Sediment Management Options for Galveston Island, Texas, USA

Ashley E. Frey1, Andrew Morang1, David B. King2, and Robert C. Thomas2

1U.S. Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory, Vicksburg, MS
2U.S. Army Engineer District, Galveston, Galveston, TX

INTRODUCTION AND BACKGROUND

1. Study Area - ~47 km long; Reach 11 highest priority; Reach 6 is lowest priority
2. Sediment Budget Analysis System (SBAS): provides a framework for formulating, documenting, and calculating sediment budgets; SBAS sediment budget equation

RESULTS: GENCADE CALIBRATION

1. Reach 1 and 2 backpassing (Source term = 138,000 or 272,000 m3/yr)
2. West End (Reaches 3, 4, and 5) with/without 1,900,000 m3 initial beach fill

REFERENCES


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CONTACT INFORMATION
Ashley Frey, Ashley.E.Frey@usace.army.mil

SUMMARY AND CONCLUSIONS

The main purpose of this study was to develop a 50-year sand management plan for Galveston Island, TX. Based on the sediment budget and GenCade simulations, initial beach fills and backpassing plants on both ends of the island are the best strategies to widen the beaches of Galveston Island, improve tourism, and better protect the island from storms. If there are funding restrictions or limited sand sources, more localized beach fills could be constructed to keep the future beaches similar to the existing ones. Before a plan is finalized, it is recommended that the rate of material moving onshore at East Beach be studied in further detail, a beach profiling program be initiated, and the magnitude and direction of wind-blown transport be quantified.

ABSTRACT

Galveston Island is a major tourist and commercial center on the Gulf of Mexico at the mouth of Galveston Bay, Texas, USA. The shoreline along the Galveston seawall regularly requires beach management; while the beach west of the seawall has remained relatively stable. In order to continue to develop the island and ensure it is available for generations to come, a 50-year sediment management plan was developed. A sediment budget using the Sediment Budget Analysis System was calculated and numerous alternatives were simulated with GenCade, a shoreline change and sand transport model. Finally, several alternatives ranging from no action to a comprehensive beach fill and backpassing system were evaluated as part of the sand management plan.

RESULTS: GENCADE ALTERNATIVES

1. Beach fills - Reach 1 placement every 5 years (Source term = 138,000 m3/yr)
2. Beach fills - Place on Galveston Park Board properties only
3. Beach fills - Placement on first 2.4 km of West End or Reach 2 every 2 years

RESULTS: SAND MANAGEMENT OPTIONS

1. Sand borrow sources:
   - Sabine Bank (110 km offshore = 1,200,000,000 m3)
   - Heald Bank (55 km offshore = 585,000,000 m3)
   - Big Reef (1,100,000 m3)
   - East Beach (300,000 m3)

2. Options to recycle sand:
   - Sand backpassing*
   - East Beach deposition basin
   -271,900 m3/yr moving onshore needed to balance cell near jetty;
   - Source term of 272,000 m3/yr (future rate of sand moving onshore could decrease; more studies needed)

3. Options to reduce sand moving onshore:
   - Reduce transmission
   - Reduce landform
   - Reduce stock of sand available from source

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