

Merkel & Associates, Inc.

5434 Ruffin Road, San Diego, CA 92123

Tel: 858/560-5465 • Fax: 858/560-7779

e-mail: associates@merkeline.com

July 14, 2010
M&A# 09-081-01

Max Oviedo
Manson Construction
772 Tuna St.
San Pedro, CA 90731

Re: Post-construction Eelgrass Survey for the Anaheim Bay Maintenance Dredging Project, Naval Weapons Station Seal Beach, Orange County, California

Dear Mr. Oviedo:

PURPOSE AND INTRODUCTION

Merkel & Associates Inc. (M&A) performed a post-construction assessment of the eelgrass (*Zostera marina*) resources within and adjacent to dredge footprints at the Naval Weapons Station at Seal Beach. The purpose of the eelgrass survey was to provide a quantitative assessment of eelgrass communities occurring within the vicinity of the dredge footprints following construction. The survey results are discussed relative to the pre-construction eelgrass survey results (M&A 2009). The survey followed the specifications outlined in ACOE Solicitation # W912PL-09-B-0003, Amendment 3 Specifications, Section 01 35 43, Page 8.

PROJECT LOCATION AND SURVEY AREA

The project site and eelgrass survey area is located in Anaheim Bay at the Naval Weapons Station Seal Beach, Orange County, California within the Outer Harbor and Inner Harbor (Figure 1).

SURVEY METHODOLOGY

M&A staff, Heather Krish and Robert Mooney, conducted an eelgrass survey on June 25, 2010. The survey consisted of eelgrass areal coverage and density investigations within the study area. Data were collected using a sidescan sonar operating at 600 kHz scanning out 20 meters (m) on both the starboard and port channels for a 40-m wide swath. All data were collected in latitude and longitude using the North American Datum of 1983 (NAD 83), converted to the Universal Transverse Mercator system in meters (UTM), and plotted on a geo-rectified aerial image of the project site. Following completion of the survey, sidescan sonar traces were geographically registered, and eelgrass was then digitized to calculate the amount of coverage and show its distribution.

The site was then visually inspected to verify the sidescan data, assess the eelgrass density and health, and measure the density of actively growing leaf shoots. Leaf shoot density was determined by conducting shoot counts within a 1/16-m² quadrat. Replicate quadrats (n=20) were randomly placed within the eelgrass bed of the study area to obtain a mean shoot density for eelgrass beds within the project site.

PROJECT SURVEY RESULTS

At the time of the survey, eelgrass covered a total of 11,789 square meters (m^2) within the project site study area. This is 2,409 m^2 less than the pre-construction condition, where 14,198 m^2 (previously reported as 14,204 m^2) of eelgrass was mapped within the project site study area (Figure 1).

Mean shoot density (± 1 SD) was 163.2 ± 89.0 shoots per m^2 ($n=45$). The observed density was not statistically different from the 141.6 ± 108.3 shoots per square meter ($n=20$) that was observed during the pre-construction survey ($t_{(\alpha=0.05, df=63)} = 0.84$; $p = 0.40$).

Given the lack of a suitable control site for this study (discussed below), the pre- and post-construction eelgrass distributions were divided into regions based on the natural breaks in the bed distributions (Figure 1). This allows for an analysis of the different beds relative to their proximity to the dredge operation.

In the inner harbor, eelgrass declined post-dredge by 8.6 percent from 1,712 m^2 to 1,564 m^2 . The closest distance between a dredge-cut line and eelgrass in the inner harbor was approximately 65 m. Most of the eelgrass mapped within the inner harbor is more than 150 m from dredged footprint.

In the outer harbor, there were three distinct areas supporting eelgrass. In the northwest portion of the outer harbor, 6,435 m^2 of eelgrass was mapped. This is a 22.0 percent decline in eelgrass cover from the 8,261 m^2 that was mapped in this area following the pre-construction survey. A small portion of this eelgrass bed occurs within 40 m of the nearest dredge footprint boundary. However, this “nearest” eelgrass is new growth relative to the pre-construction condition. Most of the eelgrass in this portion of the harbor is more than 150 m from the nearest dredge footprint boundary.

In the northeast portion of the outer harbor, there were 1,849 m^2 of eelgrass mapped. This represents an increase in cover of 62.1 percent relative to the pre-construction survey. There were 1,141 m^2 of eelgrass mapped during the pre-construction survey. Eelgrass within this portion of the harbor seems to have expanded by filling gaps between numerous small patches. The overall extent of this eelgrass bed has changed little, but it is now more contiguous within the bed. Much of this eelgrass bed is within 50 m of the nearest dredge footprint boundary, and all of this bed is within approximately 110 m of the nearest dredge footprint boundary.

In the southeast portion of the outer harbor, 1,941 m^2 of eelgrass were mapped. This is a decrease of 37.1 percent relative to the pre-construction survey; 3,084 m^2 of eelgrass were mapped during the pre-construction survey. The declines in eelgrass cover in this region were primarily at the southwestern extent of the eelgrass bed. This portion of the eelgrass bed is adjacent to the dredge footprint, while the northeastern portion of this bed is more removed from the dredge footprint. Dividing this bed along the dashed line seen in Figure 1 and Figure 2 illustrates the dichotomy in eelgrass cover within this bed. The eelgrass bed on the west side of the dashed line decreased 74 percent from 1,925 m^2 to 497 m^2 between the pre- and post-construction surveys, respectively. The eelgrass bed on the east side of the dashed line increased in cover by 25 percent; there were 1,159 m^2 and 1,444 m^2 of eelgrass mapped in this location during the pre- and post-construction surveys, respectively.

IMPACT ANALYSIS

It is difficult to determine the potential localized impacts of the dredging on eelgrass resources in Anaheim Bay. This is partly due to the large scale of the event relative to smaller and more localized

distribution of eelgrass resources. The dredging occurred throughout inner and outer Anaheim Bay leaving no known area available as an independent control site for the project. The best method to evaluate project related impacts was to look at proximity to the dredge footprints relative to patterns and abundance of eelgrass. This method is further hampered by exceptional variation in eelgrass cover across the project area.

As outlined in the ACOE Solicitation # W912PL-09-B-0003, Amendment 3 Specifications, Section 01 35 43, Page 8, if eelgrass is found within 50 feet of the proposed dredge footprint, a modification must be made so the dredge will be no closer than that to any mapped eelgrass beds. During the pre-dredge survey, a total of 1,699 m² of eelgrass was mapped in the southeastern portion of outer Anaheim Bay as inside of, or within 50 feet of, the proposed dredge footprint. Manson modified the dredge plan to follow this recommendation.

Although patterns of eelgrass abundance varied across the project area, a notable area of eelgrass decline occurred near the dredge footprint within the southeast portion of the outer harbor. While the dredge plan was modified to prevent dredging eelgrass, it is apparent that dredging occurred within close proximity to eelgrass beds in the western half of the eelgrass bed in the southeast portion of the outer harbor (Figure 1). The proximity of the dredging to these eelgrass resources likely meant there were direct impacts to eelgrass. Pre- and post-construction bathymetry data provided by Manson shows areas that were deepened where eelgrass was present prior to dredging (Figure 2). There were 539 m² of pre-construction eelgrass growing in areas where the bathymetric data shows a depth increase of 0.30 m (1 ft) or greater. Post-construction, there were 181 m² of eelgrass growing in these same areas. Thus, it is estimated that 358 m² of eelgrass were directly removed due to dredging.

The above estimate of direct eelgrass impact has an unknown level of error associated with it. There are areas that were apparently dredged that are currently mapped as having small amounts of eelgrass. But, there are also areas where the bottom appears to have been deepened but may be an artifact of collecting data on a slope at the edge of the project area. Finally, there are areas where dredging may have occurred beyond the bathymetric survey limit. These factors all make assessing direct impacts difficult. This means impacts may be mapped that did not occur. However, it also means that some direct loss impacts may not have been identified.

The localized review of data on the west side of the dashed line in Figure 2 indicates that 74 percent of the eelgrass was lost. This equals approximately 1,428 m² of lost eelgrass. Eelgrass in all other areas totaled 12,273 m² and 11,209 m², before and after the dredging, respectively. This relates to a 1,064 m² and 8.7 percent drop in eelgrass cover in areas of low probability of having been impacted.

If an allowance of 8.7 percent is given to accommodate the fact that eelgrass declined across all areas that weren't immediately adjacent to the dredge footprint (assuming a natural decline in the system), then the area immediately adjacent to the dredge activity experienced a 65.3 percent decline in eelgrass cover that was beyond that reasonably expected from variation in cover and sampling error over the duration of the project. This equates to a loss of 1,257 m² of project related impacts to eelgrass. Removing the already estimated 358 m² of direct impacts means there were up to 899 m² of indirect impacts to eelgrass in the southeast portion of outer Anaheim Bay.

It is important to point out that assessment of direct or indirect impacts associated with the dredging are estimates. Similar areas of decline can also be derived by cutting out portions of the eelgrass bed in the western portion of outer Anaheim Bay. There were extensive portions of the eelgrass bed in western side of outer Anaheim Bay that disappeared during the dredge timeline. This is particularly true of the portions of the bed fringing the south facing beach. This portion of the bed largely

disappeared while the rest of the bed remained healthy. Had dredging occurred near this beach, impacts would likely be assessed in this area as well, possibly erroneously. However, given the sandy nature of the sediment, indirect impacts associated with turbidity and sedimentation were not likely in this area and direct impacts are not possible. Thus, it is not believed that impacts occurred in this region. This discrepancy is pointed out merely to highlight the difficulty and subjective nature of assessment of impacts at this particular site and with the particular dredging activities that have been undertaken.

While the absolute impacts of the work are open to interpretation, it is our (M&A) professional opinion that 358 m² of direct eelgrass loss has occurred as a result of the dredging and up to 899 m² of indirect impact has occurred. Impacts to eelgrass need to be mitigated by restoration at a 1.2:1 area ratio in accordance with the Southern California Eelgrass Mitigation Policy (SCEMP [NMFS 1991]). The SCEMP also allows for additional mitigation due to temporal losses of eelgrass cover. It is suggested that you immediately initiate a dialog with the ACOE and National Marine Fisheries Service (NMFS) to establish a mitigation goal and plan for lost eelgrass resources.

If you have any questions or require more information, please do not hesitate to call me at 858-560-5465.

Sincerely,



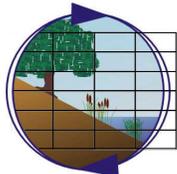
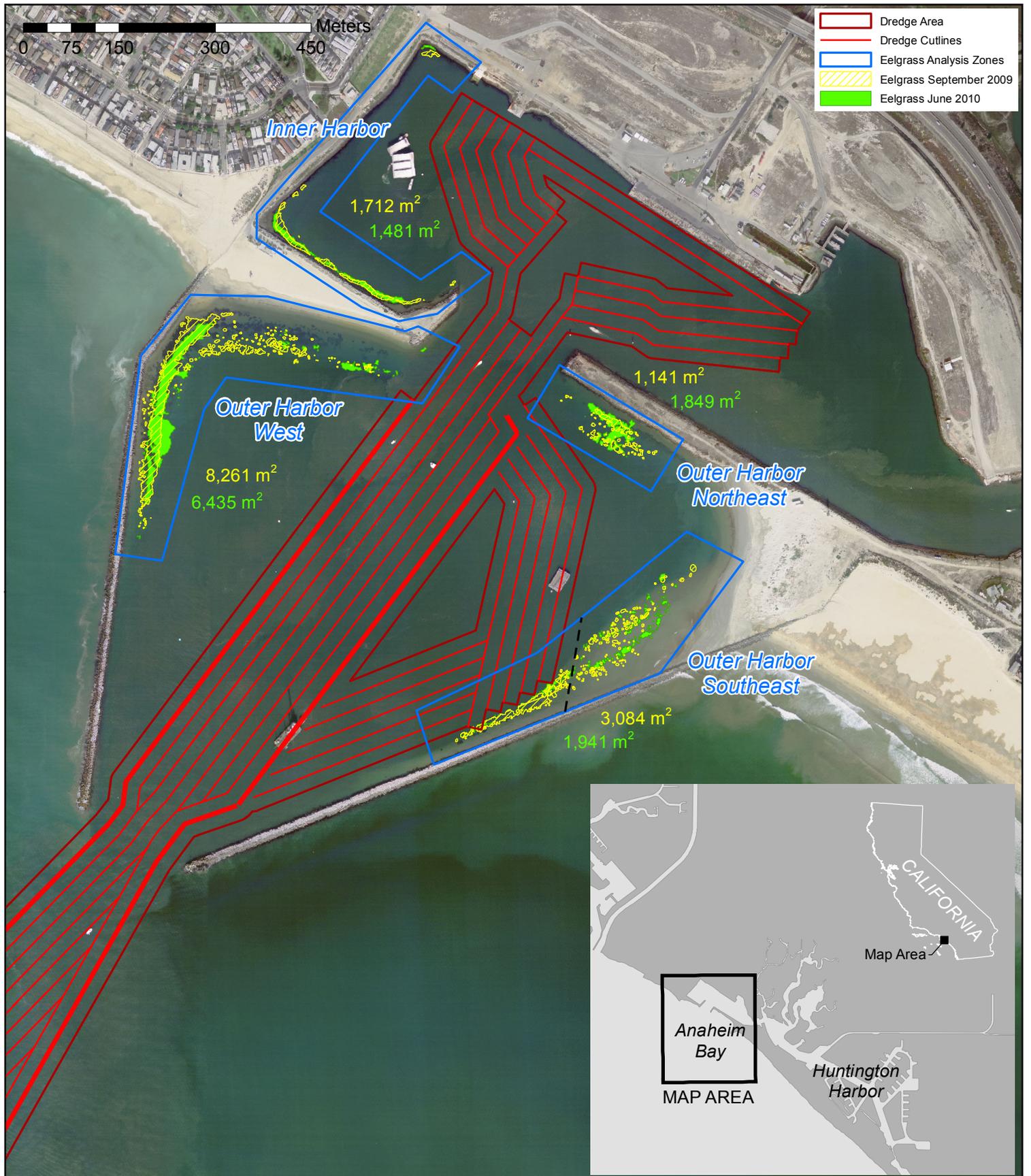
Robert Mooney, Ph.D.
Senior Biologist

REFERENCES

[M&A] Merkel & Associates, Inc. 2009. Pre-construction Eelgrass Survey for the Anaheim Bay Maintenance Dredging Project, Naval Weapons Station Seal Beach, Orange County, California. Letter Report 09-081-01. Prepared for Manson Construction. Prepared by Mary Tamburro. September 25, 2009.

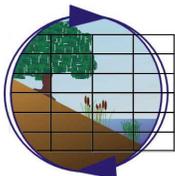
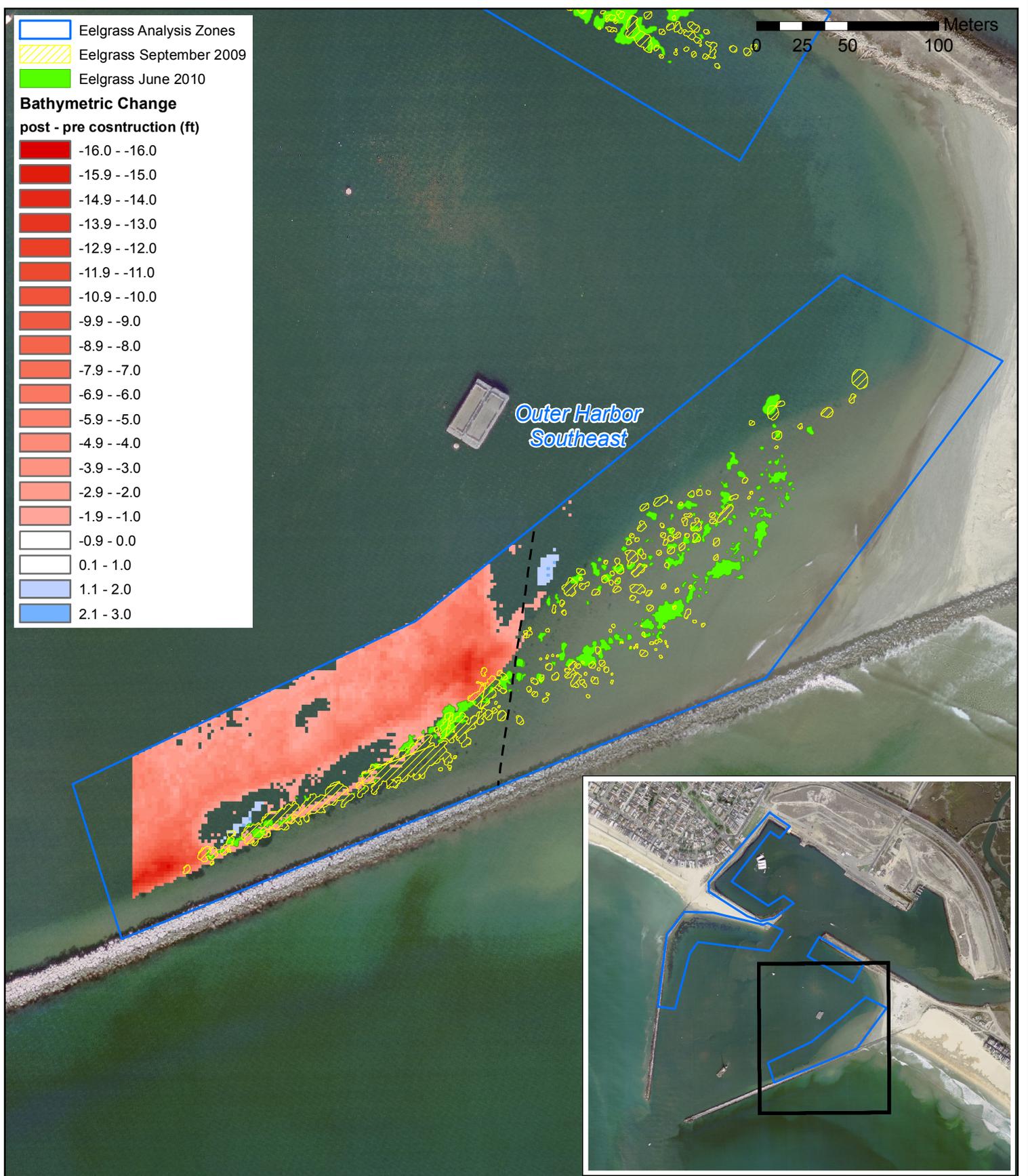
[NMFS] National Marine Fisheries Service, NOAA. 1991, Revision 11. Southern California Eelgrass Mitigation Policy. R.S. Hoffman, ed.

US Army Corps of Engineers Solicitation # W912PL-09-B-0003, Amendment 3 Specifications. 2009.



Naval Weapons Station Seal Beach
Maintenance Dredging Post-Dredge Eelgrass Distribution
 Anaheim Bay, Orange County, CA
 25 June 2010

Figure 1



**Naval Weapons Station Seal Beach
Maintenance Dredging Bathymetric Change
Outer Harbor Southeast Survey Area**
Anaheim Bay, Orange County, CA
25 June 2010

Figure 2