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October 30, 2018

File No. 15-185-01

Iron North LP
Box 72
Split Lake, Manitoba
R0B 1P0

ATTENTION: Bob Yatkowsky

RE: Hydraulic Conductivity Test Results – Kelsey Lagoon

ENG-TECH Consulting Limited (ENG-TECH) received two (2) Shelby tube samples from the above project on October 15, 2018. The samples were extracted at ENG-TECH laboratory and one sample was selected by Manitoba Sustainable Development for hydraulic conductivity testing.

The sample labelled as ST2-A was prepared for testing in accordance with ASTM D5084-16a, *Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter*. The final hydraulic conductivity value (k_{20}) of 2.3×10^{-8} cm/sec was obtained for the sample identified as ST2-A. The hydraulic conductivity test data is outlined in Table 1, while the graphical representation of the hydraulic conductivity versus elapsed time is shown in Figure 1. Photographs of the sample are attached.

ENG-TECH trusts the above is all the information you require. If you have any questions, please contact the undersigned.

Sincerely,
ENG-TECH Consulting Limited

A handwritten signature in black ink, appearing to read "Clark Hryhoruk".

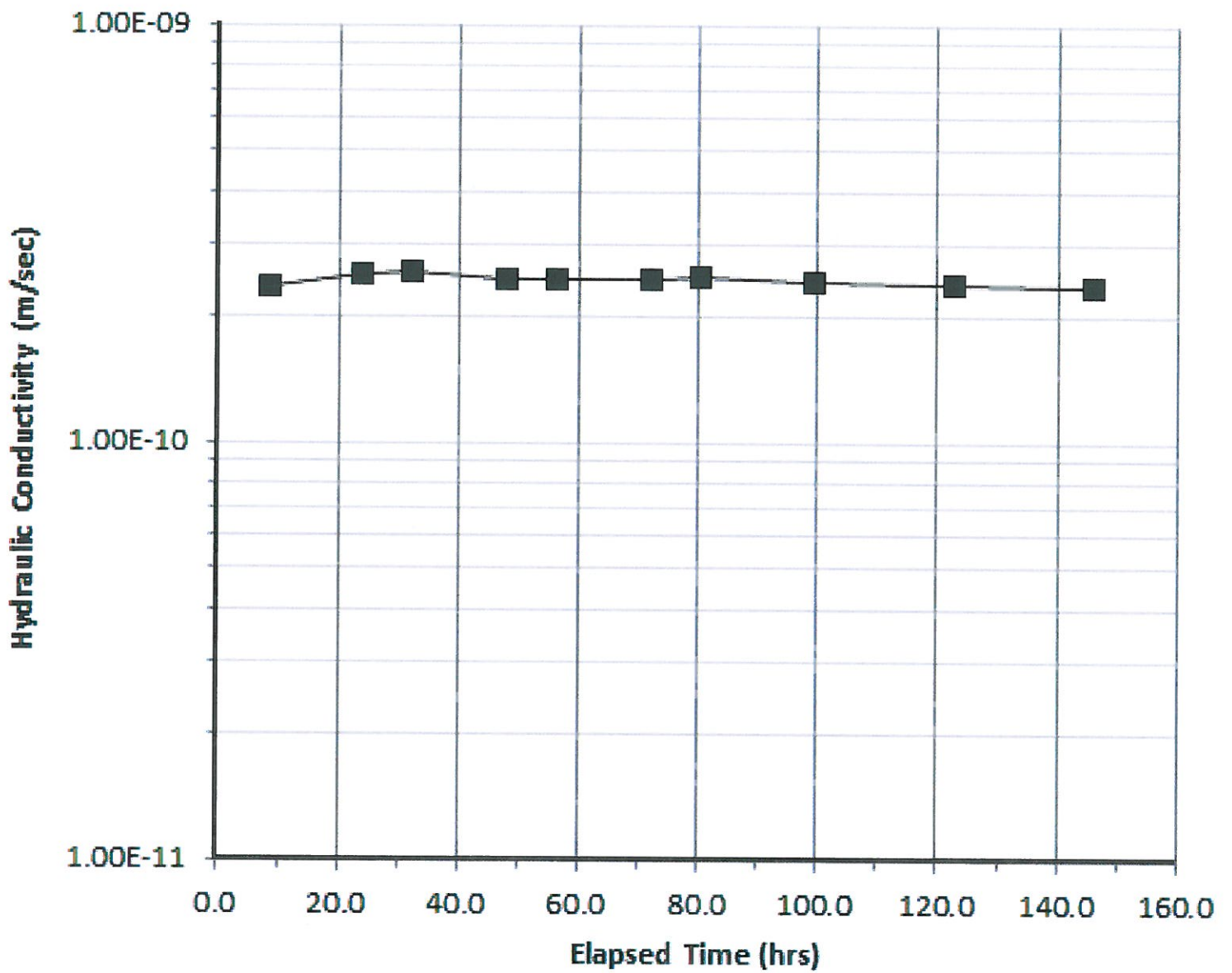
Clark Hryhoruk, M.Sc., P.Eng.
President, Geotechnical Engineer

CDH/pfpc

Attachments: Table 1 – Hydraulic Conductivity Test Data (Kelsey Lagoon)
Figure 1 – Hydraulic Conductivity Versus Elapsed Time (ST2-A)
Photographs (1 and 2)

**TABLE 1
HYDRAULIC CONDUCTIVITY TEST DATA
KELSEY LAGOON**

SAMPLE IDENTIFICATION	ST2-A
INITIAL VALUES	
ENG-TECH Reference No.	15-185-1-47
Length of Sample in Tube (cm)	44.5
Length (cm)	7.10
Diameter (cm)	6.75
Area (cm ²)	35.8
Volume (cm ³)	253.9
Water Content (%)	25.6
Bulk Dry Density (kg/m ³)	1622
Specific Gravity (G _s) (assumed)	2.70
Void Ratio	0.665
Degree of Saturation (%)	Approx. 100
FINAL VALUES	
Length (cm)	6.80
Diameter (cm)	6.90
Area (cm ²)	37.4
Volume (cm ³)	254.1
Water Content (%)	26.9
Bulk Dry Density (kg/m ³)	1585
Specific Gravity (G _s) (assumed)	2.70
Void Ratio	0.704
Degree of Saturation (%)	100
CONSOLIDATION PHASE	
Confining Pressure (kPa)	103.4
Pore Water Pressure (kPa)	82.7
Effective Stress (kPa)	20.7
PERMEATION PHASE	
Confining Pressure (kPa)	103.4
Pore Water Pressure (kPa)	82.7
Effective Stress (kPa)	20.7
Hydraulic Gradient	16.5
Permeant Fluid	Potable Tap Water
HYDRAULIC CONDUCTIVITY AT TEST TEMPERATURE OF 22 °C (cm/sec)	2.4 x 10 ⁻⁸
HYDRAULIC CONDUCTIVITY AT TEMPERATURE OF 20 °C (K₂₀) (cm/sec)	2.3 x 10 ⁻⁸



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ENG. STAMP:



CLIENT:
 IRON NORTH LP

DATE:
 OCTOBER 2018

DRAWN BY:
 PFPC

FIGURE No.:
 1

REV.:

PROJECT:
 KELSEY LAGOON

FILE No.:
 15-185-01

SCALE:
 N/A

HYDRAULIC CONDUCTIVITY
 VERSUS ELAPSED TIME
 (ST2-A)



PHOTOGRAPH #1: Sample ST2-A upon completion of test.



PHOTOGRAPH #2: Sample ST2-A after breaking apart.