

## Dey, Asit (SD)

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**From:** Jeff Hutzul [jhutzul@jrcc.ca]  
**Sent:** November-29-16 1:21 PM  
**To:** Dey, Asit (SD)  
**Cc:** 'Randal Dueck'; Genaille, Dee (IMR); 'Adam Turner'; Boswick, Robert (SD)  
**Subject:** RM of Woodlands Lagoon - Shelby Tube Results  
**Attachments:** HC- ST11 S01 @ 1-3ft - BW.PDF; HC- ST04 S01 @ 4-6ft - BW.PDF; HC- ST08 S01 @ 0.5-2.5ft - BW signed.pdf; HC- ST10 S01 @ 2 5-4 5ft - BW.PDF

Hi Asit,

For your records, attached are the shelby tube test results for the Woodlands lagoon expansion and the one test on the raised existing dike. The test confirms that the hydraulic conductivity results for all four shelby tubes are less than the specified maximum hydraulic conductivity value of  $1.0 \times 10^{-7}$  cm/s.

Please provide written authorization to allow the R.M. of Woodlands to use the lagoon upgrade/expansion.

Jeff

Jeffrey Hutzul, B.A., C.E.T.  
Controller / Project Technologist

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# ASTM D5084 - HYDRAULIC CONDUCTIVITY REPORT



**TO:** Randal Dueck  
Earthmax Construction  
Woodlands Lagoon  
Woodlands, MB

**PROJECT NO:** WX11905  
**CLIENT:** Earthmax Construction  
**DATE SUBMITTED:** 24-Oct-16

**PROJECT:** Woodlands Lagoon

**TEST HOLE:** ST11  
**SAMPLE NO.:** S01  
**SAMPLE DEPTH:** 1.3ft

**PERMEANT:** De-Aired Tap Water  
**HYDRAULIC GRADIENT:** 29.73

## CONSTANT HEAD METHOD ( $K = cQL/thA$ )


	Sample Height, L (cm)	Sample Dia. (cm)	Water Content (%)	Dry Density (kg/m <sup>3</sup> )	Degree of Saturation (%)	Cell Pressure (kPa)	Back Pressure (kPa)	Differential Pressure, h (kPa)
Initial	7.09	7.15	18.2%	1833	96.5%	241.4	196.5	20.7
Final	7.11	7.19	20.1%	1796	100.7%			

Date & Time		Time, t (seconds)	Flow (Q)		Temp. Corr, c	Hyd. Cond. Corrected, K (cm/s)
Start	End		Influent (ml)	Effluent (ml)		
11/2/16 7:31 AM	11/3/16 7:33 AM	86520	1.15	1.00	1.238	1.29E-08
11/3/16 7:33 AM	11/3/16 4:17 PM	31440	0.35	0.35	0.980	9.14E-09
11/3/16 4:17 PM	11/4/16 7:33 AM	54960	0.65	0.65	0.980	9.71E-09
11/4/16 7:33 AM	11/7/16 7:44 AM	259860	3.00	3.00	0.980	9.47E-09
11/7/16 7:44 AM	11/8/16 7:35 AM	85860	1.00	0.95	0.980	9.32E-09

Soil Description: CLAY- silty, trace sand, trace gravel, high plastic, moist, stiff ( PP= 2.00 ), greyish brown

**Average Temperature**  
**Corrected Value (cm/s):** 9.41E-09

Amec Foster Wheeler Environment & Infrastructure

Per:   
Brad Wiebe, M.Sc., P.Eng.  
Associate Geotechnical Engineer

*Reporting of these results constitutes a testing service only.  
Engineering interpretation or evaluation of the test results is provided only on written request.*

# ASTM D5084 - HYDRAULIC CONDUCTIVITY REPORT



**TO:** Randal Dueck  
Earthmax Construction  
Woodlands Lagoon  
Woodlands, MB

**PROJECT NO:** WX11905  
**CLIENT:** Earthmax Construction  
**DATE SUBMITTED:** 24-Oct-16

**PROJECT:** Woodlands Lagoon

**TEST HOLE:** ST10  
**SAMPLE NO.:** S01  
**SAMPLE DEPTH:** 2.5-4.5ft

**PERMEANT:** De-Aired Tap Water  
**HYDRAULIC GRADIENT:** 29.08

## CONSTANT HEAD METHOD ( $K = cQL/thA$ )

	Sample Height, L (cm)	Sample Dia. (cm)	Water Content (%)	Dry Density (kg/m <sup>3</sup> )	Degree of Saturation (%)	Cell Pressure (kPa)	Back Pressure (kPa)	Differential Pressure, h (kPa)
Initial	7.25	7.19	32.8%	1446	97.9%	241.4	196.5	20.7
Final	7.29	7.20	34.1%	1435	100.5%			

Date & Time		Time, t (seconds)	Flow (Q)		Temp. Corr, c	Hyd. Cond. Corrected, K (cm/s)
Start	End		Influent (ml)	Effluent (ml)		
11/2/16 7:30 AM	11/3/16 7:31 AM	86460	0.75	0.75	1.238	9.09E-09
11/3/16 7:31 AM	11/3/16 4:16 PM	31500	0.30	0.30	0.980	7.90E-09
11/3/16 4:16 PM	11/4/16 7:34 AM	55080	0.50	0.50	0.980	7.53E-09
11/4/16 7:34 AM	11/7/16 7:41 AM	259620	2.30	2.25	0.980	7.27E-09
11/7/16 7:41 AM	11/8/16 7:36 AM	86100	0.85	0.75	0.980	7.71E-09

Soil Description: CLAY- silty, trace sand, trace gravel, high plastic, moist, stiff ( PP= 1.25 ), greyish brown

**Average Temperature**  
**Corrected Value (cm/s):** 7.60E-09

Amec Foster Wheeler Environment & Infrastructure

Per: Brad Wiebe, M.Sc., P.Eng.  
Associate Geotechnical Engineer

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# ASTM D5084 - HYDRAULIC CONDUCTIVITY REPORT



**TO:** Randal Dueck  
Earthmax Construction  
Woodlands Lagoon  
Woodlands, MB

**PROJECT NO:** WX11905  
**CLIENT:** Earthmax Construction  
**DATE SUBMITTED:** 24-Oct-16

**PROJECT:** Woodlands Lagoon

**TEST HOLE:** ST08  
**SAMPLE NO.:** S01  
**SAMPLE DEPTH:** 0.5-2.5ft

**PERMEANT:** De-Aired Tap Water  
**HYDRAULIC GRADIENT:** 29.19

## CONSTANT HEAD METHOD ( $K = cQL/thA$ )


	Sample Height, L (cm)	Sample Dia. (cm)	Water Content (%)	Dry Density (kg/m <sup>3</sup> )	Degree of Saturation (%)	Cell Pressure (kPa)	Back Pressure (kPa)	Differential Pressure, h (kPa)
Initial	7.23	7.22	20.0%	1785	98.3%	241.4	196.5	20.7
Final	7.35	7.28	21.7%	1744	100.2%			

Date & Time		Time, t (seconds)	Flow (Q)		Temp. Corr, c	Hyd. Cond. Corrected, K (cm/s)
Start	End		Influent (ml)	Effluent (ml)		
11/16/16 7:30 AM	11/17/16 7:20 AM	85800	0.45	0.45	1.225	5.37E-09
11/17/16 7:20 AM	11/18/16 7:20 AM	86400	0.45	0.45	0.956	4.16E-09
11/18/16 7:20 AM	11/21/16 7:30 AM	259800	1.60	1.55	0.956	4.84E-09
11/21/16 7:30 AM	11/22/16 7:50 AM	87600	0.45	0.40	0.956	3.88E-09
11/22/16 7:50 AM	11/23/16 7:35 AM	85500	0.45	0.40	0.956	3.97E-09

Soil Description: CLAY- silty, trace sand, trace gravel, high plastic, moist, very stiff (pp=2.5 ), greyish brown

**Average Temperature**  
**Corrected Value (cm/s):** 4.21E-09

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Associate Geotechnical Engineer

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# ASTM D5084 - HYDRAULIC CONDUCTIVITY REPORT



**TO:** Randal Dueck  
Earthmax Construction  
Woodlands Lagoon  
Woodlands, MB

**PROJECT NO:** WX11905  
**CLIENT:** Earthmax Construction  
**DATE SUBMITTED:** 24-Oct-16

**PROJECT:** Woodlands Lagoon

**TEST HOLE:** ST04  
**SAMPLE NO.:** S01  
**SAMPLE DEPTH:** 4-6ft

**PERMEANT:** De-Aired Tap Water  
**HYDRAULIC GRADIENT:** 28.60

## CONSTANT HEAD METHOD ( $K = cQL/thA$ )

	Sample Height, L (cm)	Sample Dia. (cm)	Water Content (%)	Dry Density (kg/m <sup>3</sup> )	Degree of Saturation (%)	Cell Pressure (kPa)	Back Pressure (kPa)	Differential Pressure, h (kPa)
Initial	7.37	7.24	17.5%	1840	97.4%	241.4	196.5	20.7
Final	7.45	7.25	19.9%	1781	100.6%			

Date & Time		Time, t (seconds)	Flow (Q)		Temp. Corr, c	Hyd. Cond. Corrected, K (cm/s)
Start	End		Influent (ml)	Effluent (ml)		
11/2/16 7:25 AM	11/3/16 7:30 AM	86700	0.40	0.35	1.238	4.55E-09
11/3/16 7:30 AM	11/3/16 4:15 PM	31500	0.10	0.10	0.980	2.64E-09
11/3/16 4:15 PM	11/4/16 7:35 AM	55200	0.30	0.25	0.980	4.15E-09
11/4/16 7:35 AM	11/7/16 7:40 AM	259500	0.95	0.90	0.980	2.97E-09
11/7/16 7:40 AM	11/8/16 7:40 AM	86400	0.35	0.35	0.980	3.37E-09

Soil Description: CLAY- silty, trace sand, trace gravel, high plastic, moist, very stiff ( PP= 3.0 ), brownish grey

**Average Temperature**  
**Corrected Value (cm/s):** 3.28E-09

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Associate Geotechnical Engineer

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