TREK GEOTECHNICAL Quality Engineering | Valued Relationships

December 01, 2016 File No. 1000-027-02

Mr. Brad Boyd
Quantum Murray
201 Portage Avenue - 18th Floor
Winnipeg MB
R3B 3K6

RE Dauphin River First Nation Wastewater Lagoon Construction – Lab Testing for Shelby Tube Samples

Brad Boyd from Quantum Murray LP (QM) requested that two Shelby tube samples be tested for hydraulic conductivity. The samples were identified as ST2 and ST12. A sample from each Shelby tube was extruded and tested using a flexible wall permeameter following ASTM D5080-10. The test report for each is attached and the calculated hydraulic conductivity values are as follows:

ST2 6.93×10^{-11} m/s (6.93×10^{-9} cm/s)
ST12 8.20×10^{-11} m/s (8.20×10^{-9} cm/s)

The test result presented is representative of the soil sample provided. The testing services undertaken by TREK constitutes testing services only and engineering evaluation or interpretation has not been undertaken, but is available upon request.

If you have any questions or require any additional information, please contact the undersigned.

TREK Geotechnical
Per:

PROVINCE OF MANITOBA
N. J. FERREIRA
Member
22884
REGISTERED PROFESSIONAL ENGINEER
Dec. 01, 2016

Nelson Ferreira, Ph.D., P.Eng.
Geotechnical Engineer

APEGM
Certificate of Authorization
Trek Geotechnical Inc.
No. 4877 Date: Dec. 01, 2016

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Hydraulic Conductivity Determination (Flexible Wall)

ASTM D5084-10

Project No.	1000-027-02	**Test Hole**	ST2
Client	Quantum Murray	**Trek Sample #**	N/A
Project	Dauphin River First Nation Wastewater Lagoon Construction	**Depth (m)**	7.5'-9.5'
		Sample Date	Jul 04, 2016
		Test Date	Nov 04, 2016 to Nov 27, 2016
		Technician	Paul Bevel

Specimen Details

Visual Classification Clay, silty, brown, moist, firm, high plasticity

Comments The specific gravity of the soil was assumed to be 2.75.

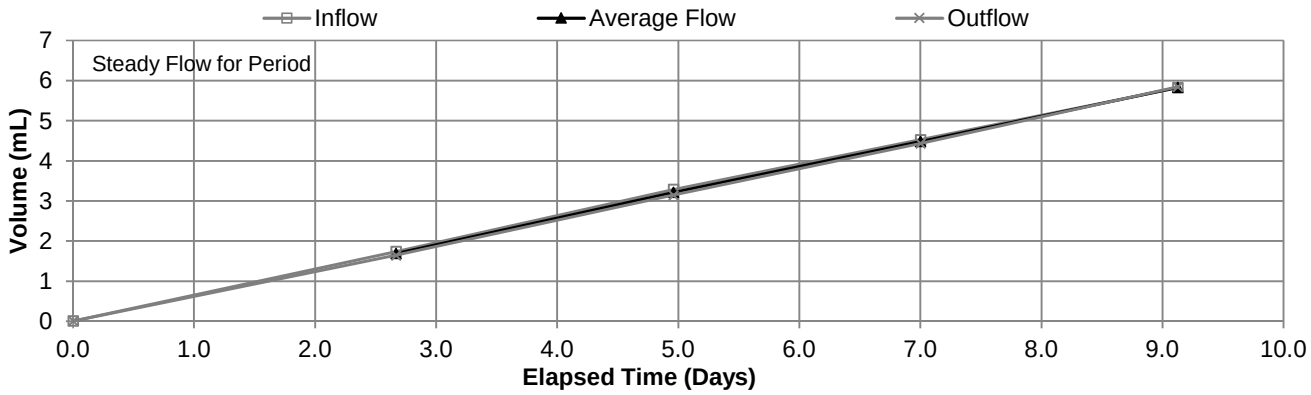
Atterberg Limits

Liquid Limit	Not Requested
Plastic Limit	Not Requested
Plasticity Index	Not Requested

Test Details

Permeant	Distilled, de-aired water
Method	Constant Head
Cell Pressure	124.8 kPa
Influent Pressure	90.3 kPa
Effluent Pressure	73.8 kPa
Gradient	24.74

Permeation Graph



Steady Flow Permeation Data

Time Increment (Days)	Elapsed Time (Days)	Flow (Q)		Inflow / Outflow Ratio	Average Flow (mL)	Temperature Correction	Corrected Hydraulic Conductivity, k_{20} (m/s)
		Influent (mL)	Effluent (mL)				
2.67	2.67	1.73	1.64	1.05	1.69	0.95	6.85E-11
2.29	4.96	1.55	1.50	1.03	1.53	0.96	7.30E-11
2.04	7.00	1.24	1.29	0.96	1.27	0.95	6.72E-11
2.13	9.13	1.30	1.41	0.92	1.36	0.94	6.83E-11

Average Temperature Corrected Hydraulic Conductivity, k_{20} (m/s) **6.93E-11** **(6.93×10^{-9} cm/s)**

Consolidation Data

	Average Height (m)	Average Diameter (m)	Moisture Content (%)	Dry Density (kN/m^3)	Degree of Saturation (%)	Cell Pressure	Back Pressure
Initial	0.0680	0.0715	30.1	14.7	99.1	124.8	73.8
Final	0.0682	0.0724	32.6	14.4	102.6	124.8	73.8

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Hydraulic Conductivity Determination (Flexible Wall)

ASTM D5084-10

Project No.	1000-027-02	**Test Hole**	ST12
Client	Quantum Murray	**Trek Sample #**	N/A
Project	Dauphin River First Nation Wastewater Lagoon Construction	**Depth (m)**	Unknown
		Sample Date	Aug 17, 2016
		Test Date	Oct 19, 2016 to Nov 14, 2016
		Technician	Paul Bevel

Specimen Details

Visual Classification Clay, silty, brown, firm, high plasticity

Comments The specific gravity of the soil was assumed to be 2.75.

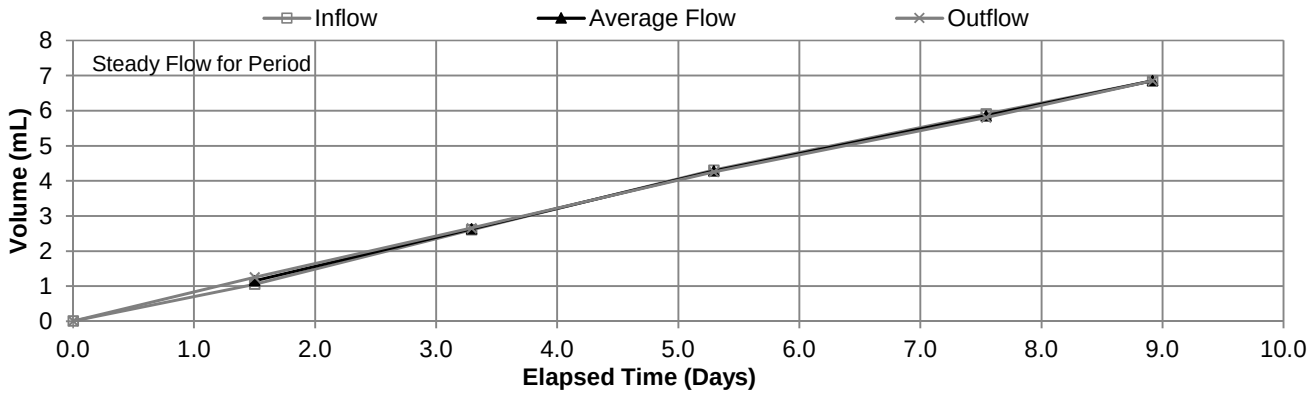
Atterberg Limits

Liquid Limit	Not Requested
Plastic Limit	Not Requested
Plasticity Index	Not Requested

Test Details

Permeant	Distilled, de-aired water
Method	Constant Head
Cell Pressure	124.1 kPa
Influent Pressure	92.4 kPa
Effluent Pressure	73.1 kPa
Gradient	25.18

Permeation Graph



Steady Flow Permeation Data

Time Increment (Days)	Elapsed Time (Days)	Flow (Q)		Inflow / Outflow Ratio	Average Flow (mL)	Temperature Correction	Corrected Hydraulic Conductivity, k_{20} (m/s)
		Influent (mL)	Effluent (mL)				
1.79	3.29	1.55	1.40	1.11	1.48	0.96	8.88E-11
2.00	5.29	1.70	1.60	1.06	1.65	0.95	8.79E-11
2.25	7.54	1.60	1.55	1.03	1.58	0.94	7.37E-11
1.38	8.92	0.95	1.05	0.90	1.00	0.95	7.75E-11

Average Temperature Corrected Hydraulic Conductivity, k_{20} (m/s) **8.20E-11** **(8.20x10^{-9} cm/s)**

Consolidation Data

	Average Height (m)	Average Diameter (m)	Moisture Content (%)	Dry Density (kN/m^3)	Degree of Saturation (%)	Cell Pressure	Back Pressure
Initial	0.0781	0.0718	24.1	16.1	98.9	124.1	73.1
Final	0.0782	0.0724	25.5	15.9	101.0	124.1	73.1