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36-MONTH POST TRANSPLANT EELGRASS STATUS REPORT FOR SOUTH SHORES, MISSION BAY

ACoE Permit No. 87-128-EW

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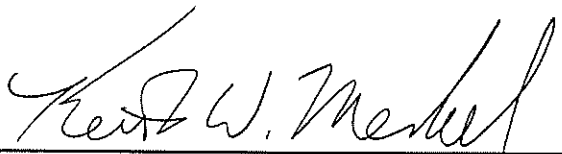

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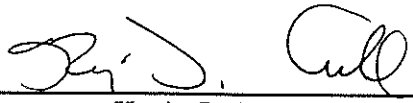

Kevin J. Cull, Project Manager

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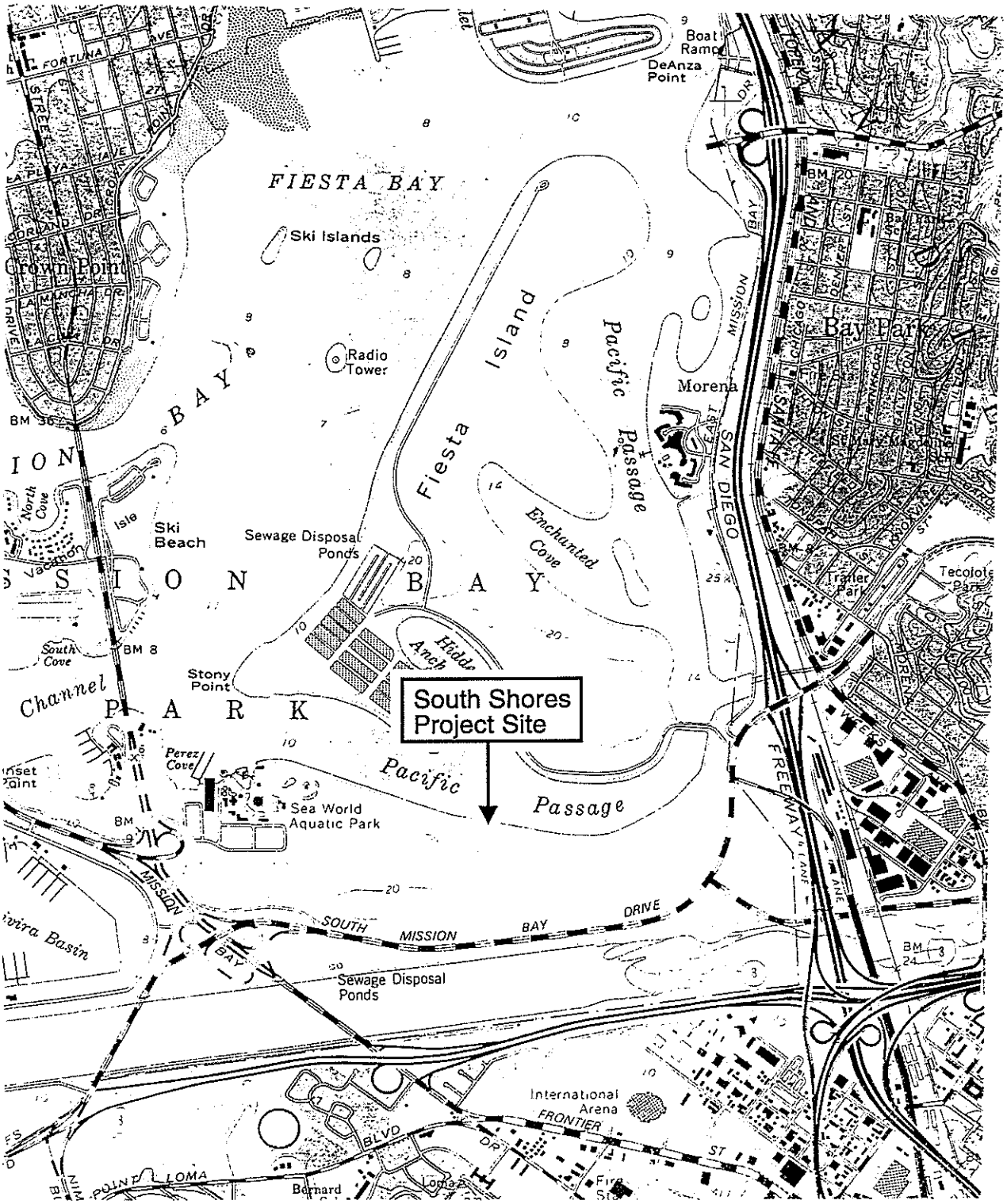
SUMMARY

Eelgrass surveys were completed for the 36-month post-transplant interval at the South Shores embayment. Eelgrass was found to occupy 3.41 acres of the embayment; this is down 18.2% from the 4.18 acres of coverage during the 24-month survey. Shoot densities between control areas (153.60 $\pm$ 38.53 shoots/m^2 (n=5)) and the transplant beds (115.69 $\pm$ 31.43 shoots/m^2 (n=13)) are not statistically different. These declines are comparable to similar declines seen elsewhere in southern California during 1997. Overall, the South Shores eelgrass is performing well and it is anticipated that the transplant will once again expand in the future. The next monitoring interval (48-month) is scheduled to occur in September 1998.

INTRODUCTION

The City of San Diego Park and Recreation Department's South Shores Phase II & III work was implemented to develop a park along the north side of Sea World Drive, east of the Sea World of California marine park, at the southeast corner of Mission Bay Park (Figure 1), and to mitigate open water loss associated with the Sail Bay Beach Replenishment Program completed several years ago. The Phase II improvements at the South Shores Boat Basin in Mission Bay Park (W. O./Doc No. 119601) have included the creation of a sandy beach (approximately 100 ft. x 350 ft.) and a boat launching ramp (approximately 100 ft. x 150 ft.). Part of the construction contract for the Phase II improvements has also included the restoration of eelgrass habitat along the eastern and southern portions of the new embayment. Eelgrass was transplanted along these areas as well as along the western edge of the project embayment. The basin, beach, and ramp were graded and constructed behind an earthen dike which separated the basin from the waters of Mission Bay. The dike was then breached and removed in early spring 1994 and the basin was allowed to fill with seawater. Once the dike was removed, water quality allowed to stabilized, and siltation problems substantially reduced, an eelgrass transplant covering approximately 4.6 acres was conducted. Docks, approximately 150 feet long, were located on both the north and south sides of the boat ramp within the South Shores basin in the late-summer of 1996. The project site lies entirely within the Coastal Zone and is subject to permitting under the California Coastal Act and Section 10 of the Rivers and Harbors Act.

As a part of the permit process for the project, the Army Corps of Engineers (ACoE Permit No. 87-128-EW) has required that the eelgrass revegetation be monitored. This project work was summarized in the initial post-transplant report (Merkel 1994). The eelgrass transplant has, previously been evaluated qualitatively for the 30-days post-transplant survey, and quantitatively and qualitatively for the 3-month, 6-month, 12-month, and 24-month post-transplant surveys (Merkel & Associates, Inc. 1995a, 1995b, 1995c, and 1996). The 12-month survey also served as the pre-construction monitoring



Scale: 1" =2,000'

Project Vicinity Map
Source: USGS 7.5' La Jolla, CA
Quadrangle

Figure
1

Merkel & Associates, Inc.

report while the 24-month survey encompassed the post-construction monitoring report for the Phase III dock construction adjacent to the boat ramp within the South Shores basin. This report constitutes the 36-month post-transplant monitoring.

SURVEY METHODS

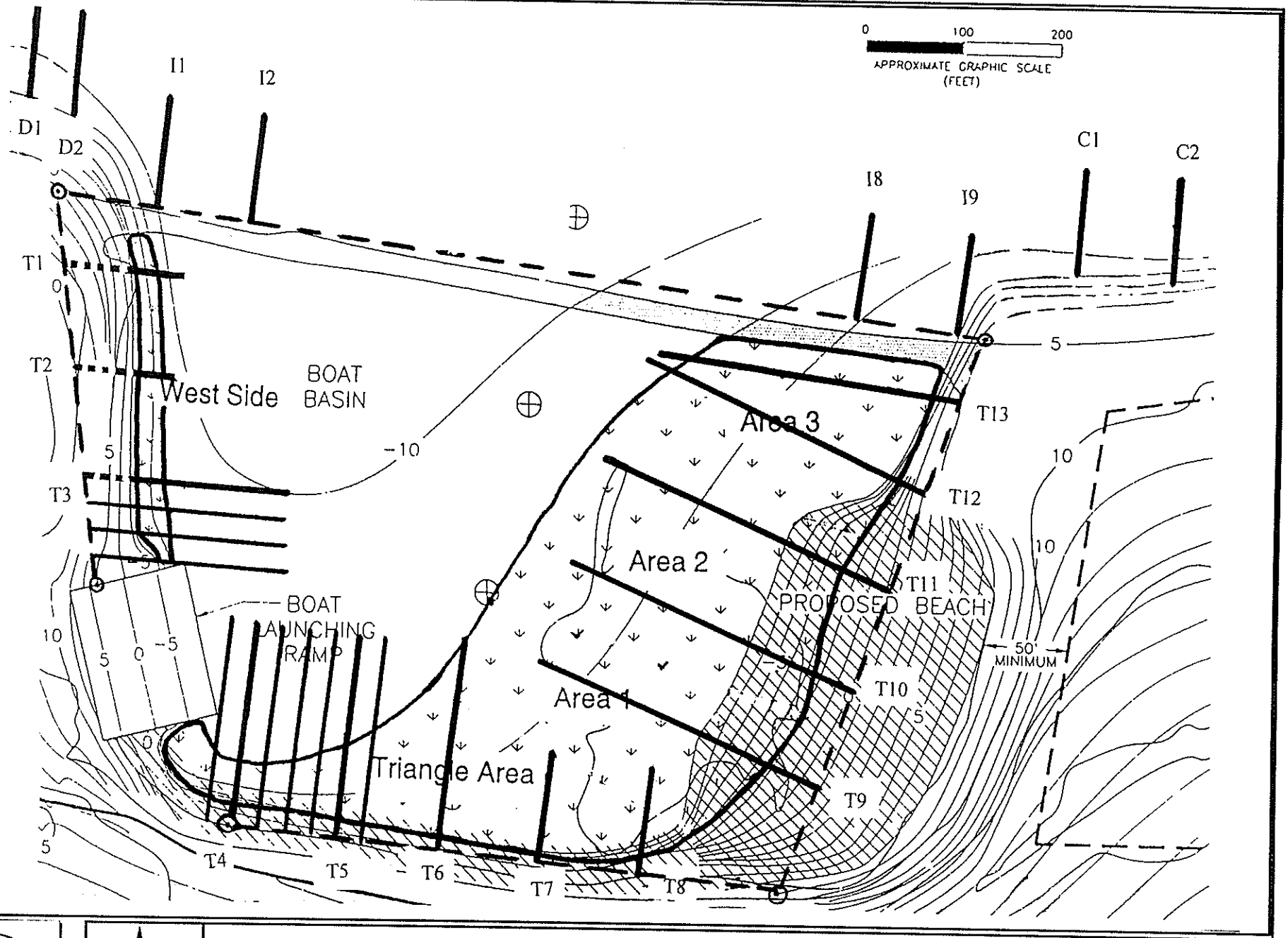
During the post-planting review by Merkel & Associates, National Marine Fisheries Service, City of San Diego, and Chilcote (the Phase II general contractor), it was recommended that the quantitative monitoring program be modified from the original design mitigation plan and subsequent contract documents. Merkel & Associates provided a proposed modification plan which was accepted by the City and the agencies, and implemented during all subsequent monitoring intervals. Modifications included changes in the placement of transects, and the distribution of quadrats for evaluating eelgrass bed-shoot density. The modifications to the monitoring program allow for better long-term evaluation of the true conditions of the site, by providing more transects within the planted area.

The 36-month field survey was conducted using side-scan sonar on October 21, 1997 and was surveyed using diver transects on December 2 and 3, 1997. This survey was conducted by Kevin J. Cull and Holly D. Hanson and followed protocols utilized in prior survey efforts.

Eelgrass Coverage

A standard diver transect methodology was employed. Permanent baselines were first established parallel to shore around each of the three sides of the South Shores basin. A total of 13 transects were surveyed within the eastern and southern sides of the basin (Areas 1-3 and the Triangle Area), and western side of the basin (Figure 2). Four transects, oriented perpendicular to the rip-rap (two on each side of the mouth of the basin) along the existing dike just outside of the basin, were surveyed; the one on the east side acted as a control transect and the one on the west side monitored the donor eelgrass beds utilized for the transplant.

The site was surveyed by a scuba diver who swam each transect line and reported the beginning and ending points of all eelgrass cover. Gaps of greater than three feet were recorded as open bay bottom. A staff member remained on shore to record data and measure transect intervals. The distribution of eelgrass along each transect was plotted on a base map and eelgrass beds were extrapolated by connecting the transect intercepts with straight line segments. For mapping purposes and area calculation, the assumption was made that eelgrass extended linearly between the correlative points of adjacent transects along which eelgrass had been recorded. Side-scan survey data further assisted in verifying bed configuration. Total coverage was determined mathematically rather than graphically to ensure greater accuracy and consistency between monitoring periods. It is believed that, at the project scale, these estimates reasonably approximate the actual extent of eelgrass meadows present. Further, the fixed transect distribution allows for monitoring trends in the transplant and control sites with a substantial degree of precision and repeatability.



South Shores, Transect Locator Map

Figure 2

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Shoot Density

The densities of the transplanted, control, and donor eelgrass beds were measured by conducting turion counts within replicated 1/16th meter quadrats randomly placed within the respective eelgrass beds. To characterize the eelgrass density, a quadrat sample was taken randomly along each of the thirteen transects within the transplanted eelgrass beds. Five shoot density measurements were take within the control area and five in the donor area.

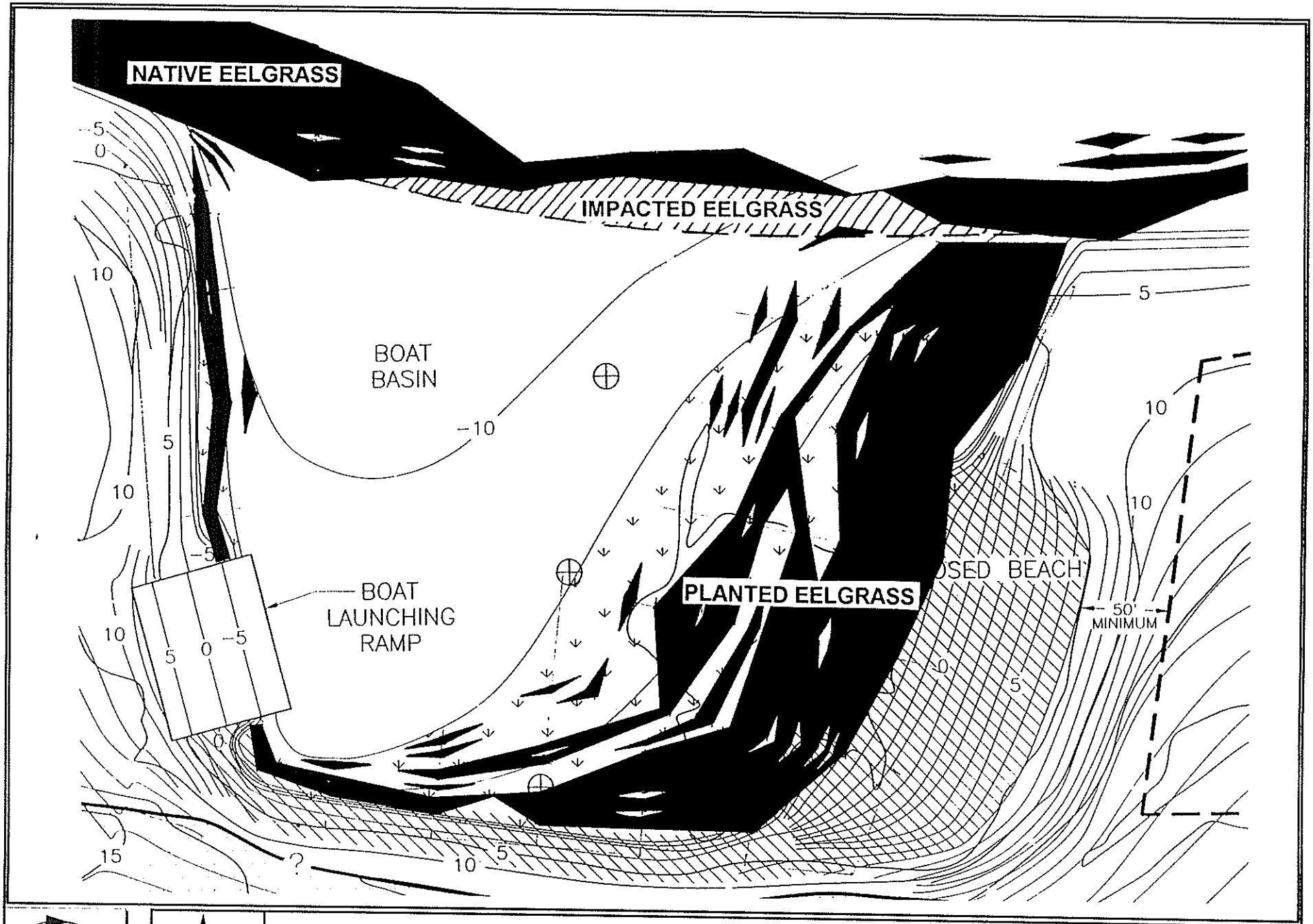
RESULTS

Transplant Area

The survey revealed the presence of moderate to high quality eelgrass meadows close to the surrounding shoreline at the beach and adjacent to the rip-rap within the basin. During the 3, 6, 12, and 24-month surveys, it was observed that the eelgrass was typically found to be most dense closer to the constructed sand beach shoreline and along the rip-rap on the eastern edge of the basin (Figures 3 - 6). This was also observed during the 36-month survey (Figure 7). Lower quality eelgrass, consisting of scattered individuals or small clusters of plants, occurred in deeper water found closer to the middle of the basin. Based on the transect survey methodology, a total of 3.41 acres (148,540 sq. ft.) of eelgrass was estimated to occur within the transplant area, this is a decrease of 0.77 acres compared to the 24-month survey which supported 4.18 acres (182,080 sq. ft.) of eelgrass. The 24-month survey revealed a 0.62 acre increase from the 12-month survey of 3.56 acres (155,183 sq. ft.) of eelgrass. There was also an increase of 0.42 acre from the 3.14 acres (136,778 sq. ft.) of eelgrass estimated in July 1995 during the 6-month survey (Merkel & Associates, Inc. 1995b). Eelgrass covered 60.4% of the total transect length sampled within the transplant site. Out of the total 4.6 acres planted, approximately 1.19 acres (51,836 sq. ft.) of the original transplant area lacked eelgrass coverage during this 36-month survey.

Eelgrass was found to be restricted to depths below 0 ft. MLLW. Eelgrass extended well into the basin to depths of approximately -8 ft. MLLW (particularly on the west side and middle of the basin); however, eelgrass at this depth was sparse and only intermittent patches existed. Eelgrass at the highest elevations was short in stature, typically growing to 0.5 to 1.0 foot in length. Bayward eelgrass ranged from about 1.5 to 3 feet in length. Within the transplant area, eelgrass shoot density was calculated at 115.69 $\pm$ 31.43 shoots/m^2 (n=13), this is slightly lower than the 164.8 $\pm$ 39.95 shoots/m^2 (n=10) estimated during the 24-month survey.

It was noted during the 3-month survey that plants in the deeper transplant areas experienced a high level of silt accumulation. During the 6-month survey water visibility was good and the eelgrass within the transplant site appeared healthy and did not exhibit a high level of silt accumulation at any depth range. During the 12-month survey water visibility was good throughout the basin, but was only 1-3 feet in the Pacific Passage near the areas of the control and donor beds. This condition was also prevalent during the 36-month survey, in which the water clarity within the eelgrass beds was good (up to 6 feet) relative to areas in the basin which are bare (not more than 1 foot). Water visibility within Pacific Passage, outside the South Shores basin, was poor both in areas of eelgrass beds and open bottom.



Scale: 1" = 130'

South Shores, Phase II Eelgrass Status - 3 Month Post-Planting

Figure 3

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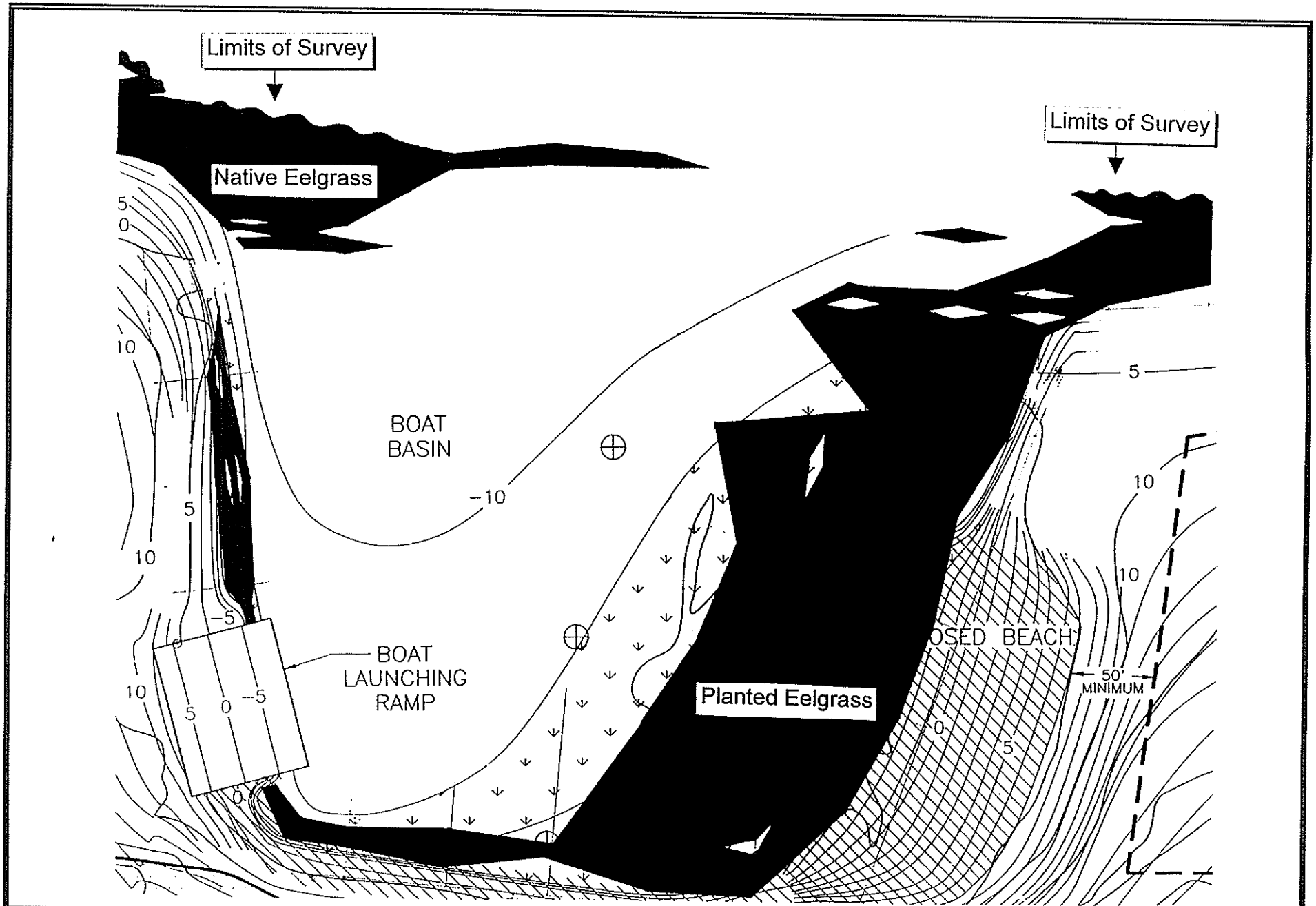

Scale: 1" = 130'

South Shores, Phase II Eelgrass Status - 6 Month Post-Planting

Figure 4

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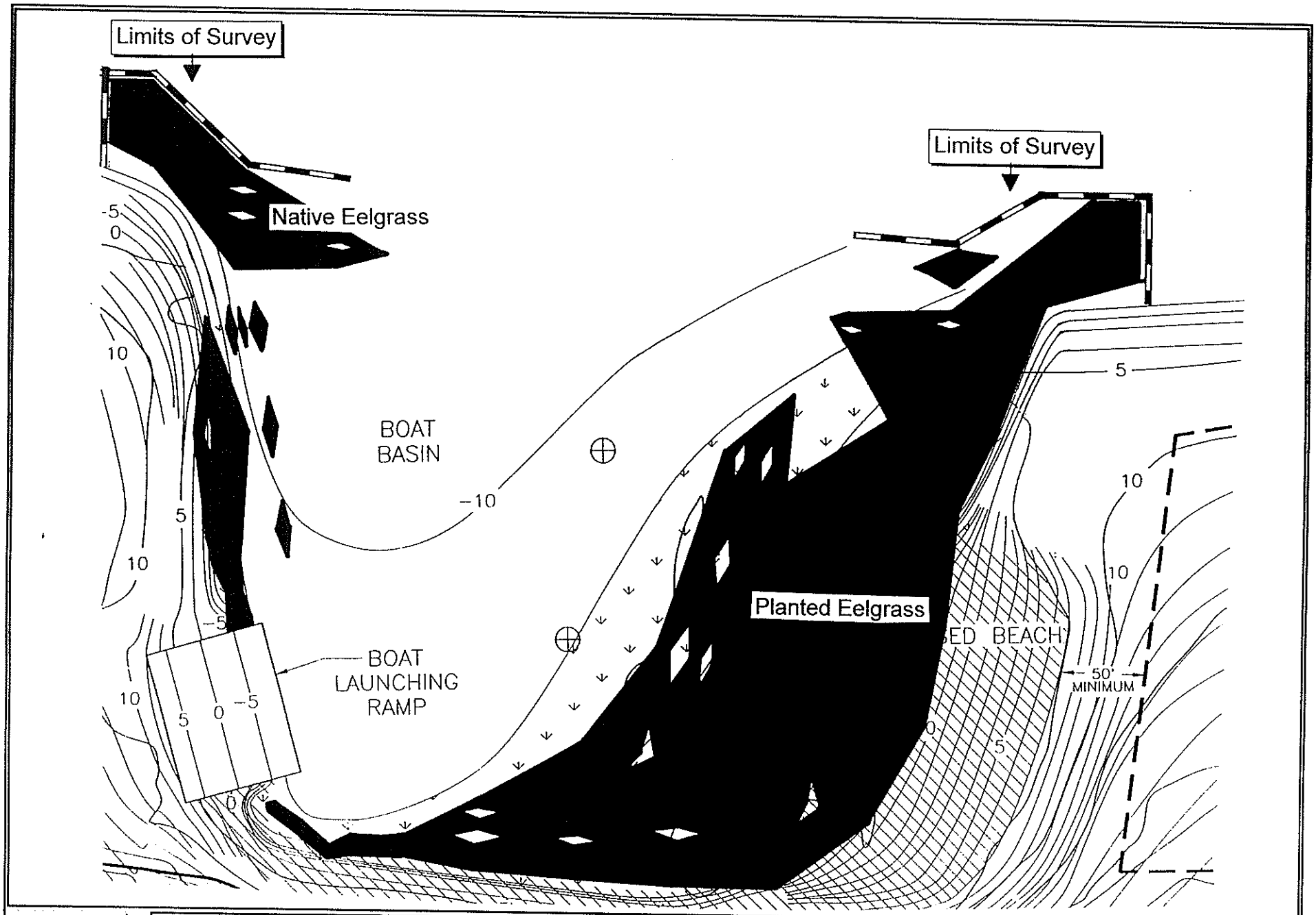

Scale: 1" = 130'

South Shores, Phase II Eelgrass Status - 12 Month Post-Planting
Dock Pre-Construction

Figure 5

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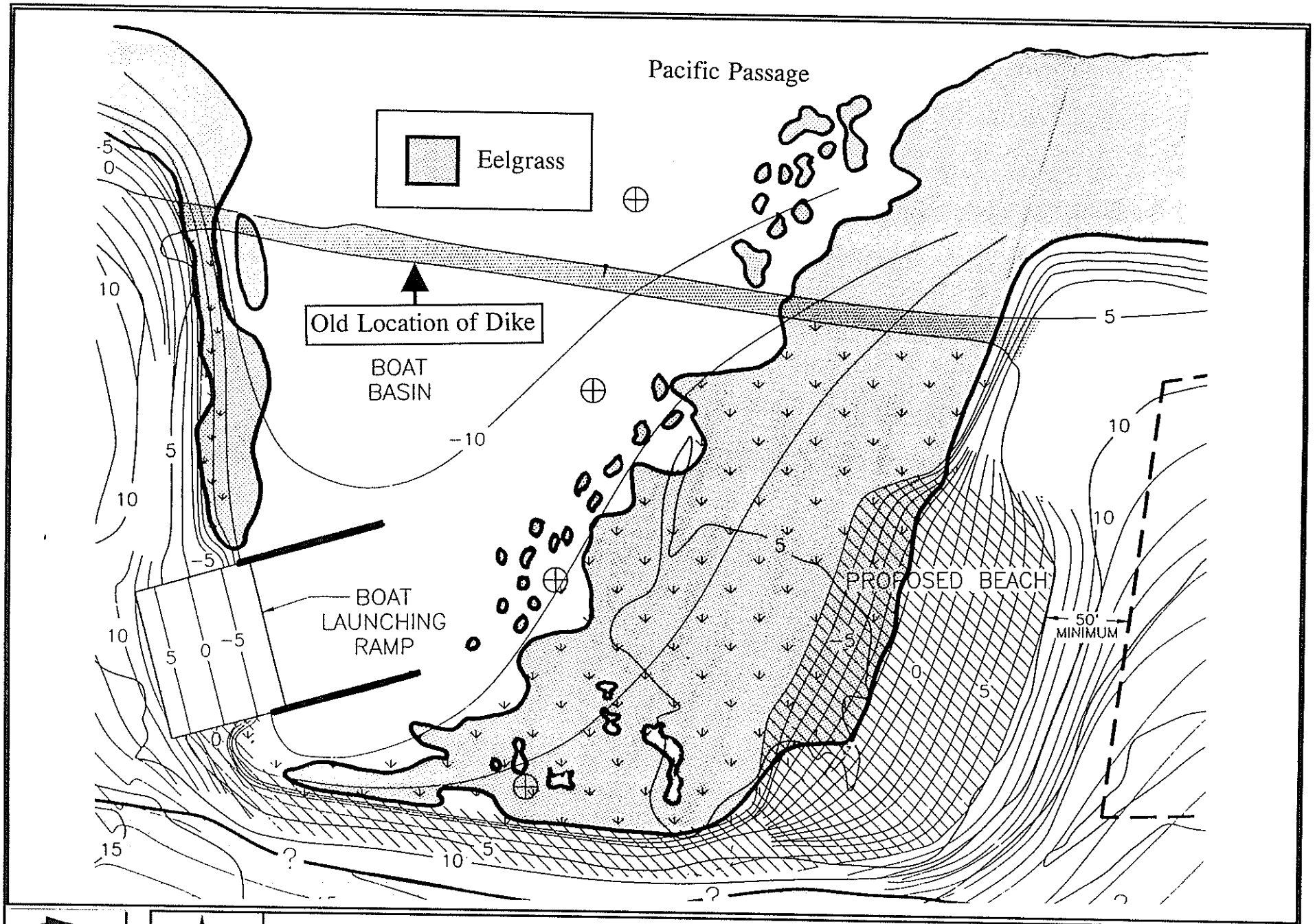

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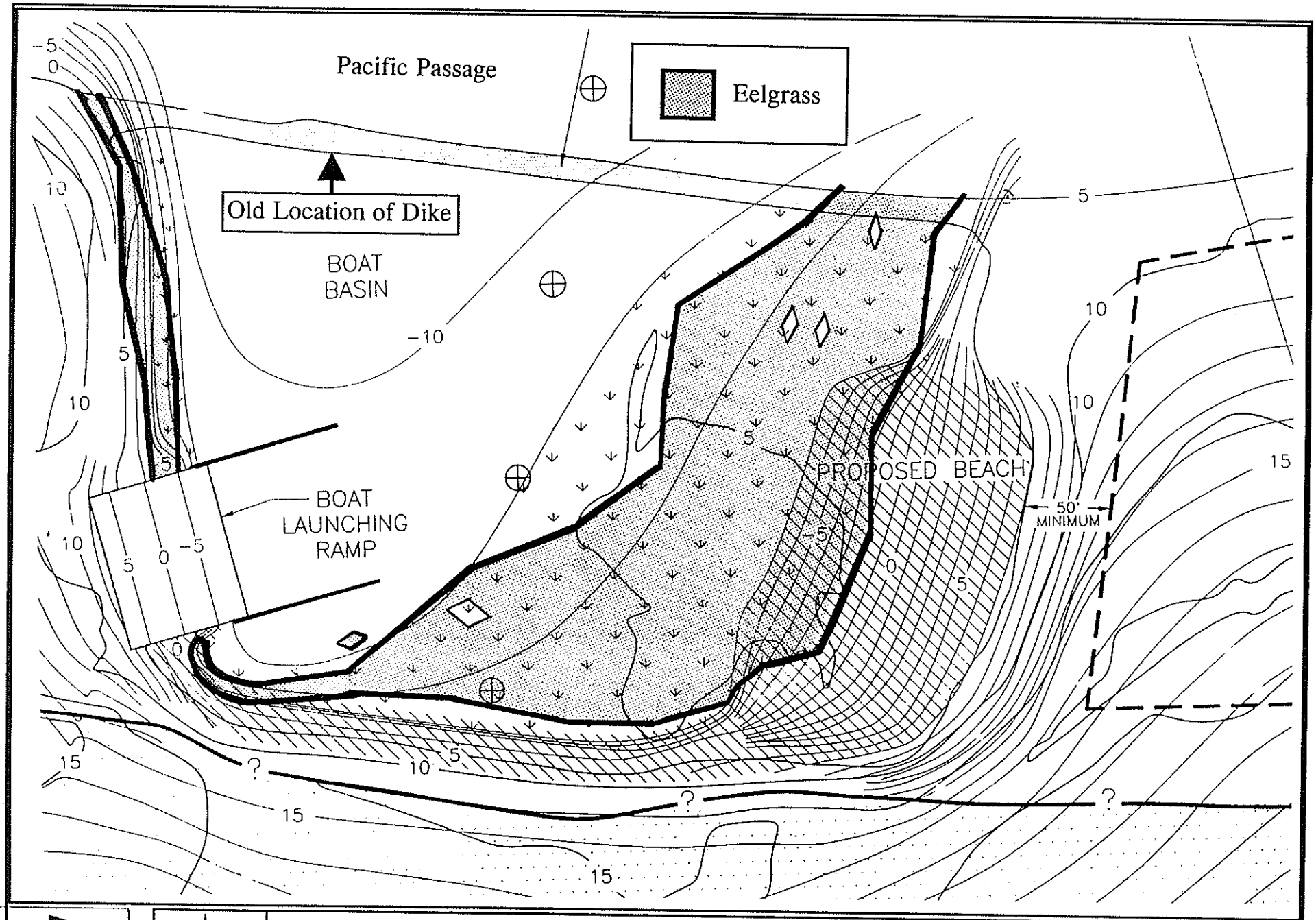
South Shores, Phase II Eelgrass Status - 24 Month Post-Planting
Dock Post-Construction

Figure 6

Merkel & Associates, Inc.



Scale: 1" = 130'

South Shores, Phase II Eelgrass Status - 36 Month Post-Planting

Figure 7

Merkel & Associates, Inc.

Similar to the 6, 12 and 24-month surveys, eelgrass observed during the 36-month survey was relatively free of silt but a considerable amount of epifaunal organisms occurred on the eelgrass; anemones and calcareous tubeworms (Spirorbids) were notably abundant on the blades. Also present in some abundance were mollusk egg masses, bryozoans, and mobile organisms such as grass shrimp and caprellid shrimp. Heavy algal accumulation continues to prevail in the extreme southeast corner of the basin, at the south end of the beach, preventing growth of eelgrass in this location.

Control Area

Eelgrass within the control area covered approximately 70% of the total sampled transect length. Since the control beds do not occur in shallow water, blade lengths along control transects were similar to those observed in the middle and deeper depths of eelgrass growth within the transplant area. Eelgrass shoot density within the control beds located to the east of the opening of the basin averaged 153.60 $\pm$ 38.53 shoots/m^2 (n=5), compared to the 96.0 $\pm$ 35.78 shoots/m^2 (n=5) during the 24-month survey. Bed densities within the control area are currently similar to the densities within the transplant areas.

Eelgrass in the control area had a moderate level of silt accumulation on upright blades. During the 6-month survey several matted patches of eelgrass were observed in the control area. It appeared that blades became so laden with epifaunal growth in these areas that they collapsed. It was assumed that these patches of grass, which were brown, would die off and that the bed would recover and spread into the gaps via rhizomatous growth. During the 12, 24, and 36-month survey, no matted patches were observed within the control area. However, there were several patches of eelgrass where dense rhizomes were visible running along the surface of the sediment. This growth pattern is known to occur as eelgrass spreads into recently created gaps within the bed or where sediments are compacted (Cull pers. obs.). These growth patterns noted during the 12-month survey are consistent with the clearing of matted areas and recolonization of bare patches, as anticipated in the 6-month survey.

Donor Area

Eelgrass at the donor site covered 60% of the sampled transect length. Blade lengths were comparable to those found within the deeper parts of both the transplant and control site, and ranged consistently between 1.5 and 3 feet.

Eelgrass turion density in the donor beds was calculated to be 140.80 $\pm$ 38.20 shoots/m^2 (n=5), compared to the 144.0 $\pm$ 13.06 shoots/m^2 (n=5) measured during the 24-month survey. Again densities were indistinguishable from either the transplant or control areas. The majority of eelgrass in this area expressed moderate vigor and little silt accumulation. No matted patches were observed; however, very limited water visibility made it difficult to assess the overall quality of the eelgrass bed in the donor area. Based on eelgrass observed along the measured transects, eelgrass in the donor bed also supported a considerable amount of epifaunal growth.

Deep areas of the basin, at present, continue to be the regions with the lowest eelgrass coverage. However, as eelgrass beds expand they have a stabilizing effect on the sediment and continue to provide a positive feedback by improving water quality in the region (Fonseca and Fisher 1986). As lateral expansion of the bed continues to occur at the site, general conditions provide reason for optimism regarding final stable coverage. The South Shores site continues to stabilize and, at the time of the 6-month survey, water was clear with visibility reaching up to 15-20 feet within the eelgrass beds. Improved summer season water quality noted in the basin during the 6-month survey may result in more rapid expansion of the patches of eelgrass located in deeper areas over the course of the summer season.

At this time, the replanting effort appears to continue to be slowly establishing eelgrass into the previously unvegetated basin as it fills in and expands westward. The eelgrass has taken hold very well close to shore. From the 6 to 12-month survey, the transplanted bed had increased 13.4% in coverage, by 0.42 acre (18,295 sq. ft.). The 12 to 24-month survey indicated the bed coverage had increased 17.4%, by 0.62 acre (26,897 sq. ft.). The current 24 to 36-month survey indicated a decrease of 18.4% by 0.77 acre (33,541 sq. ft.).

Density

Current shoot density estimates within the transplanted bed (115.69 $\pm$ 31.43, shoots/m^2 (n=13)) are less than the 24-month survey (164.8 $\pm$ 39.95, shoots/m^2 (n=10)). Both of these are less than the 12-month survey (248.8 $\pm$ 56.02 shoots/m^2 (n=20)) and those of the 6-month survey (246.2 $\pm$ 64.2 shoots/m^2 (n=18)). This is most likely due the winter dieback setting in and a continued maturation of the eelgrass bed. Many patchy areas that once occurred along the eastern shore of the basin have filled in creating a solid bed within the transplant area. It appears that the bed along the eastern shore has continued to expand westward; several patches of eelgrass occur along the boundary of this bed as eelgrass expands and fills in currently bare areas (Figure 7). It is believed this expansion in areal coverage and density of eelgrass will once again occur during the subsequent year.

The control bed appears to be as healthy as the transplanted bed, and current shoot density estimates within the control bed (153.60 $\pm$ 38.53 shoots/m^2 (n=5)) are also less than those of the 24-month survey (96.0 $\pm$ 35.78 shoots/m^2 (n=5)) and the 12-month survey (200.0 $\pm$ 59.99 shoots/m^2 (n=10). As well as the 6-month survey (280.0 $\pm$ 130.28 shoots/m^2 (n=4)). This again is probably due to the winter dieback period. The percent coverage along the transects is relatively unchanged (70% for the 36-month survey, 73% for the 24-month survey, and 70% for the 12-month survey).

The donor beds are in good condition although areal coverage has again decreased another 7% since the 24-month survey. This is in addition to the 7% decrease from the 12 to 24-month survey and the decrease of 13% from the 6 to 12-month survey. Again, this decrease may be due to the start of the seasonal winter dieback. Estimates of shoot density (140.80 $\pm$ 38.20 shoots/m^2 (n=5)) have slightly decreased since the 24-month survey (144.0 $\pm$ 13.064 shoots/m^2 (n=5)). This is also a decreased since the 12-month survey (243.0 $\pm$ 49.34 shoots/m^2 (n=10)) but the current survey results are similar

to those of the 6-month survey (160.0 $\pm$ 39.12 shoots/m^2 (n=10)). No physical evidence of past harvesting was noted within the donor site.

The eelgrass in the area of the Phase III docks is as healthy as the rest of the transplant bed and appears to not have been impacted by the past construction activities. However, due to steep slopes in this portion of the South Shores basin, only a limited amount of shallow water and sediment exists along the rip-rap in this area and a small band of eelgrass continues to occur on either side of the existing boat ramp.

The next scheduled monitoring event is the 48-month review scheduled to occur in September 1998.