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June 16, 2000

Hendrikus Schraven Landscape Construction & Design/Soil Dynamics
14461 Tiger Mountain Road S.E.
P.O. Box 1289
Issaquah, Washington 98027

Attn: Mr. Hendrikus Schraven

RE: DIRECT SHEAR TESTS ON ESSENTIALSOIL™ AND PEAT PRODUCT

Dear Mr. Schraven:

At your request we performed a series of direct shear tests on EssentialSoil™ and locally available 3-way topsoil blend. You provided both materials. Following is a description of the test methods and results.

Soils:

The EssentialSoil™ is a patent-pending product and, as such, we do not know the composition. It was developed for its ability to stay on steep slopes, be erosion-resistant, allow moisture to flow through it, rather than over the top, and to grow plants extraordinarily well. For classification purposes, it has the appearance of a combination of peat with short fibers, some fine-grained organic soils and medium to coarse sand and fine gravel. It is generally blown or dumped onto the slope and is virtually never compacted. We measured the dry density by dumping the soil at a drained but not dried moisture content into a 5-gallon bucket and generally found it to be on the order of 60 pcf. We ran all tests at a dry density of 60 pcf, which should be the minimum density it has in the field and should provide the lower bound strength.

The 3-way topsoil blend is a commercially available organic material, which appears to be entirely organic or peat. We have called it a "peat product". The same approach used on the EssentialSoil™ was used on the peat product to get a lower bound density and therefore the lower bound strength.

Test Apparatus:

We used two different apparatus. The first one was a standard Wykeham Farrance direct shear machine with a 4-inch square box. After some modifications to improve low pressure accuracy

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the Wykeham Farrance machine worked well on the EssentialSoil™. Shear displacement rates of 0.012 and 0.023 in/min were used with no apparent differences in results.

The displacement to failure was too high for the Wykeham Farrance machine to give accurate answers on the peat product. Therefore, we constructed a 10-inch-square load-controlled, direct shear box specifically for the peat product tests. This allowed us to work with higher total forces and limit the edge effects thereby giving more accurate results.

Sample Preparation:

Both materials were allowed to drain but not air dry. The samples were placed in the appropriate sample boxes by loose dumping the materials and applying a small compactive effort to achieve the appropriate dry density.

Test Results:

We performed ten tests on the EssentialSoil™ and six tests on the peat product. Through this we learned that we could not accurately measure the strength under less than a 0.5 psi normal stress and that the 4 inch by 4 inch box was unacceptably small for the peat products. These tests were eliminated from the data pool leaving eight tests on the EssentialSoil™ and two tests on the peat product. A summary of the test results is shown on Figure A. The individual test results are shown on Figures 1 through 11.

Our software is specific to one particular type of testing apparatus and is very inflexible. Therefore the test results on the peat product in the 10 inch by 10 inch box show zero normal deflection whereas we did not actually make vertical deflection measurements. When using load-controlled test equipment the failure load is somewhere between the second to last and last load increment. We have shown the second to last point on the curves and the asymptote for the last load. The failure load was estimated between these two load values.

It is our understanding that the materials being considered are generally placed between 6 inches and 2 feet deep, and that the dry unit weight is on the order of 60 to 70 pcf. The strength is of primary concern when the slope is steep. Therefore, the normal stress of primary interest is on the order of 0.2 to 0.6 psi. The test results indicate that the strengths in this range of the two materials tested are as follows.

Soil	Cohesion	Internal friction
EssentialSoil™	0.31psi	39.4 degrees
Peat Product	0.07 psi	38.6 degrees

It is obvious from Figure A that the EssentialSoil™ is much stronger than the peat products under the conditions tested.

Thank you for the opportunity to serve you. If you have any questions, please call the undersigned at 206 695-6703.

Sincerely,

SHANNON AND WILSON, INC.

Thomas C. Kinney, Ph.D., PE
Vice President

Encl: Figures A and 1 through 11.