

Case Study

application	Levee Repair	job owner	Running Y Ranch –Klamath Falls, OR
location	Klamath Falls, OR	engineer	Kleinfelder --Bend, OR
product	Mirafi® 1160N HP370 & Miragrid® 20XT	contractor	Hap Taylor & Sons, Inc. Bend, OR

TenCate develops and produces materials that function to increase performance, reduce costs and deliver measurable results by working with our customers to provide advanced solutions.

THE CHALLENGE

The Geary Dike separates Caledonia Marsh from Upper Klamath Lake in Southern Oregon. It unexpectedly breached on June 7, 2006 flooding 2800 acres of farmland and 3 holes at the Running Y Golf Course. Running Y Ranch decided to repair the dike in fall 2006 so their lands could be dewatered by Spring 2007.

THE DESIGN

Design tasks consisted of site recon, subsurface investigation, mapping, and civil design. Subsurface conditions consisted of very soft diatomaceous silt and clayey silt to an estimated 200 feet. A bathymetric survey revealed the breach scoured a long channel up to 24 feet deep. Resulting design challenges were the risk of foundation failure using single stage construction and the scour feature forcing the dike repair into deeper water.

Viable dike repair methods were reduced to building an earthen embankment, sheet piling,

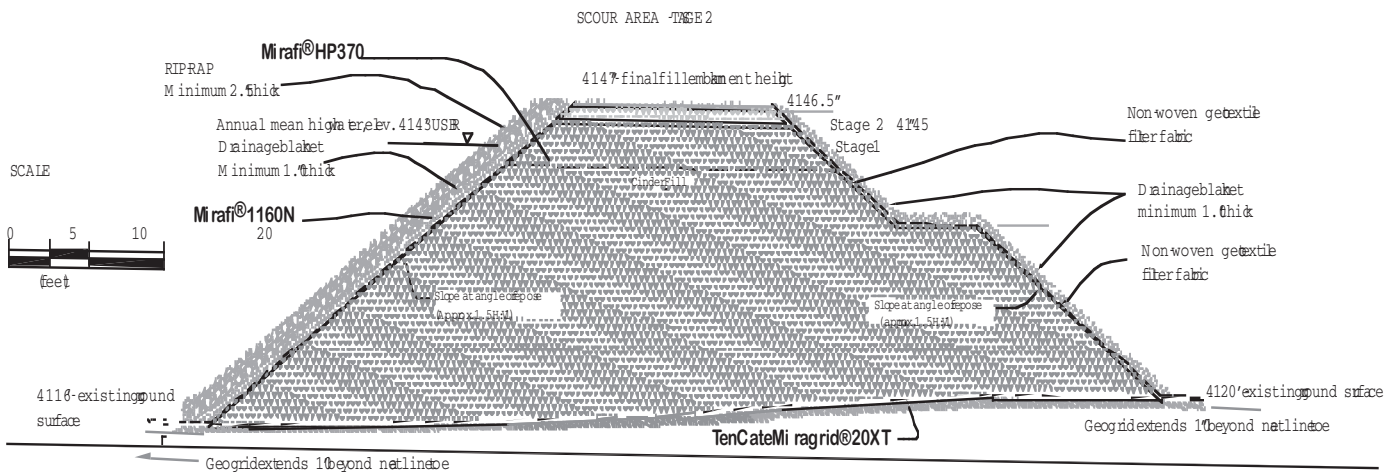
and a combination of these methods. Hap Taylor, the contractor suggested using light-weight volcanic cinders to mitigate the embankment instability issues and potentially allow embankment construction in a single stage. However, the light-weight fill was highly susceptible to erosion and vulnerable to seismic liquefaction. Embankment stability was improved using a combination of Miragrid® 20XT and Mirafi® HP370. Mirafi® 1160N non-woven geotextile, and riprap provided drainage and erosion protection.



Failed dike and tension cracks on the failing edge.



Repaired dike.



THE CONSTRUCTION

Hap Taylor and Sons, Inc. was able to use the very strong Mirafi® Miragrid® 20XT polyester geogrid to establish a base to begin embankment construction. The geogrid was placed using a long-boom extend hoe out into the water. Due to the density of polyester, the geogrid would sink to the bottom of the flooded area, so the contractor could begin placing the lightweight fill. Once the fill was above the water level a layer of Mirafi® HP370 was placed to gain a stable base to continue filling above the waterline. As the embankment was filled to the desired level, a layer of Mirafi® 1160N non-woven geotextile was placed on the outside of the embankment and sunk to the bottom of the fill area using rebar attached to the ends of the textile. Embankment armor was then placed over the Mirafi® 1160N to protect from major scouring and erosion.

THE PERFORMANCE

By placing the embankment sideslopes at the angle of repose, overcame equipment reach limitations and minimized earthfill quantities. Embankment stability was improved using Miragrid® 20XT. Mirafi® 1160N nonwoven geotextile, and riprap provided drainage and erosion protection. Soil improvement by soil mixing, soil grouting, or vibro-compaction was proposed to improve liquefaction resistance. The use of geotextiles for this dike repair was the most constructable and effective permanent solution to a significant problem.



The new dike with the riprap sides.



Geary Dike repair, December 28, 2006.

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