Boswick, Robert (SD)

From: Brett McCormac <bmccormac@jrcc.ca>
Sent: September-22-17 3:26 PM
To: Boswick, Robert (SD)
Cc: 'Brandon Loewen'; 'Terry Loewen'
Subject: RM of La Broquerie Lagoon - HC Results
Attachments: LTR_2017-09-21_La Broquerie Lagoon Expansion_1000-012-11_pb.pdf

Hi Rob,

Attached are the hydraulic conductivity test results from the RM of La Broquerie lagoon. All tests exceeded the licence requirements. Please review and provide approval to start utilizing the lagoon cells.

If you have any questions, please contact me.

Brett McCormac, P.Eng.
Environmental Engineer

JR Cousin Consultants Ltd.
Phone: (204) 489-0474
Fax: (204) 489-0487
www.jrcc.ca

***

The information contained in this email and any attachments is privileged, confidential and subject to copyright. It is intended solely for the use of the person(s) to whom it is addressed. If you receive this email in error, please notify the sender by return email and permanently delete it from your system. Note: We have taken precautions against viruses, but take no responsibility for loss or damage caused by any virus present.

TREK GEOTECHNICAL Quality Engineering | Valued Relationships

September 21, 2017 Our File No. 1000-012-11

Hermie Manalo
H. Manalo Consulting Ltd.
1402 Notre Dame Ave.
Winnipeg, Manitoba
R3E 3G5

RE La Broquerie Wastewater Treatment Lagoon Upgrade – Lab Testing for Shelby Tube Samples

---

Please see the attached Hydraulic Conductivity report. The Shelby tubes were identified by the client as ST-5, ST-6, ST-7 and ST-8. A sample was extruded from each Shelby tube and tested using a flexible wall permeameter following ASTM D5080-16. The test report for each is attached showing the calculated hydraulic conductivity values corrected to 20°C are as follows:

ST5 5.62×10^{-11} m/s (5.62×10^{-9} cm/s)
ST6 1.79×10^{-10} m/s (1.79×10^{-8} cm/s)
ST7 7.99×10^{-11} m/s (7.99×10^{-9} cm/s)
ST8 4.75×10^{-11} m/s (4.75×10^{-9} cm/s)

If you have any questions or require additional information or clarifications, please contact Angela at 204.792.8458.

Kind Regards,

TREK Geotechnical

TREK GEOTECHNICAL
www.trekgeotechnical.ca
1712 St. James Street
Winnipeg, MB R3H 0L3
Tel: 204.975.9433 Fax: 204.975.9435

Hydraulic Conductivity Determination (Flexible Wall)

ASTM D5084-16

Project No.	1000-012-11	**Test Hole**	-
Client	H. Manalo Consulting Ltd.	**Client Sample #**	ST-5
Project	La Broquerie Wastewater Treatment Lagoon Upgrade	**Depth (m)**	0.3 - 0.9
		Sample Date	August 22, 2017
		Test Date	September 01, to September 20, 2017
		Technician	Paul Bevel

Specimen Details

Visual Classification Clay, silty, trace silt inclusions (<5 mm dia.), brown, moist, firm, high plasticity

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

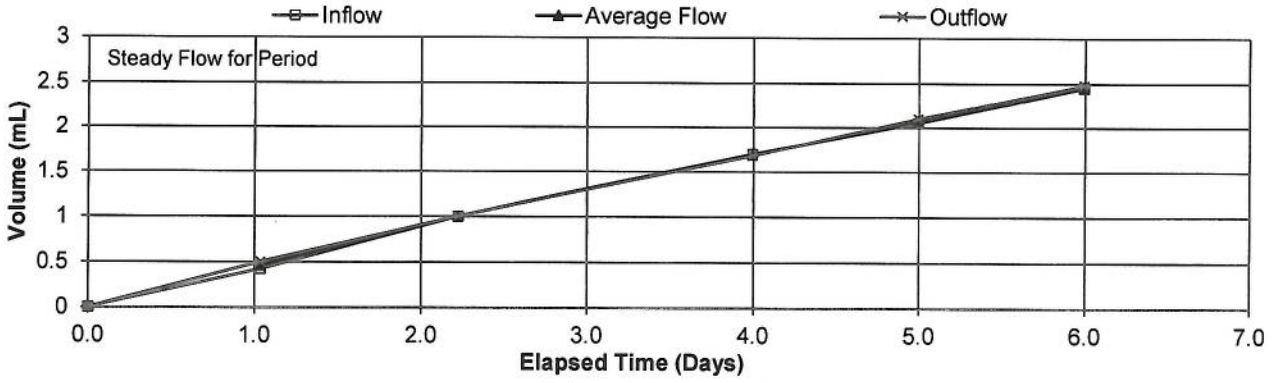
Atterberg Limits

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

Test Details

Permeant	Distilled, de-aired water
Method	Constant Head
Cell Pressure	100.0 kPa
Influent Pressure	84.1 kPa
Effluent Pressure	67.6 kPa
Gradient	19.98

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)				
1.19	2.22	0.58	0.50	1.16	0.54	1.01	6.52E-11
1.77	3.99	0.70	0.68	1.03	0.69	0.96	5.34E-11
1.00	4.99	0.35	0.42	0.83	0.39	0.98	5.38E-11
1.00	5.99	0.40	0.38	1.05	0.39	0.94	5.22E-11

Average Temperature Corrected Hydraulic Conductivity, k_{20} (m/s) **5.62E-11** **(5.62×10^{-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	0.0835	0.0723	50.2	11.1	97.1	100.0	67.6
Final	0.0845	0.0721	50.4	11.3	100.4	100.0	67.6

TREK GEOTECHNICAL
www.trekgeotechnical.ca
1712 St. James Street
Winnipeg, MB R3H 0L3
Tel: 204.975.9433 Fax: 204.975.9435

Hydraulic Conductivity Determination (Flexible Wall)

ASTM D5084-16

Project No.	1000-012-11	**Test Hole**	-
Client	H. Manalo Consulting Ltd.	**Client Sample #**	ST-6
Project	La Broquerie Wastewater Treatment Lagoon Upgrade	**Depth (m)**	0.3 - 0.9
		Sample Date	August 22, 2017
		Test Date	September 01 to September 20, 2017
		Technician	Paul Bevel

Specimen Details

Visual Classification Clay, silty, trace oxidation, mottled grey and brown, moist, firm, intermediate plasticity

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

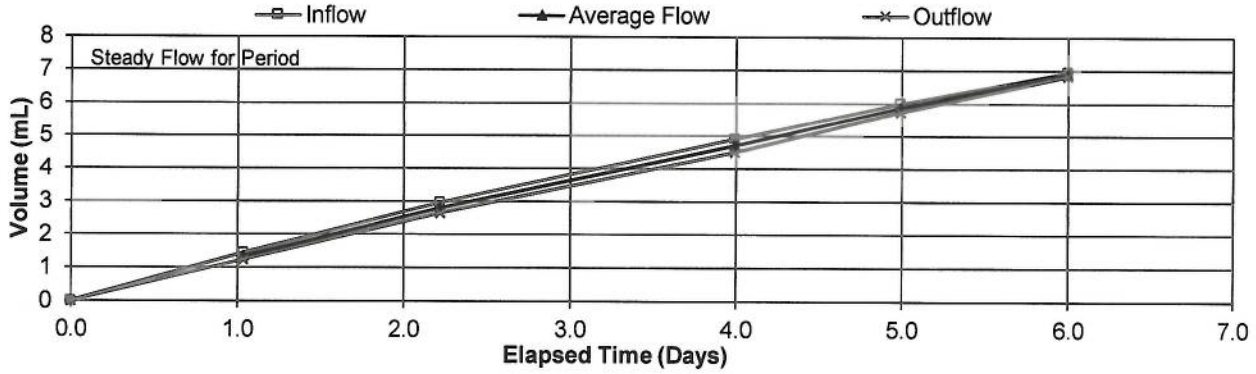
Atterberg Limits

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

Test Details

Permeant	Distilled, de-aired water
Method	Constant Head
Cell Pressure	100.0 kPa
Influent Pressure	82.7 kPa
Effluent Pressure	66.9 kPa
Gradient	17.51

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)				
1.19	2.22	1.50	1.40	1.07	1.45	1.01	2.00E-10
1.77	3.99	1.95	1.85	1.05	1.90	0.96	1.68E-10
1.00	4.99	1.10	1.25	0.88	1.18	0.98	1.88E-10
1.00	6.00	0.95	1.10	0.86	1.03	0.96	1.60E-10

Average Temperature Corrected Hydraulic Conductivity, k_{20} (m/s) **1.79E-10** **(1.79×10^{-8} 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	0.0923	0.0723	59.3	10.1	97.7	100.0	66.9
Final	0.0923	0.0720	63.5	10.0	103.0	100.0	66.9

TREK GEOTECHNICAL
www.trekgeotechnical.ca
1712 St. James Street
Winnipeg, MB R3H 0L3
Tel: 204.975.9433 Fax: 204.975.9435

Hydraulic Conductivity Determination (Flexible Wall)

ASTM D5084-16

Project No.	1000-012-11	**Test Hole**	-
Client	H. Manalo Consulting Ltd.	**Client Sample #**	ST-7
Project	La Broquerie Wastewater Treatment Lagoon Upgrade	**Depth (m)**	0.6 - 1.2
		Sample Date	August 22, 2017
		Test Date	August 31 to September 20, 2017
		Technician	Paul Bevel

Specimen Details

Visual Classification Clay, silty, trace sand, trace gravel (< 25 mm dia.), brown, moist, firm, high plasticity

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

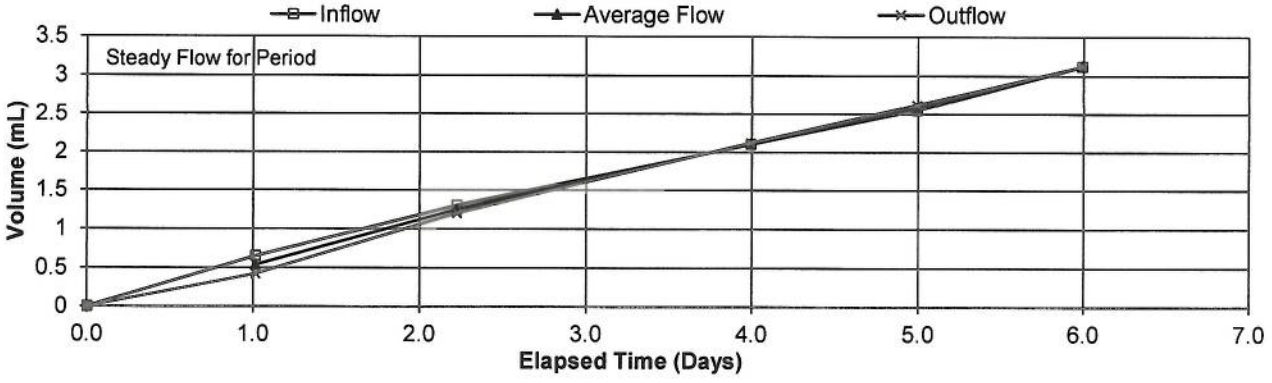
Atterberg Limits

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

Test Details

Permeant	Distilled, de-aired water
Method	Constant Head
Cell Pressure	100.0 kPa
Influent Pressure	84.1 kPa
Effluent Pressure	67.6 kPa
Gradient	17.76

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)				
1.21	2.22	0.65	0.78	0.83	0.72	0.96	9.02E-11
1.77	3.99	0.80	0.92	0.87	0.86	0.96	7.41E-11
1.00	4.99	0.45	0.50	0.90	0.48	0.98	7.38E-11
1.00	5.99	0.57	0.50	1.14	0.54	0.96	8.16E-11

Average Temperature Corrected Hydraulic Conductivity, k_{20} (m/s) **7.99E-11** **(7.99×10^{-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	0.0948	0.0721	20.2	16.8	92.0	100.0	67.6
Final	0.0950	0.0724	24.3	16.4	103.3	100.0	67.6

TREK GEOTECHNICAL
www.trekgeotechnical.ca
1712 St. James Street
Winnipeg, MB R3H 0L3
Tel: 204.975.9433 Fax: 204.975.9435

Hydraulic Conductivity Determination (Flexible Wall)

ASTM D5084-16

Project No.	1000-012-11	**Test Hole**	-
Client	H. Manalo Consulting Ltd.	**Trek Sample #**	ST-8
Project	La Broquerie Wastewater Treatment Lagoon Upgrade	**Depth (m)**	2.4 - 3
		Sample Date	August 22, 2017
		Test Date	August 31 to September 20, 2017
		Technician	Angela Fidler-Kliewer

Specimen Details

Visual Classification Clay, silty, trace fine sand, trace oxidation, mottled grey and brown, moist, firm, high plasticity

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

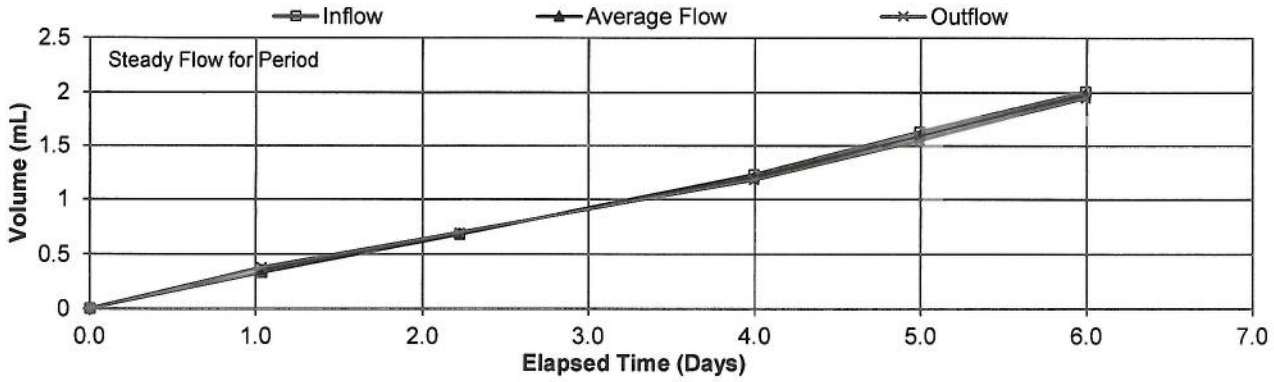
Atterberg Limits

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

Test Details

Permeant	Distilled, de-aired water
Method	Constant Head
Cell Pressure	100.0 kPa
Influent Pressure	82.7 kPa
Effluent Pressure	66.9 kPa
Gradient	19.28

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)				
1.19	2.22	0.35	0.32	1.09	0.34	0.95	3.97E-11
1.77	3.99	0.55	0.48	1.15	0.52	0.96	4.14E-11
1.00	4.99	0.40	0.37	1.08	0.39	0.94	5.35E-11
1.00	5.99	0.38	0.40	0.95	0.39	0.96	5.55E-11

Average Temperature Corrected Hydraulic Conductivity, k_{20} (m/s) **4.75E-11** **(4.75×10^{-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	0.0846	0.0717	27.1	15.3	97.7	100.0	66.9
Final	0.0839	0.0720	27.2	15.6	102.9	100.0	66.9