

Initial study on the nature of sedimentation in borrow pits used for renourishments of Hancock and Harrison County beaches

Introduction

Borrow pits have been and will continue to be created when nearshore sources of sediment are targeted for renourishment projects. The nature of the sediments filling these pits has been a question that the Mississippi Office of Geology has contemplated in the past. Work has been done to show the fate of the renourished sediments and the relative amounts that move offshore. This project would begin to answer the next logical question 'how much and what type of sediments are filling the borrow pits if they are in fact being filled'. Indirect evidence suggests that they are being filled.

Proposed study

The Mississippi Office of Geology with support from Brown and Mitchell Engineering plan to sample and measure the amount of sediment refilling nearshore borrow pits. In so doing, several questions need to be addressed initially. To begin, the locations of the borrow pits under study, both recently and previously dredged, need to be chosen and located. If data is available on the original depths, these can be compared to updated surveys to assess the general thickness of sediment deposited since initial dredging. Once delineated, the individual borrow areas will be occupied to record depths and surface sediments. Depending on these variables, different types of sampling procedures will be assessed with regards to their ability to sample the interval of newly deposited sediment. Cores, whether taken using a vibracorer or manually, will likely be the only way to determine sediment thickness, sediment trends, and sediment that characterizes short events (storms). Depending on the sediment trends, surface samples can then be retrieved at a higher density to delineate zones within each borrow pit.

Potential outcomes and results

The results should define the variables that effect sedimentation in borrow pits. Variables such as beach location (beach system), location of the borrow pit, age of the borrow pit, location within the borrow pit, water depths (prior to and following excavation), and shoreline – transport characteristics will be addressed in regards to the types and amounts of sediment present. Chemical analyses of sediments are not planned. As a result of the variables tested, a geologic/physical model of borrow pit sedimentation will be produced.

Time frame

The time frame of the sample-gathering portion of the project is expected to be from June to July. Initial results should be available by August. The following is a probable work schedule:

1. Early to Mid June: Initial site survey, site occupation, background data compilation, and initial sampling
2. Mid June to Mid July: In-depth coring and sampling
3. Mid July to Mid August: Data analysis, preliminary findings
4. August to December: Data analysis and report preparation

Initial Site Survey Results

Initial results come from the borrow pit used in the 1994 Hancock County beach renourishment. This area was chosen as a test case because of the detailed sediment character and transport information previously gathered there (Schmid, 2000;2001a;b). Three locations across the northern end of the borrow pit were sampled (Figure 1). Sampling was done using a Russian Sediment Borer, which produces two-foot intact samples. Each interval was photographed and described; samples were not taken. Sample depths ranged from 4 to 5.5 feet. Water depths ranged from 8 feet (sample 1) to 6.5 feet (sample 3).

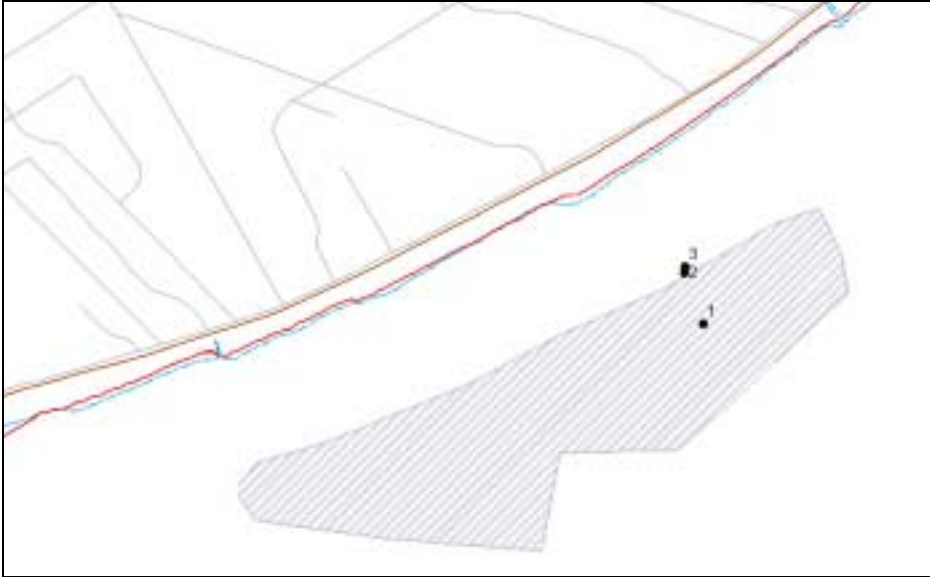


Figure 1. Sample locations in the Hancock County borrow pit

Results

Sample 1 was taken near the middle of the borrow pit in 8 feet of water. The top 3.5 feet was composed of dark gray-green mud. There was slight bioturbation, but in most of the core the sediment was laminated. At 3.5 feet there was a sharp contact between the underlying sand and the laminated mud. The sand was nearly devoid of mud and appeared to Pleistocene in age. The sharp contact (Figure 2) and age of the sand indicates that no new sand was deposited or reworked following dredge activities at this location.



Figure 2. Bottom of core showing laminated mud and the sharp contact with the underlying sand.

Sample 2 was taken in 7 feet of water near the edge of the borrow pit. In this location there was 5 feet of laminated gray-green mud. Again, there was a sharp contact with the underlying sandy unit, however the muddy sand sampled at this location was Holocene in age (Figure 3).



Figure 3. Laminated mud overlying Holocene muddy sand at sample location 2

Sample 3 was taken about 15 meters (50 feet) landward of sample 2. The depth was 6.5 feet. There was 5 feet of laminated mud over muddy sand, much the same as sample 2.

Discussion

The Hancock borrow at the locations sampled did not have any signs of sand laminations associated with offshore sand transport. It was expected that some sand would be moved offshore during storm events, however, in these locations that was not the case. It is likely that some sand is moving offshore, but it may be confined to the extreme landward edge of the borrow pit.

About 6 inches of mud have been deposited yearly, given that 4 to 5 feet of mud has been deposited since 1994. This rate may not be consistent through time; it is likely that the initial rates were higher due to the greater depths. At greater depths the sediment is less likely to be resuspended during wave events (below wave base). As the depths decrease resuspension is more likely and sediment deposition may be inhibited.

These initial results are helpful for outlining future work, however, this is only one location along the Mississippi coast. It may be more influenced by the sediment being transported from the Jordan River (mud) and Bay St. Louis than at other locations in this borrow pit and other locations along the coast (Harrison County).

References Cited

- Schmid, K., 2000, Biennial Report of Sand Beaches; Hancock County, 1999: Mississippi Office of Geology, Department of Environmental Quality, Open File Report, OF-110, p.
- Schmid, K., 2001a, Determining artificial vs natural Holocene sedimentation, Hancock County, Mississippi [abs]: Mississippi Academy of Sciences, v. 46, 1, p. 40.
- Schmid, K., 2001b, Using vibracore and profile data to quantify volumes of renourished sediments, Holocene thickness, and sedimentation patterns: Hancock County, Mississippi: Mississippi Office of Geology, Open File Report, 131, 33 p.