

application

location

product

Sludge Pond Capping

Du Pont Cherry Island - Wilmington, DE

Mirafi® HP570

THE CHALLENGE

High water content, fine-grained sludges have posed disposal problems for engineers throughout history. The DuPont Cherry Island Cell 3, located in Wilmington, Delaware, has served as a sludge disposal site for the DuPont Edge Moor facility. Usually their low shear strength combined with the magnitude of the proposed overburden loads require the sludge to be stabilized before it can be covered. Although numerous ground modification techniques such as soil mixing, grouting and chemical stabilization are available, these techniques are site specific, costly, and time-consuming.

THE DESIGN

The design engineer determined that a reinforcement layer was required to counter instability in the sludge that may result from the rapid placement of the necessary overburden. The need to reinforce the sludge resulted from the owner's agreement with the state to place a cover system over the facility at an accelerated schedule. Because of the high ultimate strength and cross-direction seam strength necessary to facilitate the construction of the closure system, a woven polypropylene geotextile, Mirafi® HP570, was chosen to reinforce and separate the sludge. The Mirafi® HP570 geotextile provided an ultimate wide-width tensile strength of 70kN/m (400 lbs./in). and a cross-direction seam strength of over 43kN/m (250 lbs./in).

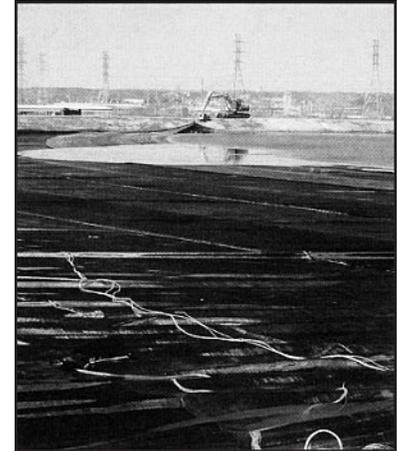
The Mirafi® HP570 geotextile was placed directly on the unstable landfill sludge with the intention to load the geotextile with a free draining embankment soil to induce excess pore water pressure in the underlying

sludge. The sludge would then expel its bound water pressure and subsequently gain strength. The primary purpose of the geotextile is to support the embankment soil and act as a separator, keeping the embankment soil free of fine-grained material and drainable.

CONSTRUCTION

The geotextile arrived on-site in prefabricated rolls 140m (456 ft) long and 4.5m (15 ft) wide. The panels of geotextile were unrolled and accordion sewn in the field along their edges by the TC Mirafi expert sewing crew using a trailer-mounted sewing machine. The geotextile was deployed in two stages from the south end of the cell to the north berm. With the aid of a steel cable threaded through the half-way point of the accordion sewn geotextile panel, the initial pull resulted in a double ply of geotextile covering the southern half of the soft sludge area. The top ply of the geotextile was then unfolded from the bottom ply, with the aid of a second cable sewn into the leading edge of the top ply of geotextile. The geotextile was pulled taut over the berms of the cell using laborers, a small backhoe and a small bulldozer. It was anchored with 0.9m (3 ft) of overburden soil on the north and south ends, and 15cm (6in) along the east and west berms. The geotextile deployment and anchoring was completed in less than two days.

After placement of the geotextile, low ground pressure bulldozers began placing a two-foot thick layer of stabilized sludge material over the geotextile, beginning at the more stable south end. The sludge fill was placed in a finger-palm configuration to allow tensioning of the geotextile perpendicular to the seam. The fine-



Deployment of HP570

grained sludge had been stockpiled on-site, awaiting land filling in Cell 3. The stabilized sludge fill was used in an effort to save cost by eliminating select granular fill material.

The sludge fill proved to be unstable and did not allow for adequate drainage of expelled water from the underlying sludge. Concerns about seam over-stressing and large vertical settlements resulted in a decision to replace the stabilized sludge backfill with a granular, free-draining lightweight fill with a unit weight of 1200kg/m³ (75 lbs./ft³). Final grade was then achieved with a pug-milled lightweight residual material.

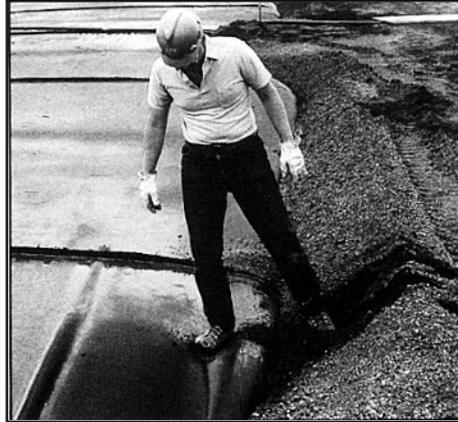
JOB OWNER
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PERFORMANCE

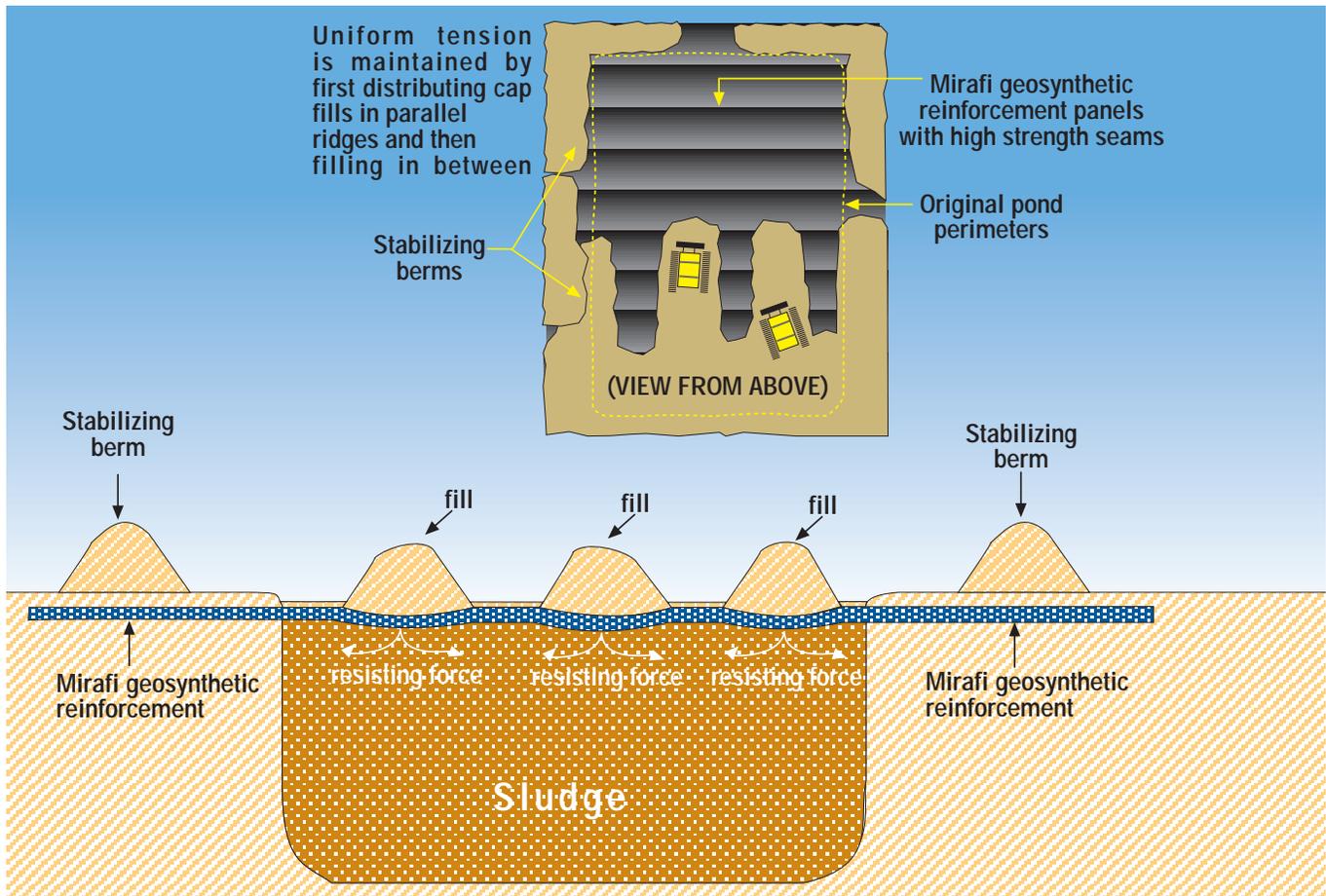
There is a growing initiative to cover and isolate waste disposal facilities rather than exhume and treat the waste. Geotextiles can be successfully used as reinforcement to help facilitate construction of a landfill closure over "zero strength" sludge. Geotextiles provide a shortened schedule and significant cost savings versus stabilization of the sludge. It is also shown that a large plot 3.5 hectares (8.6



Successful Performance of Mirafi® HP570

acres) facility can be efficiently closed with the aid of a geotextile reinforcement layer. This project has highlighted the most critical considerations for sludge pond capping which includes using a geotextile with a high cross-direction seam strength, and placing a lightweight free-draining fill material on top of the geotextile with lightweight ground pressure equipment.

Typical cross-section of sludge pond capping



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