

**PRELIMINARY REPORT ON THE NATURE OF HOLOCENE
SEDIMENTS OFFSHORE OF CENTRAL BELLE FONTAINE,
MISSISSIPPI**

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Introduction

A preliminary site investigation off the central portion of Belle Fontaine beach was conducted by the Mississippi Dept. of Environmental Quality, Office of Geology staff during the first week of July 1999. The purpose was to probe sand depths in the offshore area for possible use in beach renourishment or shoreline protection schemes. Simple probing methods were used from the Office of Geology's 17-ft boat. In addition to sediment depths, some sand samples were taken along with field descriptions of the units underlying the unconsolidated Holocene sediments. Due in part to deteriorating weather conditions and time constraints the study was restricted to the area near the Belle Fontaine headland (Figure 1). Based on the preliminary data gathered several regions have been targeted for future sand resource studies if the need is still present.

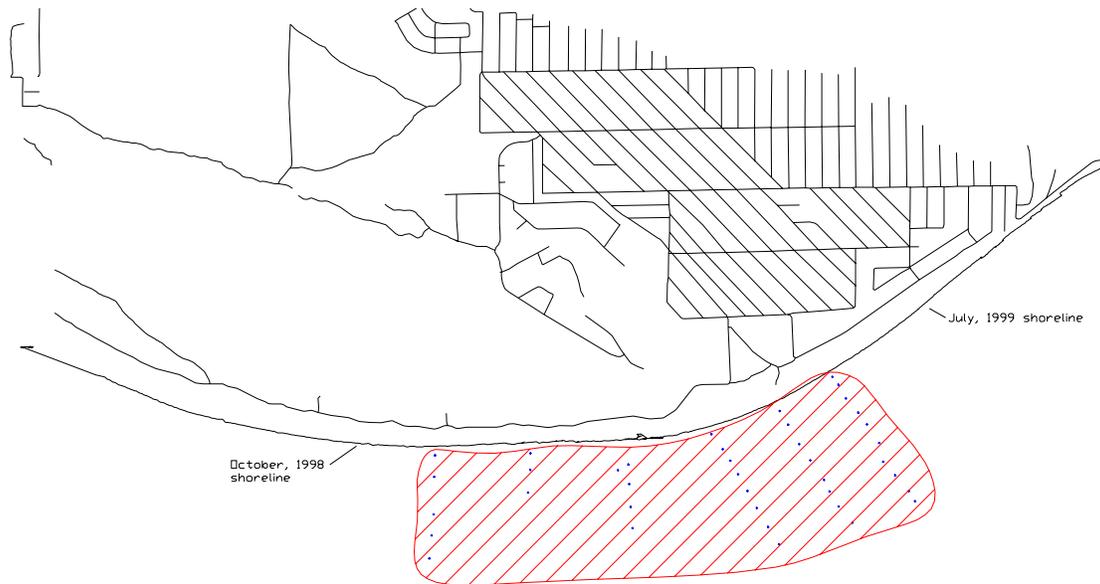


Figure 1. Study area is highlighted with red hatch; individual sample locations are shown as blue points. The two shoreline surveys meet in the center of the figure. North is up on all figures.

Methods

Sand probing was performed using an open-ended sampler on an extendable shaft. Penetration depth and end-point samples were recovered. Depth of penetration was terminated by the occurrence of semi-indurated (competent) units that have been tentatively noted as Gulfport and Biloxi formations. The Gulfport Formation is dominantly sandy and stained brown with humic acid; the Biloxi Formation is a clayey unit with some indication of an ancient soil profile. Sample locations were collected using GPS and then post-processed. End-point samples (limit of penetration) were mainly described in the field; several samples were also taken for further interpretation. In addition to end-point samples, samples from varying depths were described in the field; two samples with an "average" sand-mud ratio were then collected and analyzed for percentage of fines.

The eastern shoreline, from the water tower to the entrance of Graveline Bayou, was mapped in July 1999 using kinematic GPS techniques. The western shoreline, from the water tower to the terminal groin, was mapped in October 1998 using the same technique. It should be noted that the two shorelines meet almost exactly, indicating a limited amount of erosion in the area they join.

Sand Thickness

The general trend of Holocene sediment thickness appears to be closely related to underlying geology (Figure 2); regions underlain by the sandy Gulfport unit have a lower sediment thickness than those underlain by clayey deposits (Biloxi Fm). The areas typified by the thickest sediments are, however, near the contact of these two units (offshore of water tower). Holocene sediment thicknesses of roughly 2-6 ft were dominant on the eastern portion of the study area; in the central to western portion, sediment thickness range from 6 to a high of 14.5 ft. The offshore sample locations in all cases tended to be thicker, although a consistent thickening towards the offshore was not strictly observed.

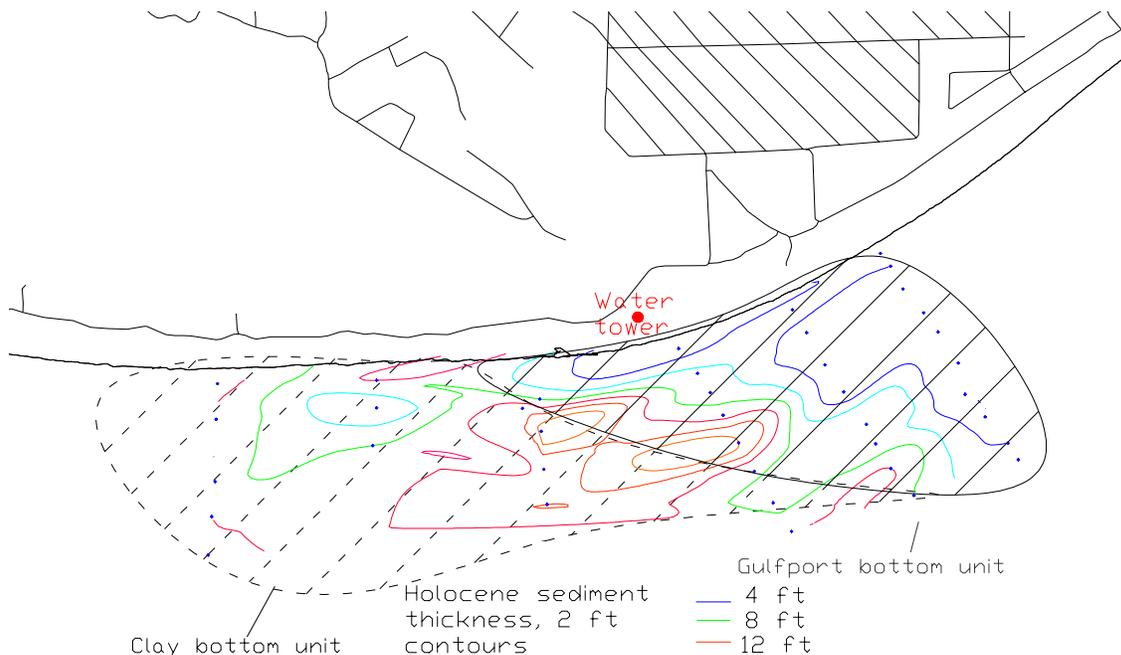


Figure 2. Sediment thickness contours. Warm tone colors show areas with high Holocene sediment thickness. The Gulfport and Biloxi (clay) Formation extents are estimated from field notes.

Sediment Texture

Sediment texture was approximated based on hand samples and ease of penetration. Holocene sediment texture ranged from sand to sandy mud, the later containing more mud sized material than sand. Sediment texture varied with depth and with location; variation with depth was estimated by the changing penetration rates. As would be expected the sediment in the nearshore was coarser than the offshore and was devoid of mud. In all, only a few locations were dominated by mud; the majority of the sediment

was classified as muddy or silty sand. Two samples of silty to muddy sand were analyzed; the non-sand fraction ranged from 15 to 20%. These samples were estimated in the field to represent the limits of what was considered useable (cool colored) sediment in Figure 3. The limited number of samples precludes the ability to draw in-depth conclusions about the nature of the Holocene sediments; however, sand content does appear to be associated with the underlying units. Holocene sediments overlying the Gulfport Formation, while thinner, have higher sand contents than those at similar water depths overlying the clayey Biloxi Formation. The “iso-sed” map (Figure 3) shows the areas with higher sand content in cool tone colors. These areas are thought to be a suitable sand resource.

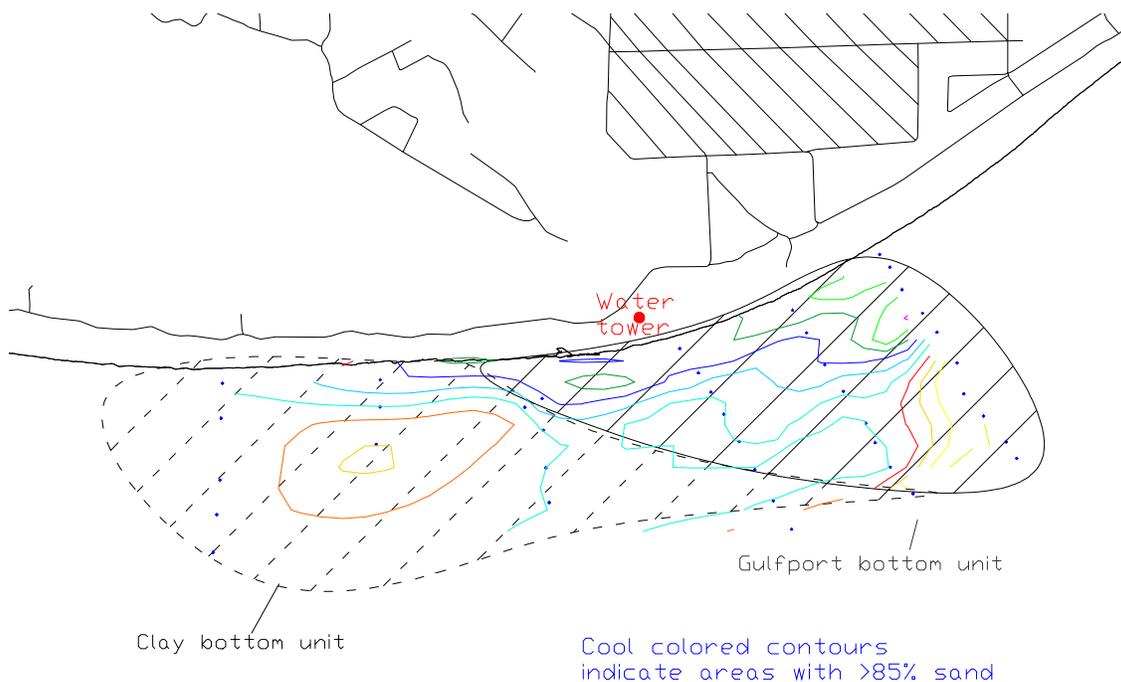


Figure 3. Sediment quality map. Cool color contours (teal to green) indicate areas with an estimated sand fraction of roughly 85% or more. Areas included within red or yellow contours are estimated to contain more than 15% mud.

Discussion

Using both the Holocene sediment depths and sediment quality contours, a basic area of interest has been highlighted (Figure 4). In this case it denotes an area with a significant thickness of sandy Holocene sediment. This area is highlighted for further sampling and a more in-depth analysis of sediment texture. It should also be noted that the character of the Gulfport fm. appears to be a suitable sand resource and may be several 10's of meters thick in this area. This unit should also be addressed in future studies, much of it occurring beyond the present study boundaries.

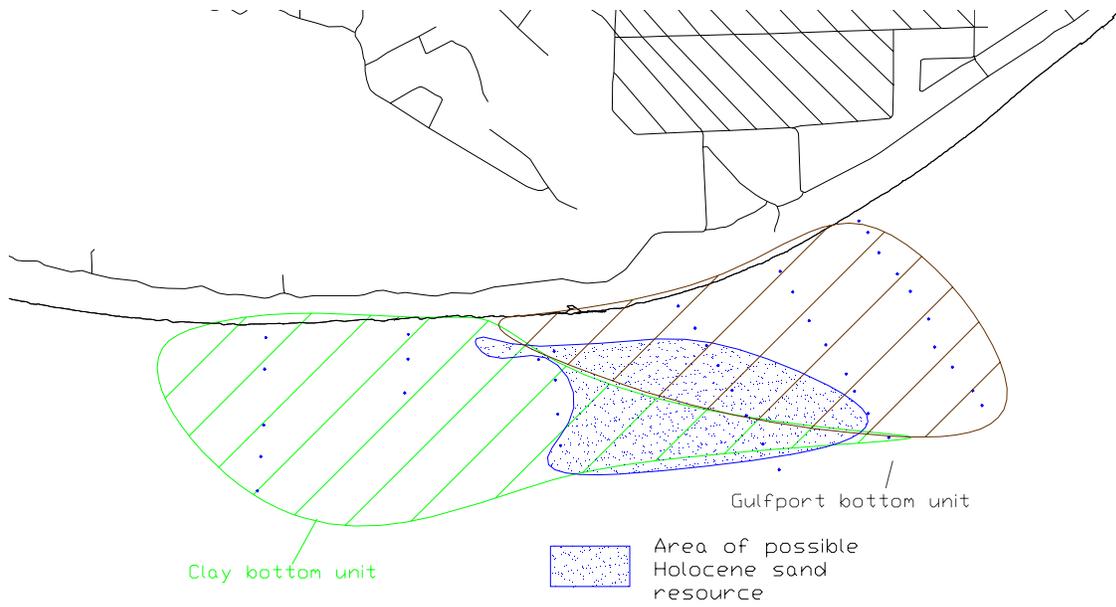


Figure 4. Area targeted for Holocene sediment investigation

Summary-Recommendations

Based on the limited data gathered only preliminary conclusions can be drawn, but certain recommendations can be made.

- The Holocene sediments in the area offshore of Belle Fontaine are underlain by two distinctly different units that appear to control thickness and composition.
- Holocene sediment thickness is greater over the clayey unit, however the sediments contain a significant amount of mud.
- Holocene sediment thickness is lower over the sandy unit, but the sediments do not contain as much mud.
- Holocene sediment thickness ranges from 2 to 14.5 ft.
- The texture of Holocene sediments varies from sand to sandy mud.
- Holocene sediment texture varies with depth at most sample locations; the exceptions are in the eastern transects near the shore.
- The underlying Gulfport Formation. appears to be a suitable sand resource; this unit should be mapped and contoured.
- Future studies should concentrate on the central to eastern half of the study area and to the east of the study area.
- Higher resolution techniques need to be used to approximate the sand resource.
- Studies of shoreline response to nearshore dredging need to be addressed (modeled) before the potential resource is utilized.