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National Regional Sediment Management Program
San Francisco District (SPN):

Monitoring of Sand Placement near Pillar Point Harbor, Half Moon Bay, CA

Description

During FY18, the first year of this project, the SPN developed an ecological monitoring plan and used the Coastal Modeling System (CMS) to develop a series of scenarios for sand placement along the coast adjacent to the East Breakwater at Pillar Point Harbor. The purpose of the scenarios was to show the San Mateo County Harbor District how sand placed on the beach would respond to waves and currents. Using those scenarios and other information, Harbor District consultants will design and construct a dune-like structure containing approximately 75,000 yd^3 of clean sand from inside the breakwater. Those scenarios will also inform interested agencies – e.g., the Monterey Bay National Marine Sanctuary, California Coastal Commission, California Natural Resources Agency – of the potential direction and magnitude of sand transport in the year following construction.

During this project year, the CMS model will be reconfigured to compare model predictions with actual morphology change measured by periodic bathymetric surveys. The results will help local communities and permitting agencies design ongoing opportunistic beach nourishment programs throughout the region. Such programs will be valuable when federal, state, and communities develop regional sediment management projects on the central California coast, an area under the jurisdiction of the Monterey Bay National Marine Sanctuary.

Issue/Challenge to Address

Pillar Point Harbor occupies the northern end of Half Moon Bay, an arcuate, open-coast embayment that is approximately 25 miles south of San Francisco, CA. As built, the Pillar Point Harbor project consists of two rubble-mound breakwaters. Construction of the East Breakwater – April 1959 to June 1961 – disrupted the equilibrium wave pattern and focused wave energy at the beach and coastal bluff south of the breakwater. After breakwater construction, the rate of bluff retreat rapidly increased from ~3 inches per year to ~80 inches per year, resulting in a county road being destroyed, an arterial state highway being threatened, and notable shoaling occurring within the harbor adjacent to the East Breakwater. To mitigate for the loss of beach, bluff retreat, and harbor shoaling, the Section 111 Project Delivery Team's preferred alternative was a one-time dredging of approximately 140,000 to 150,000 yd^3 of shoaled sand and placing that sand in front of a 3,100-foot long section of the bluff south of the East Breakwater. Although federal action was not justified because of a lack of benefits, the San Mateo County Harbor District plans to construct a scaled-down alternative (the Surfer's Beach Sand Replenishment Pilot Project) using 75,000 yd^3.

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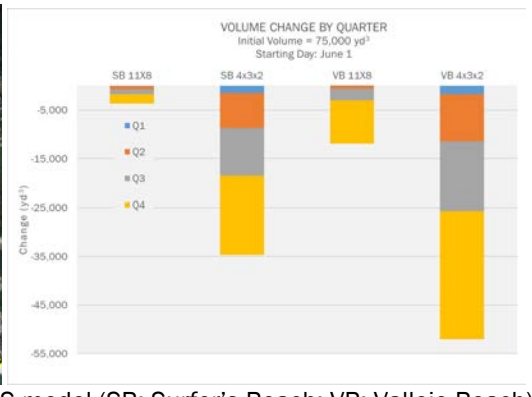
The eastern end of Pillar Point Harbor showing accretion on the harbor side of the East Breakwater and the proposed placement site along the eroding coastal bluff.

A major challenge to construction is that the Monterey Bay National Marine Sanctuary Rules and Regulations make it difficult to practice regional sediment management along a 276-mile stretch of the Central California Coast that includes Pillar Point Harbor. In essence, the Sanctuary prohibits the placement of dredged material within its boundaries regardless of its appropriateness for beneficial use. Because of increasing concerns by the State of California, the Coastal Sediment Management Workgroup, and local jurisdictions that Sanctuary policy greatly impedes effective coastal zone management, the Sanctuary has agreed to allow the project to move forward as a pilot study. One Sanctuary stipulation, however, is that a monitoring program be implemented to determine whether the beneficial impacts of sand placement warrant a change in its rules and regulations.

Successes
Lessons Learned

The CMS analysis from the first project year shows that the placed sand primarily moves alongshore; little moves offshore. The amount of sand lost from the initial structure depended on the distance of the placement site from the breakwater and the shape of the structure. Comparing two 1,000-foot-long structures – one starting at the breakwater (Surfer's Beach) and the other starting 1,000 feet downcoast (Vallejo Beach) – sand loss was greater at the Vallejo Beach site. At both sites, less sand was lost from a high and narrow structure than a wider and lower one.



Left: Sand placement sites evaluated by the CMS model (SB: Surfer's Beach; VB: Vallejo Beach)
Right: CMS results for one year

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Expected Products

- A refined CMS Grid using real-time wave data and a post-construction beach and nearshore survey
- An estimate of how well the CMS predicts the morphologic changes measured by periodic beach and nearshore surveys
- If necessary, changing CMS parameters to align model results with survey results
- A final Report and Presentation

Stakeholders & Users

Stakeholders include the San Mateo County Harbor District, Monterey Bay National Marine Sanctuary, local jurisdictions along the Half Moon Bay coast.

Projected Benefits Value Added

This project will have a major positive impact on the SPN navigation program if the results are such that the Monterey Bay National Marine Sanctuary permits future beneficial use of dredged sand within its waters based on the outcome of this project. For example, the sanctuary includes all of Monterey Bay and abuts four harbors with an SPN presence – Pillar Point, Santa Cruz, Moss Landing, and Monterey – meaning that the sanctuary prohibition limits beneficial-use opportunities for sand dredged from those harbors. The re-evaluation of the Sanctuary's restrictions should provide opportunities for good RSM practices including nearshore and beach sand placement to address the considerable challenges with shoreline erosion along the Sanctuary's 276-mile shoreline.

Leveraging Opportunities

This project is a key element in the Surfer's Beach Sand Replenishment Pilot Project, which will utilize a recently awarded $800,000 grant from the State of California Division of Boating and Waterways (DBW) for design, construction, and long-term monitoring of the placed sand. The San Mateo County Harbor District received a notification of award of the grant on June 29, 2017 and is now in its design phase.

Points of Contact

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Participating Partners

San Mateo County Harbor District, US Geological Survey, Monterey Bay National Marine Sanctuary