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A CENTURY OF SERVICE

2019 Palmdale Ditch Maintenance, Repairs & GCL Test Installation

Chris Bligh
Facilities Manager
April 8, 2019

AGENDA ITEM NO. 5.1

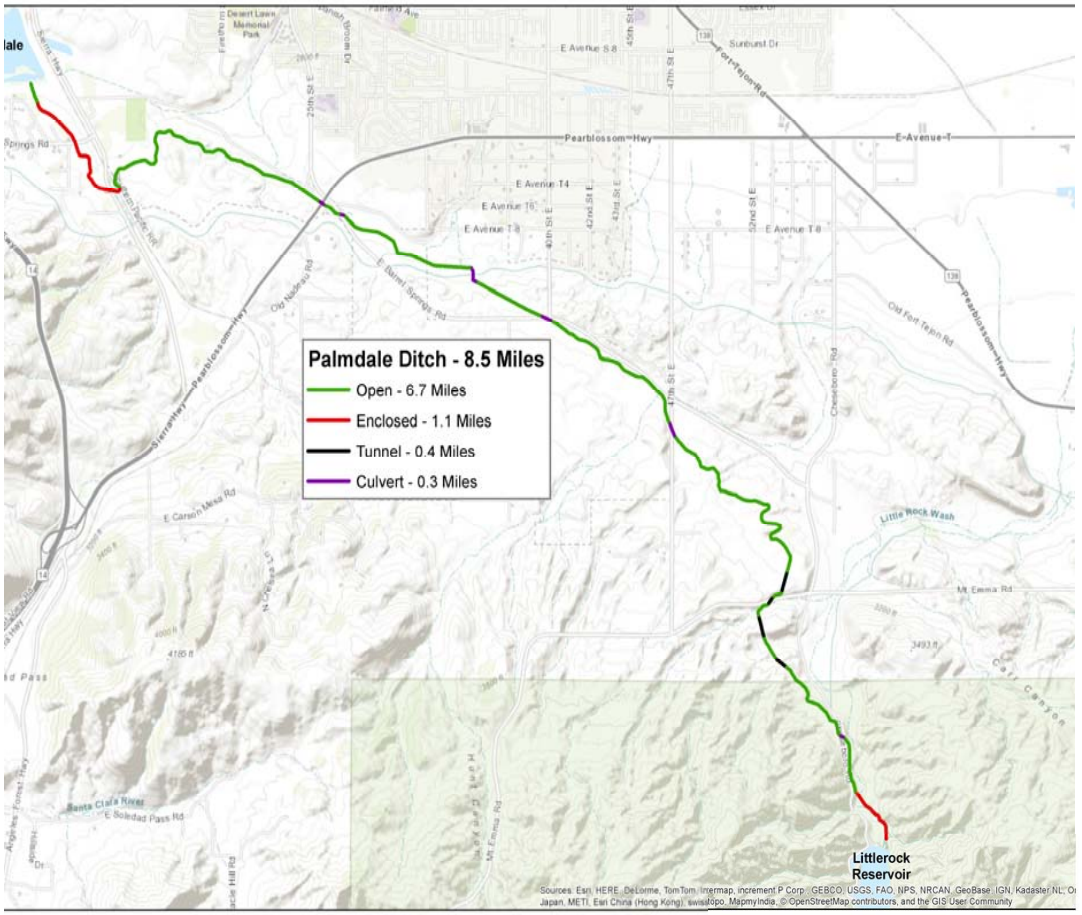


2019 Palmdale Ditch Maintenance Goals

- Annual debris removal, prior to flow from LRD to Lake Palmdale
- Small section-widely scattered concrete replacement
- Large panel concrete replacement
- Geosynthetic clay liner test area installation

Palmdale Ditch
8.5 Miles

- Open Channel – 6.7 Miles
- Pipeline – 1.1 Mile
- Tunnels – 0.4 Miles
- Culverts – Road Under Crossings - 0.3 Miles



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Debris Removal

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Debris removal, from light to heavy





Final Results





Concrete Repairs

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Bagged mix for small areas -
Concrete truck & pump for large areas





Small section replacement procedure.





Small finished sections: Approximately 250 sq. ft.





Preparation for larger concrete pours.





Pumping larger panels





Finished large sections: Approximately 1,300 sq. ft.









Geosynthetic Clay Liner Test Installation (GCL)

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The area of installation of the Geosynthetic Clay Liner, or GCL is approximately 170 linear ft.







Average water loss over the 8.5 miles of water travel is approximately 30%

High water loss area for test











Final Goal Achieved
April 1st 2019

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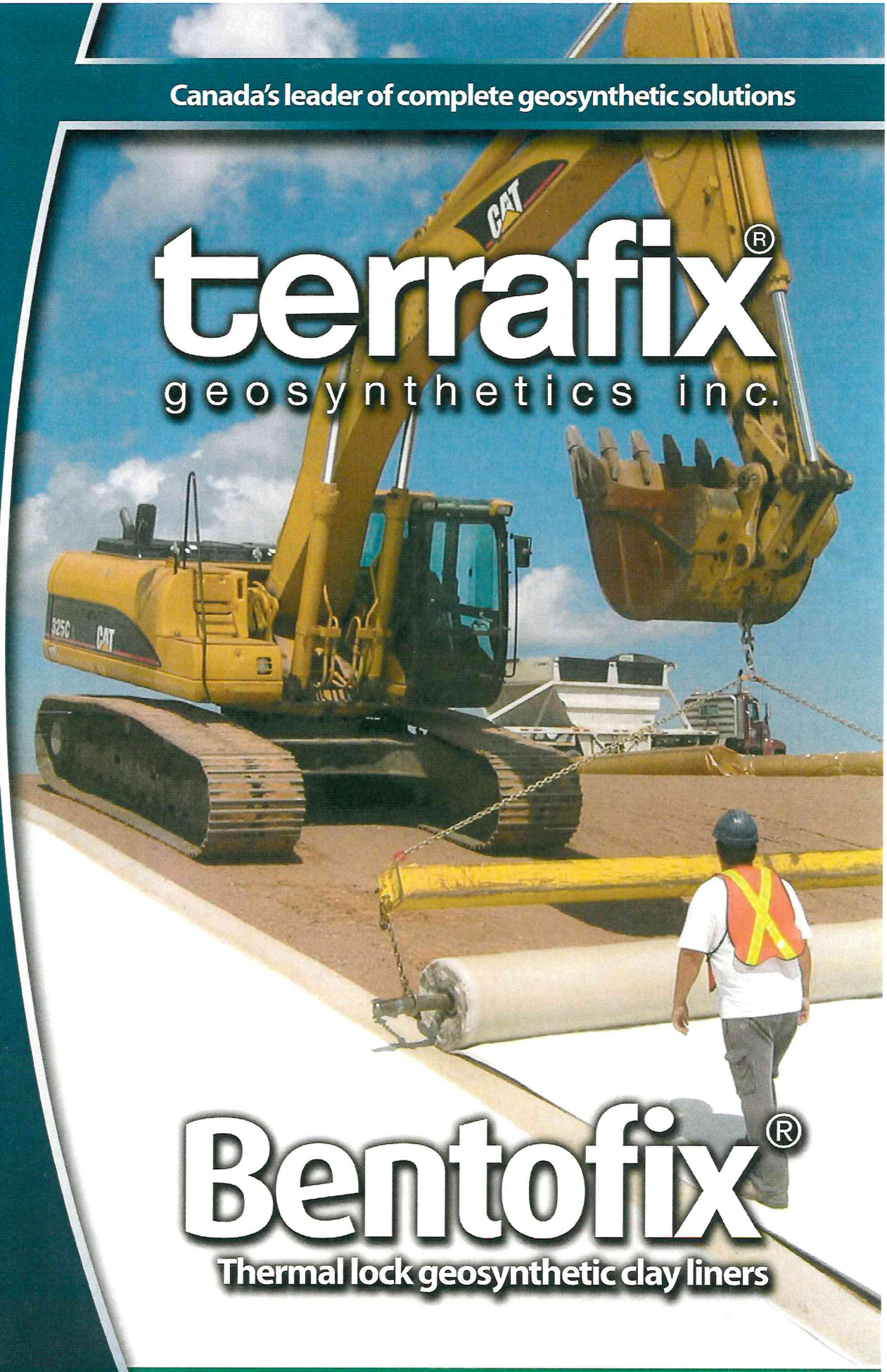
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QUESTIONS?
PWD
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Canada's leader of complete geosynthetic solutions

terrafix®

geosynthetics inc.



Bentofix®

Thermal lock geosynthetic clay liners

terrafix®
geosynthetics inc.

To view our complete product line visit us at www.terrafixgeo.com

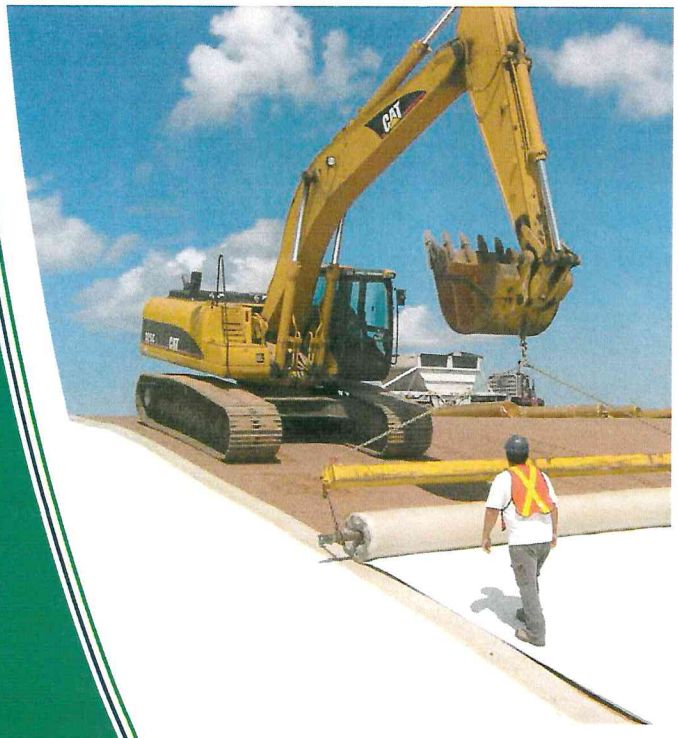
terrafix® Thern

geosynthetics inc.

Bentofix® Thermal Lock Geosynthetic Clay Liners (GCLs) are needle-punched reinforced composites which combine two durable geotextile outer layers with a uniform core of natural sodium bentonite clay to form a hydraulic barrier.

The sodium bentonite clay utilized in Bentofix® Thermal Lock GCL is a naturally occurring clay mineral that swells as water enters between its clay platelets. When hydrated under confinement, the bentonite swells to form a low permeability clay layer with the equivalent hydraulic protection of several feet of compacted clay.

Bentofix® GCLs are produced by distributing a uniform layer of the sodium bentonite between two geotextiles. Fibers from the non-woven geotextile are then needle-punched through the layer of bentonite and incorporated into the other geotextile (either a woven or a non-woven). This process results in a strong mechanical bond between the fabrics. A proprietary heat treating process - the Thermal Lock process - is then used to modify and more permanently lock the needle-punched fibres into place. Properties include increased internal shear resistance and long term creep resistance.



Superior GCL Performance

Since the late 1980s, GCLs have been specified and used by design engineers, contractors, agencies, and owners as an alternative to soil barriers in various applications.

The growing interest in these products stems from the unique properties and advantages they offer. They are very effective as a hydraulic barrier even under high gradient conditions; they are easy to install; more robust against installation stresses and can withstand elongation as well as settlement stresses without significant impact on hydraulic performance.

The wide range of GCL uses include landfill caps and base liner applications, dams, canals, ponds, rivers and lakes, and even waterproofing of buildings and similar structures. Numerous laboratory studies have shown the excellent performance capable with natural sodium bentonite GCLs.



Multi-Functional

By needle-punching fibres through the sodium bentonite clay layer, a completely uniform, reinforced GCL is produced - with shear strength and stability advantages important to any application, such as:

- Golf course ponds.
- Stormwater management ponds.
- Recreational ponds.
- Landfill cap closures / base liner.
- Dams/dikes.
- Vertical trench cutoff Barrier.
- Groundwater protection cover.
- Environmental protection barrier under roads and railways.
- Secondary containment for above ground tanks.

nal Lock Clay Liners







Efficient

Bentofix® Thermal Lock GCLs represent a cost effective solution, which is both simple and economical. To install, a core bar is inserted through the core, and the roll is suspended from a spreader bar. Ease of installation using a spreader bar allows the contractor to roll out the Bentofix® rolls with a minimal amount of labour. Please contact our technical team for detailed installation recommendations.

One truckload of GCL can carry over 6,000 m^2 compared to a truckload of native clay which will only cover an area of 40 m^2 (based on a 50 cm compacted clay layer).

Conclusion

Simple, cost-effective installation techniques make Bentofix® Thermal Lock GCL a practical alternative to a compacted clay liner or other lining systems. GCLs do not require an experienced installation contractor and can be installed by a local general contractor. Site supervision is offered by either your local geosynthetic representative and/or provided by our technical staff.









Bentofix®

Thermal Lock Clay Liners

- The industry's only Thermal Lock Geosynthetic Clay Liner
- The industry's only Scrim-Reinforced Geosynthetic Clay Liner
- The only Canadian made Geosynthetic Clay Liner
- Now available as a geomembrane

Features and Benefits

As a replacement for thick clay liners or as a replacement to geomembranes, whether as part of a composite liner or as a stand-alone liner, GCLs offer several advantages:

- Installation is relatively simple, requiring unrolling and lapping of adjacent panels, as opposed to the placement, compaction, and detailed testing of multiple lifts of clay materials comprising a clay liner.
- Due to the significantly reduced thickness, GCL's either require less excavation to develop a given containment volume, or consume a significantly reduced portion of the available containment volume.
- No welding or seaming required.
- Due to the simplified installation process, it is possible to place the covering layer immediately upon placement of the GCL, whereas multi-lift clay layers could take several days or weeks to install, during which time the liner is susceptible to the elements, especially precipitation and freezing temperatures, which can usually lead to considerable rework or repair.
- No additional protective layers such as additional textiles are required for GCLs due to its self healing characteristics, whereas other geomembranes will require protective layers such as thick textiles to avoid punctures.

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Thermal lock geosynthetic clay liners. Made in Canada

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Fax (416) 674-1159

Sept 2010 • 1446

The Use of Bentofix® in Dams

Power Dam Sainte-Marguerite, Quebec, Canada

BENTOFIX®

The following example illustrates a project using a needlepunched geosynthetic clay liner (GCL) as a stand-alone sealing barrier for a retention dam built for Sainte-Marguertie hydroelectric dam.

The construction took place during the winter and a GCL was used due to lack of natural sealing material with a low hydraulic conductivity.

The Sainte-Marguerite dam (90 km north of Sept-Iles) is a structure built up to a height of 20 m (from the riverbed) of which the imperviousness is assured by a Bentofix® Geosynthetic Clay Liner (natural sodium bentonite sandwiched between two non-woven geotextiles and needlepunched together).

The cross-section of the dam is:

- Foundation made of a 20 cm thick layer of coarse sand compacted by means of explosives and dynamic compaction.

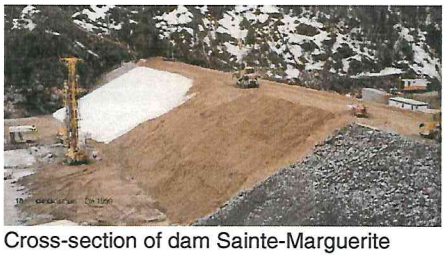
- Water tight trench with a maximum depth of 65 m, built by means of a "jet grout" high energy injection through 20 m compacted sand, 40 m coarse sediments lying underneath and 5 m into the rock

- Sealing with Bentofix®.

- A 1 m protection backfill in two layers, comprising sand, gravel and stones covers the Bentofix®.



Bentofix® cross-section used in Dam Sainte-Marguerite


Cross-section of dam Sainte-Marguerite

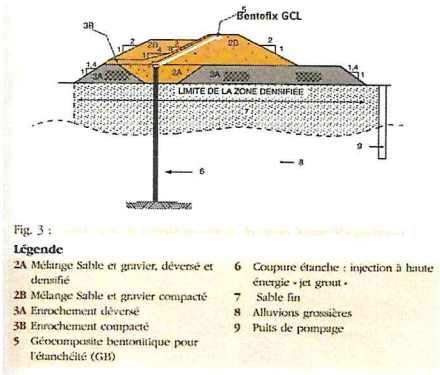


Fig. 3 :

Légende

2A Mélange Sable et gravier, déversé et densifié
2B Mélange Sable et gravier compacté
3A Enrochement déversé
3B Enrochement compacté
5 Géocomposite bentonitique pour l'étanchéité (GB)
6 Coupure étanche : injection à haute énergie - jet grout -
7 Sable fin
8 Alluvions grossières
9 Puits de pompage

Soil placement on Bentofix®

Extract from Geoglobe No. 6, 1999
By Yousef Hammamji, ing., M.ing.
Hydro-Quebec Hydraulics and Geotechnical Division

Year of construction: 1999

City / Country: Sainte-Marguerite, Quebec, Canada

Installed products:

Bentofix® NW (B4000) 5.000 [sqm]

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ARROW CONSTRUCTION PRODUCTS LIMITED ISO 9001 REGISTERED 2000

CASE HISTORY: FLY ASH CAP, NOVA SCOTIA POWER LINED WITH A GEOSYNTHETIC CLAY LINER (GCL), BENTOFIX GEOMEMBRANE CNSL.

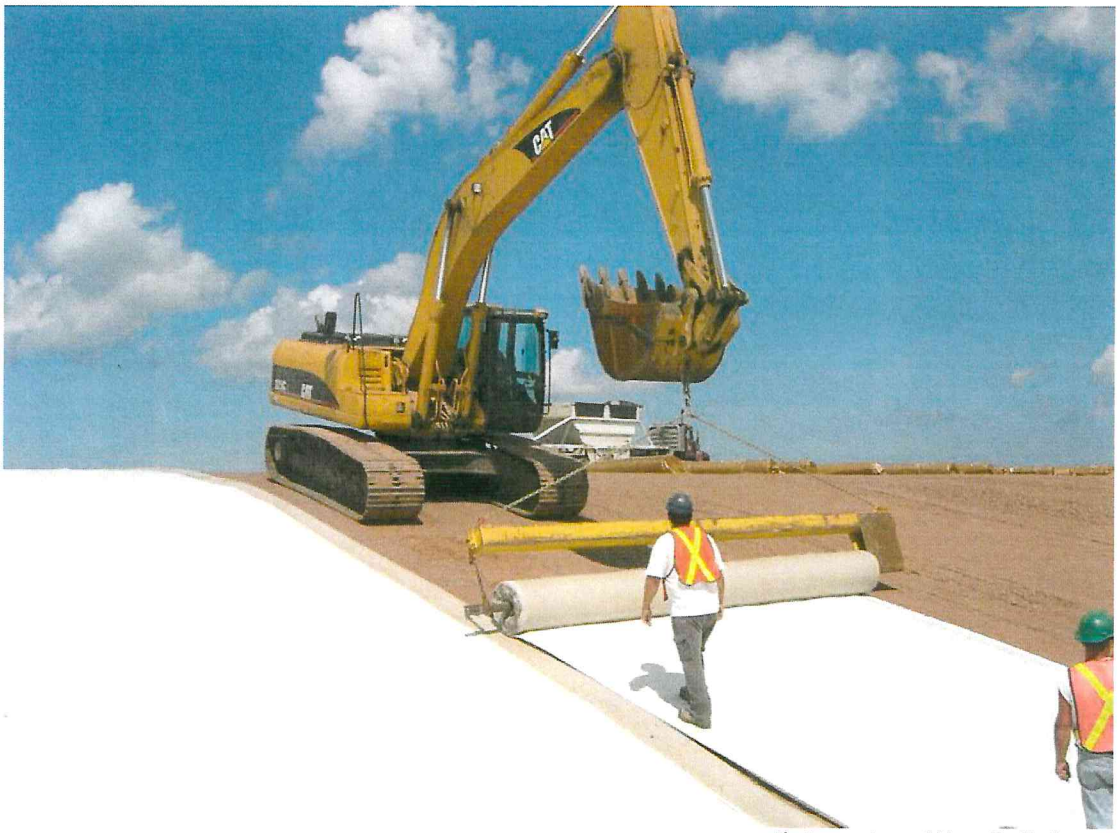


Photo courtesy of Nova Scotia Power.

BACKGROUND: Faced with finding an alternative to clay, Nova Scotia (NS) Power selected a Geosynthetic Clay Liner (GCL), to close their fly ash containment cell during the summer of 2004. The challenge was to find a liner which would meet or exceed the properties of a compacted clay liner (CCL), but to find a liner that could be installed by a local general contractor without the help of outside labour forces. Bentofix Geomembrane CNSL not only provided NS Power with a material that provided a low permeability of 5×10^{-13} cm/sec but also provided NS Power to close an area of 100,000 sq.m. within a month compared to 20,000 sq.m. done the previous year with a compacted clay liner. Each truckload of Bentofix provided 6,474 sq.m. of material compared to over 160 truckloads of clay to cover this same area (based on a 50cm thick clay / 40 sq.m. per truckload). Arrow Construction with the help of their supplier, Terrafix Geosynthetics, provided initial assistance to satisfy both the owner, NS Power, and the contractor, with a proper quality control and assurance (QA/QC) procedure, but also provided the equipment (two spreader bars) to increase the installation time.

Since the late 1980s, GCLs have been specified and used by design engineers, agencies and owners as an alternative to soil barriers in various applications. For further information on GCLs to close your landfill and/or other lining applications such as ponds please contact your local Arrow representative in Atlantic Canada or visit www.bentofix.com