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March 12, 2010
M&A #07-046-03

Eileen Maher
San Diego Unified Port District
P.O. Box 120488
San Diego, CA 92112

Re: Fish Enhancement Structures, Chula Vista Tidelands Park Borrow Pit, San Diego Bay, California 4th Quarterly Report

Dear Eileen:

This letter reports the biological observations made at the south bay artificial reef sites (Figure 1) on February 19, 2010. The reef structures were installed by Merkel & Associates, Inc. (M&A) on December 11, 2008 (M&A 2008). These observations constitute the fourth and final quarterly biological monitoring of the artificial reef site.

Biological Survey
M&A staff, Jimmy Reeves and Heather Krish, performed the biological survey. Due to turbidity, the visibility was not suitable to make species specific observations of vertebrates that may have been present. Suspended sediment plumes from fleeing bass and flatfish were observed; however, no fish could be identified down to the species level with the exception of two positive identifications of round stingray (*Urobatis halleri*). There were signs of burrowing invertebrates in the mud bottom at the reef site similar to the surrounding bay bottom. There were no signs of colonizing motile invertebrates (e.g. shed carapaces or body parts). The A-jacks were covered in a light sediment load and supported various species of sponges, tunicates, and bryozoans. Native oysters (*Ostreola conchaphila*) continue to populate the structures. Exotic species observed on the reef structures included *Bunodeopsis sp.* and *Zoobotryon verticillatum*. *Z. verticillatum* was observed at much lower abundance than during previous surveys. Vegetation associated with the structures included *Gracilaria sp.* and *Rhodymenia sp.*

Discussion and Conclusions
Physical conditions in south San Diego Bay make biological monitoring difficult. The turbidity causes visibility to be typically less than 2 feet. This condition also means that some of the suspended sediments that create the turbidity settle onto the reef structures. This further affects observations as the sediments camouflage the animals present. Sedimentation can also influence the species present. Some suspension and filter feeding animals may suffer from reduced feeding efficiency under exceptional sedimentation and others may suffer direct effects from clogging and smoothing of gills. Such an explanation for reduced diversity on south San Diego Bay reefs seems reasonable given the greater diversity observed on similarly created structures in central San Diego Bay (M&A 2009).

While the south San Diego Bay environment imposes limitations on the presence of animals associated with hard substrate, the reef structures have attracted a significant quantity and diversity of animals and algae. Although the diversity and abundance of organisms on south San Diego Bay reefs may be limited compared to other similar structures in central San Diego Bay, the

south San Diego Bay reefs increase structure and diversity over what would otherwise be a lower diversity mud-bottom habitat. Moreover, the reef structures qualitatively appear to attract more fish relative to adjacent mud bottom. This observation is consistent with data collected in M&A (2009).

It has been a pleasure working on this project with the Port of San Diego. If you have any questions regarding this letter or the reef project in general, please contact me at (858) 560-5465.

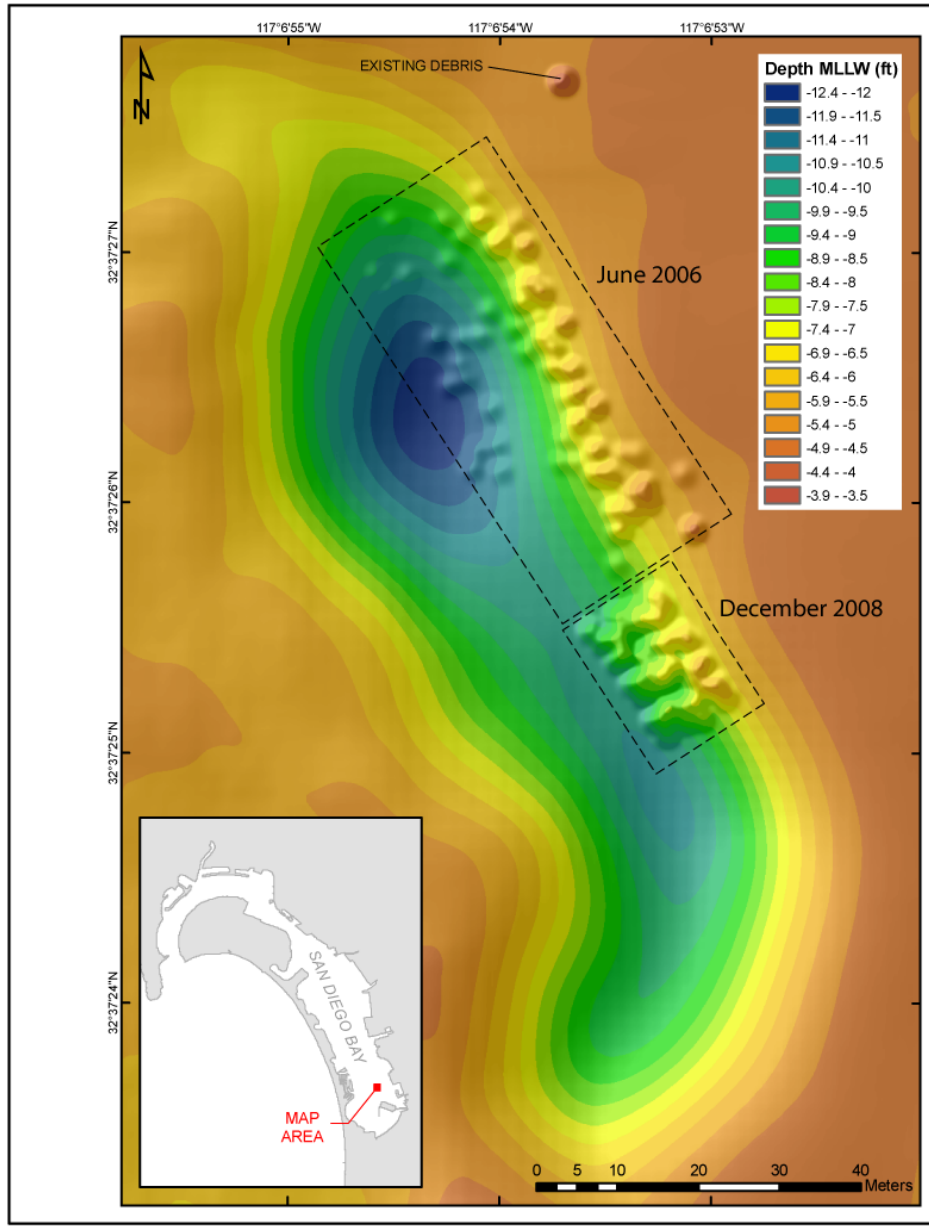
Sincerely,

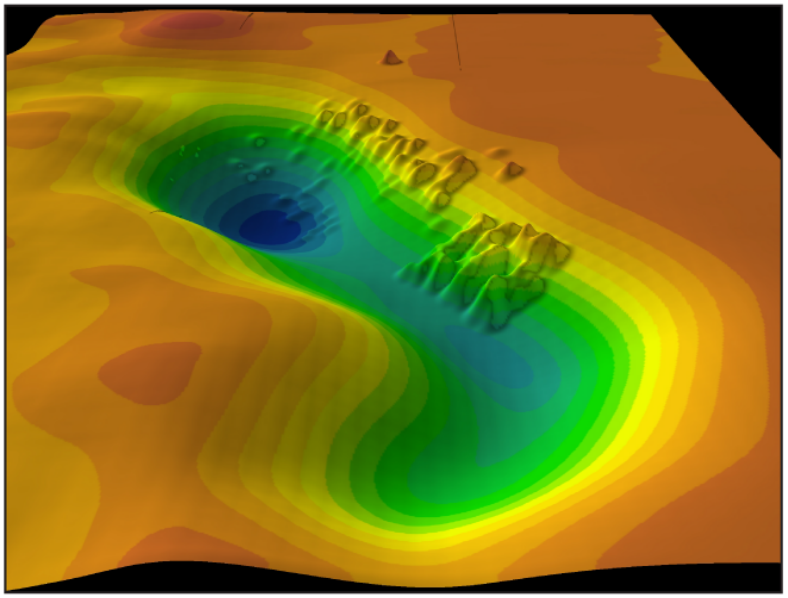
Robert Mooney, Ph.D.
Senior Biologist

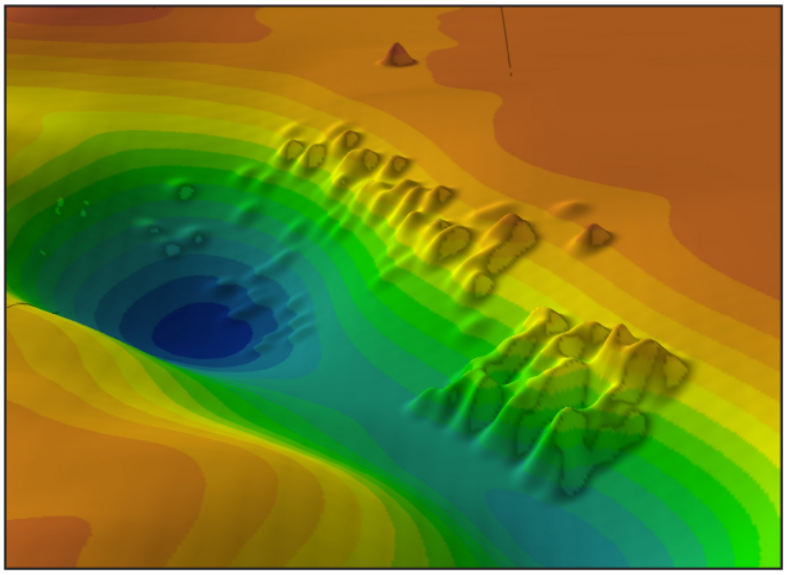
References:

[M&A] Merkel & Associates, Inc. 2008a. Embarcadero Fishing Pier and Le Meridien Fish Enhancement Structures. Letter report regarding installation process. Prepared for the San Diego Unified Port District. May 15, 2008.

[M&A] Merkel & Associates, Inc. 2009. Coronado Bay Bridge Fish Enhancement Structures Project, San Diego Bay: 1st Annual Post-Project Monitoring Report. Prepared by Keith Merkel. Prepared for California Department of Transportation. December 30, 2009.







Artificial Reef Placement Structures
South San Diego Bay, San Diego, California
June 2006 & December 2008

Figure 1

Merkel & Associates, Inc.