

June 1, 2010

Ms. Brooke Langston  
Richardson Bay Audubon Center and Sanctuary  
376 Greenwood Beach Road  
Tiburon, CA 94920

Dyan Whyte  
Regional Water Quality Control Board  
1515 Clay Street, Suite 1400  
Oakland, CA 94612

Subject: Summary of Peer Review Results for Aramburu Gravel Beach Shoreline  
Design, Richardson Bay, Marin County, California

Dear Ms. Langston and Ms. Whyte:

On behalf of the Wetlands and Water Resources (WWR) design team for the Aramburu Island Enhancement Design Project, I am pleased to submit this letter documenting the process and results of the natural beach shoreline design peer review requested by the Regional Water Quality Control Board (RWQCB). As you know, we retained one of the world's leading experts in gravel beach design for shoreline protection, Professor Mark Lorang of the University of Montana, as the designated peer reviewer. We tasked Dr. Lorang with the following tasks as part of the peer review scope:

- Review the WWR 19 April 2010 Draft Concept Enhancement Plan (includes the FarWest Restoration Engineering (FRE) engineering design memorandum) that details our approach for constructing a natural gravel beach for shoreline protection at Aramburu.
- Perform a site visit (conducted May 27 with Peter Baye and Roger Leventhal)
- Present a talk on his work on the design and construction of gravel beaches for shoreline protection and;
- Provide his assessment on the feasibility and effectiveness of the proposed design and provide comments and suggestions for any design changes.

The overall results of the peer review were excellent. Professor Lorang endorsed our design approach and concept designs for the Aramburu Island beach. He made several suggestions aimed at “softening” the micro-groin design, replacing their stabilizing functions with large woody debris in more diffuse distribution along the shoreline (described in more detail below). We will incorporate into the final project documents and permits.

**Summary of Peer Review Process** –The RWQCB requested an independent peer review of the proposed beach design by an acknowledged expert in the design and construction of these types of systems. Based upon his experience and reputation in natural gravel beach systems, we recommended and retained Professor Lorang of the University of Montana to provide this peer review. Dr Lorang is a coastal geomorphologist who has combined both the theoretical understanding of the function of gravel beaches along with years of experience actually building and monitoring these types of beach systems. Professor Lorang visited the site on May 27, 2010 with Peter Baye and myself along with Kerry Wilcox of the Richardson Bay Audubon Center. We then met in the afternoon at the Audubon Richardson Bay Center to hear a presentation of Dr. Lorang’s research on the design and construction of natural gravel beaches for shoreline protection. Following his presentation Dr. Baye and Mr. Leventhal presented on the proposed Aramburu project design along with a discussion of the site visit and proposed modifications to the project design to incorporate Dr. Lorang’s comments. Attached to this letter is a summary memo of the peer review meeting minutes and major discussion points.

### **Summary of Major Findings and Design Modifications**

Based upon the site visit and subsequent group discussion, the following are the significant recommendations and design changes to be incorporated into the final project report, permitting documents and plans and specifications for construction:

- 1) Incorporate much more large woody debris (LWD) into the project and distribute it more widely along the shoreline, in diffuse, irregular patterns rather than as regularly spaced groins that emulate traditional rock groins. Especially in the central and southern cells, replace the proposed micro-groins with much more distributed log and wood along the shoreline.
  - a) During the site walk, Mark identified where to best install logs to take advantage of the crenulations of the shoreline to provide “complexity” to the

shoreline design which helps achieve the maximum effectiveness of the gravel beach shoreline design.

- b) Use larger logs installed at angles to the shore to create wave “shadows” that reduce wave energy and help to retain the placed gravel sediments and reduce wave erosion.
- 2) In the South cell, replace the south-most micro-groin with a curved intertidal spit to create a sand-gravel beach within the wave shadow. Depending on the outboard length of the spit, the larger rock in the south cell (currently 50-60 mm rounded river rock) could be greatly reduced and replaced with the finer bay dredge sand-gravel mix, resulting in project cost reduction. We currently anticipate reducing but not eliminating the 50-60 mm rounded rock from the design.
- 3) Dr. Lorang also recommended adding much more diffuse distribution of LWD to the design of the south cell to work in conjunction with the placed gravel to create a more stable, irregular shoreline.
- 4) Professor Lorang endorsed having as much grain size variation in the sand-gravel mix as possible and also incorporating oyster shell in the mixture to be placed to the extent economically possible.
- 5) Professor Lorang stressed not to “over-engineer” these types of systems but rather to have a qualified geomorphologist on-site during construction to guide placement of LWD and wave shadow logs. He agreed that each log will need to be placed according to its characteristics when it arrives at the site, which is not something that is always known beforehand.
- 6) Professor Lorang also recommended placing approximately 30-40 percent of the expected design volume up-front and then monitoring and coming back the next year or so to add in additional sediments as needed as the most cost-effective approach to building these types of systems. During group discussion, it was noted that this phased construction approach is difficult to implement because of the way funding is provided and because of the added mobilization costs this approach would incur.
- 7) Finally, Professor Lorang commented that this project was relatively “easy” as compared with many of his beach projects on Flathead Lake, due to the ease of access to the shoreline for construction from the uplands and the lower wind-wave energies within this shallow part of the bay.

We plan to incorporate these changes into the next stage of the project design, permitting and construction documents. We appreciate the RWQCB supporting this peer review process and found it highly valuable as much for the assurance provided that this is the proper design approach for the project.

I appreciate the opportunity to work with Audubon on this project. Please feel free to call me at 510-644-2798 ext 2 or Stuart Siegel of WWR at 415-457-0250 with any questions or comments.

Sincerely,

A handwritten signature in black ink that reads "Roger Leventhal". The signature is written in a cursive style with a large, stylized initial "R" and a circular flourish at the end.

Roger Leventhal, P.E.  
Principal Engineer

Attachment: Peer review meeting minutes