

application **Sand Dune Construction**  
location **Bolivar Peninsula, Texas**  
products **Geotube® Structures**

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#### THE CHALLENGE

Bolivar Peninsula, a peninsula located in Galveston County on the Texas Gulf Coast suffers large amounts of beach erosion mostly caused by tropical storms and hurricanes. The peninsula is home to over 5,000 residents in four unincorporated communities; Port Bolivar, Crystal Beach, the Gilchrist Community and High Island. In 1998 Tropical Storm Francis devastated the Texas Gulf Coast. According to Tesa Duffey, Galveston County Emergency Management Coordinator, the storm caused 4 to 5 million dollars worth of damage in the Bolivar Peninsula. Thirty-five homes were lost either to the storm or were removed due to the state's open beach policy. The policy states that all beaches in Texas are open for public access. When a structure encroaches on to the beach due to erosion the structure must be either moved or torn down. According to Eddie Oehlers, Gilchrist Community Association President, this loss of property erodes the county's tax base. A solution was needed that would protect the structures along the coastline that would also blend in with the nat-

ural environment.

#### THE DESIGN

After researching previous installations of Geotube® containers in Avalon, New Jersey it was decided that Geotube® geotextile structures would be installed in the Galveston County with over five miles of Geotube® sand dune construction on Bolivar Peninsula. Funded by a FEMA mitigation project and the Texas Department of Housing and Community Affairs, the project began in February of 2000.

The project, engineered by Gerald Hauske of Shiner Moseley and Associates, Inc., called for a design that incorporated Geotube® structures as the core of a sand dune. The sand filled geosynthetic fabric tubes would be covered with sand and vegetated to take on the appearance of a natural sand dune. During heavy storm activity erosion would primarily be limited to the area in front (surf side) of the tubes. The area behind the tube would be protected from the heavy wave action and prevent erosion and damage to structures.

#### CONSTRUCTION

The Bolivar Peninsula project was divided into two phases. The first phase of the project, 12,000 liner feet of Geotube® containers, was awarded to Reama Contractors and began in February of 2000. The second phase of the project, over 18,000 linear feet of Geotube® containers, was awarded to DRC Inc. The second phase began in March of 2001. The total length of the project was over 30,000 linear feet, protecting more than five miles of coastline.

The 30ft circumference 250ft long geotextile tubes were manufactured by Ten Cate Nicolon at their Pendergrass, Georgia plant. The main body of the Geotube® container was constructed of Mirafi® GT 1000, a

JOB OWNER:  
**Galveston County, Texas**  
ENGINEER:  
**Shiner Moseley & Assoc.**  
CONTRACTORS:  
**DRC Inc.**  
**Reama Contractors**



Mirafi® 1120N was used as a UV resistant shroud for the Geotube® structure.



Each Geotube® container was covered and vegetated to take on the appearance of a natural dune.

white polyester woven geotextile. The scour apron with anchor tubes, which serves to prevent erosion underneath the tube as well as to anchor the structure, was constructed of black Mirafi® GT 500 fabric. Mirafi® 1120 N was fabricated to the top of the Geotube® structure. This nonwoven geotextile would serve as a shroud for increased UV protection in the event that a Geotube® container was uncovered for long periods of time (Figure 1, 2). The tubes were filled by the use of a hopper method using imported sand (Figure 3, 4). The Geotube® structures were first held in place by pumping sand into the anchor tubes. The main geotextile tube body was then filled by pumping sand through injection ports that were located on 25-foot centers. The tubes were then covered with a layer of sand and vegetated (Figure 5). According to Hauske, contractors are able to install one tube per day.

## PERFORMANCE

Before the second phase of the project was complete the Geotube® structures were put to the test. Tropical Storm Allison battered the Bolivar Peninsula in May of 2001. Little to no debris cleanup or structure loss was reported in areas protected by the Geotube® structures, saving Galveston

County 1 to 2 million dollars in clean up cost, according to Duffey. She continued saying, "With this last event (Tropical Storm Allison) we estimated that we had about 50 homes on the Bolivar Peninsula that would have been on the public Beach (due to erosion) and subject to removal if it had not been for this project." Oehlers echoed Duffey's response saying, "Not one dollar of damage or debris could be reported past the Geotubes." Some erosion was reported in front (surf side) of the tubes in some cases exposing the sand-filled containers. But no damage to the tubes themselves was reported (Figure 6,7)

"We have been very pleased with their performance. They have held up very well in both small and very large events... they have been very positive," said Duffey. "This is the first installation of these projects on the Texas Gulf Coast so we are going to watch them and see how they do and learn the pros and cons and move forward in the future."

Oehlers, a 24 year resident of the peninsula who also owns five houses and twelve lots on the peninsula, praised Galveston County officials saying, "Thank goodness for our County Commissioners and Judge D. Yarbrough (County Judge and

Emergency Management Director). They drew a line in the sand. I could never describe how much more comfortable I feel and how much better I sleep, along with a lot of other people on this peninsula (now that Geotube® containers are installed)."



Each Geotube® structure was filled by attaching a hopper to the container injection ports and filling the tubes with imported sand.



No damage could be reported in areas protected by Geotube® structures after Tropical Storm Allison. However, some erosion was reported in front of the containers, in some cases exposing the structure.

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