

# Beneficial Use of Muddy Dredged Sediment to Support Sediment Budgets, Coastal Resilience, and Ecosystem Restoration

**Joseph Z. Gailani<sup>1</sup>, Coraggio Maglio<sup>2</sup>**

<sup>1</sup>U.S. Army Corps of Engineers, 3909 Halls Ferry Road, Vicksburg, MS USA 39056

Phone: +001-601-634-4851

<sup>2</sup>U.S. Army Corps of Engineers, P.O. Box 1229, Galveston, TX USA 77553

joe.z.gailani@usace.army.mil

**Introduction:** Galveston Bay, Texas includes one of the busiest commercial ports in the United States. The Bay is broad and shallow. Before human activity, the Bay included expansive wetlands and limited open water. Wetlands were removed to mine underlying sediment as fill material. The man-made open water permitted wind wave generation, resulting in further wetland loss. Vessel wake increased the loss rate. Less than 10% of original wetlands remain and wind waves are causing shoreline erosion near infrastructure at many locations. Federal and State agencies are committed to re-establishing wetlands to reduce shoreline erosion, dampen storm surge and wind-wave generation, re-establish biodiversity, and support fisheries. Navigation dredged sediment is being used to re-establish elevation required for wetland habitats. This presentation provides a case study where dredged sediment is used to both construct and protect new wetlands near the main navigation channel.

**Methods:** Several million cubic meters are dredged from navigation channels in Galveston Bay annually. This sediment is being used strategically to re-establish wetlands which will protect shorelines, reduce wind-wave generation, and provide habitat for critical species. Presently, the Houston Ship Channel is being widened and deepened. Sediment dredged as part of the expansion is stiff Beaumont clay – unlike maintenance material which is soft. This stiff sediment is highly resistant to erosion. Therefore, it is being used to create berms between the ship channel and a site designated for re-introduction of wetlands. Under continued wave attack, the berm will eventually degrade. However, if designed properly, the berm will remain in place until the new wetland is established. In addition, a maintenance program will permit berm nourishment if necessary for continued wetland protection. After berm construction, maintenance dredged sediment will be placed behind the berm to restore elevation necessary for wetland. The site will then be planted and monitored.

Figure 1 shows one berm which has been constructed around Cell M10. The Houston Ship Channel is immediately west of Atkinson Island and Cell M10. Berm construction was completed in

summer 2018 and Cell M10 fill will commence soon. Similar cells are being planned throughout Galveston Bay. Cell distribution is being evaluated to maximize interruption of wind-wave generation to reduce wave energy eroding the shoreline. This method of increasing Bay roughness has the potential to reduce flood risk, restore Bay habitat, increase fisheries, and provide a sustainable, cost-effective dredged material management option.



**Fig. 1:** Use the template *Caption* for labelling.

**Results:** The U.S. Army Corps of Engineers, which is responsible for navigation dredging in Galveston Bay, is monitoring the evolution of the berm surrounding Cell M10. To date, monitoring indicates that berm is stable and will permit wetland construction in the Cell.

**Discussion:** Multiple stakeholders have identified dredged sediment as a resource which should be managed within the Bay (instead of being disposed of off shore). While this has been performed for decades with sandy dredged sediment, muddy sediments are often disposed of offshore or upland. By monitoring success of protective berms and wetland re-establishment in Galveston Bay, The U.S. Army Corps of Engineers is demonstrating methods to utilize muddy dredged sediment beneficially – applying stiffer sediment to build protective berms and softer sediments to re-establish wetland platform behind the berms. Lessons learned at Galveston will support engineering guidance that can be applied at other sites across the U.S. and internationally.