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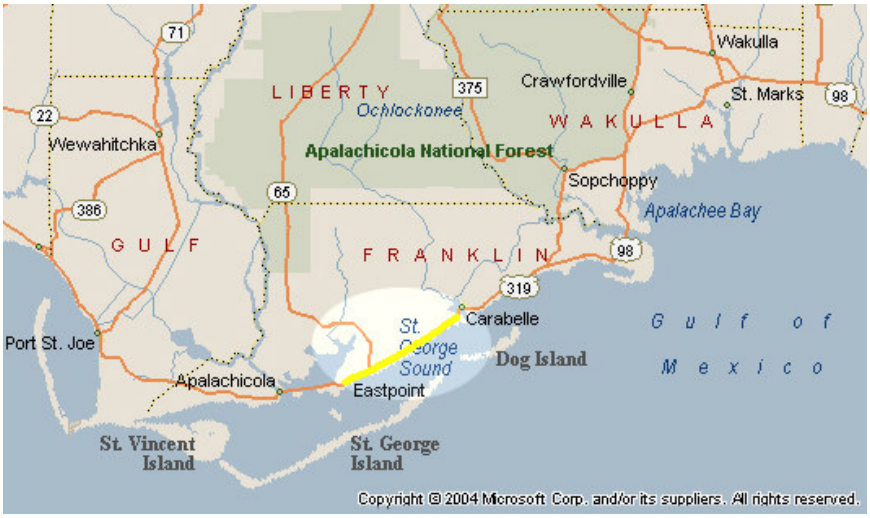
Innovations

In Soil Stabilization

US Highway 98

Summer 2005

On July 10, 2005 Hurricane Dennis raged through the Florida panhandle near Apalachicola and St. George's Island. It made landfall at 3 pm as a category 3 hurricane; with a maximum sustained wind near 140 mph and wave heights of 6 to 8 feet. US highway 98, a major tourism and transportation corridor that follows along the panhandle's coastline, felt the brunt of the hurricane's forces.



This 14 mile stretch of Highway 98 along the coast was the project area.

Damage was severe on approximately 14 miles of US highway 98, ranging from erosion of the shoulder to buckling and subsidence of the entire roadway. Immediately after the storm, the Florida Department of Transportation (FDOT) took action to reconstruct and open traffic on the stretch of damaged highway, awarding a construction contract to complete emergency repairs within 14 days. The travel lanes were quickly reconstructed and traffic soon resumed; however, within a month shoulder erosion was reoccurring, threatening to again encroach on travel lanes.

The movement of the highly erosive beach sands caused the roadway to collapse, in some places across the entire width of the two lane road.

FDOT immediately sought to implement a short-term (1-2 years) cost-effective solution to protect the roadway and minimize sheet erosion of the front slopes and shoulders until a more permanent plan could be developed. Due to the proximity of the highway to the ocean and high exposure to saline-laden moisture and wind, the vegetation used had to be a salt-tolerant species. The design chosen had to allow for possible paving of the shoulders in the future.

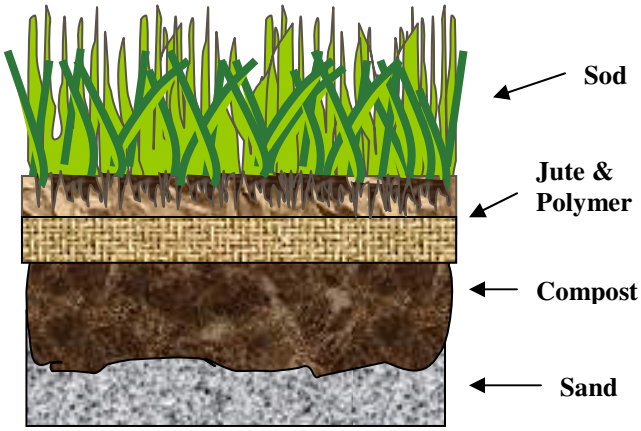
Initially considered was a turf reinforced matting (TRM) design, but it did not fulfill the project requirements or specific site challenges. It was also a costly option, with an estimated cost of $15 per square yard, or $765,000 for the TRM material alone.

Josh Boan and Michael Shepard with FDOT consulted with Applied Polymer Systems and developed a soft armoring countermeasure that was cost-effective while meeting all of the design objectives. This application was also much more cost-effective, with a total project cost of $744,650. The design consisted of the removal of the existing turf and regrading of the shoulders and front slopes, installation of a polymer enhanced soft armoring system with sod, and protection with temporary silt fence at the base of the front slope.

Once the shoulder area was regraded, two inches of nutrient-rich compost material was spread out. This compost layer provided the necessary nutrients to help establish and sustain the soil-stabilizing vegetation.

Right: A layer of compost material, covered with jute matting and Silt Stop powder, was applied before laying the sod.

Below: A cross-section diagram of the soft armor application.



Over the layer of compost, open-weave jute matting and the correct soil-specific APS 705 Silt Stop powder was applied at a rate of 50 pounds per acre. Bermuda grass sod was laid over the jute matting. The jute matting provided an initial attachment surface for the polymer powder, which immediately bound to the surrounding soil and compost layers, instantly creating a highly erosion-resistant matrix that provided structural support while the vegetation was established.

Over one year later, in August 2006, the soft armoring technique is still performing well, requiring little maintenance and successfully mitigating coastal erosion. The application sustained two major storm events, a category 1 hurricane as well as a tropical depression, with total survival of the road. This single application had added savings to FDOT because it prevented the road from having to be rebuilt or repaired after these storms.

Over time, the jute blanket has biodegraded and the sod vegetation has continued to establish root structure into the underlying topsoil. The shoulder areas along US Highway 98 are so well stabilized that they can now be used as access to the waterfront without fear of erosion. The level of performance of this type of soft armor application far surpassed the expectations of FDOT.

The shoulder of Highway 98, over 8 months after the application, is still stabilized and has held up to the extreme weather conditions of the Florida coast.