MARINE BIOLOGICAL RESOURCES: FOCUSED SURVEY REPORT FOR EELGRASS (*ZOSTERA MARINA*) AND INVASIVE ALGAE (*CAULERPA TAXIFOLIA AND UNDARIA PINNATIFIDA)* FEBRUARY-MARCH 2007 SURVEYS DANA POINT HARBOR MARINA RENOVATION PROJECT DANA POINT, CALIFORNIA

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1.0 INTRODUCTION

1.1 PROJECT PURPOSE

Coastal Resources Management, Inc. (CRM) conducted marine biological resource surveys in Dana Point Harbor on February 20th, March 6th, and March 16th, 2007. The purposes of the investigation were to (1) determine if eelgrass (*Zostera marina*) or invasive algae (*Caulerpa taxifolia or Undaria pinnatifida*) were present in regions of the harbor where proposed marina improvements are planned, (2) to collect data on the presence/absence of other species present in the Harbor on piling, rip-rap and low-relief habitats that might be affected by marina improvements and (3) assess the potential environmental effects of construction and long-term operation of the marina on sensitive marine resources.

1.2 PROJECT LOCATION

Dana Point Harbor, constructed between 1966 and 1970, is located in the City of Dana Point, Orange County, California about 40 miles south of Long Beach/Los Angeles Harbors (Figure 1). It lies in the lee (protected side) of Dana Point Headlands within Capistrano Bay and is also protected by a 1.7 mile long and 14 to 18 feet high breakwater. Harbor channel widths vary from 350 feet in the anchorage areas to 600 feet at the harbor entrance (Wiegel, 1993) The harbor is subject to in-filling of sands that migrate through the quarry rock-breakwater requiring periodic maintenance dredging to maintain safe water depths.

The marina within Dana Point Harbor is divided into two basins, the East Basin and West Basin (Figure 2). Each basin operates as a separate marina, with a total capacity of about 2,500 shallow-draft vessels. The boat launch ramp at the northeast corner of the harbor is newly upgraded as of July 2007. Other facilities within the harbor include the Dana Point Marine Institute, a dry boat storage hoist, fishing pier, shipyard, marine fuel dock, three yacht clubs, and a commercial sports fishing operation. Swimming is allowed at the west end of the Harbor, at Baby Beach. (http://www.ocparks.com/danapointharbor/

1.3 PROPOSED PROJECT COMPONENTS

The County of Orange proposes upgrade landside and waterside facilities within Dana Point Harbor. Waterside-upgrades include the renovation of the marina basin dock systems by replacing old and deteriorating docks, slips and gangways with new facilities (Figure 3). The number of boat slips will decrease to 2,009 (Marina Layout 2 with channel encroachment). A total of 1,163 existing piles will be removed and approximately 933 new piles will be emplaced. In addition, the proposed project includes adding handicap access at locations that is currently not available; Bulkheads will not be affected by the project. This report only addresses the waterside upgrade of the marina dock systems

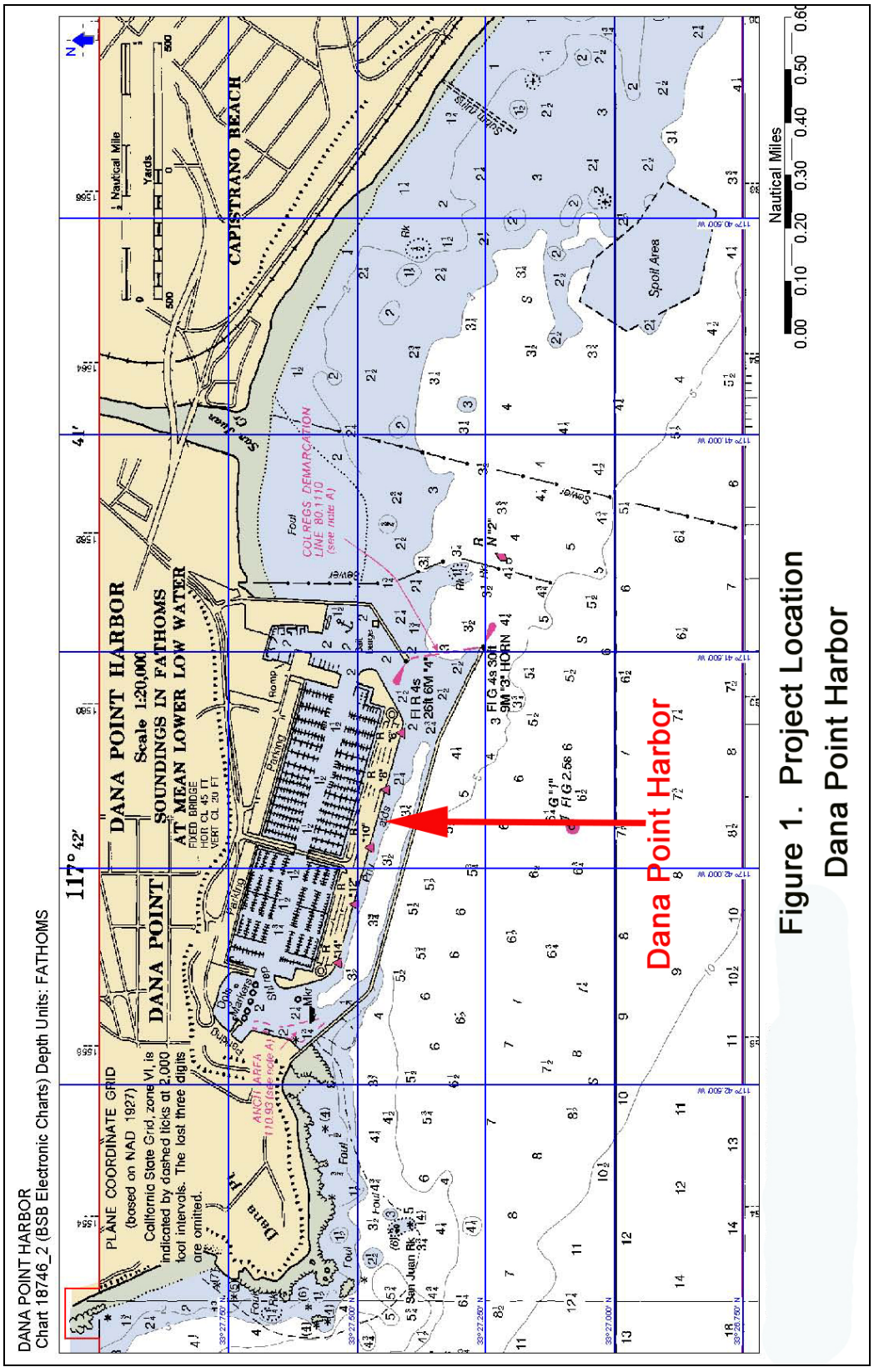


Figure 1. Project Location
Dana Point Harbor

Figure 2. Location of Marina Basins and Baby Beach

2.0 FIELD SURVEY METHODS

Underwater marine biological field surveys were conducted by CRM marine biologists Rick Ware, Stephen Whitaker, and Tom Gerlinger on February 20th, March 6th, and March 16th, 2007 between 0800 and 1430 hours. Surveys were conducted from the RV *Stacy Ann* and a 14 ft Achilles Inflatable vessel.

Underwater surveys were conducted using SCUBA. The surface support individual was in communication with the diving-biologists using an Ocean Technology Systems, Inc. (OTS) communication system due to the potential danger involved while conducting underwater surveys in the active vessel areas. Surveys were conducted in accordance with both the *Southern California Eelgrass Mitigation Policy* (National Marine Fisheries Service 1991 as amended) and the *Caulerpa Control Protocol* (National Marine Fisheries Service, Version 2.1, March 2006).

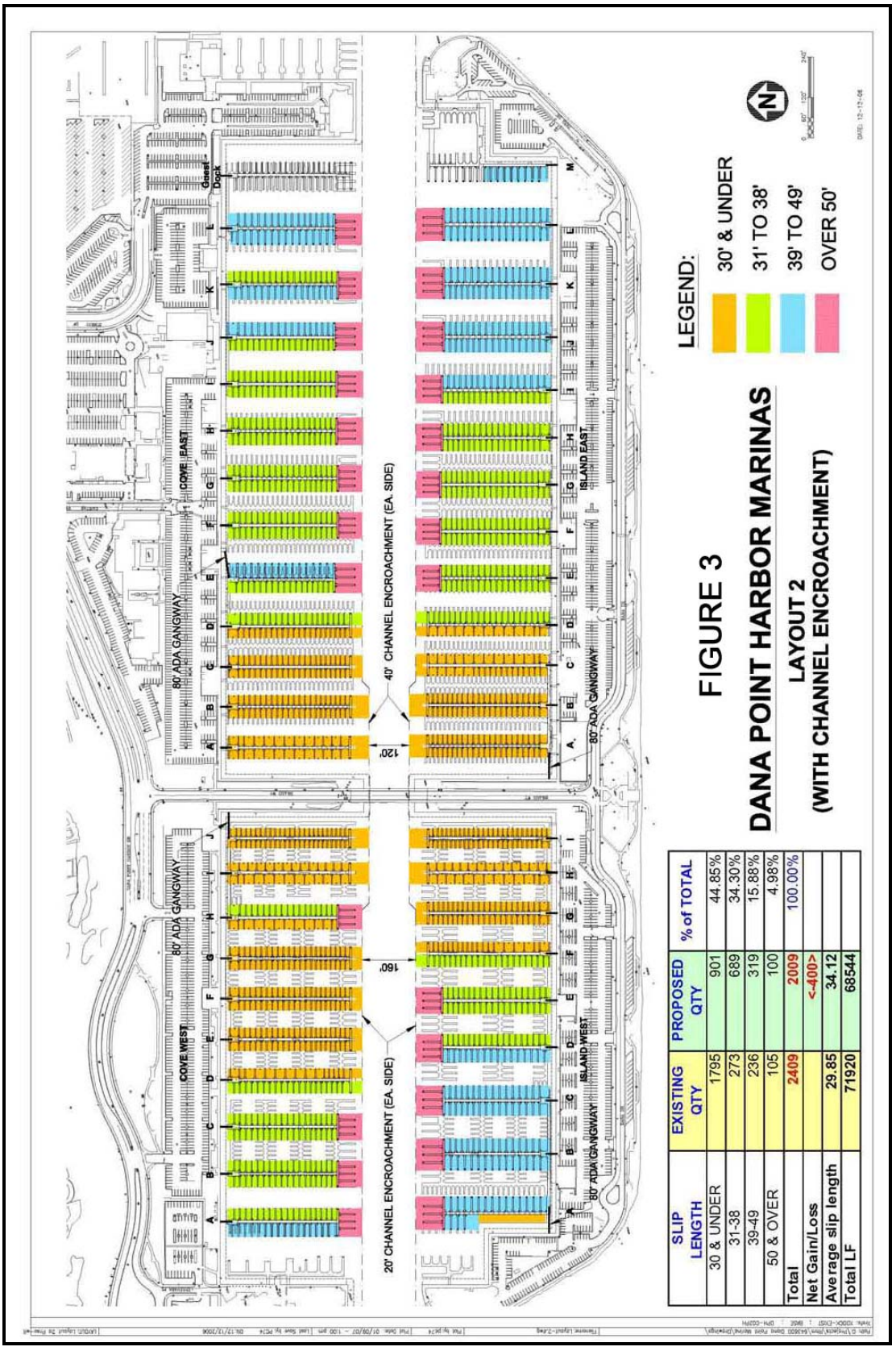
A total of 70, variable-length underwater transects (15 meters [m] to 153 m in length) were swam using SCUBA in the Cove East and West and the Island East and West marina basins (Figure 4). In addition, 43 transects varying in length between 50 m and 100 m long were swam in front of the sailing center and Baby Beach. Fourteen dock piles in the Cove East and the Island East marina basins were also surveyed to determine the types and relative abundances of marine organisms that might be affected by marina construction.

During the transect swims and the inspection of the dock support piles, divers recorded habitat types, common marine life, and the presence or absence of eelgrass and invasive algae. Depths were standardized to Mean Lower Low Water (ft, MLLW) based upon time of observation and tidal corrections for the NOAA San Clemente tidal survey station.

Caulerpa Survey Protocols. Dana Point Harbor is considered a "non-infected" system and requires a "surveillance level" monitoring effort for the presence of *Caulerpa.* The following information is extracted from the National Marine Service *Caulerpa Control Protocol* in regards to the level of survey effort required.

1) *Surveillance Level* – General survey coverage providing a systematic sub-sampling of the entire APE during which at least 20% of the bottom is inspected and widespread occurrences of *Caulerpa* would be expected to be identified if present. Surveys may be accomplished using diver transects, remote cameras, and acoustic surveys with visual ground truthing. Other proposed methodologies may be approved on a case-by-case basis by NOAA Fisheries and CDFG.

The results of the Caulerpa Survey are provided in Appendix 1 of this report.



SLIP LENGTH	EXISTING QTY	PROPOSED QTY	% of TOTAL
30 & UNDER	1795	901	44.85%
31-38	273	689	34.30%
39-49	236	319	15.88%
50 & OVER	105	100	4.98%
Total	2409	2009	100.00%
Net Gain/Loss		<-400>	
Average slip length	29.85	34.12	
Total LF	71920	68544	


Figure 4. Survey Locations
Basin Transect Surveys
Basin Piling Surveys
Baby Beach and Sailing Center Transect Surveys
Dana Point Harbor
Puerto Pl
Dana Point Harbor Dr
Street of Golden Lantern
Castaway Pl
Island Way
Dana Dr
El Camino Capistrano
Old Golden Lantern
Santa Clara Ave
Blue Lantern
Green Lantern
Google
© 2006 Google
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3.0 SURVEY RESULTS

3.1 PROJECT AREA

The dive surveys covered a total of 12,228 sq m (3 acres) of bayfloor habitat within the east and west marina basins and a total of 6,650 sq m (1.64 acres) in the vicinity of Baby Beach and the Youth Sailing Center (Figure 4). Overall, the bottom area of cover surveyed by biologist was 14% in the marina basins and between 58% and 65% at Baby Beach and the Youth Sailing Center. The higher intensity surveys within Baby Beach and the Youth Sailing Center reflected a survey effort concentrated in a region where there was a greater probability of locating either eelgrass or *Caulerpa*, since a very small patch of eelgrass (three turions) was located there in April 2005 (Chambers Group, Inc., 2005).

3.2 PHYSICAL ENVIRONMENT

3.2.1 Survey Depths

The survey within the marina basins was conducted at depths between +1 ft to – 8 ft on the along the bulkhead retaining walls and at depths between -8 and -11 ft MLLW within the fairways of each of the marina basins. Depths surveyed at Baby Beach ranged between 0.0 and -10 ft MLLW, while depths in the vicinity of the Youth Sailing Center varied between
-2 ft MLLW near the bulkhead to depths of -12 ft MLLW, 50 meters west of the dock.

3.2.2 Substrate Types

Surficial substrate types within the marina basins and in the marina channel were generally silty, although deeper sediments tend to be sandier (Geotechnical Inc., 2006). Isolated rock outcrops were also present. The isolated rock patches include three, single rock outcrops in the Island West Basin and one moderate (1 meter high) relief rock outcrop in Cove West Basin. These outcrops were at depths between -8 and -10 ft MLLW. More extensive low-to-medium reef outcrops were located within 50 meters of the Youth Sailing Center Docks at depths between -3 and -8 ft MLLW. Unconsolidated sediments in the vicinity of Baby Beach and the Youth Sailing Center were predominantly sandy silts but increased in sand percentages with a decrease in depth. Sloped, cement bulkheads around the perimeter of the marina basins were covered with a fine sediment layer.

3.2.3 Underwater Visibility and Water Temperature

Underwater visibility was generally limited throughout the three day survey and ranged between 1-3 ft on each side of the underwater transect line within the marina basins and 1-4 ft in the vicinity of Baby Beach and the Youth Sailing Center. By comparison underwater visibility averaged about 3 ft near the boat launch ramp in August 2006 (Chambers Group, Inc 2006) and eight feet at depths of 0.0 to -10 ft MLLW at Baby Beach in April 2005 (Chambers Group, Inc., 2005). Water temperature during the February and March 2007 surveys ranged between 57 and 59 degrees Fahrenheit.

3.3 EELGRASS

3.3.1 Importance of Eelgrass

Eelgrass (Figure 5) is a marine flowering plant that grows in soft sediments in coastal bays and estuaries, and occasionally offshore to depths of 50 feet (ft). Eelgrass canopy (consisting of shoots and leaves added vegetation and the vertical relief it provides enhances the abundance and the

diversity approximately two to three ft long attracts many marine invertebrates and fishes and the of the marine life compared to areas where the sediments are barren. A diverse community of bottom-dwelling invertebrates (i.e., clams, crabs, and worms) live on eelgrass or within the soft sediments that cover the root and rhizome mass system. The vegetation also serves a nursery function for many juvenile fishes, including species of commercial and/or sports fish value (California halibut and barred sand bass). Eelgrass meadows are critical foraging centers for seabirds (such as the endangered California least tern) that seek out baitfish (i.e., juvenile topsmelt) attracted to the eelgrass cover. Lastly, eelgrass is an important contributor to the detrital (decaying organic) food web of bays as the decaying plant material is consumed by many benthic invertebrates (such as polychaete worms) and reduced to primary nutrients by bacteria.

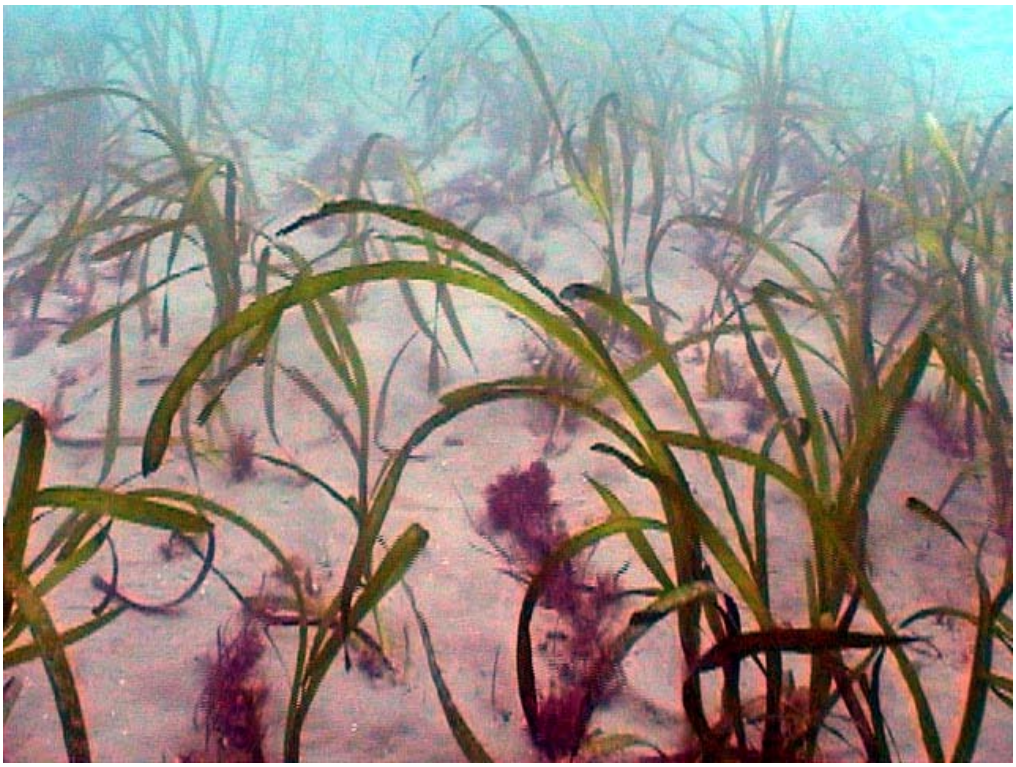

Figure 5. Eelgrass, *Zostera marina*. One "shoot" and the cluster of "blades" arising from the shoot is considered a "turion unit".

Because of the high ecological value of eelgrass meadows, it is important to document the location and amount of eelgrass in areas of proposed waterside developments and to mitigate any losses by avoiding, reducing, or compensating for any adverse effects on eelgrass habitats and communities.

3.3.2 Results of the February/March 2007 Eelgrass Field Survey

No eelgrass was observed during the underwater biological investigations within the marina basins of Dana Point Harbor or at Baby Beach. In a previous survey, Chambers Group, Inc (2005) found a single, three-turion plant at the eastern end of Baby Beach in April 2005.

3.4 INVASIVE ALGAE *(CAULERPA TAXIFOLIA)*

3.4.1 Importance of *Caulerpa taxifolia*

Invasive algae (Figure 6) has a potential to cause ecosystem-level impacts on California's bays and nearshore systems due to its extreme ability to out-compete other algae and seagrasses. *Caulerpa taxifolia* grows as a dense smothering blanket, covering and killing all native aquatic vegetation in its path when introduced in a non-native marine habitat. Fish, invertebrates, marine mammals, and sea birds that are dependent on native marine vegetation are displaced or die off from the areas where they once thrived. It is a tropical-subtropical species that is used in aquariums. It was introduced into southern California in 2000 (Agua Hedionda Lagoon) and (Huntington Harbour) by way of individuals likely dumping their aquaria waters into storm drains, or directly into the lagoons. While outbreaks have been contained, the Water Resources Board, through the National Marine Fisheries Service and the California Department of Fish and Game require that projects that have potential to spread this species through dredging, and bottom-disturbing activities conduct pre-construction surveys to determine if this species is presence using standard agency-approved protocols and by National Marine Fisheries Service/California Department of Fish and Game Certified Field Surveyors.

3.4.2 Focused Survey for Invasive Algae

No *Caulerpa* was found within the Dana Point marina basins or in the vicinity of Baby Beach. It has not been reported to have been present in Dana Point Harbor in previous surveys (Chambers Group, Inc. 2005, 2006). As noted in Section 3.1, the combined *Caulerpa*-eelgrass dive surveys covered a total of 12,228 sq m (3 acres) of bayfloor habitat within the east and west marina basins and a total of 6,650 sq m (1.64 acres) in the vicinity of Baby Beach and the Youth Sailing Center. Overall, the bottom area of cover surveyed by biologist was 14% in the marina basins and between 58% and 65% at Baby Beach and the Youth Sailing Center. The higher intensity surveys were conducted at Baby Beach and the Youth Sailing Center because the area had a greater probability of locating either eelgrass or *Caulerpa*, since a very small patch of eelgrass (three turions) was located there in April 2005 by Chambers Group, Inc. (Chambers Group, Inc. 2005). The invasive algae reporting form, submitted to the National Marine Fisheries Service and the California Department of Fish and Game is provided in Appendix A. Prior to marina construction, a pre-construction *Caulerpa* survey will need to be conducted that attains a minimum survey intensity level of 20% to meet the standard of the Southern California Caulerpa Action Team (NMFS 2006).

Figure 6. The invasive algae, *Caulerpa taxifolia*. Source: NOAA/NMFS

3.4.3 *Undaria pinnatifida*

Undaria pinnatifida (Figure 7) is a golden brown kelp native to the Japan Sea. It has been introduced in Australia, New Zealand, and Europe and has now spread to the California coastline. It has been found in Santa Barbara Harbor, Long Beach Harbor, Anaheim Bay, San Diego Bay, and on Catalina Island. ***Undaria*** was not observed during dive surveys in Dana Point Harbor in February or March, 2007.

Figure 7. *Undaria pinnatifida*

In Japan it is known as wakame and is extensively cultivated as a fresh and dried food plant. However, it has the potential to become a major pest in our coastal waters. *Undaria* grows to between 3 to 7 feet (1 and 2 m) tall and is found in sheltered harbor waters on rocks, breakwaters, and marine debris from the low-tide mark to 50 feet (15 m). A mature plant has a distinctive, spiraled (frilly), spore-producing structure at its base. It also has an obvious central stem to 4 inches (10 cm) wide that extends for the length of the plant (Figure 7). The blade may be up to 3.1 feet (1 m) wide and extends from the tip of the plant for half the length of the plant.

3.5 OTHER MARINE ORGANISMS OBSERVED DURING THE SURVEY

A total of 46 taxa of marine plants, invertebrates, and fishes were observed by biologists during the February and March 2006 field surveys (Table 1 and Table 2). Habitats that were surveyed included subtidal soft benthos (silt and sand sub-habitats), the hardscape of dock pilings, sloped cement bulkheads, and low-to-moderate relief rocky reefs. Limited underwater visibility, which ranged from 1-3 ft was a factor that likely resulted in the under-quantification of the faunal constituents in the harbor, particularly for the fish community.

Overall, marine plants contributed the highest number of taxa (28.3% of the total). Mollusks (snails and clams) were the second most abundant phyla (21.7% of the total), followed by annelid

worms (10.9%) and crustacean arthropods (8.7%). A discussion of the flora and fauna constituents, by habitat, is provided below.

Table 1. Number of Marine Taxa Observed During the CRM Dive Surveys, Feb-Mar 2007.

Group	Number of Taxa	% Total
Algae	13	28.3
Porifera	1	2.2
Cnidaria	2	4.3
Annelida	5	10.9
Arthropoda	4	8.7
Mollusca	10	21.7
Ectoprocta	3	6.5
Tunicata	4	8.7
Fish	4	8.7
Total	46	100

Table 2. List of Organisms Observed During Subtidal Surveys in Dana Point Harbor, February/March 2007

Common Name	Scientific Name	Marina Epibenthos	Marina Pilings and Bulkhead	Youth Sailing Center Reefs and Rip Rap	All Areas
diatom mat	Bacillariophyceae	x	x	x	x
green algae	*Chaetomorpha aerea*	x	x		x
green algae	*Ulva intestinalis*	x	x	x	x
brown algae	*Colpomenia perigrina*		x	x	x
brown algae	*Dictyopteris undulata*		x		x
brown algae	*Dictyota flabellata*		x		x
brown algae	*Dictyoacea*, unid.		x	x	x
brown algae	*Eisenia arborea*		x	x	x
brown algae	*Sargassum muticum*		x	x	x
red algae	*Corallina vancouverensis*		x	x	x
red algae	Filamentous Red Algae		x	x	x
red algae	*Polysiphonia sp.*		x		x
red algae	red turf algae (complex)		x		x
sponge	*Haliclona* sp.	x	x	x	x
hydroid	*Aglaophenia* sp.		x		x
white gorgonian	*Muricea fructicosa*		x	x	x
polychaete	*Dodecaceria fewksii*		x		x
polychaete	*Phragmatopoma californica*		x	x	x

polychaete	Sabellidae, unid.		x		x
polychaete	Serpulidae, unid.		x	x	x
polychaete	Spirorbidae, unid.		x	x	x
barnacle	*Balanus amphitrite*		x	x	x
barnacle	*Balanus glandula*		x	x	x
lined shore crab	*Pachygrapsus crassipes*		x	x	x
lobster	*Panilurus interruptus*			x	x
limpet	*Lottia digitalis*				x
limpet	*MacClintokea (Collisella) scabra*			x	x
slipper shell	*Crepidula onyx*			x	x
Kellet's whelk	*Kelletia kelletii*			x	x
rock scallop	*Crassedoma giganteum*		x		x
bay mussel	*Mytilus galloprovincialis*		x	x	x
sea slug	*Navanax inermis*	x			x
octopus	*Octopus bimaculoides*	x			x
reverse chama	*Pseudochama exogyra*		x	x	x
festive murex snail	*Pteropurpura festiva*	x	x		x
soft ectoproct	*Anguinella palmata*		x		x
moss animal	*Bugula neritina*		x		x
moss animal	encrusting ectoprocts		x		x
colonial tunicate	*Botrylloides* sp.		x		x
colonial tunicate	colonial tunicates		x		x
Common Name (continued)	**Scientific Name**	**Marina Epibenthos**	**Marina Pilings and Bulkhead**	**Youth Sailing Center Reefs and Rip Rap**	**All Areas**
solitary tunicate	Ascideacea, unid.		x	x	x
solitary tunicate	*Styela plicata*		x		x
opaleye perch	*Girella nigricans*			x	x
garibaldi	*Hypsypops rubicundus*			x	x
flatfish	unid. Flatfish	x			x
round sting ray	*Urolophus halleri*	x			x
	Total Taxa	**9**	**35**	**25**	**46**

3.5.1 Soft-Bottom Benthic Epiflora and Epifauna.

Seven soft-bottom benthic algae and macro-invertebrate taxa were observed by divers in the marina basins (Table 2). Of these, none were common. The basin sediments were lightly coated with a layer of diatoms, and secondarily, spotty cover of the algae *Chaetomorpha aerea* and *Ulva intestinalis*. In addition, the round sting ray (*Urolophus halleri*) and other unidentified flatfish were occasionally observed, but were not common. The lack of an extensive benthic epibiota is not uncommon in unvegetated (i.e., seagrass) environments. Species richness is considerably higher for infaunal-dwelling community that consists of a diverse assemblage of groups such as polychaete worms, micro-crustaceans, mollusks, and echinoderms.

3.5.2 Hardscape (Pier Pilings, Cement Bulkheads, and Isolated Rocky Outcrops)

The majority of plants and invertebrates observed by biologists were associated with harbor hardscape (42 of 46 taxa), divided into marina pilings and bulkheads in the marina basins (35 species) and secondarily isolated rocks and rip rap (25 species) in the vicinity of the Youth Sailing Center (Table 2). Of the various habitats surveyed, the piling community exhibited the highest cumulative richness because of the combined intertidal and subtidal nature of the structures although the number of taxa on a single pile only varied between 5 and 11. Species richness decreased with depth. The dominant organisms on the upper three feet of the pilings included a complex of green algae (*Ulva intestinalis*), a turf and filamentous red algae complex, brown algae (*Colpomenia perigrina*, *Dictyota flabellata*, and *Sargassum muticum)*, hydroids (*Aglaophenia* sp.), serpulid polychaete worms, barnacles (*Balanus amphitrite* and *B. glandula*), and mussels *(Mytilus galloprovincialis*). The mid-depth piling community (-3 to -7 ft) was dominated by a polychaete worms (serpulids and the calcareous tube-building *Dodecaceria fewksii*), mussels, solitary tunicates (*Styela plicata*), and ectoprocts (*Bugula neritina* and unid. encrusting ectoprocts). The lower-depth piling community (-7 to -10 ft MLLW) was colonized primarily by tunicates, ectoprocts, and hydroids.

The sloping, cement bulkhead around the perimeter of Cove East and West and Island East and West Basins was notable for a very low diversity of marine life. Although not abundant, the calcareous, tube-building polychaete *Dodecaceria fewksii* was one of the most conspicuous species present, along with lined-shore crabs (*Pachygrapsus crassipes*), solitary ascidians, and scattered, small-sized mussels. A fine silt layer, approximately 1-2 cm deep covered the substrate and the cover of algae was low in all areas surveyed. Most of the fauna observed was associated with the depressions formed by the meeting of adjoining cement sections.

Protective rock rip rap lining the cement bulkhead and low relief natural reef (remnant reef prior to the construction of the harbor) in the vicinity of the Youth Sailing Center supported similar types of plants and invertebrates that lived on the pilings, although larger species such as the southern sea palm algae (*Eisenia arborea*), and mobile macro invertebrates such as lobsters (*Panilurus interruptus*, snails (*Kelletia kelletii*), limpets (*Lottia digitalis*), and slipper limpets (*Crepidula onyx*) were present within this western section of the harbor, likely an indication of conducive rock habitat, better tidal circulation, and wind-wave energy motion compared to the enclosed marina basins.

The types of fishes which commonly occur in protected marinas and harbors of southern California are a combination of species that are associated with both soft-bottom habitat and hardscape of pilings, docks, cement bulkheads, and jetties.

Few species of fish were actually observed within the marina or the harbor, partially due to limited underwater visibility. The species observed included unidentified flatfish and round stingray (*Urolophus halleri*) in the marina basins, and opaleye perch *(Girella nigricans)* and garibaldi (*Hypsypops rubicundus*) in the vicinity of the rip rap and reef outcrops near the Youth Sailing Center, west of the marina basins.

Soft bottom associates that are likely to occur in Dana Point Harbor include gobies (*Clevelandia ios*), and flatfish (California halibut, P*aralichthys californicus;* diamond turbot, *Hypsopsetta guttulata*), Water-column species such as topsmelt (*Atherinops affinis*), northern anchovy (*Engraulis mordax*), black surfperch (*Embiotoca jacksoni*), shiner surfperch (*Cymatogaster aggregata*), walleye surfperch (*Hyperprosopon argenteum*), white croaker (*Genyonemus lineatus*), queenfish (*Seriphus politus*) and white surfperch (*Phanerodon furcatus*) are also common within southern California Marinas and expected to be present in Dana Point Harbor.

Marinas provide additional types of habitats (pilings, docks, and jetties) that attract a different groups of fish that prefer hard substrate (Coastal Resources Management 1993). Hard substrate in marinas offer cover, protection, or new sources of food for fishes such as pile perch (*Damalichthys vacca*), pipefish (*Sygnathus* spp.), kelpfish (*Heterostichus* spp.), and opaleye (*Girella nigricans*), while the jetty riprap protecting the harbor provides a habitat for additional species, such as barred sand bass (*Paralabrax nebulifer*), kelp bass (*P. clathratus*), sargo (*Anisotremus davidsoni*), halfmoon (*Medialuna californiensis*), and cryptic species such as blennies and sculpins.

4.0 IMPACT ASSESSMENT

4.1 PROPOSED CONSTRUCTION METHODS

The proposed Dana Point Marina dock layout is shown in Figure 3. New floating docks systems will consist of prefabricated, lightweight aggregate concrete modules. No creosote treated wood products will be included in the new concrete dock system. Marina improvements would be made over eight phases, in which between 250-350 vessels per phase would be moved to temporary docks. Within each area, the phases will include the removal of the existing dock and piles, and the installation of the new dock and piles. Piles will be removed by vibratory extraction equipment mounted to a crane operating from a barge. However, if piles break off at the mudline, they will be manually cut two to three feet below the mudline. The old piles and floating docks will be lifted from the water using a crane and then trucked off-site.

The last phase would be the placement of the prefabricated docks. Piles will be placed using impact pile driving or jetting techniques, based upon the amount of rock encountered.

4.2 CONSTRUCTION IMPACTS

4.2.1 Water Quality

Pile and Dock Emplacement. These construction activities have a potential to cause a short-term increase in turbidity and resuspension of fine sediments as the piles are removed and then new piles driven or jetted into the sediments. Pile removal and installation of new piles near the 60 inch storm drain has a potential to resuspend sediments that are higher in organics, copper, and total DDTs than other areas due to elevated levels of contaminants within this zone. This has a potential to result in a potentially short-term adverse, significant impact to water quality within the East Basin. Mitigation measures to reduce the level of impact to less-than-significant is provided in Section 5, Mitigation Measures.

Oil and Fuel Discharges. Accidental oil or fuel spills that could potentially occur during the pile removal and dock emplacement operations could result in significant effects on water quality, and subsequently, the fish and wildlife of the harbor depending on the severity of the spill. Such events are likely to be localized spills of lighter, refined diesel fuels, gasoline, and lubricating oils

that are highly toxic to marine life. The potential for the occurrence of petroleum-product leaks or spills would be low but the potential for significant, long-term effect on marine resources would be moderate to high. The inclusion and implementation of a Marina Construction Management Plan for the project will assist in preventing accidental spills and providing the necessary guidelines to follow in case of an oil or fuel spill and reduce the potential for a significant long term impact to less than significant.

Mitigation measures and Best Management Measures (BMPs) to avoid water quality degradation are provided in Section 5. With the inclusion of avoidance/mitigation measures, there will be no adverse environmental impacts on water quality.

The inclusion and implementation of a Marina Construction Management Plan for the project will assist in preventing accidental spills and providing the necessary guidelines to follow in case of an oil or fuel spill and reduce the potential for a significant long term impact to be mitigated to less than significant.

4.2.2 Eelgrass

There is no eelgrass at the project site, therefore there will be no short-or-long term impacts on eelgrass.

4.2.3 California Halibut

Juvenile halibut occur likely occur within Dana Point Harbor, although their presence within the Marina Basins is a less likely occurrence. During pile installation, any juveniles in the immediate area of pile driving activity will swim to areas outside the immediate impacted zone. No mortality is anticipated as a result of construction activities.

4.2.4 Invasive Species

Caulerpa algae is not present at the site of the proposed marina which precludes the potential for the spread of this species. However, a *Caulerpa* algae survey will be conducted according to the National Marine Fisheries Service Control Protocol (http://swr.ucsd.edu/hcd/CaulerpaControlProtocol.htm) prior to marina construction. If this species is found, then protocols for the eradication of *Caulerpa* will be implemented to remove this species from the project area.

Undaria pinnatifida is not currently growing within the marina basins in the vicinity of proposed modifications. Should it be found during pre-construction surveys, then it should be removed prior to marina modifications to prevent its spread during the pile and dock removal process. No eradication process however, is defined by the National Marine Fisheries Service or the California Department of Fish and Game.

4.3 LONG TERM IMPACTS ON MARINA OPERATION

4.3.1 Water Quality

Marina Operations. Water quality within the marina will be governed by the practices of the tenants relative to their compliance with ordinances, laws, and guidelines related to discharges, vessel maintenance and marina maintenance. Periodic and/or uncontrolled discharges of various pollutants, oils, greases, and wastes would potentially in a long-term significant adverse effects

on water quality with subsequent adverse impacts on local marine life. Surface runoff from the marina will be regulated by the NPDES permit for storm water discharges. To prevent long-term impacts on local water quality, a Marina Management Plan should be developed to provide tenants and boaters with reasonable BMPs, safety guidelines, and steps to take in response to accidental spills, leakages and fires to reduce the potential for water quality degradation. Implementation of the creation and the implementation of a Marina Management Plan will reduce potential long-term water quality impacts to less than significant.

Maintenance dredging may be periodically required (at an assumed 10 year interval) to remove trapped sediments during the long-term operation of the marina. Maintenance dredging programs, conducted under a permit from the Army Corps of Engineers would result in the periodic removal of soft bottom benthic organisms, the resuspension of bottom sediments that will increase water column turbidity, and periodic releases of trace metals and organic contaminants into the water column. Dissolved oxygen levels will be reduced slightly because of the resuspension of organic materials in the dredged sediments.

4.3.2 Eelgrass

There is no eelgrass at the project site, therefore there will be no long term impacts on eelgrass.

4.3.3 California Halibut

As a consequence of the reconfiguration of the docks and piles within Dana Point Harbor, there will likely be a slight increase (175 sq ft) or slight decrease (84 sq ft) in the amount of soft bottom habitat within the marina basins depending upon the ratio of 14 and 18 inch diameter piles that will be placed. These predicted changes in the amount of benthic soft bottom habitat is not expected to result in a significant impact to halibut nursery habitat, either positive or negative. Most halibut are likely to occur within areas outside of the marina, in the main entrance channel and open areas west of the marina basins.

4.3.4 Invasive Species

Caulerpa algae is not expected to be present in Dana Point Harbor during marina operations which precludes the potential for the spread of this species. However, if Caulerpa is found during the long-term operation of the marina, a *Caulerpa* algae eradication program will be required (National Marine Fisheries Service 2006; http://swr.ucsd.edu/hcd/CaulerpaControlProtocol.htm).

Undaria pinnatifida is not currently growing within the marina basins in the vicinity of proposed modifications; however, if during the operation of the marina it should be present, then thought should be given to its eradication, based on recommendations from the California Department of Fish and Game and the National Marine Fisheries Service.

5.0 MITIGATION MEASURES AND BEST MANAGEMENT PRACTICES

5.1 WATER QUALITY

5.1.1 Construction

The following mitigation measures and Best Management Practices (BMPs) are recommended to prevent water quality degradation and to reduce potential adverse impacts on marine resources during the renovation of the Dana Point Harbor Marina.

- All debris and trash shall be disposed in suitable trash containers on land or on the work barge at the end of each construction day;
- Discharge of any hazardous materials into Dana Point Harbor will be prohibited; and
- Where feasible, silt curtains should be deployed around the dredge zones, work barges, and the pile removal and placement operations to minimize the spread of turbid waters outside the project area;
- Federal and State permit conditions related to the maintenance of water quality standards shall be implemented throughout the term of construction; and
- Hazardous waste and oil spill contingency plans and spill response equipment should be kept on site or nearby the harbor during marina construction.

5.1.2 Marina Operations

Best Management Practices for marina operation and management should be implemented to reduce the potential for water quality and benthic habitat degradation at the Dana Point Harbor Marina. These BMPs include, but are not limited to:

- The project applicant should provide each marina tenant with a copy of all applicable regulations regarding vessel discharges of wastes, antifouling paint use, and refuse management (including handling of hazardous wastes) as part of the lease materials;
- The project applicant should provide each marina tenant with information regarding procedures for notifying appropriate authorities regarding spills of hazardous materials, containment measures, and applicable penalties for violations as a part of lease materials;
- The project applicant should provide regular cleaning of the marina dock facilities and vacuum sweeping of the parking lots;
- Adequate signs should be posted to identify the location off pump-out stations, and hours of operation;
- The pump-out facility should be user friendly;
- The project applicant should develop and adhere to a regular inspection and maintenance schedule for the pump-out facility;
- The project applicant shall provide educational information about the pump out station to tenant boaters;
- The project applicant shall enforce existing local, state and federal regulations pertaining to marine sanitation devices and the illegal discharge of boat sewage; and;

- The project applicant shall post and make available to boaters a list of other local pump out locations.

To prevent long-term impacts on local water quality, a Marina Management Plan should be developed to provide tenants and boaters with reasonable BMPs, safety guidelines, and steps to take in response to accidental spills, leakages and fires to reduce the potential for water quality degradation. In addition, two pamphlets *The Guide to Clean, Green Boating* (California Department of Fish and Game 1999) and *Clean Boating* (California Department of Boating and Waterways (undated material) should be distributed and made available to both hotel management and marina tenants.

Clean Marinas California Program (2006) has developed a guidebook for to making marinas environmentally clean facilities and to help protect the state's waterways from pollution. This guidebook is available at http://cleanmarinascalifornia.org. It is recommended that a copy of this document be kept onsite in the Dana Point Marina Office.

5.2 EELGRASS BED RESOURCES

5.2.2 Operation

Eelgrass does not occur within the project area. No BMPs or mitigation measures required.

5.3 INVASIVE SPECIES

5.3.1 Construction

Caulerpa nor *Undaria* occurs within the project area. No BMPs or mitigation measures required. However, pre-construction surveys will be required to document the presence/absence of these species per ACOE permit conditions.

5.3.2 Operation

In the event that *Caulerpa* or *Undaria* are found within the Dana Point Marina, eradication mitigation measures will have to be implemented per agency requirements. It is not known if eradication of *Undaria* will be required in the event it is found.

6.0 LITERATURE CITED

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Wiegel, Robert L. 1993. Dana Point Harbor, California. Shore and Beach 61 (3):37-55.

APPENDIX 1. *CAULERPA TAXIFOLIA* REPORTING FORM (PER NATIONAL MARINE FISHERIES SERVICE AND CALIFORNIA DEPARTMENT OF FISH AND GAME REQUIREMENTS)

Caulerpa taxifolia Survey Reporting Form

Dana Point Harbor Marina Renovation Project, Dana Point, CA

Prepared for:
LSA Associates, Inc.
20 Executive Park, Suite 200, Irvine, California
Contact: Rob Balen
(949) 533-0666

Prepared by:

Coastal Resources Management, Inc.
PMB 327, 3334 E. Coast Highway, Corona del Mar, CA 92625
Contact: Rick Ware, Senior Marine Biologist
(949) 412-9446

June 15th, 2007

This form is required to be submitted for any surveys conducted for the invasive exotic alga *Caulerpa taxifolia* that are required to be conducted under federal or state permits and authorizations issued by the U.S. Army Corps of Engineers or Regional Water Quality Control Boards (Regions 8 & 9). The form has been designed to assist in controlling the costs of reporting while ensuring that the required information necessary to identify and control any potential impacts of the authorized actions on the spread of *Caulerpa*. Surveys required to be conducted for this species are subject to modification through publication of revisions to the *Caulerpa* survey policy. It is incumbent upon the authorized permittee to ensure that survey work is following the latest protocols. For further information on these protocols, please contact: Robert Hoffman, National Marine Fisheries Service (NOAA Fisheries), (562) 980-4043, or William Paznokas, California Department of Fish & Game, (858) 467-4218).

Report Date:	April 9th, 2007
Name of bay, estuary, lagoon, or harbor:	Dana Point Harbor, Dana Point, Orange County, California. See Figure 1.
Specific Location Name:	Dana Point Marina Basins and the vicinity of Baby Beach/Youth Sailing Center. See Figures 2-4.
Site Coordinates: (UTM, Lat./Long., datum, accuracy level, and an electronic survey area map or hard copy of the map **must** be included).	Center of Marina Basins: 33.45983 ^{o} N; 118.69817 ^{o} W Accuracy: 1 m, WGS 84
Survey Contact: (name, phone, e-mail)	Rick Ware, Senior Marine Biologist, Coastal Resources Management, Inc. , (949) 412-9446, rware.crm@earthlink.net
Personnel Conducting Survey (if other than above): name, phone, email	Mr. Stephen Whitaker (Certified Caulerpa Surveyor) Mr. Tom Gerlinger (vessel skipper/dive tender)
Permit Reference: (ACOE Permit No., RWQCB Order or Cert. No.)	Pending.
Is this the first or second survey for this project?	Initial Survey for Marina Basins.
Was *Caulerpa* Detected?: (if *Caulerpa* is found, please immediately contact NOAA Fisheries or CDFG personnel identified above)	_____**X X**_____**No, *Caulerpa* was not found at this site.**

Description of Permitted Work: (describe briefly the work to be conducted at the site under the permits identified above)	The County of Orange proposes upgrade landside and waterside facilities within Dana Point Harbor. Waterside-upgrades include the renovation of the marina basin dock systems by replacing old and deteriorating docks, slips and gangways with new facilities. The number of boat slips will decrease to 2009 (Marina Layout 2 with channel encroachment). A total of 1,163 existing piles will be removed and approximately 933 new piles will be placed. In addition, the proposed project includes adding handicap access at locations that is currently not available; renovating the Dana Point Harbor Launch Ramp (recently completed), spot-dredging with Cove East Marina, and larger scale dredging in the western (Baby Beach) and southern (jetty) sections of the Harbor (Figures 2 and 3). Bulkheads will not be affected by the project. This report addresses the waterside upgrade of the marina dock systems.	
Description of Site:	*Depth range:*	0.0 ft to -15 ft MLLW.
(describe the physical and biological conditions within the survey area at the time of the survey and provide insight into variability, if known. Please provide units for all numerical information).	*Substrate type:*	Silt sediments in most part of areas surveyed. Silty sand sediments west of basins near Baby Beach.
	Temperature:	57- 59 degrees F
	Salinity:	25-35 ppt
	Dominant flora:	See Table 1 for a list of species observed. Dominant algae species included *Chaetomorpha aerea* and *Ulva intestinalis*.
	Dominant fauna:	Few benthic invertebrates were observed on soft-bottom habitats. Most organisms were observed on dock pilings and isolated rock outcrops near the Youth Sailing Center. The dominants in the upper three feet of the piling community included a complex of green algae (*Ulva intestinalis*), a turf and filamentous red algae complex, brown algae (*Colpomenia perigrina*, *Dictyota undulata*, and *Sargassum muticum)*, hydroids (*Aglaophenia* sp.), serpulid polychaete worms, barnacles (*Balanus amphitrite* and *B. glandula*), and mussels *(Mytilus galloprovincialis*). The mid-depth piling community (-3 to -7 ft) was dominated by a mixture of polychaete worms (serpulids and the calcareous tube-building *Dodecaceria fewksii*), mussels, solitary tunicates (*Styela plicata*), and ectoprocts (*Bugula neritina* and unid. encrusting forms). The lower-depth piling community (-7 to -10 ft MLLW) was colonized primarily by tunicates, ectoprocts, and hydroids. Fish were not commonly observed during the survey.
	Exotic species encountered (including any other Caulerpa species):	*Sargassum muticum*
	Other site description notes:	No eelgrass was found.

Description of Survey Effort:	*Survey date and time period:*	February 20th, March 6th, and March 16th, 2007 0800-1600
Description of Survey Effort: please describe the surveys conducted including type of survey (SCUBA, remote video, etc.) and survey methods employed, date of work, and survey density (estimated percentage of the bottom actually viewed.	*Horizontal visibility in water:*	Visibility was 3 ft on each side of the center line.
	Survey type and methods:	A total of 70, variable-length underwater transects (15 meters to 153 meters in length) were swam using SCUBA (1) in the Cove East and West and the Island East and West marina basins (Figure 4). In addition, 43 transects varying in length between and 50 m long were swam in front of the sailing center and Baby Beach. Fourteen dock piles in the Cove East and the Island East marina basins were also surveyed to determine the types and relative abundances of marine organisms (Figure 4) that might be affected by marina construction. The dive surveys covered a total of 12,228 sq m (3 acres) of bayfloor habitat within the east and west marina basins and a total of 6,650 sq m (1.64 acres) in the vicinity of Baby Beach and the Youth Sailing Center (Figure 4). Overall, the bottom area of cover surveyed by biologist was 14% in the marina basins and between 58% and 65% at Baby Beach and the Youth Sailing Center. The higher intensity surveys within Baby Beach and the Youth Sailing Center reflected habitat that had a greater probability of locating either eelgrass or Caulerpa, since a very small patch of eelgrass (three turions) was located there in April 2005 (Chambers Group, Inc. 2005). The total area of open water habitat and water habitat underneath the docks (Area of Potential Effect) in the project area was 62,859 sq ft (1.44 acres) Bottom types, common marine life, and the presence or absence of Caulerpa taxifolia and Zostera marina were noted. Depths were standardized to Mean Lower Low Water (MLLW) based upon time of observation and tidal corrections for the San Clemente Pier tidal survey station.
Describe any limitations encountered during the survey efforts.	*Survey personnel:*	Rick Ware, Steve Whitaker and Tom Gerlinger, Coastal Resources Management, Inc.
	Survey density:	A total of 70, variable-length underwater transects (15 meters to 153 meters in length) were swam using SCUBA (1) in the Cove East and West and the Island East and West marina basins (Figure 4). In addition,

		43 transects varying in length between and 50 m long were swam in front of the sailing center and Baby Beach.
	Survey limitations:	Vessel movement within the project area.
Other Information: (use this space to provide additional information or references to attached maps, reports, etc.)	See attached project maps and tables. Figure 1- Project Location Figure 2-Marina Basin Layout Figure 3- Proposed Dock Layout Plan Figure 4-Transect Locations Table 1- Organisms Observed During the Survey	

Caulerpa Survey Reporting Form (version 1.2, 10/31/04)

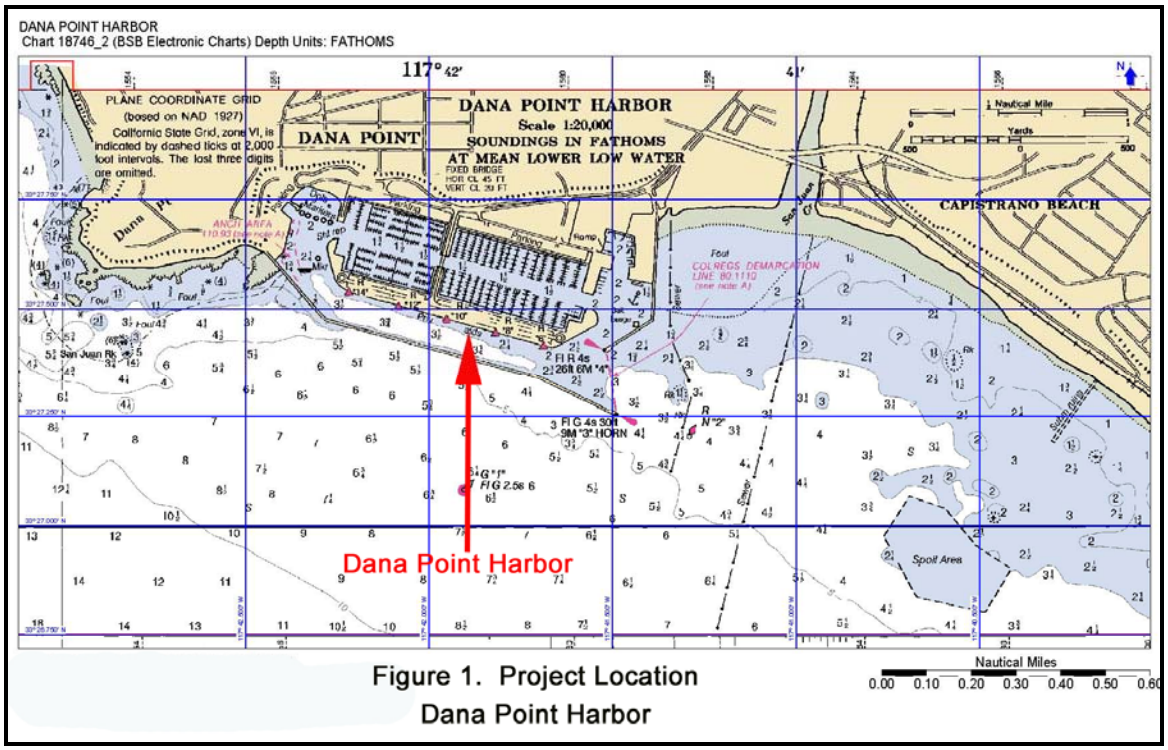
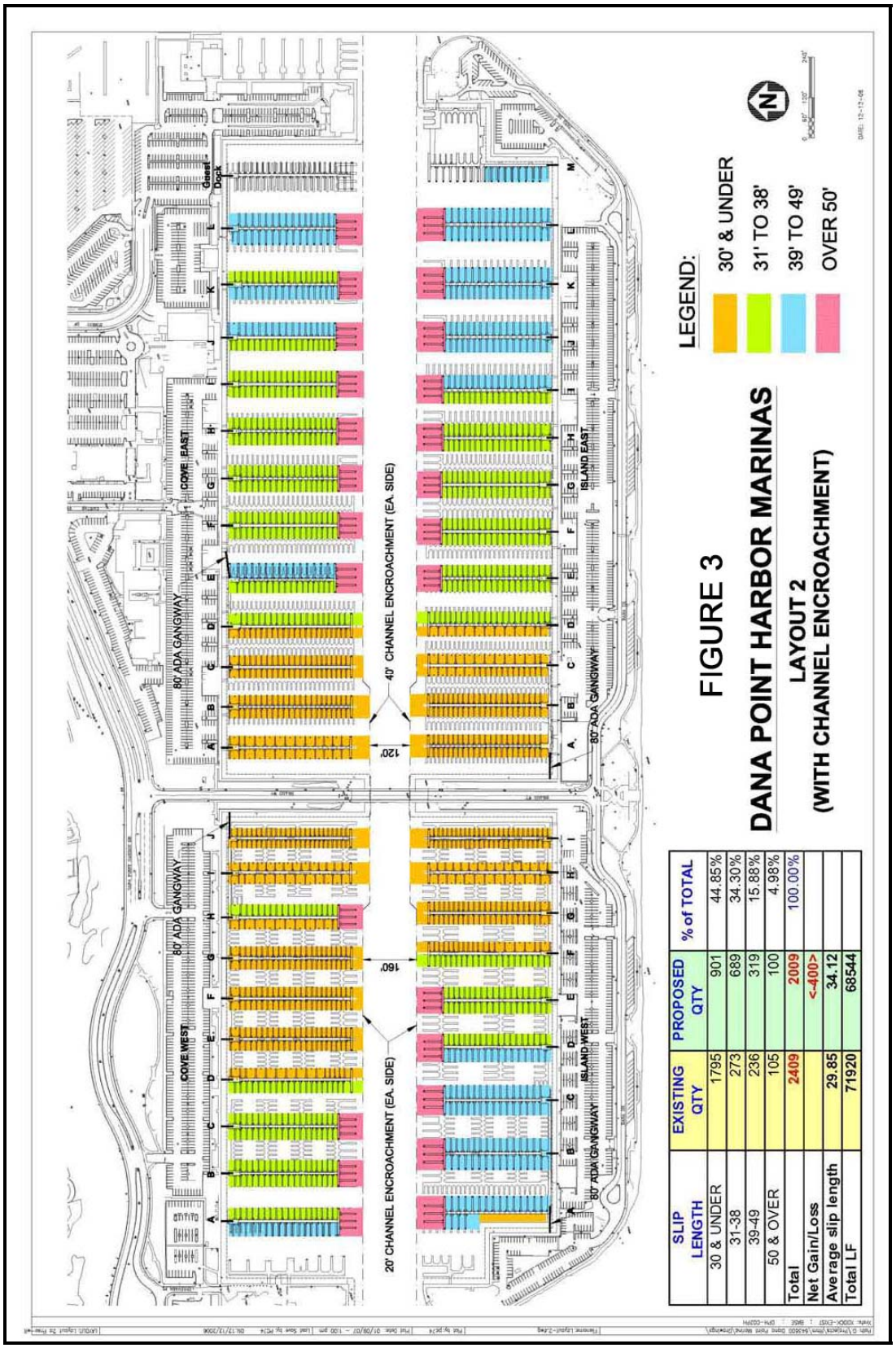


Figure 1. Project Location
Dana Point Harbor


West Basin
East Basin
Baby Beach
Dana Point Harbor Dr
Puerto Pl
Street Of Golden Lantern
Castilla Pl
Old Golden Lantern
Santa Clara Ave
Cove Rd
Google
© 2007 Navteq
Figure 2. Location of Marina Basins and Baby Beach



SLIP LENGTH	EXISTING QTY	PROPOSED QTY	% of TOTAL
30 & UNDER	1795	901	44.85%
31-38	273	689	34.30%
39-49	236	319	15.88%
50 & OVER	105	100	4.98%
Total	2409	2009	100.00%
Net Gain/Loss		<400>	
Average slip length	29.85	34.12	
Total LF	71920	68544	


Figure 4. Survey Locations
Basin Transect Surveys
Basin Piling Surveys
Baby Beach and Sailing Center Transect Surveys
Dana Point Harbor
Puerto Pl
Dana Point Harbor Dr
Street of Golden Lantern
Eastern Lantern St
Lantern Bay
Cove Lantern
Pointe Lantern
Starboard Lantern
Shore Lantern
Old Golden Lantern
El Camino Capistrano
Violet Lantern St
Amber Lantern
Santa Clara Ave
Blue Lantern
Green Lantern
Gate Rd
Castaway Pl
Island Way
Dana Dr
©2006 Google
© 2007 Navteq
Streaming 100%
Eye alt 5218 ft
1508 ft
Pointer lat 33.460258° lon -117.698844° elev 0 ft

Table 1. List of Organisms Observed During Subtidal Surveys, Feb-Mar 2007

Common Name	Scientific Name	Marina Epibenthos	Marina Pilings and Bulkhead	Youth Sailing Center Reefs and Rip Rap	All Areas
diatom mat	Bacillariophyceae	x	x	x	x
green algae	*Chaetomorpha aerea*	x	x		x
green algae	*Ulva intestinalis*	x	x	x	x
brown algae	*Colpomenia perigrina*		x	x	x
brown algae	*Dictyopteris undulata*		x		x
brown algae	*Dictyota flabellata*		x		x
brown algae	*Dictyoacea*, unid.		x	x	x
brown algae	*Eisenia arborea*		x	x	x
brown algae	*Sargassum muticum*		x	x	x
red algae	*Corallina vancouverensis*		x	x	x
red algae	Filamentous Red Algae		x	x	x
red algae	*Polysiphonia sp.*		x		x
red algae	red turf algae (complex)		x		x
sponge	*Haliclona* sp.	x	x	x	x
hydroid	*Aglaophenia* sp.		x		x
white gorgonian	*Muricea fructicosa*		x	x	x
polychaete	*Dodecaceria fewksii*		x		x
polychaete	*Phragmatopoma californica*		x	x	x
polychaete	Sabellidae, unid.		x		x
polychaete	Serpulidae, unid.		x	x	x
polychaete	Spirorbidae, unid.		x	x	x
barnacle	*Balanus amphitrite*		x	x	x
barnacle	*Balanus glandula*		x	x	x
lined shore crab	*Pachygrapsus crassipes*		x	x	x
lobster	*Panilurus interruptus*			x	x
limpet	*Lottia digitalis*				x
limpet	*MacClintokea (Collisella) scabra*			x	x
slipper shell	*Crepidula onyx*			x	x
Kellet's whelk	*Kelletia kelletii*			x	x
rock scallop	*Crassedoma giganteum*		x		x
bay mussel	*Mytilus galloprovincialis*		x	x	x
sea slug	*Navanax inermis*	x			x
octopus	*Octopus bimaculoides*	x			x
reverse chama	*Pseudochama exogyra*		x	x	x
festive murex snail	*Pteropurpura festiva*	x	x		x
soft ectoproct	*Anguinella palmata*		x		x
moss animal	*Bugula neritina*		x		x
moss animal	encrusting ectoprocts		x		x
colonial tunicate	*Botrylloides* sp.		x		x
colonial tunicate	colonial tunicates		x		x

Common Name (continued)	Scientific Name	Marina Epibenthos	Marina Pilings and Bulkhead	Youth Sailing Center Reefs and Rip Rap	All Areas
solitary tunicate	Ascideacea, unid.		x	x	x
solitary tunicate	*Styela plicata*		x		x
opaleye perch	*Girella nigricans*			x	x
garibaldi	*Hypsypops rubicundus*			x	x
flatfish	unid. Flatfish	x			x
round sting ray	*Urolophus halleri*	x			x
	Total Taxa	**9**	**35**	**25**	**46**