

0-6962: Determine Placement Areas Sustainability

Background

Placement areas for dredged material (DMPAs) from the Gulf Intracoastal Waterway (GIWW) are a responsibility of the State of Texas. Given population and industrial growth along the coastline and the continual need for dredging, it is important to use the sites efficiently and ensure their integrity. This research provided the analytical framework and methodology that will enable the Texas Department of Transportation (TxDOT) to develop a strategic program for the restoration and protection of the DMPAs of the GIWW along the Texas coast. Researchers combined general physical, environmental, and economic data to provide strategic direction and develop information on techniques and potential measures to enhance the long-term performance of placement areas and dredging activities. Researchers created a tool using the analytic hierarchy process to evaluate various feasible solutions based on consideration of multiple criteria such as life-cycle costs, safety, and environmental sustainability.

Stakeholders indicated that the highest priority segment of the GIWW is East Matagorda Bay (EMB); therefore, the detailed analysis focused on this specific segment. Figure 1 shows the location of EMB.



Figure 1. Location of East Matagorda Bay.

What the Researchers Did

Researchers interviewed several stakeholders to get insight into their organizations' viewpoints on creating and maintaining sustainable DMPAs. These insights indicated that the highest priority area was EMB. Researchers compiled data on EMB's current conditions, dredging activities, and the potential economic impacts of a lack of

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maintenance dredging. Researchers also reviewed studies performed by the United States Army Corps of Engineers, the Texas General Land Office, and university researchers that address similar problems on the Texas coast and on the coast of other Gulf of Mexico states. After examining a broad range of alternative placement area maintenance and enhancement alternatives, researchers developed a set of feasible alternatives for EMB DMPAs. The solutions with the greatest probability of success and acceptance by state agencies fall into the category of soft shoreline or living shoreline solutions. Such projects maintain the continuity of the natural land-water interface and reduce erosion while providing habitat value and enhancing coastal resiliency.

Several lessons learned that will be valuable in future DMPA assessments are described in the report. In order to be able to replicate the type of analysis used in this project for other segments of the GIWW, researchers developed a tool based on the analytic hierarchy process. This spreadsheet-based tool uses the information collected in this study in formulating the approach to the incorporation of multiple factors into the decision-making process (i.e., objectives, strategies, structural alternatives, and criteria). The tool incorporates the consideration of multiple criteria such as life-cycle costs, safety, and environmental sustainability.

What They Found

The highest priority area in EMB is where the navigation channel bends. Protecting this reach of the GIWW against long-fetch bay-induced wind/wave energies will significantly increase navigation safety and efficiencies and reduce navigation channel shoaling, reducing maintenance dredging cycles. The DMPA berm or shorelines along the GIWW will require a rock breakwater. For the bay-facing berms or shorelines, combination solutions consisting of green and/or gray features may effectively provide multifaceted protection. However, these solutions should be determined case by case.

An extended list of improvement features, considerations, and evaluation options could be prioritized as shoreline changes are observed or storm-induced waves and shoaling or current/wave regimes negatively impact navigation safety.

What This Means

The research enables TxDOT and resource agencies to focus on the highest priority segment of the GIWW and then use the analytic tools developed in this project to evaluate other segments of the GIWW and assess alternative measures for DMPA restoration or enhancement.

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