# Sands and time

## The continuing saga of Galveston's beach nourishment plans

**by Amber Payne**
**Public Affairs Office**

The Galveston District is a leader in beneficial uses of dredged material. So some may wonder why it announced in October that the proposed beach nourishment joint-project between the district and the City of Galveston is a no-go.

The Corps is in the business of solving engineering problems in a scientific way. As in any other science, after further investigation, an occassional hypothesis has to be thrown out and a new approach to the problem taken.

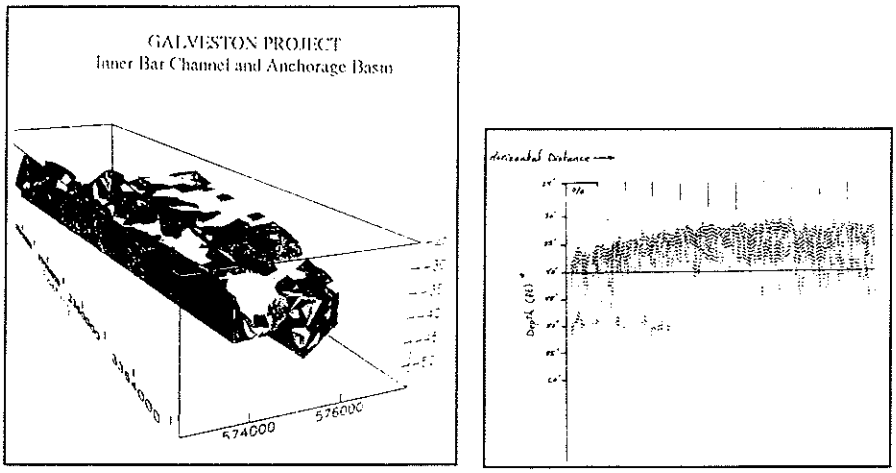
Construction Operations' Neil McLellan oversaw the scientific study done on Galveston beach nourishment.

McLellan has a bachelor's degree in civil engineering from the University of Texas, a master's degree in ocean engineering from Texas A&M University, and is a registered professional engineer in Texas.

Before he joined the district in 1990, he spent six years at the Waterways Experiment Station in Vicksburg, Miss., working on projects

related to environmental effects and beneficial uses of dredged material. So he was well qualified for the job.

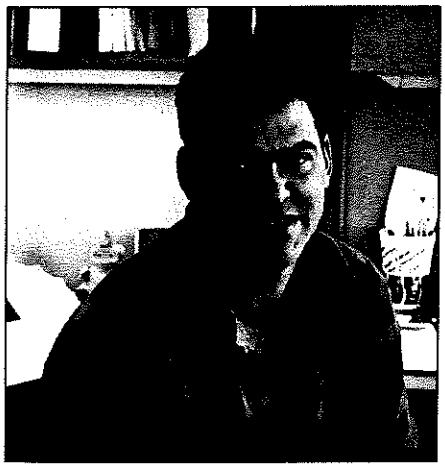
Early on, McLellan contacted personnel from the Waterways Experiment Station to take initial sediment testing in the area considered most likely to provide sand for the nourishment. In the past, sand from the Bolivar Roads, between the jetties, had been of good quality.




***Raw data from acoustic coring (right) is translated into the three-dimensional map of a portion of the Galveston Ship Channel. Color coding shows the various grades of sand on the map.***

However, because of the way waves and currents deposit materials, the sand content in any area can change drastically in a few years. And it had been three years since material at the bottom of that part of the Galveston Channel had been tested.

The first step in testing was a process called acoustic coring. Acoustic coring is performed by sending sound waves to the floor of the ocean and measuring them after they bounce back to the surface. The intensity of the sound waves and the time they take to return to the surface of the water indicate the grain size of material on the ocean floor. This process was accomplished along the length of the channel to provide engineers a very good idea of the quality of what is at the bottom, McLellan explains.



***Neil McLellan***

The next step involved using a piece of equipment called a vibracore to collect samples of sediment. The vibracore has a long tube, which is lowered down to the ocean bottom. There, it vibrates its way down into the ground, where it is able to collect samples of material well below ground surface. These extensive sediment samples were then compared with information gathered in acoustic coring.

Plant Branch, Geotech, and the Fort Point office provided support for these testing activities.

Each of the two types of testing took about three days to complete. Analyzing the results took three months. That is partially due to the complexity of turning acoustic readings into three-dimensional maps--maps which describe the quality of material in the ship channel to a depth of 50 feet.

When it was done, these three-dimensional maps showed the Corps some disappointing results. The majority of the ship channel's bottom is made up of very silty sand.

The size of a desirable grain of sand for beach nourishment is about .24 millimeters in diameter. The larger the

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## Nourishment
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grains of sand, the more stable the beach will be. Large grains of sand will erode less.

Unfortunately, the best of the small amount of sand at the bottom of the Galveston Channel was about .13 millimeters in diameter, considered very fine sand. Grains of .075 millimeters are considered silt. And 65 percent of the material at the bottom of the channel contained only 65 percent sand. The rest of it is just plain silt and clay. The Corps hoped it might be 95 percent sand, McLellan says.

Obviously, this material is not the most desirable for beach nourishment. It could be used, but there would be some problems. First, the dredged material would be unattractive initially. It would look like the Corps had dumped a large load of mud on the beach. But eventually the rain and waves would wash the sand clean, leaving a reasonably attractive beach.

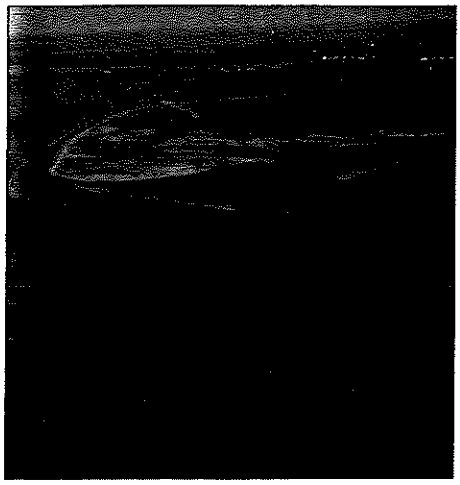
However, the second, and more perplexing problem from a project point of view, is that a huge amount of material would have to be brought in to get enough actual sand grains for the washing effect to leave a beach as large as the City of Galveston planned.

"Because of the quality of the sand in the ship channel, routine dredging of the Galveston Channel could not provide 1.5 million cubic yards of pure sand to make the beach nourishment work," McLellan says. "Even if it did, we do not have the means to move that quantity of material. And even if these two were not problems, transporting that much dredge material would be an outrageously expensive proposition."

Yet all is not lost. The Corps has received legislation directing it to investigate another possibility for beach nourishment. Sid Tanner, acting chief of Planning Division, is overseeing a Section 22, aid to the state, study investigating Big Reef as a long-term beach replenishment source for Galveston beaches. This project was in the works even before the Corps began investigating using dredged material for beach nourishment.

Big Reef, located between the jetties, off the seawall's east end, is a naturally replenishing reef. The city has a permit to take up to a million cubic yards a year from the area until December 1992. At that time they will have to apply for another permit. The reef, according to studies done 1983-1985, is made up of 9.5 to 10 million cubic yards of 90 to 95 percent good quality sand.

Big Reef exists because the area where it sits is a point of low water velocity between



*Big Reef*

the jetties. Currents slow down and bring silt and sand to rest in that point. Over the years, the materials have accumulated. But every time a hurricane has come to Galveston, the reef has been destroyed and later replenished itself.

The Corps is documenting the reef's history in that respect as part of the project. So far, this seems to suggest that the reef could easily replace sand taken from it to nourish Galveston beaches.

The city was attracted to using dredged material for beach nourishment originally because it would not have to pay for excavation of the nourishment material, which would have been part of normal dredging. The city would only have to cover the cost of moving it to the beach. However, because of the large amount of dredged material that would be required, it

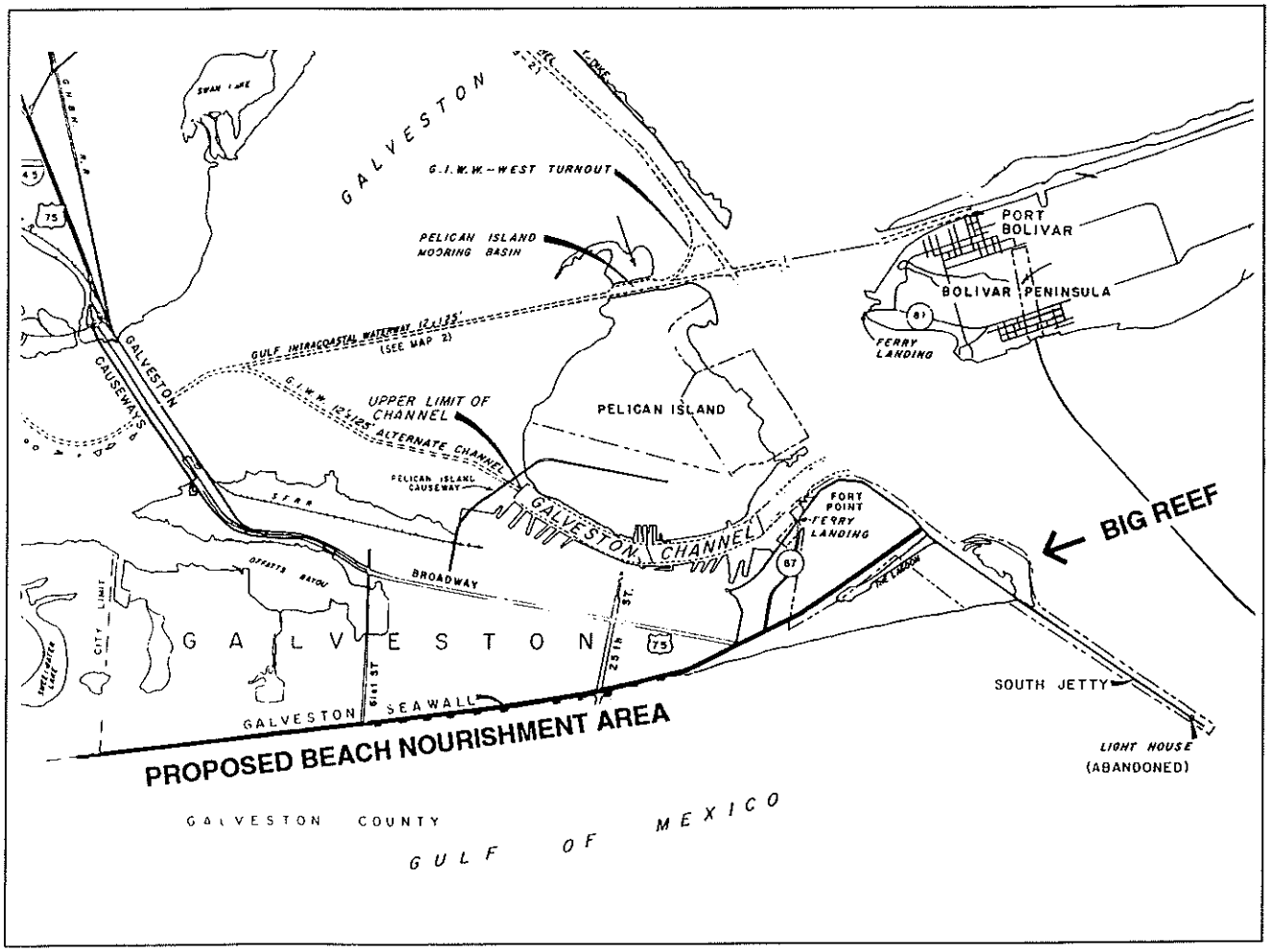
would actually be less expensive to pay for both excavation and transportation of material from Big Reef.

Environmental impact on the piping plovers and other wildlife that live on Big Reef might be avoided by taking sand for beach nourishment only from areas below water level.

"We are fully committed to assisting the City of Galveston to find an affordable alternative to rebuild the beach," Col. Basilotto said in an announcement to local city officials.

As the Section 22 study on beach replenishment is pursued, the Corps will look at the same items it did when studying the material at the bottom of the Galveston Channel. The city will then have access to these findings as public documents.

"It's very nice that we happened to get the contract at this time," says Tanner. "If we did the study a year ago or a year in the future, we might not have been able to help the city as much. Because we are engineers who work for Congress, we cannot do anything to help unless Congress funds us. And they have." ❐



# Other times, other beaches

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Unlike snowflakes, two grains of sand may in fact be exactly alike. However, no two beaches are alike. And likewise, neither are any two beach nourishment projects.

The district has a history of successful beaches nourished by dredged material. But each project it has undertaken has presented different resources to work with and challenges to overcome.

Often compared to Galveston's beach by those outside the Corps, a Corpus Christi Beach was successfully nourished in 1978.

However, fine dredge material was used only for the bottom layer of that beach. The visible top layer was coarse sand trucked in from an inland riverbed. The Corps laid this over a 1.4 mile area of land.

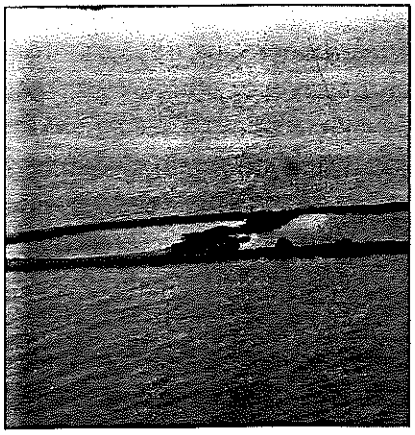
Galveston's proposed beach project is 3.8 miles long. And there is no inland river close enough to duplicate within reasonable cost limits the procedure used in Corpus. Also, Corpus Christi is a protected bay, unlike Galveston. Today, after a renourishment and the addition of a groin in 1986, the successful Beach is enjoyed by residents and visitors to Corpus Christi throughout the year.

Further north up the coast is the beach nourishment success story at Surfside Beach.

Prior to the deepening of Freeport Harbor to 45 feet, the beach at Surfside was experiencing severe erosion. More than one beach front house was lost to the sea. So residents there were very enthusiastic about finding a speedy solution to this erosion. The Corps of Engineers was able to offer one.

By placing 240,000 cubic yards of sand, clay and silt dredged during the deepening of Freeport Harbor onto the small strip of land sloping into the sea, Surfside Beach was greatly fortified. However, it took a little time for it to be pretty. Initially it looked more like mud than beach. But fairly soon, the clay and silt were washed away by rain and waves. Today Surfside's residents are pleased with their beach, as are the many visitors to the attractive recreation spot. ❐

# West Bay Demonstration Project update



*The West Bay Demonstation Project*

The West Bay Demonstration Project, a $3.3 million contract for beneficial use of dredged material, recently passed a milestone. In early October, the initial planting of the levee was completed.

The levee was constructed in spring 1992 with dredged material to protect the GIWW and Halls Lake from erosive action.

A 1,000 foot barrier was also erected in October to protect the three to five acres of young plants, which will ultimately be part of a wetland.

The next major planting will take place in spring 1993.

Neil McLellan, project engineer, reports the project is also fulfulling its purpose as a testing ground for experimental erosion control techniques. ❐