fewer numbers of clams and nemerteans (SWRCB 1997, SCCWRP 2003). Infaunal species composition and dominance has been similar among surveys in Dana Point Harbor, with the dominant species (those that contribute 1% or more to the total abundance) consisting of a group of recurring species, including the amphipods *Grandidierella japonica* and *Corophium* sp and the annelids *Pseudopolydora paucibranchiata* and *Euchone limnicola* (Tables 2 and 3). High abundances at some stations of species tolerant of variable salinities, such as *P. paucibranchiata and G. japonica*, suggest that fresh-water input from urban runoff may be considerable in some areas of the harbor. Density of infaunal organisms in Dana Point Harbor in 1994 ranged from about 3,000 organisms per m^2 in sediments from the south side of the harbor to almost 20,000 organisms per m^2 in the Stormdrain (Baby Beach) area (Table 2). During regional surveys conducted in 1998, infaunal density in the harbor ranged from about 1250 to nearly 7,000 organisms per m^2, with highest densities again found in the Baby Beach area (SCCWRP 2003 unpubl. data) (Table 3). (Lower densities determined during the Bight '98 surveys are a result of the larger screen size used to sieve infaunal samples.) As is typical in southern California harbors, species found during infauna sampling include both native and well-established introduced species. The infaunal community in Dana Point Harbor is similar to communities found in other southern California embayments (MBC 1998a,b,c; 2002b,c,d).

Table 2. Most abundant infaunal species (no./m^2) in Dana Point Harbor, September 1994. Source SWRCB 1997.

		Station					
Phylum	Species	DP Harbor North	DP Harbor South	Commercial Basin	Stormdrain	Total	% Total
AR	*Mayerella banksia*	1643	577	-	6394	8614	20.4
AR	*Grandidierella japonica*	3818	-	266	3019	7104	16.8
AN	*Pseudopolydora paucibranchiata*	2975	266	1687	1288	6216	14.7
AN	*Prionospio heterobranchia*	311	89	977	1421	2797	6.6
AN	*Exogone lourei*	844	-	44	1732	2620	6.2
AN	*Leitoscoloplos pugettensis*	1687	266	266	178	2398	5.7
AR	*Corophium acherusicum/insidiosum*	888	-	-	1288	2176	5.2
AN	*Scoletoma zonata*	133	1199	488	133	1954	4.6
AN	*Euchone limnicola*	1288	533	44	89	1954	4.6
AR	*Rudilemboides stenopropodus*	-	-	222	1732	1954	4.6
AR	*Leptognathia* sp B	266	-	-	533	799	1.9
NE	nemertea	222	-	178	89	488	1.2
AR	Bathyleberis = Cylinrolebridae	-	-	-	488	488	1.2
	Number of individuals per m^2	14386	3064	4928	19802		
	Number of species	16	9	15	32	41	
AN = Annelid; AR = Arthropod; NE = Nemertea; MO = Mollusca							

Infaunal organisms serve as food for larger invertebrates, such as epibenthic crabs, and demersal fish, such as white croaker, queenfish, black perch, white surfperch, tonguefish, sanddab, and horny-head turbot (Reish and Ware 1976, Ware 1979, Becker and Chew 1987, Peterson and

Quammen 1982). Crustaceans and mollusks are likely the favored prey of many of the dominant fish in the harbor. Infaunal organisms also ingest sediment, consuming and helping to further decompose organic matter. In addition, they rework the sediment, bringing deeper layers to the surface and facilitating oxygenation of the sediment (Rhoads 1963).

Plankton

Plankton are small, free-floating organisms in the marine environment. Their small size and limited powers of locomotion put them at the mercy of prevailing water currents. Phytoplankton exist unicellularly or in aggregate colonies and are capable of photosynthesis. Zooplankton are invertebrate adult or larval stages which generally prey on phytoplankton and other organic material. Ichthyoplankton refers to the planktonic egg and larval stages of bony fish.

Phytoplankton are primary producers, composing the first trophic level of the marine food chain. Ultimately, all marine life depends on the photosynthesis of phytoplankton. Any variation in phytoplankton population affects successive parts of the food chain. The measurement of chlorophyll *a* is the method used to determine the standing crop, or biomass, of a given phytoplankton population. Many times this value is compared with the productivity of a plankton community to give an estimate of its functional efficiency (assimilation).

Nearshore waters of southern California are subject to periodic outbreaks of plankton blooms, including red tides. These blooms generally occur during the warm weather months, and vary in extent and intensity. Seasonal influences play a role in population dynamics. Phytoplankton densities tend to be lowest in winter (most likely due to limited light and lower temperatures) and peak in mid-spring and early autumn. Other factors affecting phytoplankton distribution are terrigenous inputs, residence time of waters inside the harbor, and various water uses in the harbor, while salinity, dissolved oxygen, and pH seem to have little inhibitory or stimulatory effect on phytoplankton.

Table 3. Most abundant infaunal species (no./m^2) in Dana Point Harbor. August 1998. Source SCCWRP 2003.

		Bight '98 Station				%
Phylum	Species	2149	2150	2151	Total	Total
AN	*Pseudopolydora paucibranchiata*	2000	190	100	2290	22.7
AR	*Grandidierella japonica*	370	450	240	1060	10.5
AR	*Corophium* sp	530	250	90	870	8.6
AR	*Synaptotanais notabilis*	760	10	40	810	8.0
AN	*Euchone limnicola*	650	-	140	790	7.8
AN	*Leitoscoloplos pugettensis*	200	190	80	470	4.7
AN	Lumbrineridae	180	220	-	400	4.0
MO	*Caecum californicum*	380	10	-	390	3.9
AR	*Euphilomedes carcharodonta*	210	120	-	330	3.3
MO	*Tagelus subteres*	280	40	-	320	3.2
AN	*Lumbrineris* sp	20	-	230	250	2.5
MO	*Lyonsia californica*	150	-	-	150	1.5
AN	*Euchone incolor*	-	130	-	130	1.3
AN	*Euclymeninae* sp A	60	70	-	130	1.3
AR	*Leptochelia dubia*	110	10	-	120	1.2
AR	*Podocerus cristatus*	110	-	-	110	1.1
AN	*Scoletoma* sp C	10	10	80	100	1.0
	Number of individuals per m^2	6690	2120	1280		
	Number of species	51	39	22	77	
AN = Annelid; AR = Arthropod; NE = Nemertea; MO = Mollusca						

Populations of phytoplankton were sampled numerous times in Los Angeles-Long Beach Harbor since 1970, with population estimates ranging from several hundred to several million phytoplankton organisms per m^3 (LBHC 1976). Monthly samples taken from 1974 to 1978 were comprised primarily of diatoms and dinoflagellates (EQA/MBC 1978). Densities of phytoplankton in the harbor were predictably lower in the winter (due to limited light and lower temperatures) and peaked in mid-spring and early autumn (EQA/MBC 1978, HEP 1980).

Zooplankton are the primary grazers of phytoplankton. They include tiny crustaceans called copepods, plus the eggs, larvae, and some juveniles of other crustaceans, mollusks, polychaetes, ectoprocts and hydroids. The concentration of adenosine triphospate (ATP) in the water column is the quantitative measure of living zooplankton biomass.

Forms of zooplankton in the nearby Los Angeles-Long Beach Harbor complex include copepods, cladocerans, and larvaceans (EQA/MBC 1978). Also present are the reproductive products from rocky intertidal, subtidal and benthic communities, which include larvae of barnacles, or nauplii, and brittlestars. Concentrations of these animals fluctuate year to year in an irregular fashion. The availability of food sources influences, to some degree, the abundance of certain zooplankton during different seasons. Other factors influencing zooplankton density include breeding strategies, predation, and longevity of species.

Harbors are generally considered nurseries for ichthyoplankton. Although various fish spend their larval stages within the confines of harbors, not all of these fish use harbors and embayments as breeding habitat. Croakers, blennies and gobies are fish normally associated with nearshore habitat, and these fish probably live and reproduce within the harbor. However, anchovies, rockfish, and flatfish most likely spawn in areas outside the harbor, and large numbers of larvae subsequently end up within the harbor, either by active or passive transport.

There is likely some spatial distribution variation within the harbor, as well. Larval gobies tend to inhabit the rocky habitat preferred by adults. Northern anchovies are more commonly found in deeper channel areas of harbors. However, since plankton are primarily moved about by prevailing currents, the spatial distribution of species may at times be random, and have little to do with environmental conditions other than water movement.

1.4.3 Endangered, Threatened, and Other Species of Special Status or Concern

Several species which occur in Dana Point Harbor are listed by the federal and state governments as endangered or threatened. Additional species are listed by government agencies and other entities as being of concern, for various reasons. All marine mammals are covered under the Marine Mammal Protection Act, birds by the Migratory Bird Conservation Act, and endangered plants and animals by the Federal and California Endangered Species Acts.

California least tern and California brown pelican are the most common of the sensitive species found in the harbor. Both are listed by the state and federal governments as endangered, and both use the harbor to some degree. Other listed species are seldom found in the harbor or do not depend on the harbor for habitat. Black-crowned night heron is included here because, although it is not currently listed in any category, its populations have been in decline in some parts of the country, and the potential for risk continues with increasing human encroachment on habitat (Ehrlich et al. 1992).

Marine Mammals

Marine mammals are fully protected under the Marine Mammal Protection Act; many are also listed as threatened or endangered and are protected by the Endangered Species Act. Efficacy of the protection afforded by these various acts has been seen in the Eastern Pacific gray whale (*Eschrichtius robustus*), which attained sufficient population size to warrant its recent removal from Federal endangered status.

Cetaceans (whales and dolphins) are common offshore of Dana Point Harbor, but do not regularly inhabit any region of the harbor. These are commonly sighted just outside the breakwater, but occasionally, individuals or groups enter the harbor for a brief visit; these include common dolphin (*Delphinus delphis*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), and Eastern Pacific gray whale. All of these species are extremely mobile. Two species of pinniped, California sea lion (*Zalophus californianus*) and harbor seal (*Phoca vitulina*), have also been observed in the harbor. The harbor seal is sighted only sporadically, but California sea lions frequently haul-out on the breakwater. Although they have been seen swimming in the harbor and could forage there, the harbor would not be considered an important feeding or birthing habitat.

Reptiles

Green sea turtle *(Federal threatened)*

The green sea turtle, Federally-listed as endangered, have been sighted offshore of Dana Point Harbor, however the nearest place they are frequently seen is in and near the mouth of the San Gabriel River and Alamitos Bay (Fullerton 1985). This species would be considered uncommon to rare even offshore, as it is more common in tropical and subtropical waters.

Other sea turtles *(Federal endangered or threatened)*

Leatherback, loggerhead, and Pacific Ridley's sea turtles (the first, Federal threatened, the last two, Federal endangered) although they are known to be infrequently in the offshore area, are unlikely to be found in the harbor.

Birds

California least tern *(Federal and California State endangered)*

California least terns nest colonially on sandy beaches and prefer to forage in quiet bays and lagoons, although they also forage off 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.

In the past, California least terns nested in several locations in southern California (Grinnell and Miller 1944). Currently, nesting is known to occur at Bolsa Chica, Upper Newport Bay, the Santa Ana River mouth and in the Port of Los Angeles (Hamilton and Willick 1996). These sites are highly managed to protect from human and predator intervention.

Least terns forage primarily in the shallow waters adjacent to their nesting colony. They feed on northern anchovies (*Engraulis mordax)*, smelt (Atherinids), and grunion (*Leuresthes tenuis*) (Atwood and Kelly 1984). The size of the fish captured to feed chicks is smaller than that which the adults eat. They occasionally forage in shallower waters in Dana Point Harbor after the chicks hatch. They have been observed feeding offshore and in areas of deeper water in the harbor, but studies suggest that these are of minor importance.

California brown pelican *(Federal and California State endangered)*

The California brown pelican was originally listed as endangered because of its low reproductive success, attributed to egg-shell thinning as a consequence of pesticide contamination. Following prohibition of the use of DDT, the population has largely recovered. Brown pelicans nest on some of the offshore islands and in Mexico. They occur along the coast all year, but numbers greatly increase with the influx of post-breeding birds in summer. They are frequent visitors to the harbor in some years.

Pelicans have been observed throughout the harbor, but they prefer to rest on remote areas, such as the breakwater. Brown pelicans are plunge-divers, feeding on fish primarily in the open waters of the harbor. Northern anchovy comprises a significant portion of their diet.

Western snowy plover *(Federal threatened and California State species of special concern)*

Western snowy plovers, *Charadrius alexandinus nivosus,* feed and nest on coastal sandy beaches and the shores of salt ponds and alkaline lakes from Washington State to Mexico (Cogswell 1977, Page et al. 1991). Small numbers of migrant or wintering snowy plovers are occasionally reported from the nearby San Mateo Creek area, but no nesting has been documented at Dana Point Harbor. Population declines are attributed to human disturbance and raking of beaches. Their occurrence in the harbor is limited by the small amount of sandy beach and mudflat available. Snowy plovers prefer the same type of nesting habitat as least terns, so little potential exists for them to nest at the beaches of Dana Point Harbor.

Elegant tern *(California State species of special concern)*

Nesting populations of elegant terns have increased at several southern California coastal sites in recent years. At the present time, the harbor serves as a foraging and dispersal area from other areas. They forage in shallow waters with least terns, but take larger fish, so they also feed in slightly deeper waters (Massey and Atwood 1981).

Long-billed curlew *(California State species of special concern)*

Long-billed curlews, *Numenius americanus,* nest in northern California and migrate through and winter in coastal wetlands and along shorelines of southern California. Few birds have been observed in the harbor because of the lack of suitable habitat. They are unlikely to occur in the project area.

Black skimmer *(California State species of special concern)*

Black skimmers are increasing in southern California as nesting colonies have been reestablished at Bolsa Chica and Upper Newport Bay. Their occurrence in the harbor will probably continue to increase as their populations grow, and they may occasionally visit Dana Point Harbor, but it is unlikely that they will nest in the harbor.

Double-crested cormorant *(California State species of special concern)*

Nesting colonies of double-crested cormorants occur on the Channel Islands. Like brown pelicans, this species has increased in abundance in southern California since the early 1970s (MEC 1988). Cormorants swim underwater to capture fish, and prefer open water areas of the harbor for foraging. They rest on the water or on buoys and the breakwaters. They also congregate, with brown pelicans.

Common loon *(California 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. This species is in decline because of disturbance in its breeding range to the north (Ehrlich et al. 1992). Small numbers of common loons are seen throughout the harbor in winter.

California gull *(California State species of special concern)*

California gulls are abundant residents in the harbor, but concern for this species is based on impacts to the Mono Lake nesting colony, which is the main contributor to the California population. Abundance of California gulls has declined in recent years, a phenomenon observed for several other gull species as well. They forage throughout the harbor in a variety of habitats.

Black-crowned night heron *(Regionally rare resource)*

Black-crowned night herons forage at dusk and at night 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. They are extremely adaptable, and nest in large colonies in trees or other dense vegetation, even in urban areas. Typically the colonies are located near water, but they are known to occur some distance from water if other conditions are suitable (Gallagher 1997). Black-crowned night herons are year-round residents in Dana Point Harbor, roosting in tress throughout the area during the day. Black-crown night herons nest in several trees on the east side of Dana Point Harbor and at Doheny State Park, adjacent to the harbor. Although they are resident throughout southern California, large rookeries such as occur at Doheny State Beach are considered a rare resource (Hayes, pers. comm. in Chambers 1994).

Fish

Tidewater goby *(Federal endangered and California State species of special concern)*

The tidewater goby inhabits coastal lagoons at the mouths of freshwater streams (Eschmeyer et al. 1983). Its restricted habitat and short lifespan have led to its elimination by human activities at almost all of its former locations (Swift et al. 1989). It is unlikely to occur in the project area as the type of habitat required is not found in the harbor.

Steelhead Trout *(Federal endangered and California State species of special concern)*

The steelhead trout is an anadromous sea going rainbow trout that lives about two to four years of its life (but time varies greatly) in the open ocean prior to returning to the stream where it was first spawned. It is dependent on small clear flowing, but not rapid, streams with gravel beds to complete its spawning cycle. The area must also have protective cover and an adequate food source. Steelhead populations are declining because of impacts on habitat such as dams, turbidity, and other habitat incursions. Although, steelhead probably once existed in most of the California rivers and creeks with outlets to the ocean, none were known to have survived in southern California until recently when some fry were seined from San Mateo Creek. Subsequent sampling failed to produce any fry. Historically, a few fish were known to enter most of the waterways south of the Los Angeles Basin, however, spawning success may have been sporadic (Swift et al. 1993). The last published data indicated that anglers caught large numbers of juvenile rainbow fish in coastal lagoons in the 1930s (Swift et al. 1993). Although a steelhead trout was caught in Dana Point Harbor as recently as 30 December 2002, there is no likelihood that Dana Point Harbor has suitable habitat for spawning.

Invertebrates

White abalone *(Federal endangered)*

Abalone are marine mollusks characterized by a flattened spiral shell that live on subtidal rocks. There are eight species that live in California waters. White abalone occur relatively deep compared to other abalone and are found from 20 - 60 m depth (with the majority occurring at depths of 25 - 30 m depth. Although this species undoubtedly occurred well offshore of Dana Point Harbor in water depths of 20 m, it is no longer known to exist in the immediate area. A listing of the white abalone as having previously occurred at Doheny Marine Life Refuge is probably in error. None of the marine life refuge's area is deeper than 6-8 meters which is well outside of the white abalones' habitat range. It is endangered because of the reduction in numbers due to overfishing. It is unlikely to occur anywhere in the harbor because of the depth and otherwise lack of suitable habitat.

Plants

Saltmarsh bird's beak *(Federal and California State endangered)*

This low-growing, gray-green plant, whose flowers resemble birds' beaks, lives in only a few salt marshes in southern California and Baja California. It is endangered because of the reduction in salt marsh habitat. It is unlikely to occur anywhere in the harbor because of the lack of suitable habitat.

2.0 POTENTIAL IMPACTS OF THE REVITALIZATION PROJECTS IN DANA POINT HARBOR

Water Quality and Sediments

Most construction activities will not occur near the water, so potential impacts are limited to runoff into the harbor resulting from construction related activities (e.g. wash-down) or rain and deposition of air-borne particulates into harbor waters. Turbid water and/or introduced contaminants could potentially affect water column organisms, as well as both intertidal and subtidal organisms. Use of Best Management Practices and stringent source control measures will ensure these potential impacts are insignificant.

Modifications of the seawall or riprap structures will occur adjacent to or in the marine environment. Potential impacts from construction related activities include increased water turbidity and/or introduced contaminants which could potentially affect water column organisms, as well as both intertidal and subtidal organisms. Impacts are anticipated to be localized and short-term for the duration of construction. Use of Best Management Practices including use of silt curtains and stringent source control measures will ensure these potential impacts are insignificant.

Impacts to Baby Beach are not expected to be exacerbated by the proposed harbor renovation project. Persistent bacterial contamination at the site is probably due to rainfall and birds (SAIC 2003).

Currents

Proposed modifications in the Baby Beach area and to the existing seawall have no anticipated impacts to currents in Dana Point Harbor. The harbor is a protected embayment with minimal wave activity. The proposed project is not expected to modify wave dynamics in the Dana Point Harbor area. Coastal erosion and sedimentation in the area will likely be unaffected by the proposed project.

Marine Mammals

Proposed renovations of Dana Point Harbor are unlikely to have any impacts on marine mammals in Dana Point Harbor.

Sea Turtles

Proposed renovations of Dana Point Harbor are unlikely to have any impacts on sea turtles in Dana Point Harbor.

Water-associated Birds

In general, planned renovations of Dana Point Harbor are unlikely to have impacts on most water-associated birds in the area. However, black-crowned night herons and snowy egrets may potentially be impacted during construction and as a result of the project. Both species nest in trees on the east side of Dana Point Harbor and are subject to construction disturbance which may disrupt nesting. Black-crowned night herons are of particular concern because nests have been observed in trees near the boat yard, an area of substantial planned modification. In addition to construction impacts, any trees removed from this area during the project may reduce nesting and roosting habitat for black-crowned night herons, while trees removed in other areas of the harbor could potentially reduce roosting availability for herons and egrets.

Fish

Any renovations of Dana Point Harbor are unlikely to have any impacts on fish in Dana Point Harbor. Although, there are many species of fish that are present nearby in the Marine Life Refuges or known to frequent the harbor, none of these have populations that would be at risk from the potential effects of construction on the seawall or riprap structures. The two endangered species, either do not occur within the harbor or the habitat within the harbor or nearby is not suitable for spawning.

Rocky Intertidal Epibiota

Most construction activities will not occur near the water. Potential effects from land-based construction are limited to runoff into the harbor resulting from construction related activities (e.g. wash-down) or rain and deposition of air-borne particulates into harbor waters. Turbid water can interfere with filter-feeding intertidal organisms, and introduced contaminants could potentially affect intertidal organisms.

Modifications of seawall or riprap structures will occur adjacent to or in the marine environment. Construction activities will directly impact the rocky intertidal biota, including increased turbidity which can interfere with filter-feeding intertidal organisms, introduction of contaminants could potentially affect intertidal organisms, and direct removal of the organisms. Use of Best Management Practices and stringent source control measures during construction will minimize potential impacts to the intertidal community, which should be limited to the duration of construction. Following construction, intertidal organisms are expected to recolonize the impacted area, developing an intertidal community similar to that which was displaced during construction. Impacts to the rocky intertidal subtidal biota are expected to localized and short-term.

Rocky Subtidal Epibiota

The renovation of Dana Point Harbor is expected to have some minor impacts on the rocky subtidal epibiota of Dana Point Harbor. Modifications of the seawall or riprap structures will occur adjacent to or in the marine environment. Construction activities will directly impact the rocky subtidal biota, including increased turbidity which can interfere with filter-feeding subtidal organisms, introduction of contaminants could potentially affect these species, and direct removal and replacement of the rocky subtidal would result in the loss of some of these organisms. Use of Best Management Practices and stringent source control measures during construction will minimize potential impacts to the subtidal community, which should be limited to the duration of construction. Following construction, subtidal organisms are expected to recolonize the impacted area, developing a subtidal community similar to that which was covered or replaced during construction. Impacts to the rocky subtidal biota are expected to localized and short-term.

Benthic Infauna

The renovation of Dana Point Harbor is not expected to cause significant impacts to the resident infaunal community; however, modifications of the seawall or riprap structures will occur adjacent to or in the marine environment. Depending on the amount of construction and the need to move or replace the riprap, some portions of the infaunal community could be disrupted by these activities. There would be no permanent loss of habitat and the subtidal organisms are expected to recolonize the disturbed area.

Plankton

Most construction activities will not occur near the water, so potential impacts to the plankton communities are not likely. Expected modifications to the seawall and/or riprap structures should not impact this community. Potential effects are limited to runoff into the harbor resulting from construction related activities (e.g. wash-down) or rain and deposition of air-borne particulates into harbor waters. Turbid water can interfere with phytoplankton photosynthesis and feeding of zooplankton and ichthyoplankton. Use of Best Management Practices and stringent source control measures will ensure these potential impacts are insignificant. No open water habitat will be lost due to the proposed project.

Endangered, Threatened, and Other Species of Special Concern

The renovation of Dana Point Harbor is expected to have no impact on endangered, threatened, and other species of special concern in Dana Point Harbor area.

2.1 CUMULATIVE IMPACTS

No cumulative impacts on water quality, sediment quality, or marine biota due to project construction or operations, or in relation to other harbor projects, are expected. However, it is possible that some species of water-associated birds may have nesting and roosting interrupted by construction activities or the removal of trees.

2.2 MITIGATION MEASURES

Terrestrial Resources

As no significant impacts are expected to terrestrial resources, no mitigation measures are necessary.

Water Quality and Sediments

No mitigation measures will be necessary for impacts to water or sediment quality from project operations. Best management practices will be implemented which should result in little to no impact to the marine environment. The construction activities are not expected to impact Baby Beach. Preventative measures are already in place in an attempt to lower the number of beach closings and postings.

Marine Mammals

Since no significant impacts to marine mammals are expected, no mitigation should be necessary.

Sea Turtles

Since no significant impacts to sea turtles are expected, no mitigation should be necessary.

Water-associated Birds

Mitigation may be necessary to offset impacts to black-crowned night heron and snowy egret nesting during construction and as a result of potential project disturbance in the boat yard area. While construction disturbance to roosting in other areas of the harbor will be temporary, mitigation may be required to offset loss of roosting habitat for herons and egrets if trees are removed in other areas of the harbor.

Fish

Since no significant impacts on the nearshore fish population are expected, no mitigation would be necessary.

Rocky Intertidal Epibiota

Since no significant impacts to the rocky intertidal epibiota are expected, no mitigation would be necessary.

Rocky Subtidal Epibiota

Since no significant impacts to the rocky subtidal epibiota are expected, no mitigation would be necessary.

Benthic Infauna

Since no significant impacts to the benthic infauna are expected, no mitigation should be necessary.

Plankton

Since no significant impacts to phytoplankton, zooplankton, or ichthyoplankton are expected, no mitigation should be necessary.

Endangered, Threatened, and Other Species of Special Status or Concern

Since no significant impacts are expected, no mitigation should be necessary.

Unavoidable Significant Adverse Impacts

No unavoidable significant adverse impacts on water quality, sediment quality, or marine biota would occur due to project operations. However, there is the potential for impacts to nesting of the black-crowned night heron and snowy plover and potential disruption to roosting activites of herons and egrets.

3.0 ENVIRONMENTAL CONSEQUENCES FOR WATER QUALITY AND BIOLOGICAL RESOURCES IN DANA POINT HARBOR

3.1 METHODOLOGY / IMPACT CRITERIA

Water Quality and Sediments

The California Water Pollution Control Act of 1949 provides that regional boards prescribe requirements based on the beneficial uses of the waters. The Act defined pollution as an "impairment of the quality of the water of the State by sewage or industrial waste to a degree which adversely or unreasonably affects such waters for various beneficial uses." Section 402 of the Federal Water Pollution Control Act of 1972 (the Clean Water Act) regulates the discharge of pollutants to surface water bodies through NPDES permits, which are administered by the State Water Resources Control Board and the nine Regional Water Quality Control Boards on the authority of USEPA.

Several sections from the California Coastal Act of 1976 apply to development in Dana Point Harbor (State of California 1981). Chapter 3, Article 4, Section 30230 assures "Marine resources shall be maintained, enhanced, and, where feasible, restored... Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes." Section 30232 from Article 4 dictates "Protection against the spillage of crude oil, gas, petroleum products, or hazardous substances shall be provided in relation to any development or transportation of such materials. Effective containment and cleanup facilities and procedures shall be provided for accidental spills that do occur."

The Oil Pollution Act of 1990 requires that a state oil spill contingency plan be established with a specific component to include a marine oil spill contingency planning element. The Act also specifies area plans to be capable of removing a "worst case discharge of oil or a hazardous substance, and to mitigate or prevent a substantial threat of such a discharge, from a vessel, offshore facility, or onshore facility operating in or near the geographic area." Area Committees are responsible for pre-planning with state and local officials for joint response efforts.

The Rivers and Harbors Act of 1899 gave authority to the U.S. Army, acting through the Corps of Engineers, to exercise control over all construction in navigable waters. More importantly, section 13 of this Act prohibits the discharge of any refuse from a ship or shore installation into navigable waters of the United States or their tributaries.

Sections 401 and 402 of the Federal Water Pollution Control Act of 1972 apply to the discharge of water or pollution into waters of the United States. Section 401 requires any applicant for a federal license or permit to conduct activities which could result in water discharges to provide the licensing agency with a certification from the state where the activity is conducted (or the U.S. EPA) that the discharge will comply with state Water Quality Standards. Section 402 requires an NPDES permit be issued for the discharge of any pollution discharges into waters of the United States. The source of pollution must meet the "best available technology" standards developed by the EPA for different effluent sources. An NPDES permit also specifies effluent limitations, a compliance schedule, and a reporting requirement.

Concerning contamination during project operation, input of contaminants to Dana Point Harbor would be considered significant if any of the following applied: 1) permanent deterioration or contamination of the aquatic habitat such that the aquatic ecosystem of the harbor is substantially disrupted, 2) generation of on-site runoff rates which exceed the capacity of existing storm drain systems, 3) substantial alteration of flood water flow due to a 100-year standard flood, resulting in on-site flooding, 4) discharges that create a pollution, contamination, or nuisance as defined in Section 13050 of the California Water Code, 5) release of toxic substances that would be deleterious to humans, fish, bird, or plant life, and/or 6) release of hydrocarbon or related contaminants to the surface waters in such concentrations that they would violate existing local, State or Federal statutes, or cause noticeable degradation to the biota within and proximal to the project site such that recovery of the biota would be substantially impaired, prevented or prolonged for extended periods.

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.

Water-associated Birds

The Migratory Bird Treaty Act of 1918 was enacted to implement the Migratory Bird Treaty, which had been signed in 1916 by the United States and Great Britain (on behalf of Canada). The treaty designates three groups of migratory birds: game birds, insectivorous birds, and other nongame birds, and provides a season in which the birds of each group could not be taken "except for scientific or propagating purposes under permits." With minor exceptions, the closed season for the second and third categories is year-round. The taking of nests or eggs of any migratory birds is prohibited, except for scientific purposes. Similar treaties were signed with Mexico in 1936, with Japan in 1972, and with the Soviet Union in 1976. In the Mexican treaty, additional avian groups were specified, completing the basic legal protection of North American birds. Non-native species are not protected. Under special permits, protected (but not endangered) nongame native species may be killed if they become serious local pests.

The California Water Pollution Control Act of 1949 provides that regional boards prescribe requirements based on the beneficial uses of the waters. The Act defined pollution as an "impairment of the quality of the water of the State by sewage or industrial waste to a degree which adversely or unreasonably affects such waters for various beneficial uses." Section 402 of the Federal Water Pollution Control Act of 1972 (the Clean Water Act) regulates the discharge of pollutants to surface water bodies through NPDES permits, which are administered by the State Water Resources Control Board and the nine Regional Water Quality Control Boards on the authority of USEPA. The Water Quality Control Board enumerates beneficial uses of coastal and tidal waters in the nearshore zone of the Pacific Ocean (California State Water Resources Control Board 1978). These uses include the preservation of the marine ecosystem, including the propagation and sustenance of fish, shellfish, marine mammals, waterfowl, and marine vegetation, and commercial and ocean shipping.

Fish

Several agencies including federal, state, county, and city levels have overlapping jurisdiction for the marine resources.

Federal Agencies

U.S. Fish and Wildlife Service (FWS)
National Marine Fisheries Service (NMFS)

Federal Regulations

National Environmental Policy Act of 1969 - provides requirements for protecting marine resources.

Coastal Zone Management Act of 1972 - encourages coastal states to develop and implement coastal zone management plans which are approved by Federal agencies. Each states plan was required to define boundaries of the coastal zone, to identify uses of the area to be regulated by the State, the mechanism (criteria, standards or regulations) for controlling such uses, and broad guidelines for priorities of uses within the coastal zone.

Fish and Wildlife Act of 1956 - establishes a comprehensive national fish, shellfish, and wildlife resources policy with emphasis on the commercial fishing industry but also with a direction to maintain and increase public opportunities for recreational use of fish and wildlife.

Fish and Wildlife Coordination Act

State Agencies

California Regional Water Quality Control Board (RWQCB)

California Department of Fish and Game (CDFG) is responsible for protecting and maintaining the coastal fish populations. Their jurisdiction includes oversight of any commercial or sportfishing that takes place.

State Regulations

California Environmental Quality Act (CEQA) - provides State level requirements for protecting marine resources. According to CEQA guidelines, any impact that would substantially deplete local or migratory fish populations or their respective habitats is considered significant. Significance criteria: "Impacts to attached or free-swimming aquatic animals for ten years or longer directly or indirectly resulting in measurable changes in (a) species composition or abundance beyond that of normal variability or (b) ecological function within a localized area."

California Coastal Act of 1976 - provides various levels of protection for areas of special concern through designations of marine life refuges, reserves, ecological reserves, and areas of special biological significance.

Local Agencies

Through the California Coastal Act of 1976, jurisdiction is also given to local government to enforce and implement regulations that comply with the objective of maintaining and protecting the resources of the coastal zone.

County of Orange
City of Dana Point

California Coastal Act of 1976

Article 2 - Section 30708

All port-related developments shall be located, designed, and constructed so as to:
(a) Minimize substantial adverse environmental impacts.

Article 3 - Section 30711

(3) An estimate of the effect of development on habitat areas and the marine environment, a review of existing water quality, habitat areas, and quantitative and qualitative biological inventories, and proposals to minimize an mitigate any substantial adverse impact.

Upon review of the previous documents, a construction- and/or operation-related impact is considered significant if:

It would substantially degrade local or migratory fish populations or their respective habitats.

It would impact attached or free-swimming aquatic animals for ten years or longer directly or indirectly resulting in measurable changes in (a) species composition or abundance beyond that of normal variability or (b) ecological function within a localized area.

It results in the permanent deterioration or contamination of the aquatic habitat such that the aquatic ecosystem of the harbor is substantially disrupted.

Rocky Intertidal Epibiota

Protection of the rocky intertidal epibiota is found in several sections of California code. Section 30230, Article 4, Chapter 3 of the California Coastal Act of 1976 requires that "Marine resources shall be maintained, enhanced, and where feasible, restored" (State of California 1981).

The California Water Pollution Control Act of 1949 provides that regional boards prescribe requirements based on the beneficial uses of the waters. The Act defined pollution as an "impairment of the quality of the water of the State by sewage or industrial waste to a degree which adversely or unreasonably affects such waters for various beneficial uses." Section 402 of the Federal Water Pollution Control Act of 1972 (the Clean Water Act) regulates the discharge of pollutants to surface water bodies through NPDES permits, which are administered by the State Water Resources Control Board and the nine Regional Water Quality Control Boards on the authority of USEPA. The Water Quality Control Plan covering Dana Point Harbor enumerates 11 beneficial uses of coastal and tidal waters in the nearshore zone of the Pacific Ocean (SDRWQCB 1994). These uses include industrial service supply, navigation (shipping and travel), contact and non-contact water recreation, commercial and sport fishing, wildlife habitat, marine habitat, habitat that supports rare, threatened, or endangered species, migration of aquatic organisms, habitat that supports reproduction and early development of fish, and shellfish harvesting.

Rocky Subtidal Epibiota

Protection of the rocky subtidal epibiota is found in several sections of California code. Section 30230, Article 4, Chapter 3 of the California Coastal Act of 1976 requires that "Marine resources shall be maintained, enhanced, and where feasible, restored" (State of California 1981). Environmental consequences of the proposed revitalization are required to be evaluated by state laws. The overall guidance for all state projects that may have adverse environmental impacts comes from the California Environmental Quality Act (CEQA) and requires that adverse impacts on the environment are avoided or mitigated and that environmental ramifications are evaluated prior to implementation of any project.

Section 401 of the Clean Water Act requires that the State certify that the project complies with the State's water quality standards or, in the case of coastal states like California, with the Coastal Zone Management Act of 1972 or waive their right to do so by not taking action within a specified time period provided for in the California Coastal Act of 1976 (CCC 1981).

Other water quality regulations are covered by the State Water Resources Control Board, Enclosed Bays and Estuaries Plan and the Water Quality Control Plan for the Dana Point Harbor area. Biological resources are further protected by the Marine Protection, Research and Sanctuaries Act of 1972 (Section 103) and the Fish and Wildlife Act of 1956.

Benthic Infauna

Impacts to infauna would be considered significant if there were measurable changes in (a) species composition or abundance beyond that of normal variability or (b) ecological function within a localized area, or if there were permanent deterioration or contamination of the aquatic habitat such that the infauna of the harbor is substantially disrupted.

Legislation pertaining to activities which would potentially impact benthic infauna include the following:

Section 30230, Article 4, Chapter 3 of the California Coastal Act of 1976 requires that "Marine resources shall be maintained, enhanced, and where feasible, restored" (State of California 1981). "Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms...."

The California Water Pollution Control Act of 1949 provides that regional boards prescribe requirements based on the beneficial uses of the waters. The Act defined pollution as an "impairment of the quality of the water of the State by sewage or industrial waste to a degree which adversely or unreasonably affects such waters for various beneficial uses." Section 402 of the Federal Water Pollution Control Act of 1972 (the Clean Water Act) regulates the discharge of pollutants to surface water bodies through NPDES permits, which are administered by the State Water Resources Control Board and the nine Regional Water Quality Control Boards on the authority of USEPA.

Plankton

The National Environmental Policy Act of 1969 (NEPA) ensures environmental considerations are included in project proposals. From the NEPA comes the requirement that an Environmental Impact Statement (EIS) be prepared as part of activities that significantly affect the quality of the environment. The California Environmental Quality Act (CEQA) also requires consideration of environmental impacts prior to development. Impacts to biological resources in

Dana Point Harbor are considered significant if any of the following occur: 1) impacts to aquatic plants for ten years or longer directly or indirectly resulting in measurable changes in (a) species composition or abundance beyond that of normal variability or (b) ecological function within a localized area, 2) impacts to attached or free-swimming aquatic animals for ten years or longer directly or indirectly resulting in measurable changes in (a) species composition or abundance beyond that of normal variability or (b) ecological function within a localized area, 3) permanent deterioration or contamination of the aquatic habitat such that the aquatic ecosystem of the harbor is substantially disrupted, or 4) the release of toxic substances that would be deleterious to humans, fish, bird or plant life.

Chapter 3, Article 4, Section 30230 of the California Coastal Act of 1976 states "Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long term commercial, recreational, scientific, and educational purposes" (State of California 1981).

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APPENDIX A

Results of bird survey conducted 10 March 2003

Appendix A. Results of bird survey conducted 10 March 2003 at Dana Point Harbor, Dana Point California.

Location	Number	Common Name	Scientific Name	Comment
Baby Beach Area				
Beach				
	7	western gull	*Larus occidentalis*	
	1	willet	*Catoptrophorus semipalmatus*	
	1	snowy egret	*Egretta thula*	
Lawn and landscaping				
	10	Brewer's blackbird	*Euphagus cyanocephalus*	
	8	brown-headed cowbird	*Molothrus ater*	
	>10*	house finch	*Carpodacus mexicanus*	nesting
	>10*	European starling	*Sturnus vulgaris*	
	>10*	rock dove	*Columba livia*	
	>10*	English house sparrow	*Passer domesticus*	
Base of cliff				
	1	mourning dove	*Zenaida macroura*	
	2	yellow-rumped (Audubon's) warbler	*Dendroica coronata auduboni*	
	1	Allen's hummingbird	*Selasphorus sasin*	
	>10*	house finch		
	2	American crow	*Corvus brachyrhynchos*	
Mudflat, inside west end of breakwater				
	16	western gull		
	7	Heermann's gull	*Larus heermanni*	
Dana Pt. Yacht Club - Beach House Restaurant				
Trees and landscaping				
	>10*	rock dove		
	>10*	yellow-rumped (Audubon's) warbler		
	>10*	Brewer's blackbird		
	>10*	European starling		on cat feeder
	>10*	American crow		
Riprap				
	8	western gull		
	1	Heermann's gull		
Beach House Restaurant - Harbor Patrol				
Trees and landscaping				
	2	black-crowned night heron	*Nycticorax nycticorax*	in *Ficus* tree
	>10*	rock dove		
	>10*	European starling		
Riprap				
	1	Heermann's gull		
	1	snowy egret		
Breakwaters				
West				
	10	western gull		
	>10*	rock dove		
South				
	25	western gull		
	2	Heermann's gull		
	2	California gull	*Larus californicus*	
	7	double-crested cormorant	*Phalacrocorax auritus*	2 with white tufts above eyes
	2	California brown pelican	*Pelecanus occidentalis californicus*	
	1	great egret	*Ardea alba*	
Bait barge				
	25	western gull		
	1	Heermann's gull		
	3	snowy egret		
	1	great blue heron	*Ardea herodias*	
	1	great egret		
	2	double-crested cormorant		in water

Appendix A. Results of bird survey conducted 10 March 2003 at Dana Point Harbor, Dana Point California.

Location	Number	Common Name	Scientific Name	Comment
Dana Wharf (restaurant area)				
	2	barn swallow	*Hirundo rustica*	on boat antenna
	1	Heermann's gull		
	>10*	European starling		
	>10*	Brewer's blackbird		
	>10*	rock dove		
Boat launch				
	8	western gull		
South Catalina Ferry dock (Puerto Place)				
Trees				
	3	black-crowned night heron		2 in coral tree, 1 in *Eucalyptus*
	9	BCNH or snowy egret nest		in 3 *Eucalyptus* trees
	2	American crow		
	>10*	European starling		
South-facing riprap				
	1	Heermann's gull		
Public parking west of Doheny Beach (Dana Pt. Harbor Drive and Puerto Place)				
	8	Black-crowned night heron		6 adults in large-leaf *Ficus*, 2 juveniles in adjacent small *Eucalyptus* near lot entrance
	10	cedar waxwing	*Bombycilla cedrorum*	
	>10*	European starling		
	>10*	American crow		

>10* = common in the area