

June 5, 2012

Mr. Marinus Verhagen

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Subject: Geotechnical Investigation – Asbestos Disposal Area
Verhagen C & D Site, McLellans Brook, NS
Our ref.: 14547

Mr. Marinus Verhagen:

LVM/Maritime Testing Limited (LVM-MTL), at the request of M. Verhagen Enterprises, has conducted a geotechnical investigation for of a new asbestos disposal area at the above-mentioned site. The purpose of the work was to investigate the subsurface conditions at the new cell area, and evaluate the site soils for use as a low permeable liner.

BACKGROUND INFORMATION

An asbestos disposal area at the Verhagen C & D site in McLellans Brook Nova Scotia is proposed for construction. From discussion with the owner, the new cell will be created through a mass cut into the site native glacial soils. It is understood that the soils underlying the new asbestos disposal cell must meet a maximum permeability requirement of 1×10^{-5} cm/sec and must be present for a minimum thickness of 1 metre. From review of design drawings the new cell will likely be at a maximum depth of 3 metres below existing ground surface. It is understood that the asbestos waste must be covered with a minimum of 200 mm of low permeable soil on a daily basis. The approximate location of the new asbestos disposal cell is shown on the attached Figure 1.

INVESTIGATION PROCEDURE

The field work for this investigation was carried out on May 9 and 11, 2012, when nine (9) test pits were excavated at the locations shown on the enclosed Figure 1. Test pits were put down with a track-mounted excavator and terminated at maximum reach of the excavator or within competent soil strata.

The investigation was carried out by qualified field engineering personnel who located and logged all test pits.

Grab samples were obtained during the test pitting and transported to LVM/Maritime Testing's Laboratory in Dartmouth for routine index testing and classification. Approximate test pit locations are indicated on the enclosed site plan. An explanation of terms and symbols used is provided in Appendix 1. Detailed records of the subsurface conditions are provided on the Test Pit Logs in Appendix 2. Laboratory Testing results are provided in Appendix 3.

SUBSURFACE CONDITIONS

In summary, the subsurface conditions throughout the site are generally similar. Below the rootmat/topsoil, undisturbed site native glacial soils were encountered at all test pits. The glacial till deposit was fine-grained and varied from silty sand, some gravel with trace to some clay to silty clay, some sand with trace gravel. Occasional to some cobbles were also present in the glacial unit. The glacial till was in a moist condition and compact to dense state of relative density. The glacial till was proven to a total depth of 6.1 metres at all test pits, except TP 2. Bedrock and groundwater were not encountered during the current investigation.

Laboratory gradation testing of select till samples indicated a material with 7 to 22 percent gravel, 18 to 36 percent sand and a fines (i.e. silt and clay sizes) content of 42 to 75 percent. The results of moisture content testing performed on select till samples indicated 10.3 to 14.7 percent.

The coefficient of permeability (k) of select samples of the site native till based on the Flexible Wall Permeameter (Remoulded) ranged from 3.6×10^{-8} to 3.0×10^{-8} cm/sec. The observed low permeability of the site materials are consistent with previous testing conducted for construction debris cells at the property.

RECCOMENDATIONS

From field observations and laboratory testing, the site native glacial soils meet the required specification of 1×10^{-5} cm/sec for use as a low permeable liner. Following mass excavation to design grades, the exposed subgrade should be proof-rolled with a large vibratory drum roller to recompact the surface of the liner following excavation. For design, it is recommended that "interior" embankments have side slopes not exceeding 2:1 (horizontal to vertical). Flatter slopes may be necessary to facilitate equipment access for liner preparation.

SUMMARY

The in situ soils throughout much of the site typically have a low permeability characteristic. Available laboratory test results suggests that the site soils in remoulded form would have a coefficient of permeability in the order of 3.6×10^{-8} to 3.0×10^{-8} cm/sec, which is below the specified permeability of 1.0×10^{-5} cm/sec. We expect that after cell preparation, in situ permeability would be less than 1.0×10^{-7} cm/sec.

The test pit investigation has been undertaken in the area of the new asbestos cell and test pits have been terminated approximately 2 to 3 metres below anticipated cell elevations. At the test pits low permeable soil has been encountered, however isolated sand seams of higher permeability are possible within the glacial soils. If these soils are encountered during the construction of the cell they should be removed and replaced

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with select low permeable soils.

We trust that the enclosed information meets with your satisfaction. If, however, additional information should be required, please contact the undersigned.

Yours very truly,
LVM/Maritime Testing Limited

S. A. Simms, M.Eng., P.Eng.

Team Leader
Geotechnical Engineering

Encl.

document 14547-1

TABLE 3-1: SUMMARY OF LABORATORY DATA
Geotechnical Investigation
Proposed Asbestos Disposal Cell, VerHagen C & D Facility, MacLellans Brook, NS
MTL Project No. 14547

| Test Pit No. | Sample No. | Depth (m) | Description | Moisture Content (%) | Particle Size Distribution | | | Permeability (cm/s) |
|--------------|------------|-----------|--|----------------------|----------------------------|----------|-----------------------------|---------------------|
| | | | | | Gravel (%) | Sand (%) | Fines (silts and clays) (%) | |
| TP 1 | 1 | 3 - 3.6 | TILL : silty clay, some sand, trace gravel | 10.3 | 7 | 18 | 75 | 3.00E-08 |
| TP 4 | 1 | 1.2 - 1.8 | TILL : silty clay, some sand, some gravel | 14.7 | 13 | 27 | 60 | |
| TP 5 | 2 | 3.6 - 4.0 | TILL : silty clay, some sand, some gravel | 10.5 | 14 | 23 | 63 | |
| TP 9 | 1 | 1.8 - 2.4 | TILL : silty sand, some gravel, trace to some clay | 14.2 | 22 | 36 | 42 | 3.60E-08 |