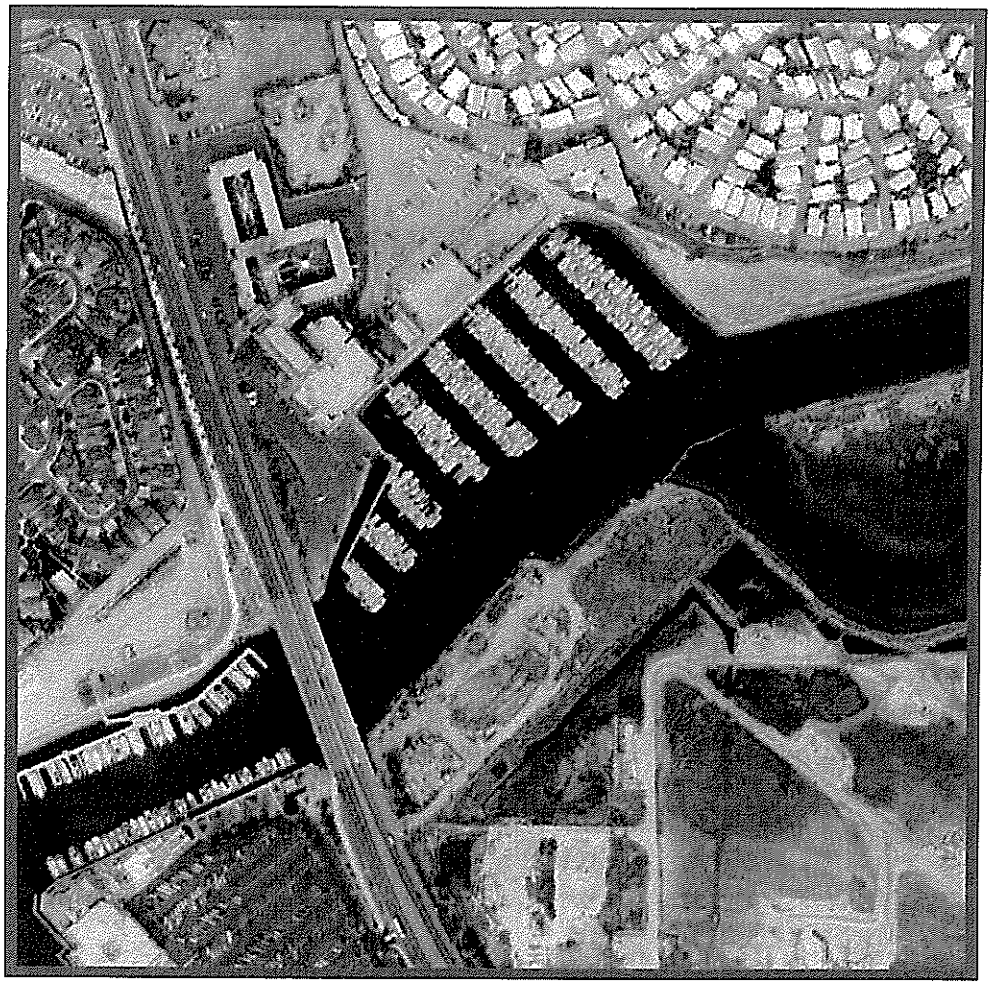
Appendix V – Draft Eelgrass Mitigation Plan

TC 23068-01



Eelgrass Survey and Draft Mitigation Plan

Cerritos Bahia Marina Maintenance Dredging Project

November 2008

Prepared For:
Cerritos Bahia Marina
6289 E. Pacific Coast Hwy.
Long Beach, California 90803

Prepared By:
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1.0 INTRODUCTION

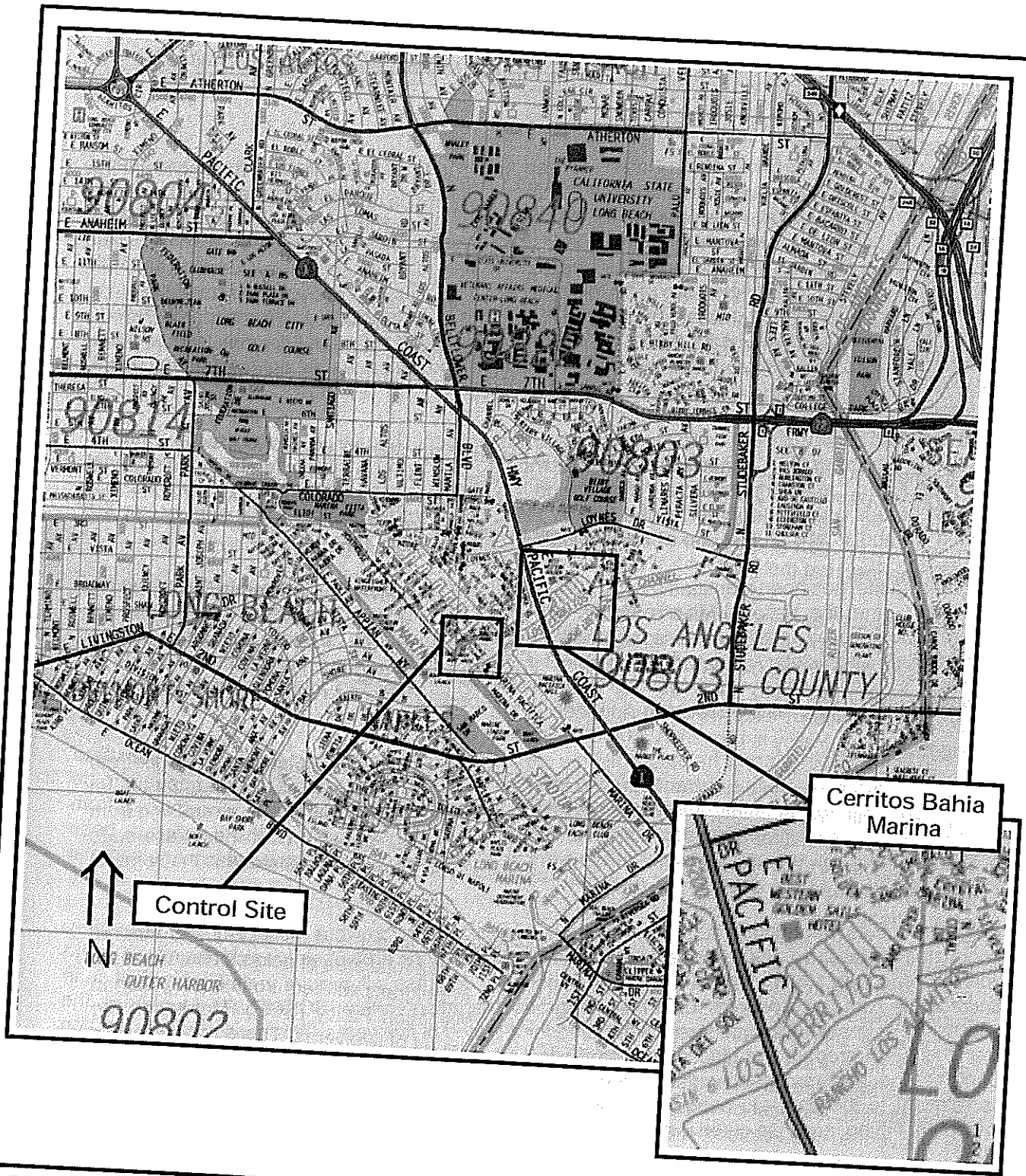
The owners of Cerritos Bahia Marina intend to dredge the marina to a depth of -6 ft mean lower low water (mllw). The purpose of this project is to perform maintenance dredging for the Cerritos Bahia Marina to maintain sufficient water depth for marina operations. Cerritos Bahia Marina is located at 6289 East Pacific Coast Highway in Long Beach, California (Figure 1 and Figure 2). The site is in the northeastern part of Alamitos Bay. The marina is on the north side of the Los Cerritos Channel and east of Pacific Coast Highway. The project area is approximately 7.8 acres in size (Figure 3). Based on recent bathymetric data, the project design consists of dredging an area of approximately 3.9 acres including area beneath docks. In order to determine the impact this project would have on eelgrass (*Zostera marina*) Tetra Tech, Inc. was contracted to conduct an eelgrass survey of the area of potential effect.

A Bathymetric survey of Cerritos Bahia Marina and the adjacent channel was conducted on October 22, 2008. Depths in the Cerritos Bahia Marina range from -2 to -11 ft mllw. Depths in the channel that runs along the southeast side of the marina range from -3 to -12 ft mllw. The marina and channel area is open on both ends and is tidally influenced from the west. The entrance to the marina channel is at the west end at the Pacific Coast Highway Bridge.

Eelgrass habitat has been identified as a sensitive marine resource by the California Department of Fish and Game, the National Marine Fisheries Service, and the U.S. Fish and Wildlife Service. Eelgrass beds serve as refuges, foraging areas, and nursery habitats for various coastal and bay invertebrates and fishes. Due to the ecological importance of eelgrass, the Southern California Eelgrass Mitigation Policy (revision 11) was developed to specify requirements for eelgrass mitigation. This Policy is presented in Appendix A.

The area of potential eelgrass habitat within the survey area is limited by factors such as substrate type and depth, water clarity, currents, boat traffic, and shading from docks. Depth appears to be the predominant limiting factor to eelgrass growth for the soft bottom areas where no shading from docks occurs. In previous surveys conducted at sites within Alamitos Bay, the eelgrass beds typically extended to a depth of -7ft mllw then stopped even though the substrate was the same at greater depths.

Eelgrass occurs throughout the Cerritos Bahia Marina. In a previous survey of the marina, conducted in March 15, 2007 (Tetra Tech, unpublished), the total area of eelgrass found within the survey areas was 1,883 m^2 (0.19 ha). Any impacts to eelgrass will require in-kind mitigation in accordance with the Southern California Eelgrass Mitigation Policy (SCEMP). Monitoring the success of eelgrass mitigation shall be required for a period of five years. This eelgrass mitigation plan has been prepared to discuss the methods and schedule for planting eelgrass at Cerritos Bahia Marina, and post-planting monitoring. This mitigation plan includes the following information, as relevant to the eelgrass mitigation sites: baseline conditions, location, transplant methods, transplant timing, success criteria, and a five year monitoring program.



Site Vicinity Map

Cerritos Bahia Marina

Long Beach, California

FIGURE 1

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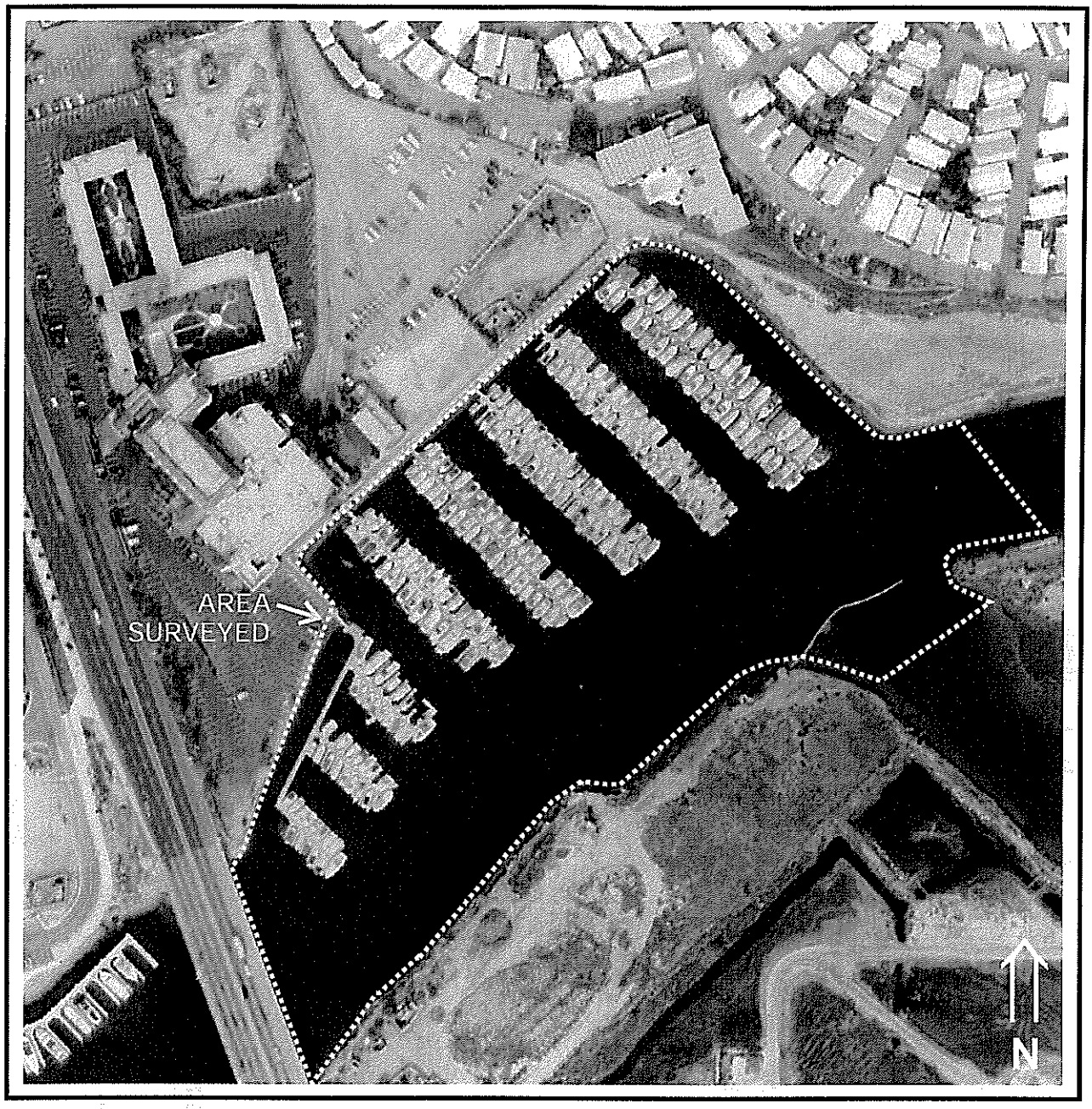

Source: USGS 2004

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Aerial Photograph
Eelgrass Survey Location

Cerritos Bahia Marina
Long Beach, California

FIGURE 2

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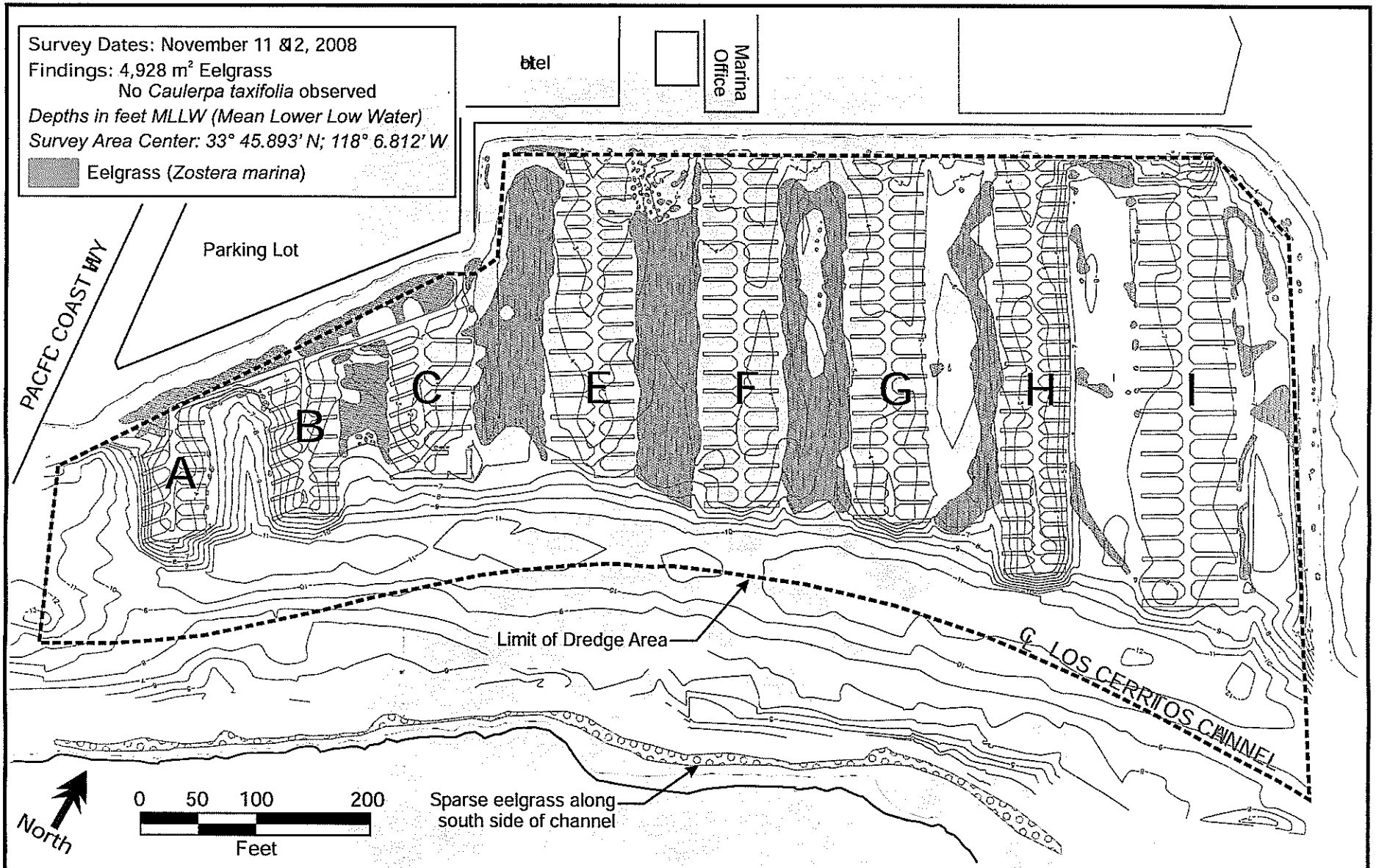

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Site Plan
Eelgrass (***Zostera marina***) Survey
Cerritos Bahia Marina
Alamitos Bay, Long Beach, California

FIGURE 3

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2.0 EELGRASS SURVEY METHODS

In October and November 2008 personnel from Tetra Tech conducted an eelgrass mapping survey of the project area (Cerritos Bahia Marina) including the area of potential affect surrounding the project footprint (Figure 2). The survey area is approximately 500-ft by 1,200-ft and includes the dredge footprint and surrounding area where equipment anchors may be placed or other associated impacts may occur. The area surveyed includes the area between the marina shoreline, the Pacific Coast Highway Bridge, the southeast shoreline across the channel, and 100 feet up the Los Cerritos Channel. Cerritos Bahia Marina was surveyed on October 22nd, 28th, and 30th, 2008. The south side of the channel and the Control Site (Jack Dunster Marine Biological Reserve) were surveyed on November 19, 2008.

One scientific diver, experienced in eelgrass ecology swam along the bottom in transects using a compass and measuring tapes. Transects were run parallel at distances of two to five feet apart depending on visibility. Field data collected include distribution and density of eelgrass in the project area. During the surveys, underwater visibility was approximately 5 to 8 feet. Depths in the area surveyed at the project site ranged from +2 ft to –12 ft mean lower low water. Turion shoot density was measured within eelgrass beds using a 1/8m^2 quadrat.

The information on distribution of eelgrass was digitally plotted, to scale, using AutoCAD® 2008 software. A plan view drawing (Figure 3) was then created to show the survey area and eelgrass. The eelgrass area was analyzed by depth and location within each fairway (large open area between docks). Each fairway was delineated by the shoreline to the northwest, the ends of the dock fingers, and the outside end of the docks along the channel.

The project site was also surveyed for Caulerpa in accordance with the Caulerpa Protocol prepared by National Marine Fisheries Service and California Department of Fish & Game. The purpose of the survey is to determine the presence or absence of *Caulerpa taxifolia* prior to construction activities. *Caulerpa taxifolia* is a non-native alga that poses a threat to coastal marine life. It has been found in Carlsbad and in Huntington Harbour. Currently Alamitos Bay is not designated as an infected system.

The bathymetric survey of the project sites was conducted by Tetra Tech October 22, 2008. The survey was conducted from a boat. An integrated system of bathymetric equipment was used including a Trimble Ag122 Differential GPS (DGPS) receiver, a Meridata 100 digital fathometer and a laptop computer running Trimble HYDRO Pro software. This system records real-time DGPS position, depth and time at 1-second intervals as the boat traverses the survey area. Accuracies for the survey system are ± 3 feet horizontally and ± 0.5 feet vertically. In areas that are inaccessible by boat, surveyors used a lead line to take depth measurements.

In order to correct depth readings for tidal variation, tidal elevations are observed from a calibrated tide staff and recorded at frequent intervals. Observations of the tidal elevations from the tide staff(s) were used to adjust all depth data to the correct datum during post-processing. At the completion of the survey, the data was reviewed, edited for false readings, and tidal corrections applied. The DGPS coordinates were converted to California State Plane Coordinates based on the North American Datum 1983 (NAD83). Contour lines were constructed for the data set of adjusted depths and coordinates. The data set was imported in to AutoCAD® to create a drawing which was used for plotting the eelgrass.

3.0 EELGRASS SURVEY RESULTS

Results of the October 2008 eelgrass survey indicate that patches and beds of eelgrass occur throughout the marina (Figure 3 and Table 1). The total area of eelgrass found within the marina survey area was 4,928 m^2 (0.49 ha). Eelgrass was found at depths between -2ft mllw and -8ft mllw. Eelgrass predominantly occurs at -6ft mllw and shallower. No eelgrass was found in the channel beyond the end of the docks. Sparse eelgrass was found along the southeast side of the channel opposite the marina (Figure 3). The area of eelgrass along the south side of the channel was 547 m^2 (0.054 ha).

Table 1. Summary of eelgrass (*Zostera marina*) survey areas and results, Cerritos Bahia Marina, Long Beach, California, October 2008.

Location	Eelgrass Area (m^2)			Eelgrass Area (ha)		
	Within Dredge Footprint*	Outside Dredge Footprint	Total	Within Dredge Footprint*	Outside Dredge Footprint	Total
Inside Long Dock (includes south of dock A)	166.6	238.2	404.8	0.017	0.024	0.040
Fairway A - B	21.1	0.0	21.1	0.002	0.000	0.002
Fairway B - C	243.1	0.0	243.1	0.024	0.000	0.024
Fairway C - E	991.6	42.5	1034.1	0.099	0.004	0.103
Fairway E - F	1,136.9	5.2	1142.1	0.114	0.001	0.114
Fairway F - G	1,034.5	2.0	1036.5	0.103	0.000	0.104
Fairway G - H	543.5	1.0	544.5	0.054	0.000	0.054
Fairway H - I	215.6	0.3	215.9	0.022	0.000	0.022
North of Dock I	258.2	27.7	285.9	0.026	0.003	0.029
Marina Total	**4,849.3**	**78.7**	**4,928**	**0.485**	**0.008**	**0.493**
* Dredge Footprint includes entire marina as indicated in Figure 3.						

Eelgrass patches in the marina ranged in size from 0.09 m^2 to 1,082 m^2. Most of the eelgrass occurs in the middle of the marina in the fairways from Dock B to Dock G. The largest patch of eelgrass is located in the fairway between Dock E and Dock F which had 75% cover of eelgrass. The total area of eelgrass found within the proposed dredge footprint area was 4,849 m^2 (0.48 ha). Eelgrass turion density within eelgrass beds ranged from 1 to 128 turions per square meter and averaged 43.7 turions per square meter.

No *Caulerpa* was observed in the survey area. The completed *Caulerpa* survey reporting form is

included in Appendix D of this report.

3.1 Eelgrass Depth Ranges

Eelgrass was found at depths between -2ft mllw and -8ft mllw (Table 2). Eelgrass within the marina predominantly occurs at –6ft mllw and shallower. Approximately 84% of the eelgrass area in the current survey was found at 6ft mllw and shallower. Approximately 16% was found at depths greater than 6ft mllw.

Table 2. Summary of total eelgrass area and percent cover at each depth range, Cerritos Bahia Marina, Long Beach, California, October 2008.

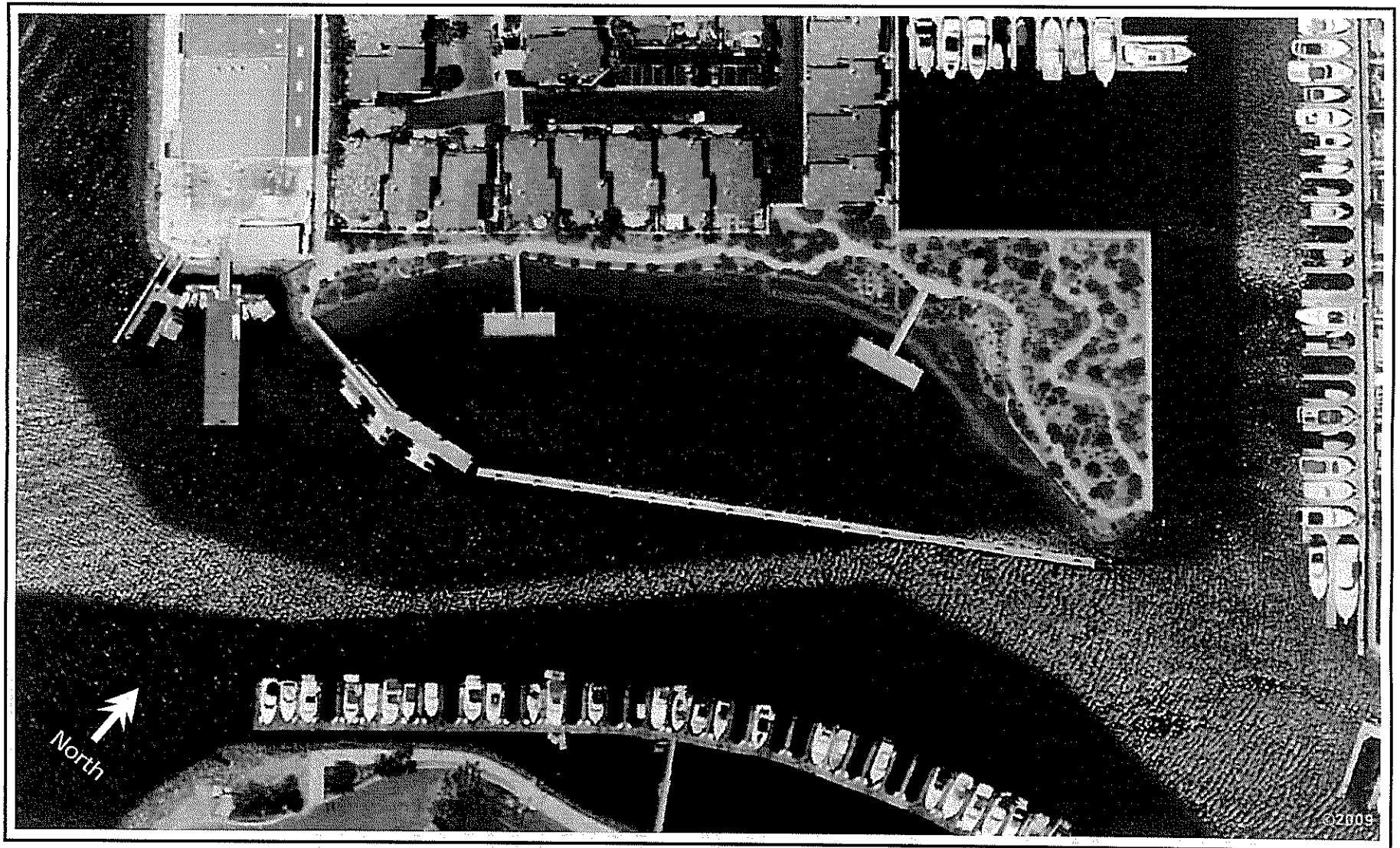
Depth Range (ft mllw)	Total Area*		Eelgrass Area (m^2)			Eelgrass Area (ha)			Percent of Total Eelgrass Area
	m^2	ha	Within Dredge Footprint**	Outside Dredge Footprint	Total	Within Dredge Footprint**	Outside Dredge Footprint	Total	
<5	3,535.0	0.35	2,046.7	78.7	2,125.4	0.20	0.01	0.21	43
5-6	3,523.3	0.35	2,021.8	0.0	2,021.8	0.20	0.00	0.20	41
6-7	2,218.1	0.22	524.0	0.0	524.0	0.05	0.00	0.05	11
7-8	2,133.5	0.21	256.7	0.0	256.7	0.03	0.00	0.03	5
>8	332.1	0.03	0.0	0.0	0.0	0.00	0.00	0.00	0
Total	11,742.0	1.17	4,849.3	78.7	4,927.9	0.48	0.01	0.49	100

* Total Area includes open water area at each depth within marina minus the dock area which is shaded.

** Dredge Footprint includes entire marina as indicated in Figure 3.

3.2 Control Site

The selected Control Site survey area is Jack Dunster Marine Biological Reserve in Alamitos Bay (Figure 1 and Figure 4). This site is 0.25 mile from the project site and has similar orientation to the sun and similar depths. The Control Site was surveyed on November 19, 2008. The eelgrass beds at this site are protected from boat traffic by a floating breakwater. The Control Site was surveyed for comparison with the project site post-construction and the transplant monitoring surveys for this project. Based on previous eelgrass surveys in Alamitos Bay, the eelgrass has been found to be variable from year to year. In the November 2008 survey 1,788.8 m^2 (0.18 ha) of eelgrass was found at the Control Site. During the survey, underwater visibility was approximately 6 to 8 feet. Depths in the area surveyed ranged between 0 ft and –16 ft mllw. Eelgrass was found between depths from -1ft mllw to -8.5ft mllw. Turion density within eelgrass beds ranged from 1 to 112 turions per square meter. The average turion density within eelgrass beds at the control site was 52.3 turions per square meter. The Control Site will be surveyed concurrently with the pre-construction, post-construction, and transplant monitoring eelgrass surveys.



Source: Google Earth July 2007

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Aerial Photo
Eelgrass (*Zostera marina*) Survey
Control Site - Jack Dunster Marine Biological Reserve
Alamitos Bay, Long Beach, California

FIGURE 4

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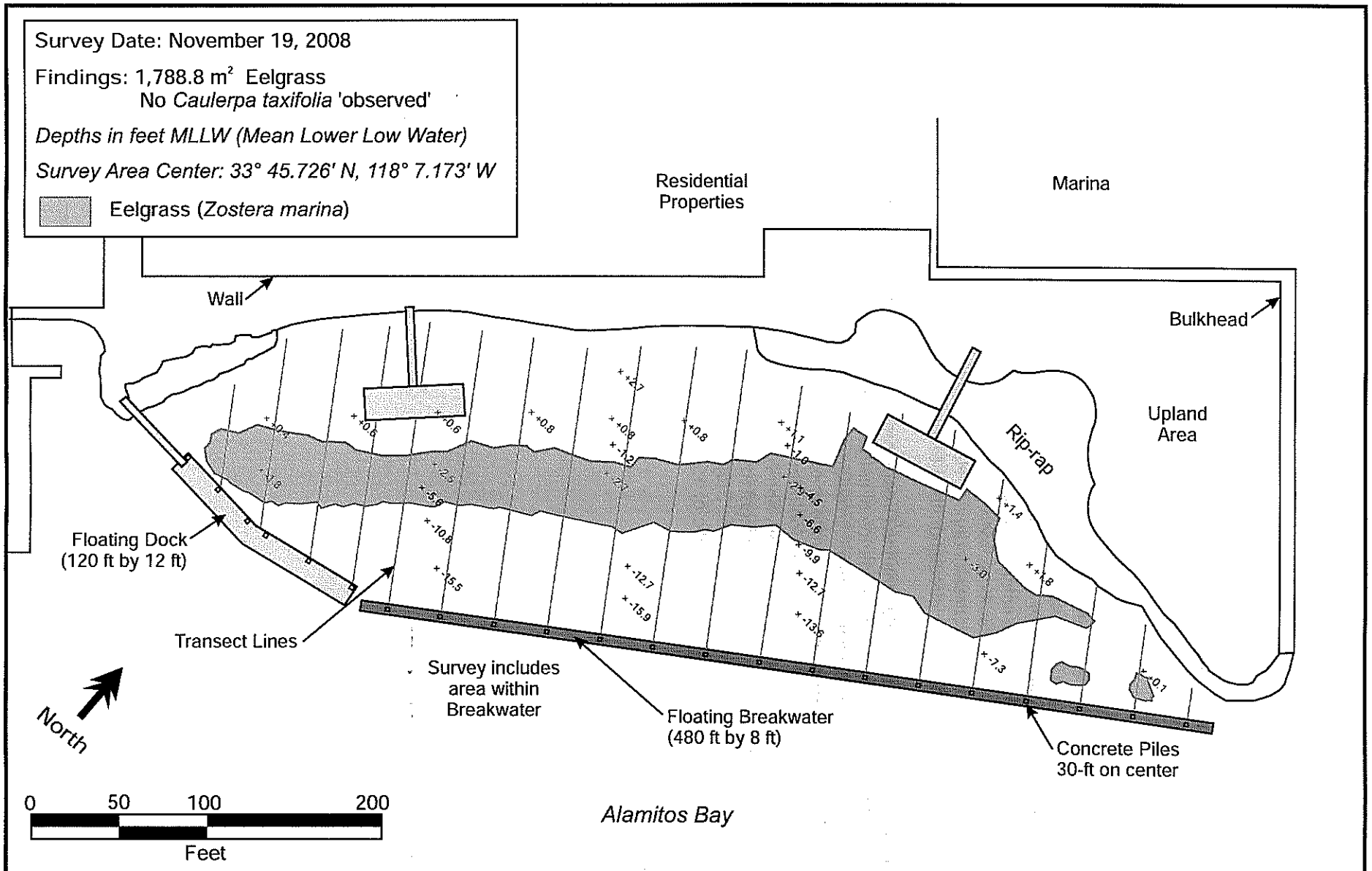

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Site Plan
Eelgrass (*Zostera marina*) Survey
Control Site - Jack Dunster Marine Biological Reserve
Alamitos Bay, Long Beach, California

FIGURE 5

November 2008

4.0 EELGRASS SURVEY DISCUSSION

Eelgrass habitat has been identified as a sensitive marine resource by the California Department of Fish and Game, the National Marine Fisheries Service, and the U.S. Fish and Wildlife Service. Eelgrass beds serve as refuges, foraging areas, and nursery habitats for various coastal and bay invertebrates and fishes.

The area of potential eelgrass habitat within the survey area is limited by factors such as substrate type and depth, water clarity, currents, boat traffic, and shading. Depths in the area surveyed ranged from -2-ft mllw to -12-ft mllw. Approximately 84 percent of the eelgrass was found at the depths of -6ft mllw and shallower (Table 2). Besides the shading from docks, depth appears to be the predominant limiting factor for the soft bottom areas. In a previous survey conducted at Marine Stadium in Alamitos Bay, the eelgrass beds extended to a depth of -7ft mllw then stopped even though the substrate was the same at greater depths. However Cerritos Bahia Marina has eelgrass at greater depths likely due to greater circulation than Marine Stadium.

Based on this survey, the Cerritos Bahia Marina Dredge project would result in a temporary loss of eelgrass within the marina. Due to the presence of eelgrass within the marina, the project design has been modified to minimize potential impacts to eelgrass. The depth of dredging will be limited to a depth of -6ft mean lower low water (mllw) instead of the design depth of -8ft mllw. In addition, eelgrass along the outer edges of the project footprint will be protected. This resource provides important ecological functions to the ecosystem and is regulated by state and federal agencies. Impacts to eelgrass will therefore need to be mitigated in accordance with the Southern California Eelgrass Mitigation Policy (SCEMP Rev. 11). The Project Proponent proposes in-kind and on-site mitigation of these resources at a minimum ratio of 1.2 to 1.

5.0 EELGRASS IMPACT CALCULATIONS

The potential impacts to eelgrass are discussed below for the project area. Table 3 summarizes the amount of eelgrass found within the dredge footprint in each fairway and the respective 1.2 to 1 mitigation areas. Based on the current survey findings the proposed project would impact a maximum of approximately 4,849 square meters of eelgrass beds. The actual amount of eelgrass to be impacted may be considerably less. In a previous survey of the marina, conducted in March 15, 2007 (Tetra Tech, unpublished), the total area of eelgrass found within the survey areas was 1,883 m^2 (0.19 ha) which would result in a significantly lower impact quantity. The actual mitigation quantities will be based on the pre-construction eelgrass survey that will be conducted within 60 days of the commencement of dredging.

Table 3. Potential eelgrass impact areas and required mitigation areas by fairway, Cerritos Bahia Marina, Long Beach, California, October 2008.

	Potential Impact Area		Required Mitigation (1.2 to 1 Ratio)		Recommended Mitigation (1.4 to 1 Ratio)	
Location	m^2	ha	m^2	ha	m^2	ha
Inside Long Dock (includes south of dock A)	166.6	0.017	200	0.020	233	0.023
Fairway A - B	21.1	0.002	25	0.003	30	0.003
Fairway B - C	243.1	0.024	292	0.029	340	0.034
Fairway C - E	991.6	0.099	1190	0.119	1388.3	0.139
Fairway E - F	1136.9	0.114	1364	0.136	1592	0.159
Fairway F - G	1034.5	0.103	1241	0.124	1448	0.145
Fairway G - H	543.5	0.054	652	0.065	761	0.076
Fairway H - I	215.6	0.022	259	0.026	302	0.030
North of Dock I	258.2	0.026	310	0.031	361	0.036
Total	**4,849**	**0.485**	**5,819**	**0.582**	**6,789**	**0.679**

6.0 EELGRASS MITIGATION REQUIREMENTS

This report has been prepared to assess the potential effects of the proposed project on eelgrass. Dredging operations would affect the eelgrass at the site. Applicable mitigation measures are also discussed below. Under the California Environmental Quality Act (CEQA) *mitigation* includes the following:

a) **Avoiding** the impact altogether by not taking a certain action or parts of an action.

b) **Minimizing** impact by limiting the degree or magnitude of the action and its implementation.

c) **Rectifying** the impact by repairing, rehabilitating, or restoring the impacted environment.

d) **Reducing or Eliminating** the impact over time by preservation and maintenance operations during the life of the action

e) **Compensating** for the impact by replacing or providing substitute resources or environments.

This project has been designed to avoid eelgrass where possible and minimize impacts to eelgrass by revising the proposed dredge depth from -8ft mllw to -6ft mllw. Unavoidable impacts will be mitigated in-kind by transplanting eelgrass back into the marina.

A total of 4,928 m^2 of eelgrass habitat was mapped in the project area (Table 1). Eelgrass occurs predominantly in the central fairways at depths of minus 6-ft mllw or shallower. Based on the October 2008 eelgrass survey, dredging the marina would result in an impact to 4,849 m^2 (Table 3). The remaining 79 m^2 of eelgrass is outside of the dredge footprint and would be avoided. In addition the eelgrass along the south side of the channel would be avoided.

Due to the project design of dredging to -6ft mllw no potential eelgrass habitat, where eelgrass does not currently occur, will be impacted.

The reduction in acreage of eelgrass habitat must be mitigated according to State and Federal environmental policies (SCEMP), which include the replacement, in kind, of these habitat types. According to the Policy, a minimum of 1.2 to 1 mitigation is required. If the total impact is 4,849 m^2, at least 5,819 m^2 must be transplanted as mitigation. However, it is recommended to mitigate at a ratio of 1.4 to 1, which would be a total of 6,789 m^2. This provides extra eelgrass area to increase likelihood of success of meeting the 1.2 to 1 requirement at the end of the 5-year monitoring period.

Prior to construction activities, a pre-construction eelgrass survey will be required. This survey is in order to update actual eelgrass locations, determine anticipated impacts, and to determine if any eelgrass can be avoided and protected in place. In the case where eelgrass occurs outside of the dredge footprint and can be avoided, an Anchor Management Plan is required. If an Anchor Management Plan is required, the following measures will be implemented in order to protect eelgrass that occurs outside of the project footprint:

- Maps depicting all eelgrass in and around the project area will be provided to the contractor prior to commencement of any work.

- At sites where avoidable eelgrass occurs, boundaries of the avoidable eelgrass shall be marked with buoys prior to the initiation of work so that equipment and vessel operators will avoid damage to that eelgrass.

- Barges or other vessels shall be anchored away from avoidable eelgrass. Anchors and/or spuds shall not impinge upon any avoidable eelgrass.

- Eelgrass beds located on adjacent parcels shall be protected from any impacts by maintaining a buffer area of at least 5 feet between the placement of a spud and the eelgrass.

Upon completion of the project, a post-construction eelgrass survey will be required to determine the actual impact to eelgrass as a result of the project. Mitigation requirements will be based on this impact quantity.

An eelgrass mitigation project must be conducted in compliance with the SCEMP (Appendix A) and includes the following tasks: (1) selecting a potential eelgrass receiver site, (2) conducting eelgrass transplants at a replacement ratio of at least 1.2 to 1 for eelgrass, (3) conducting mitigation monitoring surveys to evaluate the level of transplant success, and (4) if required, conducting additional transplants if the primary transplant does not meet project success criteria. These components are described in full in the (SCEMP).

7.0 PROPOSED EELGRASS MITIGATION PLAN

To mitigate for impacts to approximately 4,800 m^2 (0.48 ha) of eelgrass, the project proponent proposes to re-create approximately 6,000 m^2 (0.60 ha) of eelgrass beds within the marina. However the actual mitigation quantities will be determined with the pre-construction eelgrass survey results. This section provides the site specific details of the proposed mitigation effort.

7.1 Transplant Methodology and Techniques

The new eelgrass transplant will involve several steps; collecting stock material from donor sites including the project sites prior to construction, preparing the material for transplanting, replanting the eelgrass in the mitigation area receiver sites, following up the transplant with monitoring surveys, and evaluating the success of the transplant.

Biologist divers will collect eelgrass from sites Alamitos Bay, Anaheim Bay and Sunset Harbor (Figure 6) and replant it in the marina. The proposed transplant size will be at a 1.4 to 1 ratio in order to provide additional area and increase the likelihood of meeting the success criteria of the SCEMP. The estimated area available for transplanting (-6 ft mllw or shallower) at the site after dredging will be 7,058 m^2 (0.71 ha).

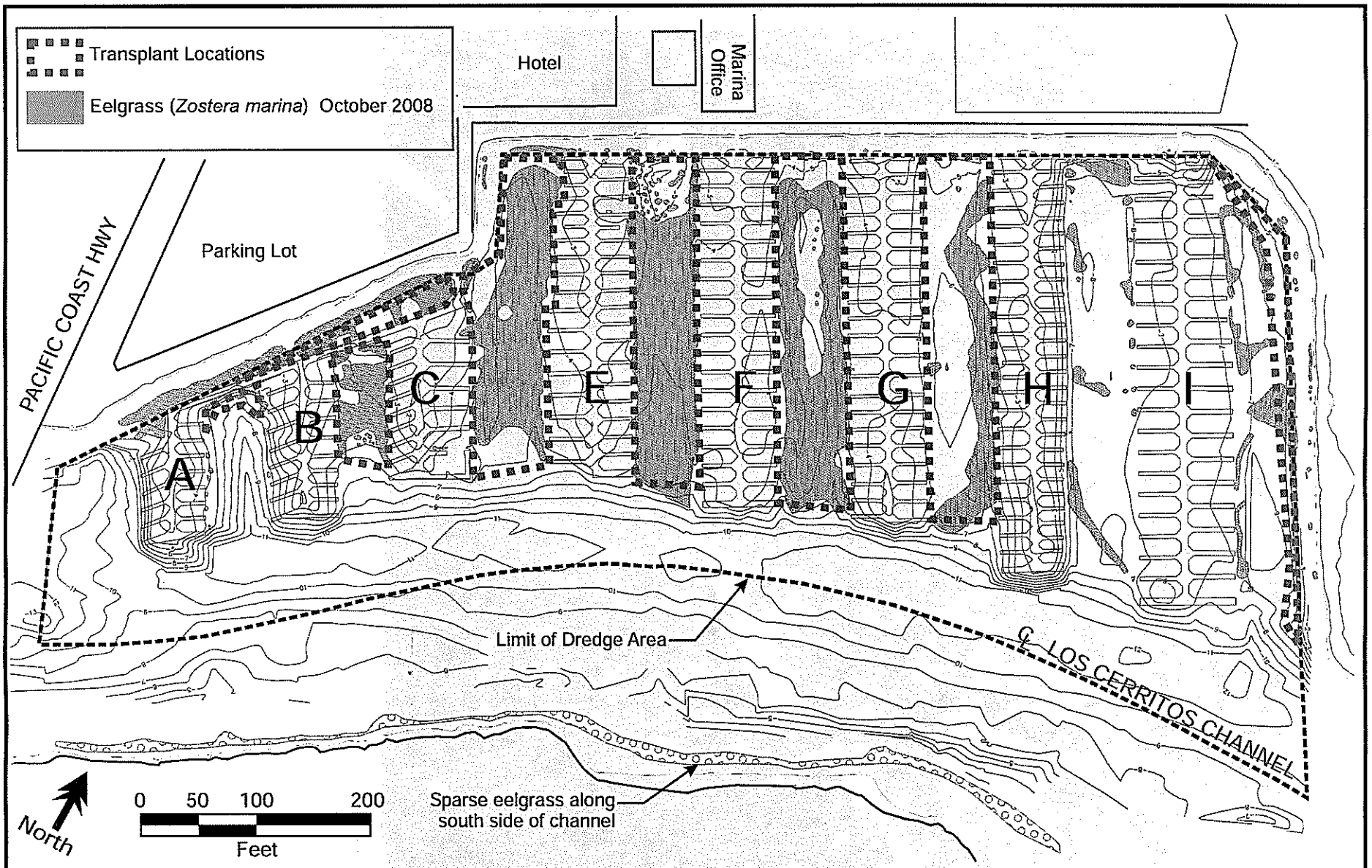
The proposed technique will be a bare root anchor/bundle technique method. The donor stock material will be assembled into eelgrass bundle units. For an impact of 4,800 m^2 (0.48 ha), the 1.2 ratio would be 5,760 m^2 (0.576 ha). Eelgrass habitat would be replanted at depths between -2 ft and -6 ft mllw along pre-determined planting grids. Bundles will be planted on the nearest 1-meter centers. Each bundle will consist of 8 to 12 shoots of eelgrass.

For a mitigation site of 6, 000 m^2 (0.60 ha) , the project would require the removal of approximately 6,000 transplant bundles of eelgrass comprised of up to 80,000 shoots of eelgrass from other nearby locations. The donor stock eelgrass material will be collected by biologist divers within Alamitos Bay and from nearby Anaheim Bay and Sunset Harbor eelgrass meadows (Figure 7). If feasible, eelgrass will be salvaged from the project site prior to dredging. Eelgrass will be salvaged from within the dredge footprint as the project proceeds. This will depend in part on the timing of planting efforts and when project impacts may occur. At the offsite donor beds no more than 10% of the eelgrass shoots will be collected. Written permission will be obtained from the California Department of Fish and Game before collection of donor stock commences.

7.2 Field Monitoring and Transplant Evaluation

Once completed, the transplant area would be surveyed and checked for planting quality. Each transplanted bundle is inspected and repaired or replaced as needed to ensure proper planting of the entire site. Immediately following the transplant the location of the transplant area is to be mapped and documented using GPS and area landmarks. Divers will also perform an underwater survey of the pre-determined control site to document the eelgrass area and density. An Eelgrass Transplant Report documenting the transplant methodologies and control site survey results is then prepared and submitted to the associated regulatory and resource agencies.

A series of six (7) monitoring surveys will be required to evaluate transplant success. A survey will be conducted immediately after the transplant is completed. Subsequent monitoring surveys will be conducted during the active vegetative growth periods of eelgrass (March through October) at intervals of 6 months, 12 months, 24 months, 36 months, 48 months, and 60 months after the transplant to determine the health of the transplanted vegetation and to evaluate transplant success based on established criteria (SCEMP rev 11). Additional monitoring beyond the 60 month period may be required by the agencies.



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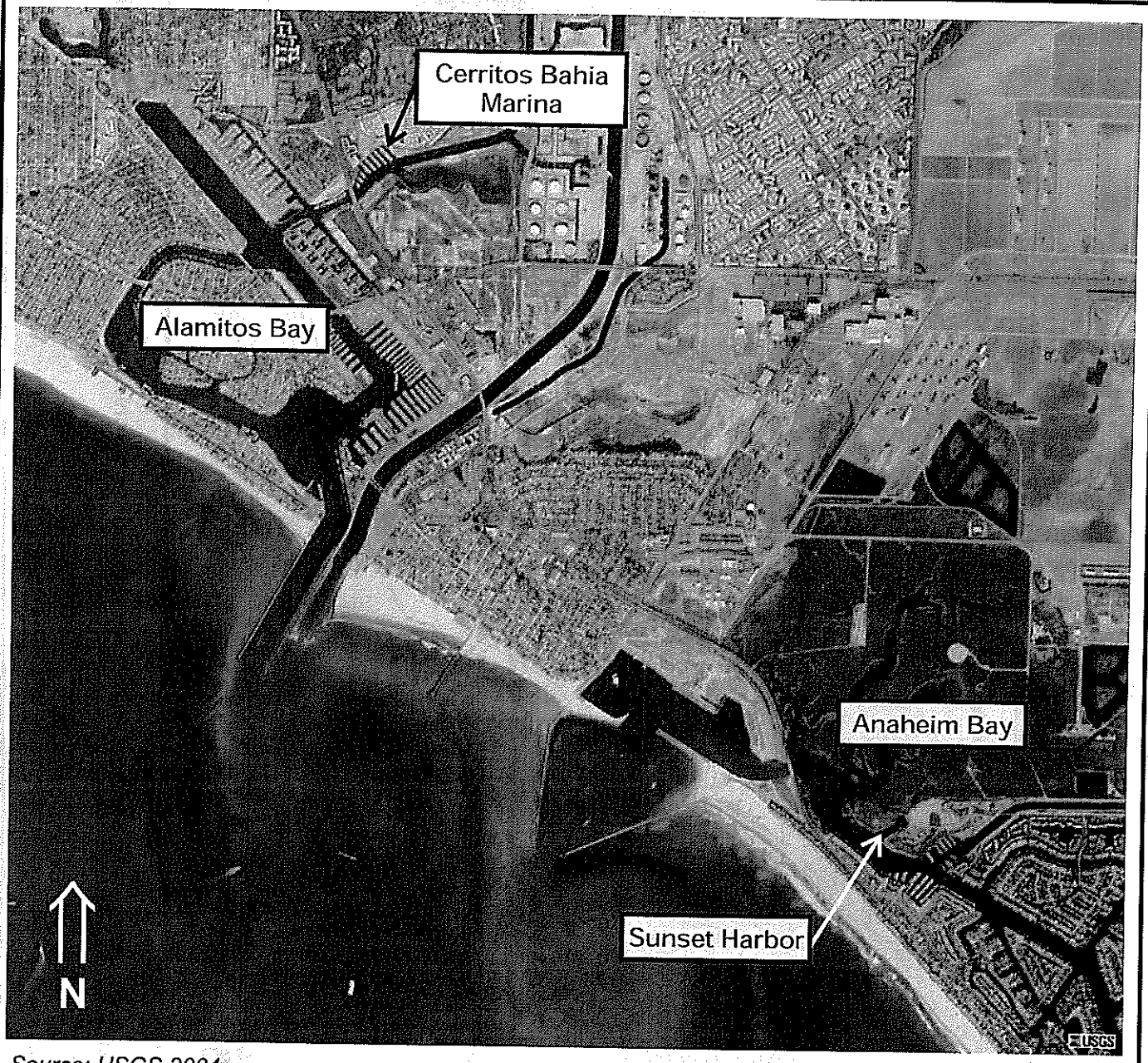
Proposed Eelgrass Transplant Locations
Maintenance Dredging Project
Cerritos Bahia Marina
Alamitos Bay, Long Beach, California

FIGURE 6

November 2008



Source: USGS 2004

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Eelgrass Donor Sites

Cerritos Bahia Marina

Long Beach, California

FIGURE 7

November 2008

The percent cover and shoot density of eelgrass will be determined during each monitoring survey. The undisturbed areas of eelgrass at the nearby Control Site will be used when assessing the results of the transplant.

If yearly transplant criteria are not met, then a replant will be conducted. The amount to be replanted is based upon a formula that takes into account area and/or density deficiencies (SCEMP). Table 4 shows the area requirements for a mitigation requirement of 6,000 m^2 assuming that the density requirement is met each year.

Table 4. Annual eelgrass transplant success criteria for a mitigation transplant of 6,000 square meters of eelgrass.

Post Transplant Year	SUCCESS CRITERIA		
	Percent of Transplant Area	Minimum Area	
		(m^2)	ha
Year 1	70	4,200	0.42
Year 2	85	5,100	0.51
Year 3	100	6,000	0.60
Year 4	100	6,000	0.60
Year 5	100	6,000	0.60

Note: Transplant of 6,000 m^2 is for example only and is based on an impact to 5,000m^2. Project may result in an impact requires a different mitigation quantity.

As stated in the SCEMP, criteria for determination of transplant success shall be based upon a comparison of vegetation coverage (area) and density (turions per square meter) between the adjusted project impact area (i.e., original impact area multiplied by 1.2) and mitigation site(s). Extent of vegetated cover is defined as that area where eelgrass is present and where gaps in coverage are less than one meter between individual turion clusters. Density of shoots is defined by the number of turions per area present in representative samples within the original impact area, control or transplant bed.

Specific criteria are as follows:

a. the mitigation site shall achieve a minimum of 70 percent area of eelgrass and 30 percent density as compared to the adjusted project impact area after the first year.

b. the mitigation site shall achieve a minimum of 85 percent area of eelgrass and 70 percent density as compared to the adjusted project impact area after the second year.

c. the mitigation site shall achieve a sustained 100 percent area of eelgrass bed and at least 85 percent density as compared to the adjusted project impact area for the third, fourth and fifth years.

Should the required eelgrass transplant fail to meet any of the established criteria, then a Supplementary Transplant Area (STA) shall be constructed, if necessary, and planted. The size of this STA shall be determined by the following formula:

$$STA = MTA \times (|A_t + D_t| - |A_c + D_c|)$$

MTA = mitigation transplant area.

A_t = transplant deficiency or excess in area of coverage criterion (%).

D_t = transplant deficiency in density criterion (%).

A_c = natural decline in area of control (%).

D_c = natural decline in density of control (%).

The STA formula shall be applied to actions that result in the degradation of habitat (i.e., either loss of areal extent or reduction in density).

Five conditions apply:

1) For years 2-5, an excess of only up to 30% in area of coverage over the stated criterion with a density of at least 60% as compared to the project area may be used to offset any deficiencies in the density criterion.

2) Only excesses in area criterion equal to or less than the deficiencies in density shall be entered into the STA formula.

3) Densities which exceed any of the stated criteria shall not be used to offset any deficiencies in area of coverage.

4) Any required STA must be initiated within 120 days following the monitoring event that identifies a deficiency in meeting the success criteria. Any delays beyond 120 days in the implementation of the STA shall be subject to the penalties as described in Section 8 of the SCEMP.

5) Annual monitoring will be required of the STA for five years following the implementation and all performance standards apply to the STA.

7.3 Reporting

Field survey results will be submitted to the resource agencies in report format within 30 days of each of the surveys. The reports will present eelgrass percent cover and density data, an assessment of the functional quality of the area, a qualitative assessment of invertebrate and fish use of the area, and recommended remedial measures if the transplant is not meeting mitigation success criteria.

8.0 SCHEDULING OF MITIGATION ACTIVITIES

A proposed schedule of project sequencing is provided in Table 5. The schedule takes into account the typical approved in-water work period of September 1 to March 15. The assumed dredge start date of November 1, 2009 was used to provide the resulting dates and deadlines. Once the project is permitted and scheduled, a construction schedule which includes specific starting and ending dates for all work including mitigation activities will be provided to the resource agencies for approval at least 30 days prior to initiating in-water construction.

Table 5. Sequence of mitigation activities based on a project start date of November 1, 2009.

Task	Comments	Start Date	End Date
Pre-dredge Eelgrass Survey of Project Site and Control Site	30 to 60 days prior to project commencement	2-Sep-2009	2-Oct-2009
Pre-dredge Bathymetry			
Establish eelgrass avoidance measures	Avoid eelgrass as much as is practical		
Dredging	30 to 60 days duration (assumes 60 days) excavate mitigation site to appropriate elevations	1-Nov-2009	31-Dec-2009
Post-dredge Eelgrass Survey	within 30 days of project completion		30-Jan-2010
Post-dredge Bathymetric Survey	within 30 days of project completion establish cross-sections to be used in monitoring site stability		30-Jan-2010
Impact Determination		30-Jan-2010	6-Feb-2010
Final Mitigation Plan based on Impact and Bathymetry	2 weeks	6-Feb-2010	20-Feb-2010
Site Settlement	60 days duration Survey cross-sections to monitor site stability	31-Dec-2009	1-Mar-2010
Conduct Transplant	2 weeks	1-Mar-2010	15-Mar-2010
Transplant Verification/Monitoring Survey: 0-month	upon completion of transplant; to include transplant and control sites	16-Mar-2010	
6-month Transplant Monitoring Survey	survey transplant and control sites determine if any corrective measures are needed	15-Sep-2010	
12-month Transplant Monitoring Survey	survey transplant and control sites determine if any corrective measures are needed	16-Mar-2011	
24-month Transplant Monitoring Survey	survey transplant and control sites determine if any corrective measures are needed	15-Mar-2012	
36-month Transplant Monitoring Survey	survey transplant and control sites determine if any corrective measures are needed	15-Mar-2013	
48-month Transplant Monitoring Survey	survey transplant and control sites determine if any corrective measures are needed	15-Mar-2014	
60-month Transplant Monitoring Survey	survey transplant and control sites determine if any corrective measures are needed	15-Mar-2015	

The following measures will be conducted as part of this project:

1) A pre-construction eelgrass survey will be conducted of the entire marina including the channel and opposite bank to the south. This survey will be conducted in accordance with the Southern California Eelgrass Mitigation Policy (SCEMP Revision 11). This

survey will be conducted during the period of March through October. The survey is considered valid by NMFS for a period of no more than 60 days, with the exception that surveys conducted in August through October which will be valid until the following March 1. Pre-construction survey results will be submitted to National Marine Fisheries Service (NMFS) and the California Department of Fish and Game (CDFG) in an appropriate data format for the information to be mapped on the project drawings.

2) A project marine biologist shall mark the positions of eelgrass beds with buoys prior to the initiation of any construction to minimize damage to eelgrass beds outside the construction zone.

3) The project marine biologist shall meet with the construction crews prior to dredging to review areas of eelgrass to avoid and to review proper construction techniques.

4) If barges and work vessels are used during construction, measures shall be taken to ensure that eelgrass beds are not impacted through grounding, propeller damage, or other activities that may disturb the sea floor. Such measures shall include speed restrictions, establishment of off-limit areas, and use of shallow draft vessels.

5) A post-construction survey will be conducted within 30 days of the completion of construction activities to determine the actual area of eelgrass affected for mitigation purposes. The Project Proponent will be required to mitigate the loss of eelgrass in accordance with the Southern California Eelgrass Mitigation Policy (SCEMP Revision 11). As per the SCEMP the loss of eelgrass habitat must be mitigated at a minimum 1.2:1 ratio.

6) Eelgrass mitigation (transplant) will be initiated within 135 days of project inception. The amount of mitigation necessary will be determined by the difference between the pre-construction and post-construction surveys.

7) An eelgrass transplant report will completed following the transplant and monitoring surveys conducted at 6, 12, 24, 36, 48, and 60 months post-transplant. All monitoring work will be conducted during the active vegetative growth period and shall avoid the winter months of November through February. The Project Proponent shall ensure that project achievement of specific milestones and criteria for success, as directed in the SCEMP along with guidelines for remedial actions, are documented. If the success criteria are not met, construction of a Supplementary Transplant Area and monitoring for an additional 5 years may be required by NMFS.

9.0 CONCLUSION

Eelgrass is in the proposed project area that would be impacted as a result of the maintenance dredging project. A total of 4,928 m^2 of eelgrass habitat was mapped in the project area in October 2008 at depths between -2ft mllw and -8ft mllw. Of this, an estimated 4,849 m^2 would be directly impacted by dredging. However, eelgrass has been found to be variable from year to year and the actual impact is expected to be less. Approximately 547 m^2 of eelgrass was mapped along the south side of the channel. Due to the distance and channel currents this eelgrass is unlikely to be affected by the project. The project has been designed to minimize and compensate for impacts to eelgrass. Compensation consists of transplanting eelgrass back into the marina after the dredging is completed. The estimated area available for transplanting (-6 ft mllw or shallower) at the site after dredging will be 7,058 m^2. It is recommended that a ratio of 1.4 to 1 of eelgrass be transplanted to increase the likelihood of meeting the 1.2 to 1 requirement. Mitigation, monitoring, and reporting would be conducted in accordance with the Southern California Eelgrass Mitigation Policy (Revision 11) which is included in Appendix A.

10.0 REFERENCES

Fonseca, Mark S., W. Judson Kenworthy, and Gordon W. Thayer. 1998. *Guidelines for the conservation and restoration of seagrasses in the United States and adjacent waters*. NOAA Coastal Ocean Program Decision Analysis Series No. 12. NOAA Coastal Ocean Office, Silver Spring, MD. 222 pp.

National Marine Fisheries Service Southwest Region, 2003. *Caulerpa* Control Protocol (Ver. 1.2b). (http://swr.ucsd.edu/hcd/caulerpa/ccp.pdf)

Thom, Ronald M. et al. 2003. *Factors influencing spatial and annual variability in eelgrass (Zostera marina L.) meadows in Willapa Bay, Washington, and Coos Bay, Oregon, estuaries*. Estuaries, Vol. 26, No. 4B, p. 1117-1129, August 2003.

Thom, Ronald M. et al. 2001. *Effects of multiple stressors on eelgrass restoration projects*. Battelle Marine Sciences Laboratory and Pacific Northwest National Laboratory. Puget Sound Research 2001.

Thom, Ronald M. et al. 1998. *Puget Sound's eelgrass meadows: Factors contributing to depth distribution and spatial patchiness*. Battelle Marine Sciences Laboratory and Pacific Northwest National Laboratory. Puget Sound Research 2001.

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APPENDIX A

Southern California Eelgrass Mitigation Policy (Rev. 11)

SOUTHERN CALIFORNIA EELGRASS MITIGATION POLICY

(Adopted July 31, 1991)

Eelgrass (Zostera marina) vegetated areas are recognized as important ecological communities in shallow bays and estuaries because of their multiple biological and physical values. Eelgrass habitat functions as an important structural environment for resident bay and estuarine species, offering both predation refuge and a food source. Eelgrass functions as a nursery area for many commercially and recreational important finfish and shellfish species, including those that are resident within bays and estuaries, as well as oceanic species that enter estuaries to breed or spawn. Eelgrass also provides a unique habitat that supports a high diversity of non-commercially important species whose ecological roles are less well understood.

Eelgrass is a major food source in nearshore marine systems, contributing to the system at multiple trophic levels. Eelgrass provides the greatest amount of primary production of any nearshore marine ecosystem, forming the base of detrital-based food webs and as well as providing a food source for organisms that feed directly on eelgrass leaves, such as migrating waterfowl. Eelgrass is also a source of secondary production, supporting epiphytic plants, animals, and microbial organisms that in turn are grazed upon by other invertebrates, larval and juvenile fish, and birds.

In addition to habitat and resource attributes, eelgrass serves beneficial physical roles in bays and estuaries. Eelgrass beds dampen wave and current action, trap suspended particulates, and reduce erosion by stabilizing the sediment. They also improve water clarity, cycle nutrients, and generate oxygen during daylight hours.

In order to standardize and maintain a consistent policy regarding mitigating adverse impacts to eelgrass resources, the following policy has been developed by the Federal and State resource agencies (National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the California Department of Fish and Game). While the intent of this Policy is to provide a basis for consistent recommendations for projects that may impact existing eelgrass resources, there may be circumstances (e.g., climatic events) where flexibility in the application of this Policy is warranted. As a consequence, deviations from the stated Policy may be allowed on a case-by-case basis. This policy should be cited as the Southern California Eelgrass Mitigation Policy (revision 11).

For clarity, the following definitions apply. "Project" refers to work performed on-site to accomplish the applicant's purpose. "Mitigation" refers to work performed to compensate for any adverse impacts caused by the "project". "Resource agencies" refers to National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and the California Department of Fish and Game (CDFG).

1. **Mitigation Need.** Eelgrass transplants shall be considered only after the normal provisions and policies regarding avoidance and minimization, as addressed in the Section 404 Mitigation Memorandum of Agreement between the Corps of Engineers and Environmental Protection Agency, have been pursued to the fullest extent possible prior to the development of any mitigation program. Mitigation will be required for the loss of

existing vegetated areas, loss of potential eelgrass habitat, and/or degradation of existing/potential eelgrass habitat. Mitigation for boat docks and/or related work is addressed in section 2.

2. **Boat Docks and Related Structures**. Boat docks, ramps, gangways and similar structures should avoid eelgrass vegetated or potential eelgrass vegetated areas to the maximum extent feasible. If avoidance of eelgrass or potential eelgrass areas is infeasible, impacts should be minimized by utilizing, to the maximum extent feasible, construction materials that allow for greater light penetration (e.g., grating, translucent panels, etc.). For projects where the impact cannot be determined until after project completion (i.e., vessel shading, vessel traffic) a determination regarding the amount of mitigation shall be made based upon two annual monitoring surveys conducted during the time period of August to October which document the changes in the bed (areal extent and density) in the vicinity of the footprint of the boat dock, moored vessel(s), and/or related structures. Any impacts determined by these monitoring surveys shall be mitigated per sections 3-12 of this policy. Projects subject to this section must include a statement from the applicant indicating their understanding of the potential mitigation obligation which may follow the initial two-year monitoring.

3. **Mitigation Map.** The project applicant shall map thoroughly the area, distribution, density and relationship to depth contours of any eelgrass beds likely to be impacted by project construction. This includes areas immediately adjacent to the project site which have the potential to be indirectly or inadvertently impacted as well as potential eelgrass habitat areas. Potential habitat is defined as areas where eelgrass would normally be expected to occur but where no vegetation currently exists. Factors to be considered in delineating potential habitat areas include appropriate circulation, light, sediment, slope, salinity, temperature, dissolved oxygen, depth, proximity to eelgrass, history of eelgrass coverage, etc.

Protocol for mapping shall consist of the following format:

1) Bounding Coordinates

   Horizontal datum - Universal Transverse Mercator (UTM), NAD 83, Zone 11 is the preferred projection and datum. If another projection or datum is used, the map and spatial data must include metadata that accurately defines the projection and datum.

   Vertical datum - Mean Lower Low Water (MLLW), depth in feet.

2) Units

   Transects and grids in meters.

   Area measurements in square meters/hectares.

3) File format

   A spatial data layer compatible with readily available geographic information system software must be sent to NMFS and any other interested resource agency when the area mapped has greater than 10 square meters of

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Eelgrass (Zostera marina) vegetated areas are recognized as important ecological communities in shallow bays and estuaries because of their multiple biological and physical values. Eelgrass habitat functions as an important structural environment for resident bay and estuarine species, offering both predation refuge and a food source. Eelgrass functions as a nursery area for many commercially and recreational important finfish and shellfish species, including those that are resident within bays and estuaries, as well as oceanic species that enter estuaries to breed or spawn. Eelgrass also provides a unique habitat that supports a high diversity of non-commercially important species whose ecological roles are less well understood.

Eelgrass is a major food source in nearshore marine systems, contributing to the system at multiple trophic levels. Eelgrass provides the greatest amount of primary production of any nearshore marine ecosystem, forming the base of detrital-based food webs and as well as providing a food source for organisms that feed directly on eelgrass leaves, such as migrating waterfowl. Eelgrass is also a source of secondary production, supporting epiphytic plants, animals, and microbial organisms that in turn are grazed upon by other invertebrates, larval and juvenile fish, and birds.

In addition to habitat and resource attributes, eelgrass serves beneficial physical roles in bays and estuaries. Eelgrass beds dampen wave and current action, trap suspended particulates, and reduce erosion by stabilizing the sediment. They also improve water clarity, cycle nutrients, and generate oxygen during daylight hours.

In order to standardize and maintain a consistent policy regarding mitigating adverse impacts to eelgrass resources, the following policy has been developed by the Federal and State resource agencies (National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the California Department of Fish and Game). While the intent of this Policy is to provide a basis for consistent recommendations for projects that may impact existing eelgrass resources, there may be circumstances (e.g., climatic events) where flexibility in the application of this Policy is warranted. As a consequence, deviations from the stated Policy may be allowed on a case-by-case basis. This policy should be cited as the Southern California Eelgrass Mitigation Policy (revision 11).

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1. **Mitigation Need.** Eelgrass transplants shall be considered only after the normal provisions and policies regarding avoidance and minimization, as addressed in the Section 404 Mitigation Memorandum of Agreement between the Corps of Engineers and Environmental Protection Agency, have been pursued to the fullest extent possible prior to the development of any mitigation program. Mitigation will be required for the loss of

existing vegetated areas, loss of potential eelgrass habitat, and/or degradation of existing/potential eelgrass habitat. Mitigation for boat docks and/or related work is addressed in section 2.

2. **Boat Docks and Related Structures.** Boat docks, ramps, gangways and similar structures should avoid eelgrass vegetated or potential eelgrass vegetated areas to the maximum extent feasible. If avoidance of eelgrass or potential eelgrass areas is infeasible, impacts should be minimized by utilizing, to the maximum extent feasible, construction materials that allow for greater light penetration (e.g., grating, translucent panels, etc.). For projects where the impact cannot be determined until after project completion (i.e., vessel shading, vessel traffic) a determination regarding the amount of mitigation shall be made based upon two annual monitoring surveys conducted during the time period of August to October which document the changes in the bed (areal extent and density) in the vicinity of the footprint of the boat dock, moored vessel(s), and/or related structures. Any impacts determined by these monitoring surveys shall be mitigated per sections 3-12 of this policy. Projects subject to this section must include a statement from the applicant indicating their understanding of the potential mitigation obligation which may follow the initial two-year monitoring.

3. **Mitigation Map.** The project applicant shall map thoroughly the area, distribution, density and relationship to depth contours of any eelgrass beds likely to be impacted by project construction. This includes areas immediately adjacent to the project site which have the potential to be indirectly or inadvertently impacted as well as potential eelgrass habitat areas. Potential habitat is defined as areas where eelgrass would normally be expected to occur but where no vegetation currently exists. Factors to be considered in delineating potential habitat areas include appropriate circulation, light, sediment, slope, salinity, temperature, dissolved oxygen, depth, proximity to eelgrass, history of eelgrass coverage, etc.

Protocol for mapping shall consist of the following format:

1) Bounding Coordinates

Horizontal datum - Universal Transverse Mercator (UTM), NAD 83, Zone 11 is the preferred projection and datum. If another projection or datum is used, the map and spatial data must include metadata that accurately defines the projection and datum.

Vertical datum - Mean Lower Low Water (MLLW), depth in feet.

2) Units

Transects and grids in meters.

Area measurements in square meters/hectares.

3) File format

A spatial data layer compatible with readily available geographic information system software must be sent to NMFS and any other interested resource agency when the area mapped has greater than 10 square meters of

eelgrass. For those areas with less than 10 square meters, a table must be provided giving the bounding x,y coordinates of the eelgrass areas. In addition to a spatial layer or table, a hard-copy map should be included within the survey report. The projection and datum should be clearly defined in the metadata and/or an associated text file.

All mapping efforts must be completed during the active growth phase for the vegetation (typically March through October) and shall be valid for a period of 60 days with the exception of surveys completed in August - October. Surveys completed after unusual climatic events (i.e., high rainfall) may have modified requirements and surveyors should contact NMFS, CDFG, and USFWS to determine if any modifications to the standard survey procedures will be required. A survey completed in August - October shall be valid until the resumption of active growth (i.e., in most instances, March 1). After project construction, a post-project survey shall be completed within 30 days. The actual area of impact shall be determined from this survey.

4. **Mitigation Site.** The location of eelgrass transplant mitigation shall be in areas similar to those where the initial impact occurs. Factors such as, distance from project, depth, sediment type, distance from ocean connection, water quality, and currents are among those that should be considered in evaluating potential sites.

5. **Mitigation Size.** In the case of transplant mitigation activities that occur concurrent to the project that results in damage to the existing eelgrass resource, a ratio of 1.2 to 1 shall apply. That is, for each square meter adversely impacted, 1.2 square meters of new suitable habitat, vegetated with eelgrass, must be created. The rationale for this ratio is based on, 1) the time (i.e., generally three years) necessary for a mitigation site to reach full fishery utilization and 2) the need to offset any productivity losses during this recovery period within five years. An exception to the 1.2 to 1 requirement shall be allowed when the impact is temporary and the total area of impact is less than 100 square meters. Mitigation on a one-for-one basis shall be acceptable for projects that meet these requirements (see section 11 for projects impacting less than 10 square meters).

Transplant mitigation completed three years in advance of the impact (i.e., mitigation banks) will not incur the additional 20 percent requirement and, therefore, can be constructed on a one-for-one basis. However, all other annual monitoring requirements (see sections 8-9) remain the same irrespective of when the transplant is completed.

Project applicants should consider increasing the size of the required mitigation area by 20-30 percent to provide greater assurance that the success criteria, as specified in Section 10, will be met. In addition, alternative contingent mitigation must be specified, and included in any required permits, to address situation where performance standards (see section 10) are not likely to be met.

For potential eelgrass habitat, a ratio of 1 to 1 of equivalent habitat shall be created.

Degradation of existing eelgrass vegetated habitat that results in a reduction of density greater than 25 percent shall be mitigated on a one-for-one basis. For example, a 25

percent reduction in density of a 100 square meter (100 turions/meter) eelgrass bed to 75 turions/meter would require the establishment of 25 square meters of new eelgrass with a density at or greater than the pre-impact density. All other provisions of the Policy would apply.

6. **Mitigation Technique.** Techniques for the construction and planting of the eelgrass mitigation site shall be consistent with the best available technology at the time of the project. Donor material shall be taken from the area of direct impact whenever possible, but also should include a minimum of two additional distinct sites to better ensure genetic diversity of the donor plants. No more than 10 percent of an existing bed shall be harvested for transplanting purposes. Plants harvested shall be taken in a manner to thin an existing bed without leaving any noticeable bare areas. Written permission to harvest donor plants must be obtained from the California Department of Fish and Game.

Plantings should consist of bare-root bundles consisting of 8-12 individual turions. Specific spacing of transplant units shall be at the discretion of the project applicant. However, it is understood that whatever techniques are employed, they must comply with the stated requirements and criteria.

7. Mitigation Timing. For off-site mitigation, transplanting should be started prior to or concurrent with the initiation of in-water construction resulting in the impact to the eelgrass bed. Any off-site mitigation project which fails to initiate transplanting work within 135 days following the initiation of the in-water construction resulting in impact to the eelgrass bed will be subject to additional mitigation requirements as specified in section 8. For on-site mitigation, transplanting should be postponed when construction work is likely to impact the mitigation. However, transplanting of on-site mitigation should be started no later than 135 days after initiation of in-water construction activities. A construction schedule which includes specific starting and ending dates for all work including mitigation activities shall be provided to the resource agencies for approval at least 30 days prior to initiating in-water construction.

8. **Mitigation Delay.** If, according to the construction schedule or because of any delays, mitigation cannot be started within 135 days of initiating in-water construction, the eelgrass replacement mitigation obligation shall increase at a rate of seven percent for each month of delay. This increase is necessary to ensure that all productivity losses incurred during this period are sufficiently offset within five years.

9. **Mitigation Monitoring.** Monitoring the success of eelgrass mitigation shall be required for a period of five years for most projects. Monitoring activities shall determine the area of eelgrass and density of plants at the transplant site and shall be conducted at initial planting, 6, 12, 24, 36, 48, and 60 months after completion of the transplant. All monitoring work must be conducted during the active vegetative growth period and shall avoid the winter months of November through February. Sufficient flexibility in the scheduling of the 6 month surveys shall be allowed in order to ensure the work is completed during this active growth period. Additional monitoring beyond the 60 month period may be required in those instances where stability of the proposed transplant site is questionable or where other factors may influence the long-term success of transplant.

The monitoring of an adjacent or other acceptable control area (subject to the approval of the resource agencies) to account for any natural changes or fluctuations in bed width or density must be included as an element of the overall program.

A monitoring schedule that indicates when each of the required monitoring events will be completed shall be provided to the resource agencies prior to or concurrent with the initiation of the mitigation (see attached monitoring and compliance summary form).

Monitoring reports shall be provided to the resource agencies within 30 days after the completion of each required monitoring period and shall include the summary sheet included at the end of this policy.

10. **Mitigation Success.** Criteria for determination of transplant success shall be based upon a comparison of vegetation coverage (area) and density (turions per square meter) between the **adjusted project impact area** (i.e., original impact area multiplied by 1.2) and **mitigation site(s)**. Extent of vegetated cover is defined as that area where eelgrass is present and where gaps in coverage are less than one meter between individual turion clusters. Density of shoots is defined by the number of turions per area present in representative samples within the original impact area, control or transplant bed. Specific criteria are as follows:

a. the mitigation site shall achieve a minimum of 70 percent area of eelgrass and 30 percent density as compared to the adjusted project impact area after the first year.

b. the mitigation site shall achieve a minimum of 85 percent area of eelgrass and 70 percent density as compared to the adjusted project impact area after the second year.

c. the mitigation site shall achieve a sustained 100 percent area of eelgrass bed and at least 85 percent density as compared to the adjusted project impact area for the third, fourth and fifth years.

Should the required eelgrass transplant fail to meet any of the established criteria, then a Supplementary Transplant Area (STA) shall be constructed, if necessary, and planted. The size of this STA shall be determined by the following formula:

$$STA = MTA \times (|A_t + D_t| - |A_c + D_c|)$$

MTA = mitigation transplant area.
A_t = transplant deficiency or excess in area of coverage criterion (%).
D_t = transplant deficiency in density criterion (%).
A_c = natural decline in area of control (%).
D_c = natural decline in density of control (%).

The STA formula shall be applied to actions that result in the degradation of habitat (i.e., either loss of areal extent or reduction in density).

Five conditions apply:

1) For years 2-5, an excess of only up to 30% in area of coverage over the stated criterion with a density of at least 60% as compared to the project area may be used to offset any deficiencies in the density criterion.
2) Only excesses in area criterion equal to or less than the deficiencies in density shall be entered into the STA formula.
3) Densities which exceed any of the stated criteria shall not be used to offset any deficiencies in area of coverage.
4) Any required STA must be initiated within 120 days following the monitoring event that identifies a deficiency in meeting the success criteria. Any delays beyond 120 days in the implementation of the STA shall be subject to the penalties as described in Section 8.
5) Annual monitoring will be required of the STA for five years following the implementation and all performance standards apply to the STA.

11. **Mitigation Bank.** Any mitigation transplant success that, after five years, exceeds the mitigation requirements, as defined in section 10, may be considered as credit in a "mitigation bank". Establishment of any "mitigation bank" and use of any credits accrued from such a bank must be with the approval of the resource agencies and be consistent with the provisions stated in this policy. Monitoring of any approved mitigation bank shall be conducted on an annual basis until all credits are exhausted.

12. **Exclusions.**

1) Placement of a single pipeline, cable, or other similar utility line across an existing eelgrass bed with an impact corridor of no more than 1 meter wide may be excluded from the provisions of this policy with concurrence of the resource agencies. After project construction, a post-project survey shall be completed within 30 days and the results shall be sent to the resource agencies. The actual area of impact shall be determined from this survey. An additional survey shall be completed after 12 months to insure that the project or impacts attributable to the project have not exceeded the allowed 1 meter corridor width. Should the post-project or 12 month survey demonstrate a loss of eelgrass greater than the 1 meter wide corridor, then mitigation pursuant to sections 1-11 of this policy shall be required.

2) Projects impacting less than 10 square meters. For these projects, an exemption may be requested by a project applicant from the mitigation requirements as stated in this policy, provided suitable out-of-kind mitigation is proposed. A case-by-case evaluation and determination regarding the applicability of the requested exemption shall be made by the resource agencies.

(last revised 08/30/05)

percent reduction in density of a 100 square meter (100 turions/meter) eelgrass bed to 75 turions/meter would require the establishment of 25 square meters of new eelgrass with a density at or greater than the pre-impact density. All other provisions of the Policy would apply.

6. **Mitigation Technique.** Techniques for the construction and planting of the eelgrass mitigation site shall be consistent with the best available technology at the time of the project. Donor material shall be taken from the area of direct impact whenever possible, but also should include a minimum of two additional distinct sites to better ensure genetic diversity of the donor plants. No more than 10 percent of an existing bed shall be harvested for transplanting purposes. Plants harvested shall be taken in a manner to thin an existing bed without leaving any noticeable bare areas. Written permission to harvest donor plants must be obtained from the California Department of Fish and Game.

Plantings should consist of bare-root bundles consisting of 8-12 individual turions. Specific spacing of transplant units shall be at the discretion of the project applicant. However, it is understood that whatever techniques are employed, they must comply with the stated requirements and criteria.

7. Mitigation Timing. For off-site mitigation, transplanting should be started prior to or concurrent with the initiation of in-water construction resulting in the impact to the eelgrass bed. Any off-site mitigation project which fails to initiate transplanting work within 135 days following the initiation of the in-water construction resulting in impact to the eelgrass bed will be subject to additional mitigation requirements as specified in section 8. For on-site mitigation, transplanting should be postponed when construction work is likely to impact the mitigation. However, transplanting of on-site mitigation should be started no later than 135 days after initiation of in-water construction activities. A construction schedule which includes specific starting and ending dates for all work including mitigation activities shall be provided to the resource agencies for approval at least 30 days prior to initiating in-water construction.

8. **Mitigation Delay.** If, according to the construction schedule or because of any delays, mitigation cannot be started within 135 days of initiating in-water construction, the eelgrass replacement mitigation obligation shall increase at a rate of seven percent for each month of delay. This increase is necessary to ensure that all productivity losses incurred during this period are sufficiently offset within five years.

9. **Mitigation Monitoring.** Monitoring the success of eelgrass mitigation shall be required for a period of five years for most projects. Monitoring activities shall determine the area of eelgrass and density of plants at the transplant site and shall be conducted at initial planting, 6, 12, 24, 36, 48, and 60 months after completion of the transplant. All monitoring work must be conducted during the active vegetative growth period and shall avoid the winter months of November through February. Sufficient flexibility in the scheduling of the 6 month surveys shall be allowed in order to ensure the work is completed during this active growth period. Additional monitoring beyond the 60 month period may be required in those instances where stability of the proposed transplant site is questionable or where other factors may influence the long-term success of transplant.

The monitoring of an adjacent or other acceptable control area (subject to the approval of the resource agencies) to account for any natural changes or fluctuations in bed width or density must be included as an element of the overall program.

A monitoring schedule that indicates when each of the required monitoring events will be completed shall be provided to the resource agencies prior to or concurrent with the initiation of the mitigation (see attached monitoring and compliance summary form).

Monitoring reports shall be provided to the resource agencies within 30 days after the completion of each required monitoring period and shall include the summary sheet included at the end of this policy.

10. **Mitigation Success.** Criteria for determination of transplant success shall be based upon a comparison of vegetation coverage (area) and density (turions per square meter) between the **adjusted project impact area** (i.e., original impact area multiplied by 1.2) and **mitigation site(s)**. Extent of vegetated cover is defined as that area where eelgrass is present and where gaps in coverage are less than one meter between individual turion clusters. Density of shoots is defined by the number of turions per area present in representative samples within the original impact area, control or transplant bed. Specific criteria are as follows:

a. the mitigation site shall achieve a minimum of 70 percent area of eelgrass and 30 percent density as compared to the adjusted project impact area after the first year.

b. the mitigation site shall achieve a minimum of 85 percent area of eelgrass and 70 percent density as compared to the adjusted project impact area after the second year.

c. the mitigation site shall achieve a sustained 100 percent area of eelgrass bed and at least 85 percent density as compared to the adjusted project impact area for the third, fourth and fifth years.

Should the required eelgrass transplant fail to meet any of the established criteria, then a Supplementary Transplant Area (STA) shall be constructed, if necessary, and planted. The size of this STA shall be determined by the following formula:

$$STA = MTA \times (|A_t + D_t| - |A_c + D_c|)$$

MTA = mitigation transplant area.
A_t = transplant deficiency or excess in area of coverage criterion (%).
D_t = transplant deficiency in density criterion (%).
A_c = natural decline in area of control (%).
D_c = natural decline in density of control (%).

The STA formula shall be applied to actions that result in the degradation of habitat (i.e., either loss of areal extent or reduction in density).

Five conditions apply:

1) For years 2-5, an excess of only up to 30% in area of coverage over the stated criterion with a density of at least 60% as compared to the project area may be used to offset any deficiencies in the density criterion.
2) Only excesses in area criterion equal to or less than the deficiencies in density shall be entered into the STA formula.
3) Densities which exceed any of the stated criteria shall not be used to offset any deficiencies in area of coverage.
4) Any required STA must be initiated within 120 days following the monitoring event that identifies a deficiency in meeting the success criteria. Any delays beyond 120 days in the implementation of the STA shall be subject to the penalties as described in Section 8.
5) Annual monitoring will be required of the STA for five years following the implementation and all performance standards apply to the STA.

11. **Mitigation Bank.** Any mitigation transplant success that, after five years, exceeds the mitigation requirements, as defined in section 10, may be considered as credit in a "mitigation bank". Establishment of any "mitigation bank" and use of any credits accrued from such a bank must be with the approval of the resource agencies and be consistent with the provisions stated in this policy. Monitoring of any approved mitigation bank shall be conducted on an annual basis until all credits are exhausted.

12. **Exclusions.**

1) Placement of a single pipeline, cable, or other similar utility line across an existing eelgrass bed with an impact corridor of no more than 1 meter wide may be excluded from the provisions of this policy with concurrence of the resource agencies. After project construction, a post-project survey shall be completed within 30 days and the results shall be sent to the resource agencies. The actual area of impact shall be determined from this survey. An additional survey shall be completed after 12 months to insure that the project or impacts attributable to the project have not exceeded the allowed 1 meter corridor width. Should the post-project or 12 month survey demonstrate a loss of eelgrass greater than the 1 meter wide corridor, then mitigation pursuant to sections 1-11 of this policy shall be required.

2) Projects impacting less than 10 square meters. For these projects, an exemption may be requested by a project applicant from the mitigation requirements as stated in this policy, provided suitable out-of-kind mitigation is proposed. A case-by-case evaluation and determination regarding the applicability of the requested exemption shall be made by the resource agencies.

(last revised 08/30/05)

Southern California Eelgrass Mitigation Policy
Monitoring and Compliance Reporting Summary

PERMIT DATA:

Permit (Type, Number)	Issuance Date	Expiration Date	Agency Contact
ACOE:			
CDP:			
Other:			

EELGRASS IMPACT AND MITIGATION REQUIREMENTS SUMMARY:

Permitted Eelgrass Impact Estimate	(m^2)	
Actual Eelgrass Impact,	(m^2)	(post-const. survey date)
Eelgrass Mitigation Requirement	(m^2)	(mitigation plan ref.)
Impact Site Location		(location)
Impact Site Center Coordinates		(define projection and datum)
Mitigation Site Location		(location)
Mitigation Site Center Coordinates		(define projection and datum)

PERMITTEE CONTACT INFORMATION:

Project Name	(same as permit ref.)
Permittee Information	(permittee name)
	(mailing address)
	(city, state, zip)
	(permittee contact)
	(phone, fax., e-mail)
Mitigation Consultant	(consultant contact)
	(phone, fax., e-mail)

PROJECT ACTIVITY DATA:

Activity	Start Date	End Date	Reference Info.
Eelgrass Impact			
Installation of Eelgrass Mitigation			
Initiation of Mitigation Monitoring			

MITIGATION STATUS DATA:

Mitigation Milestone	Scheduled Survey	Survey Date	Area (m^2)	Density (turions/m^2)	Reference Info.
Requirement					
0-month					
6-month					
12-month					
24-month					
36-month					
48-month					
60-month					

FINAL ASSESSMENT:

Was mitigation met?	
Were mitigation and monitoring performed timely?	
Was delay penalty required or were supplemental mitigation programs necessary?	

APPENDIX B

Eelgrass Data and Mitigation Quantities by Fairway

Appendix A. Eelgrass (*Zostera marina*) & survey areas and results by depth range, Cerritos Bahia Marina, Long Beach, California, October 2008.

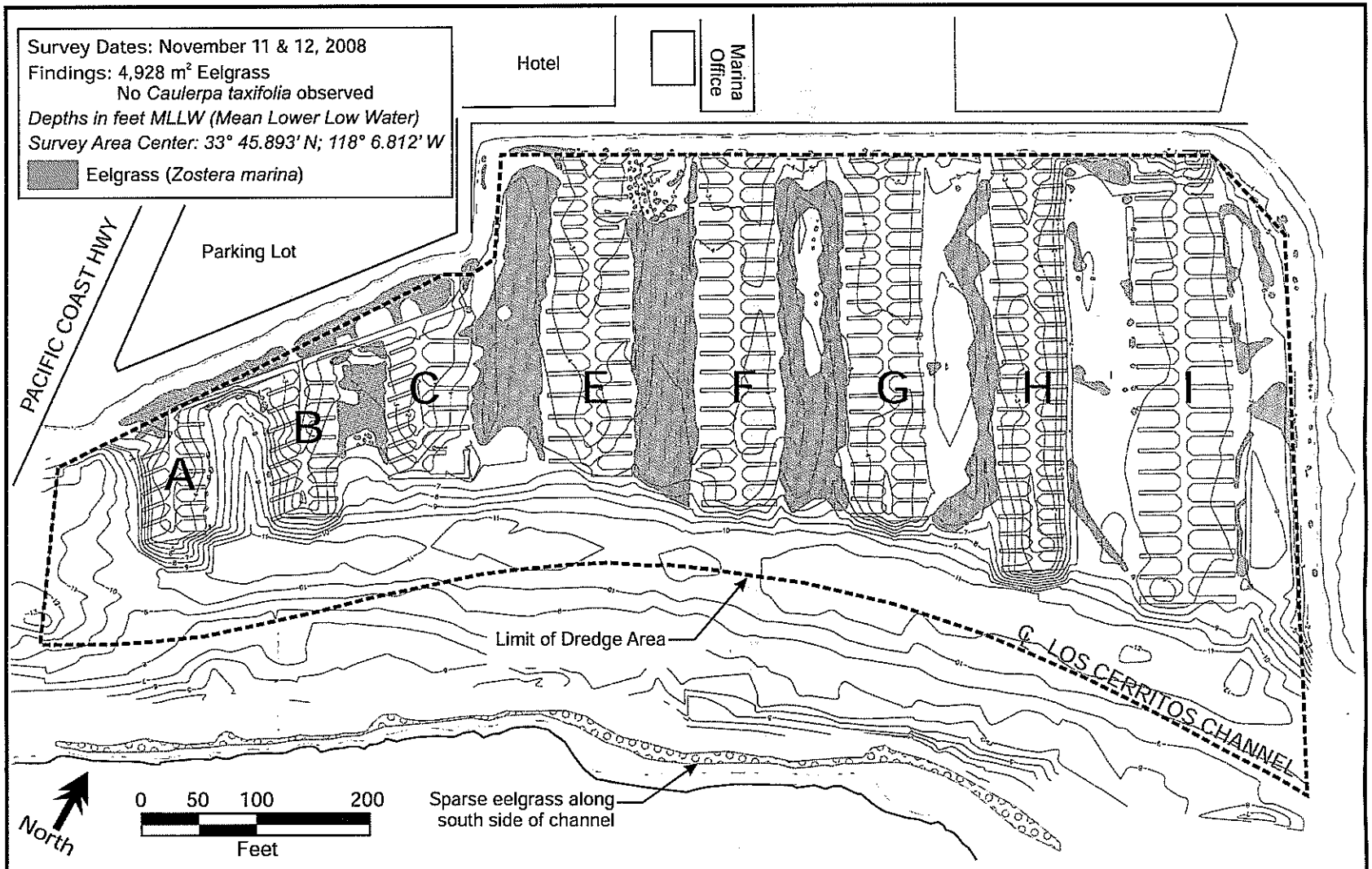
Location	Area within -8 ft contour ft^2	Depth Range (ft mllw)	Depth Range of Eelgrass (ft mllw)	Eelgrass Area (ft^2)		Total Eelgrass Area			Potential Impact Area			Required Mitigation (1.2 to 1 Ratio)		
				Within Dredge Footprint	Outside Dredge Footprint	ft^2	m^2	ha	ft^2	m^2	ha	ft^2	m^2	ha
Inside Long Dock (includes south of dock A)	**7,900**	**-2 to -11**	**-2 to -5**	**1,793**	**2,564**	**4,357**	**404.8**	**0.040**	**1,793**	**166.6**	**0.017**	**2,152**	**200**	**0.02**
Fairway A - B	520	<5				96	8.9	0.001						
Fairway A - B	1,000	5-6				104	9.7	0.001						
Fairway A - B	1,200	6-7				16	1.5	0.000						
Fairway A - B	1,230	7-8				11	1.0	0.000						
Fairway A - B	2,250	>8				0	0.0	0.000						
Fairway A - B Total	**6,200**	**-5 to -11**	**-5 to -8**	**227**	**0**	**227**	**21.1**	**0.002**	**227**	**21.1**	**0.002**	**272**	**25**	**0.00**
Fairway B - C	3,840	<5				2,549	236.8	0.024						
Fairway B - C	455	5-6				68	6.3	0.001						
Fairway B - C	810	6-7				0	0.0	0.000						
Fairway B - C	490	7-8				0	0.0	0.000						
Fairway B - C	30	>8				0	0.0	0.000						
Fairway B - C Total	**5,625**	**-5 to -8**	**-5 to -6**	**2,617**	**0**	**2,617**	**243.1**	**0.024**	**2,617**	**243.1**	**0.024**	**3,140**	**292**	**0.03**
Fairway C - E	6,400	<5			457	4,019	373.4	0.037						
Fairway C - E	8,900	5-6				6,959	646.5	0.065						
Fairway C - E	850	6-7				153	14.2	0.001						
Fairway C - E	0	7-8				0	0.0	0.000						
Fairway C - E	0	>8				0	0.0	0.000						
Fairway C - E Total	**16,150**	**-5 to -8**	**-5 to -7**	**10,674**	**457**	**11,131**	**1034.1**	**0.103**	**10,674**	**991.6**	**0.099**	**12,809**	**1190**	**0.12**
Fairway E - F	10,965	<5			56	8,227	764.3	0.076						
Fairway E - F	4,780	5-6				3,633	337.5	0.034						
Fairway E - F	550	6-7				331	30.8	0.003						
Fairway E - F	50	7-8				102	9.5	0.001						
Fairway E - F	0	>8				0	0.0	0.000						
Fairway E - F Total	**16,345**	**-4 to -8**	**-4 to -8**	**12,237**	**56**	**12,293**	**1142.1**	**0.114**	**12,237**	**1136.9**	**0.114**	**14,684**	**1364**	**0.14**

Appendix A. Eelgrass (*Zostera marina*) & survey areas and results by depth range, Cerritos Bahia Marina, Long Beach, California, October 2008.

Location	Area within -8 ft contour ft^2	Depth Range (ft mllw)	Depth Range of Eelgrass (ft mllw)	Eelgrass Area (ft^2)		Total Eelgrass Area			Potential Impact Area			Required Mitigation (1.2 to 1 Ratio)		
				Within Dredge Footprint	Outside Dredge Footprint	ft^2	m^2	ha	ft^2	m^2	ha	ft^2	m^2	ha
Fairway F - G	4,355	<5			22	1,912	177.6	0.018						
Fairway F - G	7,990	5-6				6,478	601.8	0.060						
Fairway F - G	4,850	6-7				2,628	244.1	0.024						
Fairway F - G	390	7-8				139	12.9	0.001						
Fairway F - G	25	>8				0	0.0	0.000						
Fairway F - G Total	**17,610**	**-4 to -8**	**-4 to -8**	**11,135**	**22**	**11,157**	**1036.5**	**0.104**	**11,135**	**1034.5**	**0.103**	**13,362**	**1241**	**0.12**
Fairway G - H	3,725	<5			11	1,351	125.5	0.013						
Fairway G - H	10,280	5-6				4,065	377.7	0.038						
Fairway G - H	4,485	6-7				445	41.3	0.004						
Fairway G - H	470	7-8				0	0.0	0.000						
Fairway G - H	200	>8				0	0.0	0.000						
Fairway G - H Total	**19,160**	**-4 to -9**	**-4 to -7**	**5,850**	**11**	**5,861**	**544.5**	**0.054**	**5,850**	**543.5**	**0.054**	**7,020**	**652**	**0.07**
Fairway H - I	50	<5			3	15	1.4	0.000						
Fairway H - I	300	5-6				124	11.5	0.001						
Fairway H - I	3,580	6-7				891	82.8	0.008						
Fairway H - I	16,000	7-8				1,294	120.2	0.012						
Fairway H - I	1,070	>8				0	0.0	0.000						
Fairway H - I Total	**21,000**	**-5 to -8**	**-5 to -8**	**2,321**	**3**	**2,324**	**215.9**	**0.022**	**2,321**	**215.6**	**0.022**	**2,785**	**259**	**0.03**
North of Dock I	295	<5			298	352	32.7	0.003						
North of Dock I	4,220	5-6				332	30.8	0.003						
North of Dock I	7,550	6-7				1,176	109.3	0.011						
North of Dock I	4,335	7-8				1,217	113.1	0.011						
North of Dock I	0	>8				0	0.0	0.000						
North of Dock I Total	**16,400**	**-4 to -8**	**-6 to -8**	**2,779**	**298**	**3,077**	**285.9**	**0.029**	**2,779**	**258.2**	**0.026**	**3,335**	**310**	**0.03**
Entire Marina	38,050	<5			847	22,878	2125.4	0.213						
Entire Marina	37,925	5-6				21,763	2021.8	0.202						
Entire Marina	23,875	6-7				5,640	524.0	0.052						
Entire Marina	22,965	7-8				2,763	256.7	0.026						
Entire Marina	3,575	>8				0	0.0	0.000						
Marina Total	**126,390**	**-2 to -11**	**-2 to -8**	**52,197**	**847**	**53,044**	**4,928**	**0.493**	**52,197**	**4,849**	**0.485**	**62,636**	**5,819**	**0.58**

APPENDIX C

Plan View of Eelgrass in Cerritos Bahia Marina



Tetra Tech, Inc.
ENGINEERS ARCHITECTS SCIENTISTS
401 East Ocean Blvd., Suite 420
Long Beach, California 90802
Ph. (562) 495-0495 fax (562) 495-5029

Site Plan
Eelgrass (*Zostera marina*) Survey
Cerritos Bahia Marina
Alamitos Bay, Long Beach, California

FIGURE 3

November 2008

APPENDIX D

Caulerpa Survey Reporting Form

Caulerpa Survey Reporting Form

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 permitte 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:	10/22/08 & 10/30/2008
Name of bay, estuary, lagoon, or harbor:	Cerritos Bahia Marina, Alamitos Bay, Long Beach, CA
Specific Location Name: (address or common reference)	6289 East Pacific Coast Highway The site is comprised of the area of potential effect in and around the marina (Figure 2 of eelgrass report).
Site Coordinates: (UTM, Lat./Long., datum, accuracy level, and an electronic survey area map or hard copy of the map **must** be included)	Lat 33° 45' 49.40" N, Long 118° 06' 54.96" W Lat 33° 45' 57.99" N, Long 118° 06' 48.14" W Lat 33° 45' 46.50" N, Long 118° 06' 53.54" W Lat 33° 45' 54.40" N, Long 118° 06' 40.94" W
Survey Contact: (name, phone, e-mail)	Sarah McFadden (Caulerpa Surveyor) Environmental Scientist Tetra Tech, Inc. 401 East Ocean Blvd., Suite 420 Long Beach, CA 90802 (562) 495-0495; cell (626) 945-1456 Sarah.McFadden@tetratech.com
Personnel Conducting the Survey: (if other than above): (name, phone, email)	Rafael Holcombe Principal Engineer Tetra Tech, Inc. 401 East Ocean Blvd., Suite 420 Long Beach, CA 90802 (562) 495-0495 Rafael.Holcombe@tetratech.com

Caulerpa Survey Reporting Form

Permit Reference: (ACOE Permit No., RWQCB Order or Cert. No.)	199915256-JLB	
Is this the first or second survey for this project?	1st Survey	
Was *Caulerpa* Detected: (if *Caulerpa* is found, please immediately contact NOAA Fisheries or CDFG personnel identified above)	_____ **Yes, Caulerpa was found at this site and** _____ **has been contacted on** _____ **date.** __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 project design consists of removing the maintenance dredging to -6ft mllw throughout the marina. The project area is approximately 7.8 acres in size.	
Description of Site: (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).	*Depth range:*	-3ft to -12ft MLLW
	Substrate type:	Silt & Mud; riprap along shoreline to north and east Mussel shells covering shallower areas
	Temperature:	58° F (14.4° C)
	Salinity:	Normal
	Dominant flora:	Eelgrass (*Zostera marina*)
	Dominant fauna:	Mussels on riprap to depth of approximately -4-ft mllw
	Exotic species encountered (including any other Caulerpa species:	None
	Other site description notes:	The marina is on the north side of the Los Cerritos Channel and east of Pacific Coast Highway.

Caulerpa Survey Reporting Form

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). Describe any limitations encountered during the survey efforts.	*Survey date and time period:*	October 22 & 30, 2008 Between 9:00 am and 3:30 pm PDT
	Horizontal visibility in water:	5-ft to 8-ft
	Survey type and methods:	One scientific diver using SCUBA swam transects.
	Survey personnel:	Sarah McFadden (diver) Rafael Holcombe Shannon Feeney
	Survey density:	High Intensity Surveillance <50 % visual coverage
	Survey limitations:	None
Other Information: (use this space to provide any additional information or references to attached materials such as maps, reports, etc.)	Survey conducted in conjunction with an eelgrass (*Zostera marina*) survey in which eelgrass was mapped. Eelgrass Report prepared for this project	

Caulerpa Survey Reporting Form (version 1.2, November 22, 2002)