

APPENDIX 'G'

GEOTECHNICAL REPORT



Quality Engineering | Valued Relationships

Morrison Hershfield

2015 Local Streets Package (PW File #: 15-R-05)

Prepared for:

Morrison Hershfield
25 Scurfield Blvd, Unit 1
Winnipeg, MB R3Y 1G4
Attention: Ron Bruce

Distribution:

Ron Bruce, P.Eng.

Project Number:

0035 018 00

Date:

February 24, 2015
Final Report



Quality Engineering | Valued Relationships

February 24, 2015

Our File No. 0035 018 00

Ron Bruce, P.Eng.
Morrison Hershfield
25 Scurfield Blvd, Unit 1
Winnipeg, MB R3Y 1G4

**RE: Sub-Surface Investigation Report for
2015 Local Streets Package (PW File #: 15-R-05)**

TREK Geotechnical Inc. is pleased to submit our report for the sub-surface investigations for the 2015 Local Streets Package (PW File #: 15-R-05).

Please contact the undersigned if you have any questions. Thank you for the opportunity to serve you on this assignment.

Sincerely,

TREK Geotechnical Inc.

Per:

A handwritten signature in blue ink, appearing to read "N. Ferreira".

Nelson John Ferreira, M. Sc., P. Eng.
Geotechnical Engineer, Principal
Tel: 204.975.9433 ext. 103

cc: Sylvio Precourt C.E.T. (TREK Geotechnical)

Revision History

Revision No.	Author	Issue Date	Description
0	SP	February 24, 2015	Final Report

Authorization Signatures

Prepared By:


Sylvio L. Precourt, C.E.T.
Senior Engineering Technologist

Reviewed By:


Nelson John Ferreira, M. Sc., P.Eng.
Geotechnical Engineer


Certificate of Authorization
Trek Geotechnical Inc.
No. 4877 Date: Feb 24, 2015

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1.0 Introduction

This report summarizes the results of the sub-surface investigation completed for the 2015 Local Street Package (PW File #: 15-R-05). Information regarding the asphalt, concrete, road base for the existing road and the soil stratigraphy beneath the pavement structure is provided.

2.0 Sub-Surface Investigation and Laboratory Program

A total of 33 test holes were drilled along Bienvenue St., Chelsea Ave., Neil Ave., Ravenhill Rd. and Reay Cres. as part of the sub-surface investigation. The test holes drilled at each location are listed in Table 1 and are shown on Figures 01 and Figure 02.

Table 1. List of Test Holes Drilled at Each Location

Street Location	Test Hole
Bienvenue St. - between Regent Ave. and Ravelston Ave. West	TH14-01 to TH14-07
Chelsea Ave - between Watt St. and Roche St.	TH14-01 to TH14-05
Neil Ave. - between Watt St. and Roche St.	TH14-01 to TH14-07
Ravenhill Rd. - between Tomlinson Ave. and Tu Pelo Ave.	TH14-01 to TH14-08
Reay Cres. - between Antrim Rd. and London St.	TH14-01 to TH14-06

The sub-surface investigation was conducted between December 9th and 11th, 2014. The test holes were drilled to a depth of 3 m below top of road surface. Test holes were drilled by Paddock Drilling Ltd. with an MP8 truck mounted drill rig equipped with 125 mm diameter solid stem augers. The pavement structure (asphalt and/or concrete) was cored by Paul Bevel, B.Sc. of TREK Geotechnical Inc. (TREK) using a portable coring drill press equipped with a hollow 150 mm diameter diamond core drill bit. The sub-surface conditions were observed during drilling and were visually classified by Sylvio Precourt, C.E.T. of TREK Geotechnical Inc. (TREK). Other pertinent information such as groundwater and drilling conditions were also recorded during the sub-surface investigation.

Disturbed (auger cuttings) samples retrieved during the sub-surface investigation were transported to TREK's material testing laboratory for further testing. Pavement core samples were also retrieved and logged at TREK's material testing laboratory. The laboratory testing program consisted of moisture content determination on all samples, and Atterberg limits and grain size analysis (hydrometer method) on select samples.

Information gathered for each street is included in separate appendices (Appendix A to E). The information provided in the Appendices includes test hole logs, laboratory testing summary tables and results, and photos of the asphalt and concrete cores.

Test hole locations shown on Figure 01 to Figure 05 are based on measured distances from the nearest address/edge of pavement (Chelsea Ave., Neil Ave., Ravenhill Rd. and Reay Cres.) and assumed stationing as noted on the figures (Bienvenue St.).

Figures

8 1/2" x 11"

FILE NAME: FIG 0001 2015-02-10 Site Plan_E_SP 0035 018 00 Bienvenue.dwg PLOT: 10/02/2015 2:18:56 PM

LEGEND



FIGURE 01

TEST HOLE LOCATIONS

BIENVENUE STREET

0 20 40 60 80m
SCALE : 1:2000 (279mm x 432mm)

LEGEND



TEST HOLE

NOTES :

Stationing noted based on assumed datum of 0+00.00 starting at intersection of Ravelston Avenue West to Regent Avenue

8 1/2" x 11"

PLOT: 23/02/2015 10:11:22 AM

FILE NAME: FIG 0002 2015-02-23 Site Plan_F_SP 0035 018 00 Chelsea.dwg

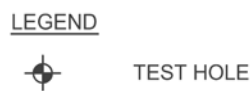
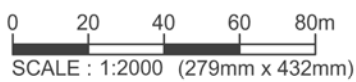


FIGURE 02
TEST HOLE LOCATIONS
CHELSEA AVENUE

8 1/2" x 11"

PLOT: 23/02/2015 10:23:40 AM

FILE NAME: FIG 0003 2015-02-23 Site Plan_F_SP 0035 018 00 Neil.dwg

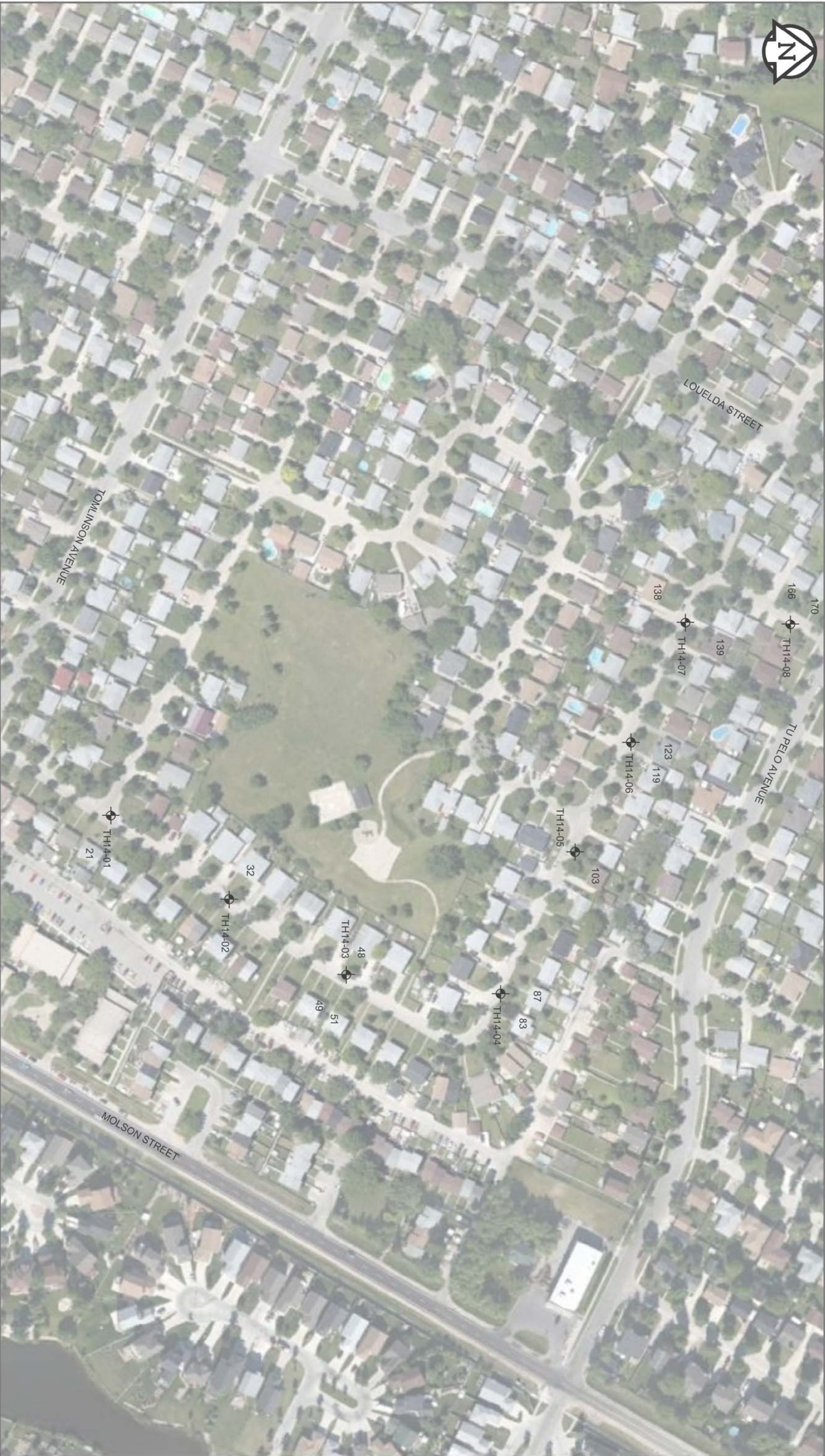


0 20 40 60 80m
SCALE : 1:2000 (279mm x 432mm)

LEGEND

 TEST HOLE

FIGURE 03
TEST HOLE LOCATIONS
NEIL AVENUE



TEST HOLE

8 1/2" x 11"

PLOT: 10/02/2015 2:51:11 PM

FILE NAME: FIG 0005 2015-02-10 Site Plan_F_SP 0035 018 00 Reay.dwg

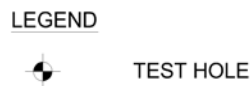
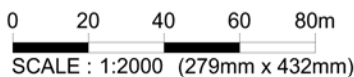


FIGURE 05
TEST HOLE LOCATIONS
REAY CRESCENT

Appendix A

Bienvenue St., between Regent Ave. and Ravelston Ave. West



Sub-Surface Log

Test Hole TH14-01

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Bienvenue St. - between Regent Ave. & Ravelston Ave. W.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 9 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)
Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
		ASPHALT - (25 mm thick)														
		CONCRETE - (180 mm thick)		C01												
		SAND AND GRAVEL (FILL) - clayey, brown, frozen, moist when thawed	G	G1												
		ORGANIC CLAY - silty, dark grey - frozen, moist and soft when thawed, intermediate plasticity														
0.5		CLAY - silty - brown - moist, stiff - high plasticity	G	G2												
			G	G3												
			G	G4												
			G	G5												
			G	G6												
			G	G7												
2.0		- firm below 2.0 m														
			G	G8												

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located 390m south from Ravelston, 1.5m west from east curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0001 2015-02-26 BIENVENUE D. SP 0035 018 00.GPJ TREK GEOTECHNICAL GDT 26/2/15



Sub-Surface Log

Test Hole TH14-02

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Bienvenue St. - between Regent Ave. & Ravelston Ave. W.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 9 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)									
					16	17	18	19	20	21	0	50	100	150	200	250		
0.0 - 0.1		CONCRETE - (202 mm thick)		C02														
0.1 - 0.45		SAND (FILL) - trace gravel (<10mm diam.) - brown, frozen, moist when thawed		G9														
0.45 - 0.6		ORGANIC CLAY - silty - dark grey - frozen to 0.6 m, moist and soft when thawed, moist and very stiff below - intermediate plasticity		G10														
0.6 - 0.9		CLAY - silty - grey - moist, stiff - intermediate to high plasticity		G11														
0.9 - 1.1		CLAY - silty - grey - moist, stiff - intermediate to high plasticity		G12														
1.1 - 1.5		SILT - clayey, trace sand - brown - moist, soft - low plasticity		G13														
1.5 - 1.6		SILT - clayey, trace sand - brown - moist, soft - low plasticity		G14														
1.6 - 2.0		CLAY - silty - mottled brown and grey - moist, very stiff - high plasticity		G15														
2.0 - 2.4		CLAY - silty - mottled brown and grey - moist, very stiff - high plasticity		G15														
2.4 - 3.0		- firm below 2.4 m		G16														

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located 340m south from Ravelston, 2.0m east from west curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG - LOGS 0001 2015-02-26 BIENVENUE D. SP_0035 018 00.GPJ TREK GEOTECHNICAL.GDT 26/2/15



Sub-Surface Log

Test Hole TH14-03

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Bienvenue St. - between Regent Ave. & Ravelston Ave. W.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 9 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)				
					16	17	18	19	20	21	Test Type				
					Particle Size (%)										
					0	20	40	60	80	100					
					PL MC LL										
					0	20	40	60	80	100	0	50	100	150	200/250
		ASPHALT - (65 mm thick)													
		CONCRETE - (145 mm thick)		C03											
		SAND (FILL) - trace gravel (<10mm diam.) - dark grey, frozen, moist when thawed, poorly graded	G	G17											
0.5		ORGANIC CLAY - silty - dark grey - frozen, moist and firm when thawed, moist and very stiff below - intermediate plasticity	G	G18											
1.0		CLAY - silty - brown - moist, very stiff - intermediate plasticity	G	G19											
1.5		SILT - trace clay - brown - wet, soft - low plasticity	G	G21											
2.0		CLAY - silty - mottled brown and grey - moist, firm - high plasticity	G	G23											
2.5															
3.0				G24											

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located 270m south from Ravelston, 2.0m west from east curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0001 2015-02-26 BIENVENUE D.SP 0035 018 00.GPJ TREK GEOTECHNICAL.GDT 26/2/15



Sub-Surface Log

Test Hole TH14-04

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Bienvenue St. - between Regent Ave. & Ravelston Ave. W.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 9 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL _____ MC _____ LL _____ 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.1		CONCRETE - (212 mm thick)		C04												
0.1 - 0.2		SAND (FILL) - trace clay, trace gravel (<10mm diam.) - brown, frozen, moist when thawed, poorly graded		G25												
0.2 - 0.4		ORGANIC CLAY - silty - dark grey - frozen, moist and firm when thawed - intermediate plasticity		G26												
0.4 - 0.8		CLAY - silty - dark grey - moist, firm - intermediate plasticity		G27												
0.8 - 1.5		SILT - trace sand - brown - moist, soft - low plasticity		G28												
1.5 - 2.0		CLAY - silty, trace silt inclusion (<5mm diam.) - mottled brown, grey and black - moist, firm - high plasticity		G29												
2.0 - 2.2				G30												
2.2 - 2.4				G31												
2.4 - 2.6																
2.6 - 2.8																
2.8 - 3.0				G32												

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located 210m south from Ravelston, 2.5m east from west curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0001 2015-02-26 BIENVENUE D. SP 0035 018 00.GPJ TREK GEOTECHNICAL.GDT 26/2/15



Sub-Surface Log

Test Hole TH14-05

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Bienvenue St. - between Regent Ave. & Ravelston Ave. W.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 9 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)								
					16	17	18	19	20	21	0	50	100	150	200	250	
0.0		CONCRETE - (190 mm thick)		C05													
0.0		SAND (FILL) - trace clay - dark grey, frozen, moist to wet when thawed, poorly graded		G33													
0.5		ORGANIC CLAY - silty, trace sand, trace gravel - dark grey - frozen, moist and soft when thawed - intermediate plasticity		G34													
0.5		CLAY - silty - dark grey - frozen to 1.1 m, moist and firm when thawed, moist below - intermediate to high plasticity		G35													
1.0		- grey, stiff below 1.1 m		G36													
1.5		- 150 mm thick silt seam, brown, moist, soft, low plasticity		G37													
2.0		- mottled brown and grey, firm below 2.1 m		G38													
2.5				G39													
3.0				G40													

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located 150m south Ravelston, 2.0m west from east curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0001 2015-02-26 BIENVENUE D.SP 0035 018 00.GPJ TREK GEOTECHNICAL.GDT 26/2/15



Sub-Surface Log

Test Hole TH14-06

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Bienvenue St. - between Regent Ave. & Ravelston Ave. W.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 9 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.1		CONCRETE - (202 mm thick)		C06												
0.1 - 0.45		SAND (FILL) - trace clay, trace gravel (<10mm diam.) - brown, frozen, wet when thawed - poorly graded	Grab (G)	G41												
0.45 - 0.9		ORGANIC CLAY - silty, trace sand, trace gravel - dark grey - frozen, moist and firm when thawed - intermediate plasticity	Grab (G)	G42												
0.9 - 1.1		CLAY - silty - dark grey - frozen to 1.1 m, moist and soft when thawed, moist below - intermediate plasticity	Grab (G)	G43												
1.1 - 1.4		CLAY - silty - dark grey - frozen to 1.1 m, moist and soft when thawed, moist below - intermediate plasticity	Grab (G)	G44												
1.4 - 1.8		SILT - clayey - brown - moist, soft - low plasticity	Grab (G)	G45												
1.8 - 2.0		CLAY - silty - mottled brown and grey - moist, stiff - high plasticity	Grab (G)	G46												
2.0 - 2.1		- trace silt inclusion (<10mm diam.)	Grab (G)	G47												
2.1 - 3.05		CLAY - silty - mottled brown and grey - moist, stiff - high plasticity	Grab (G)	G48												

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located 90m south from Ravelston, 2.0m east from west curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG - LOGS 0001 2015-02-26 BIENVENUE D. SP_0035 018 00.GPJ TREK GEOTECHNICAL.GDT 26/2/15



Sub-Surface Log

Test Hole TH14-07

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Bienvenue St. - between Regent Ave. & Ravelston Ave. W.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 9 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)
Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)						
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0		CONCRETE - (178 mm thick)		C07												
0.0		SAND (FILL) - trace clay, trace gravel (<10mm diam.) - brown, frozen, moist when thawed, poorly graded		G49												
0.0		ORGANIC CLAY - silty, trace gravel (<15mm diam.) - dark grey - frozen, moist and soft when thawed - intermediate plasticity		G50												
0.5		CLAY - silty - dark grey - frozen to 1.1 m, moist and soft when thawed, moist below - intermediate plasticity		G51												
0.5		- very stiff below 1.1 m		G52												
1.0				G53												
1.5		- mottled brown and grey below 1.5 m		G54												
2.0		- trace silt inclusion (<10mm diam.) below 2.0 m		G55												
2.5																
3.0		- firm below 2.9 m		G56												

END OF TEST HOLE AT 3.05 m IN CLAY
 Notes:
 1) No seepage or sloughing observed.
 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
 3) Test hole located 30m south from Ravelston, 2.0m west from east curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0001 2015-02-26 BIENVENUE D. SP_0035 018 00.GPJ TREK GEOTECHNICAL GDT_26/2/15



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 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Bienvenue Street

Sample Date 9-Dec-14
Test Date 14-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-01	TH14-01	TH14-01	TH14-01	TH14-01	TH14-01
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G01	G02	G03	G04	G05	G06
Tare ID	E3	E62	E41	F57	F56	A103
Mass of tare	8.8	8.7	8.8	8.8	8.3	8.5
Mass wet + tare	466.6	438.0	415.3	465.6	472.0	467.6
Mass dry + tare	376.3	339.0	316.5	367.9	367.9	305.5
Mass water	90.3	99.0	98.8	97.7	104.1	162.1
Mass dry soil	367.5	330.3	307.7	359.1	359.6	297.0
Moisture %	24.6%	30.0%	32.1%	27.2%	28.9%	54.6%

Test Pit	TH14-01	TH14-01	TH14-02	TH14-02	TH14-02	TH14-02
Depth (m)	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G07	G08	G09	G10	G11	G12
Tare ID	N37	W54	D1	Z29	Z10	W69
Mass of tare	8.5	8.3	9.1	8.4	8.3	8.5
Mass wet + tare	460.6	596.8	428.6	374	471.6	478.7
Mass dry + tare	351.6	412.9	378.2	285	351.8	348.9
Mass water	109.0	183.9	50.4	89.0	119.8	129.8
Mass dry soil	343.1	404.6	369.1	276.6	343.5	340.4
Moisture %	31.8%	45.5%	13.7%	32.2%	34.9%	38.1%

Test Pit	TH14-02	TH14-02	TH14-02	TH14-02	TH14-03	TH14-03
Depth (m)	1.2 - 1.4	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6
Sample #	G13	G14	G15	G16	G17	G18
Tare ID	F15	N33	F64	N35	N16	K22
Mass of tare	8.5	8.5	8.5	8.4	8.7	8.7
Mass wet + tare	613.5	619.3	519.9	442.1	480.0	493.7
Mass dry + tare	496.7	489.8	384.2	300.5	414.3	378.6
Mass water	116.8	129.5	135.7	141.6	65.7	115.1
Mass dry soil	488.2	481.3	375.7	292.1	405.6	369.9
Moisture %	23.9%	26.9%	36.1%	48.5%	16.2%	31.1%



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Bienvenue Street

Sample Date 9-Dec-14
Test Date 14-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-03	TH14-03	TH14-03	TH14-03	TH14-03	TH14-03
Depth (m)	0.8 - 0.9	1.2 - 1.4	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0
Sample #	G19	G20	G21	G22	G23	G24
Tare ID	Z94	H67	F140	E63	N70	E93
Mass of tare	8.3	8.4	8.3	8.5	8.4	8.3
Mass wet + tare	527.2	540.1	531.1	629.2	500	449
Mass dry + tare	411.1	413.8	411	509.2	363	302
Mass water	116.1	126.3	120.1	120.0	137.0	147.0
Mass dry soil	402.8	405.4	402.7	500.7	354.6	293.7
Moisture %	28.8%	31.2%	29.8%	24.0%	38.6%	50.1%

Test Pit	TH14-04	TH14-04	TH14-04	TH14-04	TH14-04	TH14-04
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.6 - 0.8	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G25	G26	G27	G28	G29	G30
Tare ID	E70	D43	E83	F123	E61	E13
Mass of tare	8.5	8.5	8.5	8.5	8.6	8.6
Mass wet + tare	462.7	386.6	489.9	579	527	544.5
Mass dry + tare	415.3	307.6	388.6	465.7	421.4	384.8
Mass water	47.4	79.0	101.3	113.3	105.6	159.7
Mass dry soil	406.8	299.1	380.1	457.2	412.8	376.2
Moisture %	11.7%	26.4%	26.7%	24.8%	25.6%	42.5%

Test Pit	TH14-04	TH14-04	TH14-05	TH14-05	TH14-05	TH14-05
Depth (m)	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G31	G32	G33	G34	G35	G36
Tare ID	K31	N55	F131	W43	Z24	N88
Mass of tare	8.2	8.4	8.4	8.3	8.2	8.3
Mass wet + tare	445.7	463.4	522.1	489	435.4	450.8
Mass dry + tare	305.8	312.9	440.2	381.7	341.8	357.7
Mass water	139.9	150.5	81.9	107.3	93.6	93.1
Mass dry soil	297.6	304.5	431.8	373.4	333.6	349.4
Moisture %	47.0%	49.4%	19.0%	28.7%	28.1%	26.6%



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Bienvenue Street

Sample Date 9-Dec-14
Test Date 14-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-05	TH14-05	TH14-05	TH14-05	TH14-06	TH14-06
Depth (m)	1.4 - 1.5	1.5 - 1.7	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6
Sample #	G37	G38	G39	G40	G41	G42
Tare ID	F121	H30	P09	N15	H79	P08
Mass of tare	8.5	8.4	8.6	8.6	8.5	8.5
Mass wet + tare	462	451.8	501.2	461.6	569.1	380.5
Mass dry + tare	364.1	365.6	355.4	309.5	473.1	286.1
Mass water	97.9	86.2	145.8	152.1	96.0	94.4
Mass dry soil	355.6	357.2	346.8	300.9	464.6	277.6
Moisture %	27.5%	24.1%	42.0%	50.5%	20.7%	34.0%

Test Pit	TH14-06	TH14-06	TH14-06	TH14-06	TH14-06	TH14-06
Depth (m)	0.8 - 0.9	1.1 - 1.2	1.2 - 1.4	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0
Sample #	G43	G44	G45	G46	G47	G48
Tare ID	W07	W17	H77	N19	Z108	Q01
Mass of tare	8.6	8.5	8.6	8.8	8.4	8.6
Mass wet + tare	419.7	475.9	470.6	497.3	477.8	491.3
Mass dry + tare	303.8	367.4	390.4	364.9	331.4	330.2
Mass water	115.9	108.5	80.2	132.4	146.4	161.1
Mass dry soil	295.2	358.9	381.8	356.1	323.0	321.6
Moisture %	39.3%	30.2%	21.0%	37.2%	45.3%	50.1%

Test Pit	TH14-07	TH14-07	TH14-07	TH14-07	TH14-07	TH14-07
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.2 - 1.4	1.4 - 1.5	1.7 - 1.8
Sample #	G49	G50	G51	G52	G53	G54
Tare ID	F151	F1	W30	F35	H31	F55
Mass of tare	8.9	8.5	8.3	8.4	8.4	8.5
Mass wet + tare	420.8	485.3	437.9	355.0	359.0	480.9
Mass dry + tare	356.3	418.3	319.3	256.5	258.4	335.7
Mass water	64.5	67.0	118.6	98.5	100.6	145.2
Mass dry soil	347.4	409.8	311.0	248.1	250.0	327.2
Moisture %	18.6%	16.3%	38.1%	39.7%	40.2%	44.4%



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Bienvenue Street

Sample Date 9-Dec-14
Test Date 14-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-07	TH14-07			
Depth (m)	2.0 - 2.1	2.9 - 3.0			
Sample #	G55	G56			
Tare ID	N76	H11			
Mass of tare	8.4	8.3			
Mass wet + tare	425.1	401.1			
Mass dry + tare	285.8	280.6			
Mass water	139.3	120.5			
Mass dry soil	277.4	272.3			
Moisture %	50.2%	44.3%			

Test Pit					
Depth (m)					
Sample #					
Tare ID					
Mass of tare					
Mass wet + tare					
Mass dry + tare					
Mass water					
Mass dry soil					
Moisture %					

Test Pit					
Depth (m)					
Sample #					
Tare ID					
Mass of tare					
Mass wet + tare					
Mass dry + tare					
Mass water					
Mass dry soil					
Moisture %					



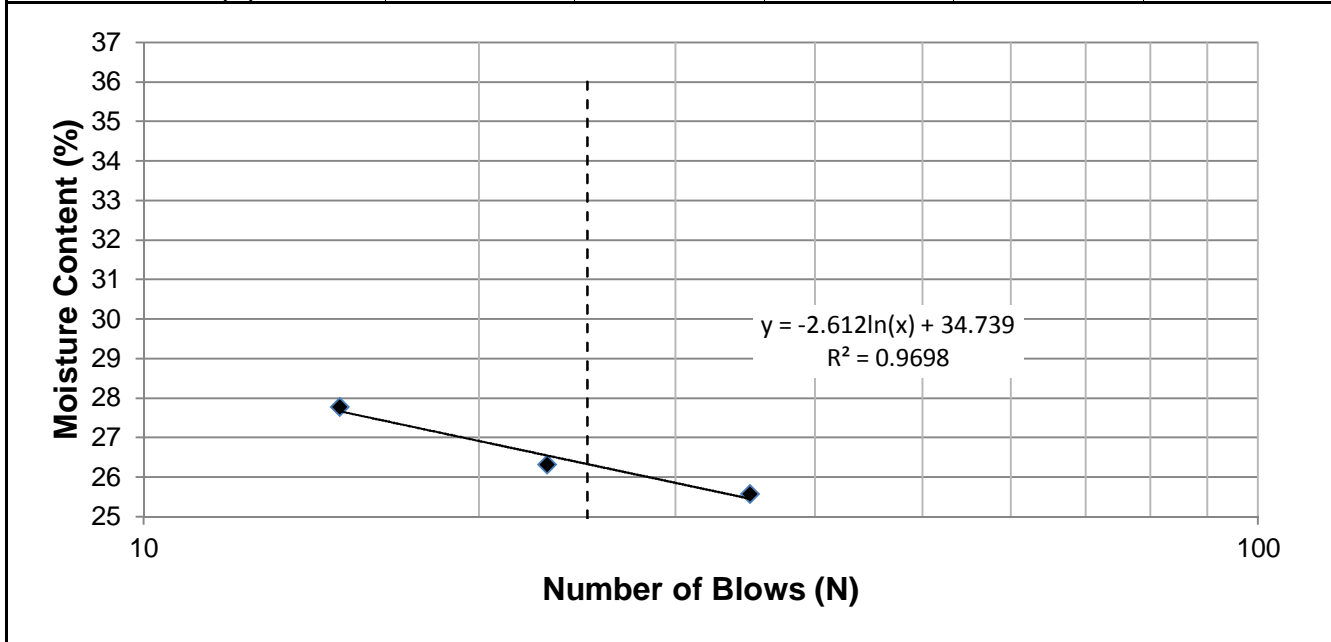
Project No. 0035 018 00
Client Morrision Hershfield
Project Local Streets Package 15-R-05, Bienvenue Street

Test Hole TH14-02
Sample # G13
Depth (m) 1.2-1.4
Sample Date 12-Dec-14
Test Date 26-Jan-15
Technician Xin Xiong

Liquid Limit	26
Plastic Limit	18
Plasticity Index	8

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	15	23	35		
Mass Wet Soil + Tare (g)	26.286	28.060	27.297		
Mass Dry Soil + Tare (g)	23.651	25.207	24.591		
Mass Tare (g)	14.165	14.369	14.007		
Mass Water (g)	2.635	2.853	2.706		
Mass Dry Soil (g)	9.486	10.838	10.584		
Moisture Content (%)	27.778	26.324	25.567		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	21.325	21.870			
Mass Dry Soil + Tare (g)	20.216	20.664			
Mass Tare (g)	14.045	14.026			
Mass Water (g)	1.109	1.206			
Mass Dry Soil (g)	6.171	6.638			
Moisture Content (%)	17.971	18.168			



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**Atterberg Limits
 ASTM D4318**

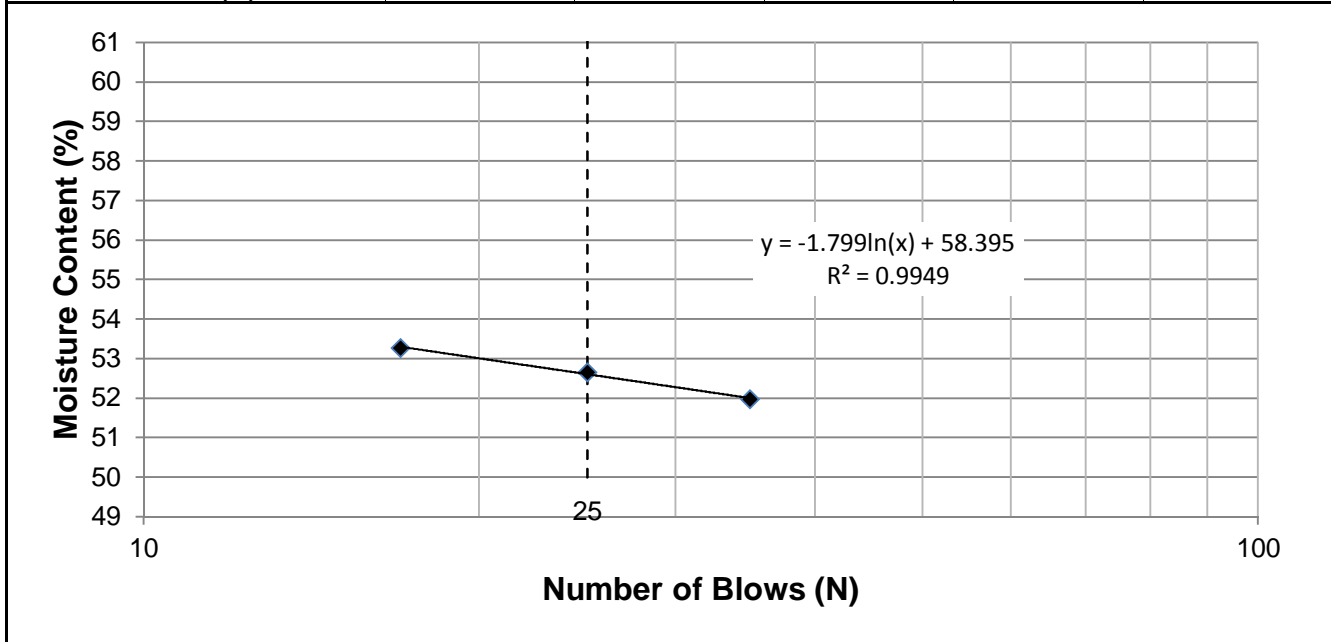
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Client Morrison Hershfield
Project Local Streets Package 15-R-05, Bienvenue Street

Test Hole TH14-02
Sample # G20
Depth (m) 1.2-1.4
Sample Date 12-Dec-14
Test Date 26-Jan-15
Technician Xin Xiong

Liquid Limit	53
Plastic Limit	21
Plasticity Index	31

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	35	25	17		
Mass Wet Soil + Tare (g)	26.167	24.966	26.657		
Mass Dry Soil + Tare (g)	22.081	21.223	22.231		
Mass Tare (g)	14.219	14.115	13.923		
Mass Water (g)	4.086	3.743	4.426		
Mass Dry Soil (g)	7.862	7.108	8.308		
Moisture Content (%)	51.972	52.659	53.274		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.702	20.311			
Mass Dry Soil + Tare (g)	19.536	19.204			
Mass Tare (g)	14.048	14.083			
Mass Water (g)	1.166	1.107			
Mass Dry Soil (g)	5.488	5.121			
Moisture Content (%)	21.246	21.617			



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**Atterberg Limits
 ASTM D4318**

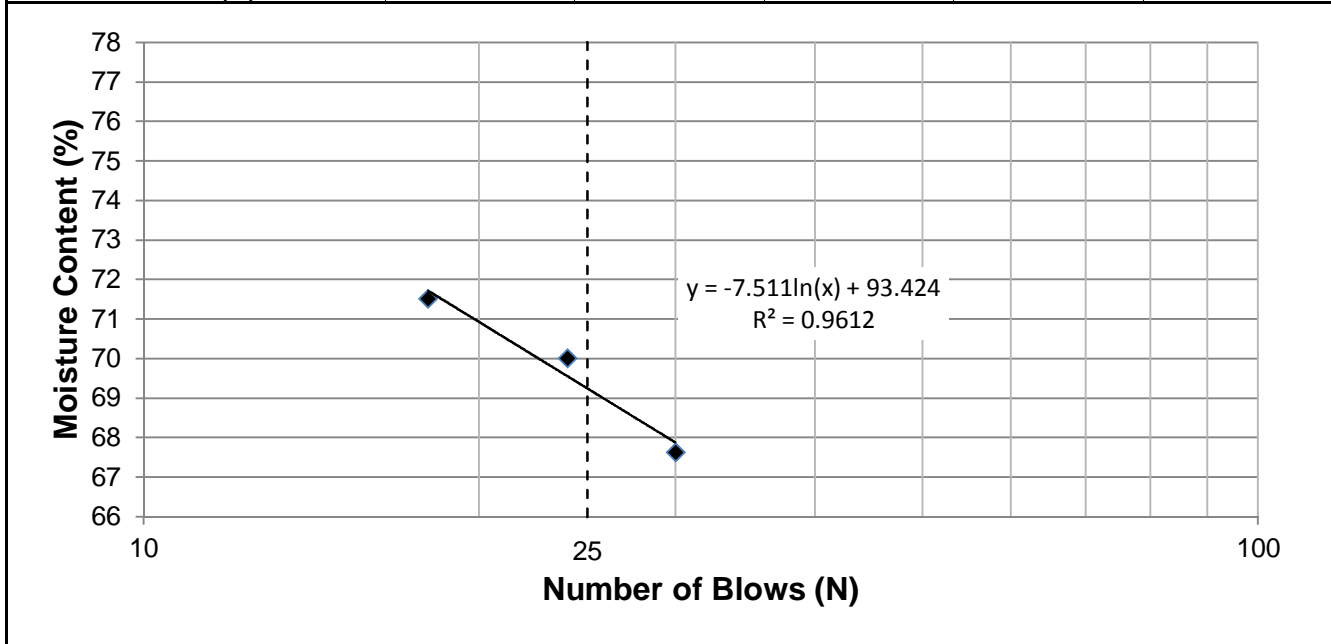
Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Bienvenue Street

Test Hole TH14-06
Sample # G43
Depth (m) 0.8-0.9
Sample Date 12-Dec-14
Test Date 05-Feb-15
Technician Xin Xiong/Junhui

Liquid Limit	69
Plastic Limit	22
Plasticity Index	47

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	30	24	18		
Mass Wet Soil + Tare (g)	23.454	23.751	26.013		
Mass Dry Soil + Tare (g)	19.679	19.789	21.038		
Mass Tare (g)	14.097	14.129	14.082		
Mass Water (g)	3.775	3.962	4.975		
Mass Dry Soil (g)	5.582	5.660	6.956		
Moisture Content (%)	67.628	70.000	71.521		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	19.793	19.990			
Mass Dry Soil + Tare (g)	18.732	18.966			
Mass Tare (g)	14.089	14.262			
Mass Water (g)	1.061	1.024			
Mass Dry Soil (g)	4.643	4.704			
Moisture Content (%)	22.852	21.769			

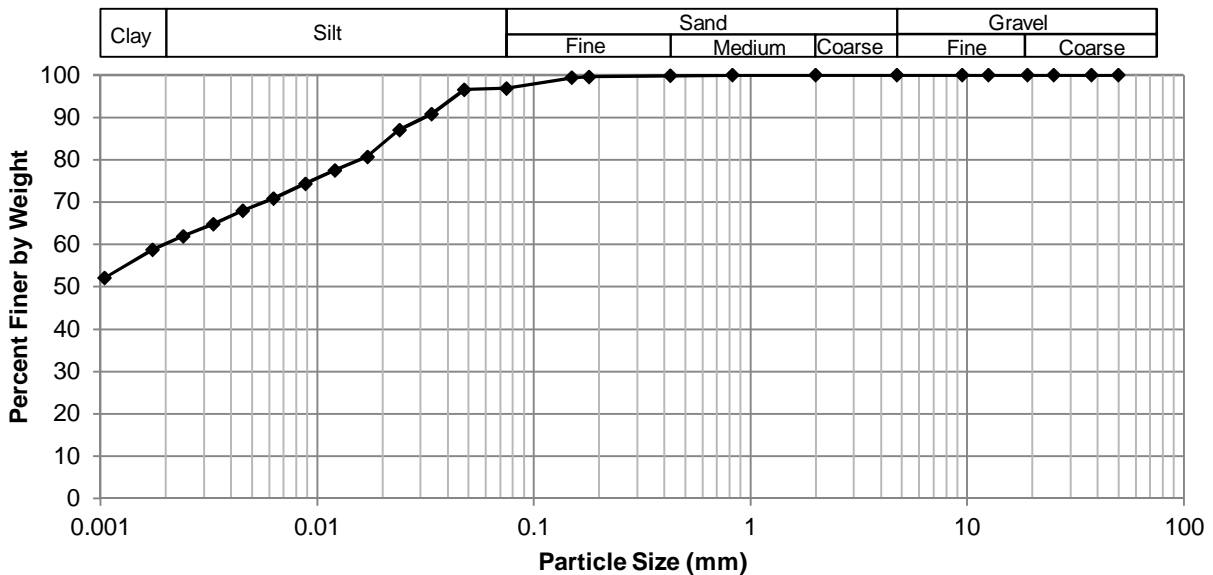


Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Bienvenue Street

Test Hole TH14-02
Sample # G13
Depth (m) 0.4 - 0.4
Sample Date 4-Dec-14
Test Date 21-Jan-15
Technician Xin Xiong/Junhui Wu

Gravel	0.0%
Sand	3.1%
Silt	36.9%
Clay	60.0%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	96.87
37.5	100.00	2.00	100.00	0.0479	96.58
25.0	100.00	0.825	99.94	0.0338	90.86
19.0	100.00	0.425	99.86	0.0239	87.05
12.5	100.00	0.180	99.63	0.0171	80.70
9.50	100.00	0.150	99.39	0.0121	77.52
4.75	100.00	0.075	96.87	0.0088	74.35
				0.0063	70.85
				0.0045	68.00
				0.0033	64.82
				0.0024	61.96
				0.0017	58.79
				0.0010	52.12

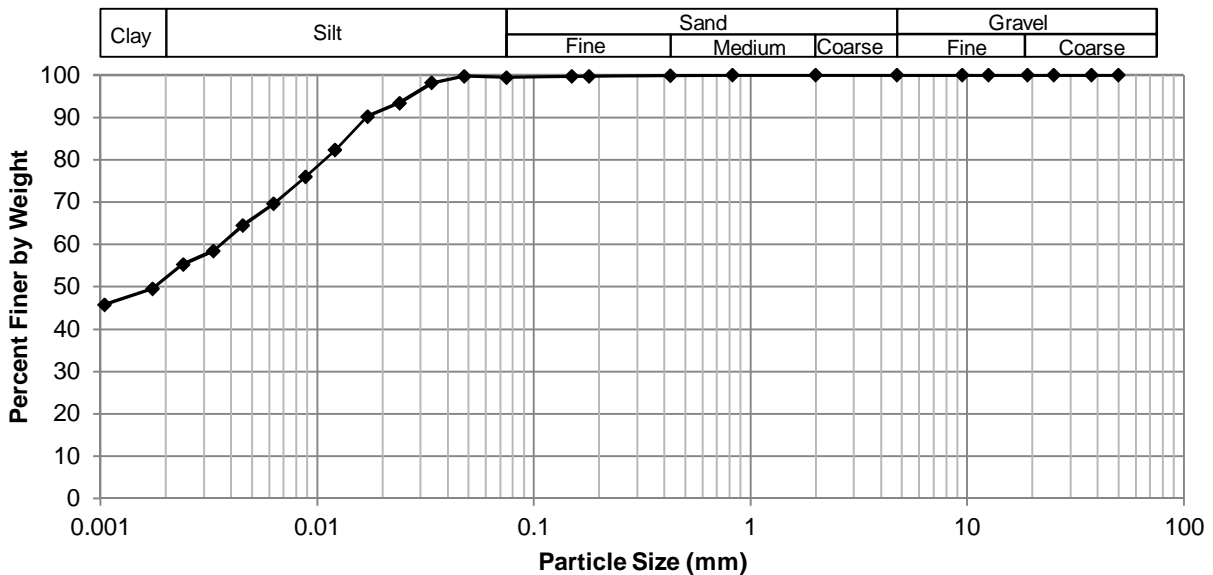


Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Bienvenue Street

Test Hole TH14-02
Sample # G20
Depth (m) 0.4 - 0.4
Sample Date 4-Dec-14
Test Date 21-Jan-15
Technician Xin Xiong/Junhui Wu

Gravel	0.0%
Sand	0.6%
Silt	47.7%
Clay	51.8%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	99.44
37.5	100.00	2.00	100.00	0.0479	99.75
25.0	100.00	0.825	99.95	0.0338	98.16
19.0	100.00	0.425	99.87	0.0239	93.40
12.5	100.00	0.180	99.72	0.0171	90.23
9.50	100.00	0.150	99.68	0.0121	82.29
4.75	100.00	0.075	99.44	0.0088	75.94
				0.0063	69.58
				0.0045	64.50
				0.0033	58.47
				0.0024	55.29
				0.0017	49.58
				0.0010	45.77

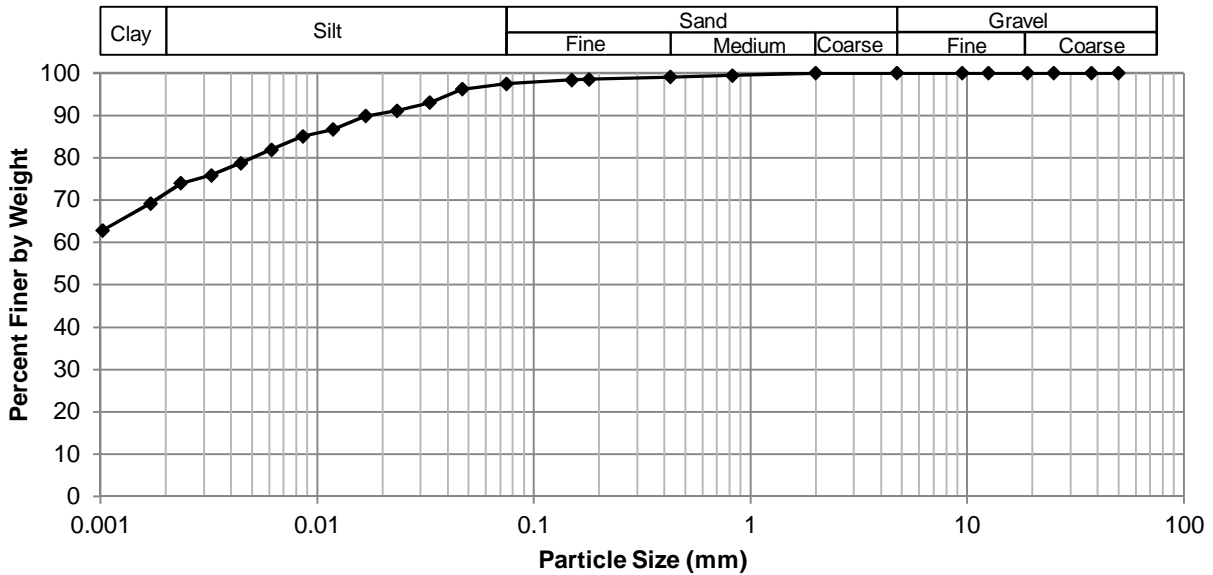


Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Bienvenue Street

Test Hole TH14-06
Sample # G43
Depth (m) 0.8 - 0.9
Sample Date 4-Dec-14
Test Date 5-Feb-15
Technician Xin Xiong/Junhui Wu

Gravel	0.0%
Sand	2.5%
Silt	26.1%
Clay	71.4%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	97.50
37.5	100.00	2.00	100.00	0.0468	96.19
25.0	100.00	0.825	99.47	0.0331	93.02
19.0	100.00	0.425	99.05	0.0234	91.11
12.5	100.00	0.180	98.54	0.0167	89.84
9.50	100.00	0.150	98.41	0.0118	86.67
4.75	100.00	0.075	97.50	0.0086	85.08
				0.0062	81.90
				0.0044	78.73
				0.0032	75.87
				0.0024	73.96
				0.0017	69.20
				0.0010	62.85

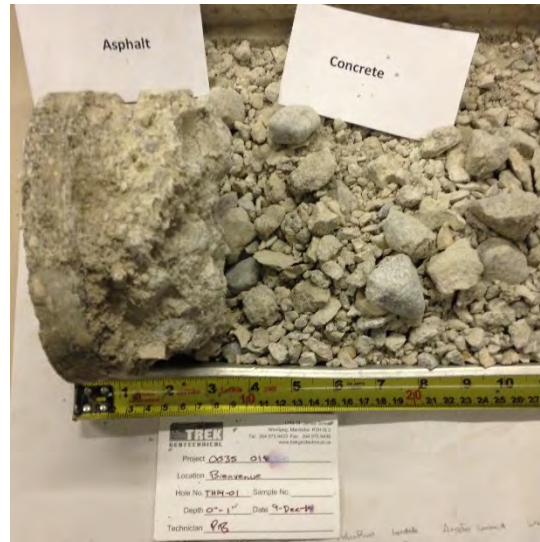


Photo 1: Concrete Core Sample From Test Hole TH14-01



Photo 2: Concrete Core Sample From Test Hole TH14-02



Photo 3: Concrete Core Sample From Test Hole TH14-03

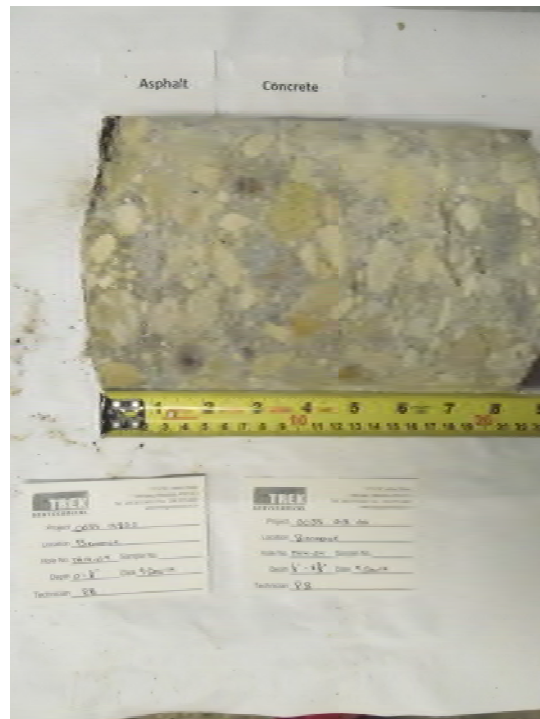


Photo 4: Concrete Core Sample From Test Hole TH14-4



Photo 5: Concrete Core Sample From Test Hole TH14-05



Photo 6: Concrete Core Sample From Test Hole TH14-06



Photo 7: Concrete Core Sample From Test Hole TH14-07

Appendix B

Chelsea Ave., between Watt St. and Roche St.



Sub-Surface Log

Test Hole TH14-01

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Chelsea Ave - between Watt St. and Roche St.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 11 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					0	20	40	60	80	100	0	50	100	150	200	250
0.0		ASPHALT - (13 mm Thick)		C01												
0.0		CONCRETE - (127 mm thick)														
0.0		SAND (FILL) - trace gravel (<15mm diam.) - dark grey, frozen, wet when thawed - poorly graded	G	G1												
0.5		CLAY (FILL) - silty, trace gravel (<10mm diam.) - dark grey - frozen, moist and firm when thawed - intermediate plasticity	G	G2												
1.0		CLAY - silty - dark grey - moist, very stiff - intermediate to high plasticity	G	G3												
1.5			G	G4												
2.0			G	G5												
2.5			G	G6												
3.0			G	G7												
3.0			G	G8												
2.5		SILT - trace clay - brown - moist, soft - low plasticity														

END OF TEST HOLE AT 3.05 m IN SILT

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #496, 2.0m north of south curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0002 2015-02-25 CHELSEA_C.SP_0035 018 00 GPJ TREK GEOTECHNICAL GDT 25/2/15



Sub-Surface Log

Test Hole TH14-02

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Chelsea Ave - between Watt St. and Roche St.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 11 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)						
					16	17	18	19	20	21	Test Type						
					Particle Size (%)												
					0	20	40	60	80	100							
					PL _____ MC _____ LL _____ 0 20 40 60 80 100 0 50 100 150 200 250												
											<input checked="" type="checkbox"/> Torvane <input type="checkbox"/> Pocket Pen. <input checked="" type="checkbox"/> Qu <input checked="" type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>						
0.00 - 0.05		ASPHALT - (35 mm thick)		C02													
0.05 - 0.10		CONCRETE - (125 mm thick)															
0.10 - 0.45		CLAY (FILL) - silty, trace sand, trace gravel - dark grey - frozen, moist and soft when thawed - intermediate plasticity	<input checked="" type="checkbox"/>	G9		●											
0.45 - 1.70		CLAY - silty - brown - frozen to 0.8 m, moist and firm when thawed, moist and very stiff, below - intermediate to high plasticity	<input checked="" type="checkbox"/>	G10		●											
			<input checked="" type="checkbox"/>	G11		●											
			<input checked="" type="checkbox"/>	G12		●										◆	
			<input checked="" type="checkbox"/>	G13		●										◆	
		- stiff below 1.7 m	<input checked="" type="checkbox"/>	G14		●										◆	
1.70 - 2.00		SILT - trace clay - brown - moist, soft - low plasticity	<input checked="" type="checkbox"/>	G15		●											
2.00 - 3.05			<input checked="" type="checkbox"/>	G16		●											

END OF TEST HOLE AT 3.05 m IN SILT

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located in the center of driveway at house #483, 2.0m south from north curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0002 2015-02-25 CHELSEA_C.SP_0035 018 00 GPJ TREK GEOTECHNICAL GDT 25/2/15



Sub-Surface Log

Test Hole TH14-03

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Chelsea Ave - between Watt St. and Roche St.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 11 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)								
					16	17	18	19	20	21	0	50	100	150	200	250	
0.0 - 0.05		ASPHALT - (32 mm thick)		C03													
0.05 - 0.1		CONCRETE - (145 mm thick)															
0.1 - 0.5		SAND (FILL) - trace clay - brown, frozen, wet when thawed - poorly graded	<input checked="" type="checkbox"/>	G17													
0.5 - 1.0		CLAY - silty - brown - frozen to 0.8 m, moist and firm when thawed, moist and very stiff, below - intermediate to high plasticity	<input checked="" type="checkbox"/>	G18													
1.0 - 1.1			<input checked="" type="checkbox"/>	G19													
1.1 - 1.2			<input checked="" type="checkbox"/>	G20													
1.2 - 1.3			<input checked="" type="checkbox"/>	G21													
1.3 - 1.4			<input checked="" type="checkbox"/>	G22													
1.4 - 1.5			<input checked="" type="checkbox"/>	G23													
1.5 - 2.0			<input checked="" type="checkbox"/>	G24													
2.0 - 3.0		SILT - trace clay - brown - moist, soft - low plasticity															

END OF TEST HOLE AT 3.05 m IN SILT

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #468, 2.0m north of south curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0002 2015-02-25 CHELSEA_C.SP_0035 018 00.GPJ TREK GEOTECHNICAL.GDT 25/2/15



Sub-Surface Log

Test Hole TH14-04

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Chelsea Ave - between Watt St. and Roche St.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 11 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL _____ MC _____ LL _____ 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.05		CONCRETE - (152 mm thick)		C04												
0.05 - 0.45		SAND (FILL) - trace gravel (<10mm diam.) - brown, frozen, moist when thawed - poorly graded		G25	●											
0.45 - 2.4		CLAY - silty, trace silt inclusions (<5mm diam.), trace sand - brown - frozen to 0.9 m, moist and firm when thawed, moist below - intermediate to high plasticity - very stiff below 0.9 m - trace silt seam below 1.8 m - stiff below 2.0 m - trace oxidation below 2.4 m		G26 G27 G28 G29 G30 G31	●	●	●	●	●	●			⊕	⊕	⊕	
2.4 - 3.05		SILT - trace clay - brown - moist, soft - low plasticity		G32	●											

END OF TEST HOLE AT 3.05 m IN SILT

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #424, 2.0m south of north curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0002 2015-02-25 CHELSEA C. SP. 0035 018 00 GPJ TREK GEOTECHNICAL GDT 25/2/15



Sub-Surface Log

Test Hole TH14-05

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Chelsea Ave - between Watt St. and Roche St.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 11 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL _____ MC _____ LL _____ 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.00 - 0.05		ASPHALT - (5 mm thick)		C05												
0.05 - 0.10		CONCRETE - (172 mm thick)														
0.10 - 0.45		SAND (FILL) - trace clay - brown, frozen, moist when thawed - poorly graded		G33	●											
0.45 - 0.80		CLAY - silty - dark grey - frozen to 0.8 m, moist and firm when thawed - intermediate to high plasticity - very stiff below 0.8 m		G34		●										
				G35			●									
				G36				●								
				G37					●					⊕		
				G38						●				⊕		
				G39							●			⊕		
				G40								●		⊕	△	

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #404, 2.0m north of south curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0002 2015-02-25 CHELSEA_C.SP_0035 018 00 GPJ TREK GEOTECHNICAL GDT 25/2/15



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Chelsea Avenue

Sample Date 11-Dec-14
Test Date 20-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-01	TH14-01	TH14-01	TH14-01	TH14-01	TH14-01
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G1	G2	G3	G4	G5	G6
Tare ID	H55	F130	P16	E3	P22	W84
Mass of tare	8.8	8.5	8.4	8.5	8.4	8.2
Mass wet + tare	405.9	382.2	417.0	377.3	437.3	412
Mass dry + tare	327.2	300.1	301.9	283.9	331.1	315.2
Mass water	78.7	82.1	115.1	93.4	106.2	96.8
Mass dry soil	318.4	291.6	293.5	275.4	322.7	307.0
Moisture %	24.7%	28.2%	39.2%	33.9%	32.9%	31.5%

Test Pit	TH14-01	TH14-01	TH14-02	TH14-02	TH14-02	TH14-02
Depth (m)	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G7	G8	G9	G10	G11	G12
Tare ID	E117	E26	Z103	N113	F30	H18
Mass of tare	8.3	8.5	8.3	8.5	8.4	8.6
Mass wet + tare	440.5	527.9	366.7	364.1	395.5	457.2
Mass dry + tare	343.2	432.5	289.6	276.9	301.9	349.4
Mass water	97.3	95.4	77.1	87.2	93.6	107.8
Mass dry soil	334.9	424.0	281.3	268.4	293.5	340.8
Moisture %	29.1%	22.5%	27.4%	32.5%	31.9%	31.6%

Test Pit	TH14-02	TH14-02	TH14-02	TH14-02	TH14-03	TH14-03
Depth (m)	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6
Sample #	G13	G14	G15	G16	G17	G18
Tare ID	F67	A15	Z37	K20	N32	Z53
Mass of tare	8.5	8.3	8.3	8.4	8.3	8.5
Mass wet + tare	357.7	444.1	480.8	473.7	256.4	407.9
Mass dry + tare	272.5	341.7	382.1	378.0	193.1	309.0
Mass water	85.2	102.4	98.7	95.7	63.3	98.9
Mass dry soil	264.0	333.4	373.8	369.6	184.8	300.5
Moisture %	32.3%	30.7%	26.4%	25.9%	34.3%	32.9%



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Chelsea Avenue

Sample Date 11-Dec-14
Test Date 20-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-03	TH14-03	TH14-03	TH14-03	TH14-03	TH14-03
Depth (m)	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0
Sample #	G19	G20	G21	G22	G23	G24
Tare ID	F110	P40	E24	Z02	P02	W63
Mass of tare	8.1	8.5	8.4	8.3	8.4	8.3
Mass wet + tare	358.3	481.6	419.3	358.8	382.1	376.2
Mass dry + tare	272.8	376.8	314.9	269.3	299.1	299.8
Mass water	85.5	104.8	104.4	89.5	83.0	76.4
Mass dry soil	264.7	368.3	306.5	261.0	290.7	291.5
Moisture %	32.3%	28.5%	34.1%	34.3%	28.6%	26.2%

Test Pit	TH14-04	TH14-04	TH14-04	TH14-04	TH14-04	TH14-04
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G25	G26	G27	G28	G29	G30
Tare ID	H35	W45	W80	Z51	C25	N107
Mass of tare	8.5	8.3	8.5	8.5	8.3	8.4
Mass wet + tare	428.8	377.9	441.9	397.2	495.4	376.9
Mass dry + tare	389.1	294.3	346.7	300.3	377.7	283.6
Mass water	39.7	83.6	95.2	96.9	117.7	93.3
Mass dry soil	380.6	286.0	338.2	291.8	369.4	275.2
Moisture %	10.4%	29.2%	28.1%	33.2%	31.9%	33.9%

Test Pit	TH14-04	TH14-04	TH14-05	TH14-05	TH14-05	TH14-05
Depth (m)	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G31	G32	G33	G34	G35	G36
Tare ID	W15	H57	N25	F127	E121	E82
Mass of tare	8.3	8.4	8.5	8.2	8.4	8.6
Mass wet + tare	544.9	450.8	336.4	417.7	421.3	450.4
Mass dry + tare	391.5	352.7	291.1	318.8	307.6	332.4
Mass water	153.4	98.1	45.3	98.9	113.7	118.0
Mass dry soil	383.2	344.3	282.6	310.6	299.2	323.8
Moisture %	40.0%	28.5%	16.0%	31.8%	38.0%	36.4%



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Chelsea Avenue

Sample Date 11-Dec-14
Test Date 20-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-05	TH14-05	TH14-05	TH14-05		
Depth (m)	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0		
Sample #	G37	G38	G39	G40		
Tare ID	E59	E66	E42	H36		
Mass of tare	8.4	8.3	8.4	8.5		
Mass wet + tare	412.6	457.5	424.9	470.5		
Mass dry + tare	310.9	341.3	325	339.6		
Mass water	101.7	116.2	99.9	130.9		
Mass dry soil	302.5	333.0	316.6	331.1		
Moisture %	33.6%	34.9%	31.6%	39.5%		

Test Pit						
Depth (m)						
Sample #						
Tare ID						
Mass of tare						
Mass wet + tare						
Mass dry + tare						
Mass water						
Mass dry soil						
Moisture %						

Test Pit						
Depth (m)						
Sample #						
Tare ID						
Mass of tare						
Mass wet + tare						
Mass dry + tare						
Mass water						
Mass dry soil						
Moisture %						



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**Atterberg Limits
 ASTM D4318**

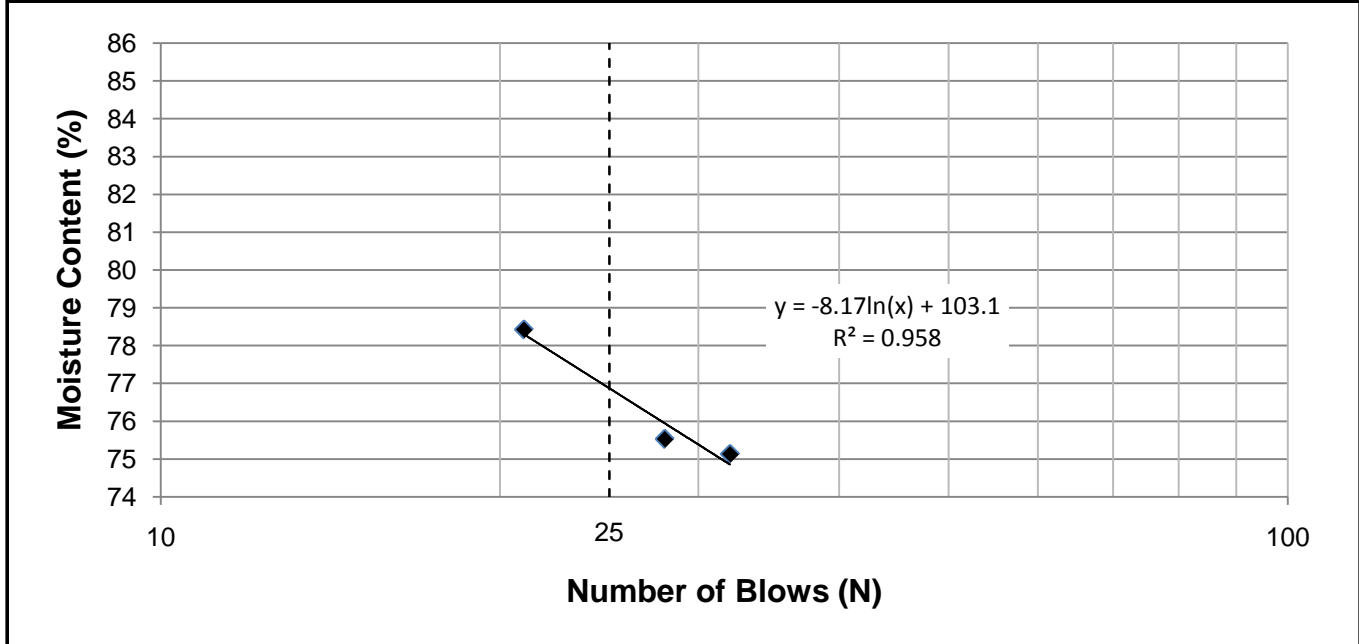
Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Chelsea Avenue

Test Hole TH14-03
Sample # G19
Depth (m) 0.8 - 0.9
Sample Date 11-Dec-14
Test Date 27-Jan-15
Technician Daniel Wiebe

Liquid Limit	77
Plastic Limit	22
Plasticity Index	54

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	32	28	21		
Mass Wet Soil + Tare (g)	24.121	22.309	23.603		
Mass Dry Soil + Tare (g)	20.014	18.762	19.371		
Mass Tare (g)	14.548	14.066	13.975		
Mass Water (g)	4.107	3.547	4.232		
Mass Dry Soil (g)	5.466	4.696	5.396		
Moisture Content (%)	75.137	75.532	78.428		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	21.112	20.919			
Mass Dry Soil + Tare (g)	19.817	19.650			
Mass Tare (g)	14.097	13.970			
Mass Water (g)	1.295	1.269			
Mass Dry Soil (g)	5.720	5.680			
Moisture Content (%)	22.640	22.342			

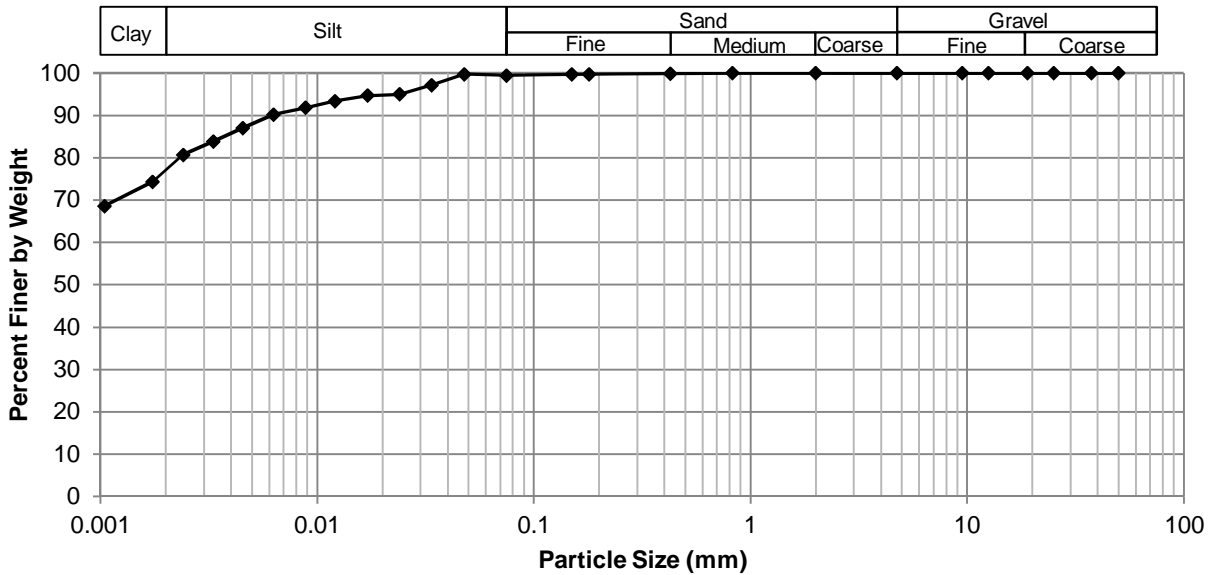


Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Chelsea Avenue

Test Hole TH14-03
Sample # G19
Depth (m) 0.2 - 0.3
Sample Date 4-Dec-14
Test Date 21-Jan-15
Technician Xin Xiong/Junhui Wu

Gravel	0.0%
Sand	0.6%
Silt	22.6%
Clay	76.8%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	99.44
37.5	100.00	2.00	100.00	0.0479	99.75
25.0	100.00	0.825	99.95	0.0338	97.21
19.0	100.00	0.425	99.87	0.0239	94.99
12.5	100.00	0.180	99.72	0.0171	94.67
9.50	100.00	0.150	99.68	0.0121	93.40
4.75	100.00	0.075	99.44	0.0088	91.81
				0.0063	90.23
				0.0045	87.05
				0.0033	83.87
				0.0024	80.70
				0.0017	74.35
				0.0010	68.63



Photo 1: Concrete Core Sample From Test Hole TH14-01



Photo 2: Concrete Core Sample From Test Hole TH14-02



Photo 3: Concrete Core Sample From Test Hole TH14-03



Photo 4: Concrete Core Sample From Test Hole TH14-04

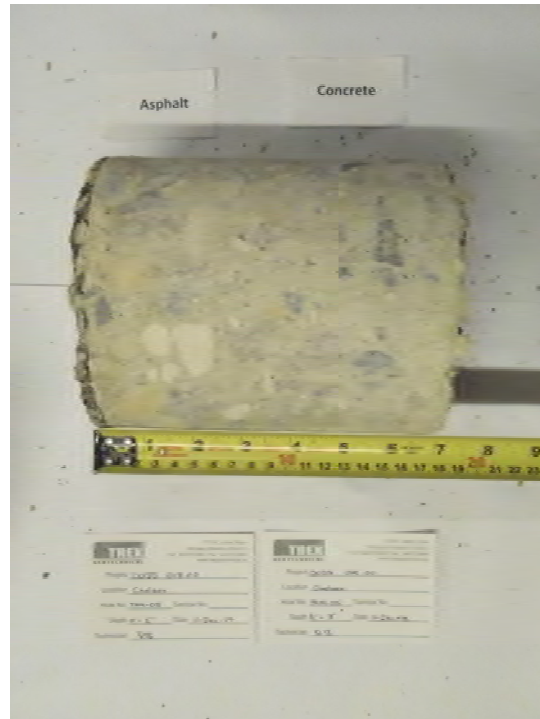


Photo 5: Concrete Core Sample From Test Hole TH14-05

Appendix C

Neil Ave., between Watt St. and Roche St.



Sub-Surface Log

Test Hole TH14-01

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Neil Ave. - between Watt St. and Roche St.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 11 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.05		ASPHALT - (25 mm thick)		C01												
0.05 - 0.1		CONCRETE - (130 mm thick)														
0.1 - 0.45		SAND (FILL) - some clay, trace gravel (<15mm diam.), - dark brown, frozen, moist when thawed - poorly graded		G1												
0.45 - 0.65		CLAY (FILL) - silty, trace gravel (<20mm diam.) - dark brown - frozen, moist and firm when thawed - intermediate plasticity		G2												
0.65 - 1.0		CLAY - silty, trace gravel, trace silt inclusion - mottled brown and grey - moist, stiff - high plasticity		G3												
1.0 - 1.2				G4												
1.2 - 1.4				G5												
1.4 - 1.6				G6												
1.6 - 1.8				G7												
1.8 - 2.0				G8												
2.0 - 3.05		- firm below 2.0 m SILT - trace clay - brown - moist, soft - low plasticity														

END OF TEST HOLE AT 3.05 m IN SILT

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #497, 2m south from north curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0003 2015-02-25 NEIL C SP 0035 018 00 GPJ TREK GEOTECHNICAL.GDT 25/2/15



Sub-Surface Log

Test Hole TH14-02

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Neil Ave. - between Watt St. and Roche St.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 11 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL _____ MC _____ LL _____ 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0		ASPHALT - (30 mm thick)		C02												
0.0		CONCRETE - (115 mm thick)														
0.0		SAND (FILL) - trace clay, trace gravel (<10mm diam.), - dark grey, frozen, moist when thawed, poorly graded		G9	●											
0.0		CLAY (FILL) - silty, trace sand, trace gravel (<10mm diam.) - dark grey - frozen, moist and firm when thawed - intermediate plasticity		G10		●										
0.0		CLAY - silty - dark grey - frozen to 0.8 m, moist and firm when thawed - intermediate plasticity		G11			●									
0.0				G12				●						◆		
0.0				G13					●					◆		
0.0				G14						●				◆		
0.0		SILT - trace clay - brown - moist to wet, soft - low plasticity		G15							●					
0.0																
0.0		CLAY - silty, trace silt inclusions (<5mm diam.) - dark grey - moist, firm - high plasticity		G16								●		◆△		

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #486, 2m north from south curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0003 2015-02-25 NEIL C SP 0035 018 00 GPU TREK GEOTECHNICAL GDT 25/2/15



Sub-Surface Log

Test Hole TH14-03

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Neil Ave. - between Watt St. and Roche St.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 11 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)								
					16	17	18	19	20	21	0	50	100	150	200	250	
0.0 - 0.05		ASPHALT - (30 mm thick)		C03													
0.05 - 0.15		CONCRETE - (165 mm thick)															
0.15 - 0.45		SAND (FILL) - trace clay - brown, frozen, moist when thawed - poorly graded	<input checked="" type="checkbox"/>	G17													
0.45 - 0.65			<input checked="" type="checkbox"/>	G18													
0.65 - 1.05		CLAY - silty - dark grey - frozen to 0.8 m, moist and firm when thawed - intermediate plasticity - very stiff below 0.8 m	<input checked="" type="checkbox"/>	G19													
1.05 - 1.45			<input checked="" type="checkbox"/>	G20													
1.45 - 1.65			<input checked="" type="checkbox"/>	G21													
1.65 - 2.05		SILT - trace clay - brown - moist, soft - low plasticity	<input checked="" type="checkbox"/>	G22													
2.05 - 2.45			<input checked="" type="checkbox"/>	G23													
2.45 - 3.05		CLAY - silty - mottled brown and grey - moist, stiff - intermediate plasticity	<input checked="" type="checkbox"/>	G24													

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #475, 2m south from north curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0003 2015-02-25 NEIL_C.SP_0035 018 00.GPJ TREK GEOTECHNICAL.GDT 25/2/15



Sub-Surface Log

Test Hole TH14-04

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Neil Ave. - between Watt St. and Roche St.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 11 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.1		ASPHALT - (13 mm thick)		C04												
0.1 - 0.2		CONCRETE - (105 mm thick)														
0.2 - 0.5		SAND (FILL) - trace clay - brown, frozen, moist when thawed - poorly graded		G25		●										
0.5 - 1.5		CLAY - silty - dark grey - frozen to 0.8 m, moist, very stiff - intermediate plasticity		G26			●									
				G27			●									
				G28			●								⊕	
				G29			●								⊕	
				G30			●									
				G31			●									
				G32			●								⊕	

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #457, 2m south from north curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0003 2015-02-25 NEIL_C.SP_0035 018 00.GPJ TREK GEOTECHNICAL.GDT 25/2/15



Sub-Surface Log

Test Hole TH14-05

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Neil Ave. - between Watt St. and Roche St.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 11 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)										
					16	17	18	19	20	21	0	50	100	150	200	250			
0.0 - 0.05		ASPHALT - (40 mm thick)																	
0.05 - 0.1		CONCRETE - (165 mm thick)		C05															
0.1 - 0.45		SAND (FILL) - trace clay, trace gravel, brown, frozen, moist when thawed, poorly graded	<input checked="" type="checkbox"/>	G33															
0.45 - 0.9		CLAY (FILL) - silty, trace gravel, trace inclusions (<10mm diam.) - dark grey - frozen, moist and firm when thawed - intermediate plasticity	<input checked="" type="checkbox"/>	G34															
0.9 - 1.1		CLAY - silty - dark grey - moist, hard - intermediate plasticity	<input checked="" type="checkbox"/>	G35															
1.1 - 1.5		- 100 mm thick silt seam, brown, moist, soft, low plasticity at 1.1 m	<input checked="" type="checkbox"/>	G36															
1.5 - 1.9		CLAY - silty - dark grey - moist, hard - intermediate plasticity	<input checked="" type="checkbox"/>	G37															
1.9 - 2.5		SILT - trace clay - brown - moist, soft - low plasticity	<input checked="" type="checkbox"/>	G38															
2.5 - 3.0		CLAY - silty - grey - moist, very stiff - high plasticity	<input checked="" type="checkbox"/>	G39															
3.0 - 3.05		CLAY - silty - grey - moist, very stiff - high plasticity	<input checked="" type="checkbox"/>	G40															

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #438, 2m north from south curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0003 2015-02-25 NEIL C. SP. 0035 018 00.GPJ TREK GEOTECHNICAL.GDT 25/2/15



Sub-Surface Log

Test Hole TH14-07

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Neil Ave. - between Watt St. and Roche St.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 11 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)								
					16	17	18	19	20	21	0	50	100	150	200	250	
0.0		ASPHALT - (25 mm thick)		C07													
0.0		CONCRETE - (155 mm thick)															
0.0		SAND (FILL) - trace clay, brown, frozen, moist when thawed, poorly graded		G49													
0.0		CLAY (FILL) - silty, trace sand, trace gravel - brown - frozen, moist and firm when thawed - intermediate plasticity		G50													
0.0		CLAY - silty - dark grey - frozen to 0.8 m, moist and soft when thawed - intermediate plasticity - very stiff below 0.8 m		G51													
0.0				G52													
0.0		SILT - trace clay - brown - moist, soft - low plasticity		G53													
0.0				G54													
0.0				G55													
0.0		CLAY - silty - brown - moist, very stiff - high plasticity		G56													

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located 20 east from Roach St., 1m north from south curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0003 2015-02-25 NEIL C.SP_0035 018 00.GPJ TREK GEOTECHNICAL.GDT 25/2/15



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Project 15-R-05, Neil Avenue

Sample Date 11-Dec-14
Test Date 19-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-01	TH14-01	TH14-01	TH14-01	TH14-01	TH14-01
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G1	G2	G3	G4	G5	G6
Tare ID	K25	N84	W29	A16	N87	W96
Mass of tare	8.4	8.3	8.3	8.5	8.4	8.5
Mass wet + tare	493.4	389.1	419.0	442.6	455.0	378.6
Mass dry + tare	448.4	324.4	312.4	339.6	358.4	291.7
Mass water	45.0	64.7	106.6	103.0	96.6	86.9
Mass dry soil	440.0	316.1	304.1	331.1	350.0	283.2
Moisture %	10.2%	20.5%	35.1%	31.1%	27.6%	30.7%

Test Pit	TH14-01	TH14-01	TH14-02	TH14-02	TH14-02	TH14-02
Depth (m)	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G7	G8	G9	G10	G11	G12
Tare ID	K36	H1	Z19	C5	Z70	E22
Mass of tare	8.4	8.3	8.6	8.4	8.6	8.7
Mass wet + tare	502.2	629.8	414.9	427.2	402.1	411.3
Mass dry + tare	376.1	506.5	364.8	337.9	302.3	319.5
Mass water	126.1	123.3	50.1	89.3	99.8	91.8
Mass dry soil	367.7	498.2	356.2	329.5	293.7	310.8
Moisture %	34.3%	24.7%	14.1%	27.1%	34.0%	29.5%

Test Pit	TH14-02	TH14-02	TH14-02	TH14-02	TH14-03	TH14-03
Depth (m)	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6
Sample #	G13	G14	G15	G16	G17	G18
Tare ID	E119	N53	F12	C19	D33	H5
Mass of tare	8.4	8.3	8.5	8.4	8.3	8.3
Mass wet + tare	395.9	366.2	664.4	418.7	352.2	430.3
Mass dry + tare	310.3	293.8	542.2	292.8	300.4	336.2
Mass water	85.6	72.4	122.2	125.9	51.8	94.1
Mass dry soil	301.9	285.5	533.7	284.4	292.1	327.9
Moisture %	28.4%	25.4%	22.9%	44.3%	17.7%	28.7%



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Project 15-R-05, Neil Avenue

Sample Date 11-Dec-14
Test Date 19-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-03	TH14-03	TH14-03	TH14-03	TH14-03	TH14-03
Depth (m)	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0
Sample #	G19	G20	G21	G22	G23	G24
Tare ID	H4	Z34	F9	Z131	z14	D45
Mass of tare	8.3	8.4	8.9	8.5	8.5	8.3
Mass wet + tare	358.2	420	414.4	550.1	601.8	413.7
Mass dry + tare	276.2	325.4	323.1	451.2	481.6	297
Mass water	82.0	94.6	91.3	98.9	120.2	116.7
Mass dry soil	267.9	317.0	314.2	442.7	473.1	288.7
Moisture %	30.6%	29.8%	29.1%	22.3%	25.4%	40.4%

Test Pit	TH14-04	TH14-04	TH14-04	TH14-04	TH14-04	TH14-04
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G25	G26	G27	G28	G29	G30
Tare ID	Z123	W85	F122	N66	E53	P34
Mass of tare	8.5	8.5	8.5	8.4	8.5	8.4
Mass wet + tare	374.7	355.3	388.1	444.6	384.3	580.8
Mass dry + tare	315.4	266.5	295.3	348.7	297.1	476.8
Mass water	59.3	88.8	92.8	95.9	87.2	104.0
Mass dry soil	306.9	258.0	286.8	340.3	288.6	468.4
Moisture %	19.3%	34.4%	32.4%	28.2%	30.2%	22.2%

Test Pit	TH14-04	TH14-04	TH14-05	TH14-05	TH14-05	TH14-05
Depth (m)	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G31	G32	G33	G34	G35	G36
Tare ID	E11	H44	E101	Z116	W75	C2
Mass of tare	8.4	8.5	8.4	8.3	8.3	8.3
Mass wet + tare	426.2	422.6	411.2	365.2	401	385.3
Mass dry + tare	344.7	305.5	383.6	284.6	322.7	315.4
Mass water	81.5	117.1	27.6	80.6	78.3	69.9
Mass dry soil	336.3	297.0	375.2	276.3	314.4	307.1
Moisture %	24.2%	39.4%	7.4%	29.2%	24.9%	22.8%



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Project 15-R-05, Neil Avenue

Sample Date 11-Dec-14
Test Date 19-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-05	TH14-05	TH14-05	TH14-05	TH14-06	TH14-06
Depth (m)	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6
Sample #	G37	G38	G39	G40	G41	G42
Tare ID	F25	F20	N13	Z57	E4	H27
Mass of tare	8.3	8.4	8.5	8.4	8.4	8.2
Mass wet + tare	431.8	394.8	442.6	429.5	366.6	394.6
Mass dry + tare	345.2	337	395.3	315.3	296.8	301.8
Mass water	86.6	57.8	47.3	114.2	69.8	92.8
Mass dry soil	336.9	328.6	386.8	306.9	288.4	293.6
Moisture %	25.7%	17.6%	12.2%	37.2%	24.2%	31.6%

Test Pit	TH14-06	TH14-06	TH14-06	TH14-06	TH14-06	TH14-06
Depth (m)	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0
Sample #	G43	G44	G45	G46	G47	G48
Tare ID	F115	A104	F75	N64	W83	E67
Mass of tare	8.2	8.4	8.5	8.3	8.3	8.3
Mass wet + tare	378.3	380.7	418.0	432.4	410.2	380.6
Mass dry + tare	282.0	296.7	317.1	335.8	333.8	284.9
Mass water	96.3	84.0	100.9	96.6	76.4	95.7
Mass dry soil	273.8	288.3	308.6	327.5	325.5	276.6
Moisture %	35.2%	29.1%	32.7%	29.5%	23.5%	34.6%

Test Pit	TH14-07	TH14-07	TH14-07	TH14-07	TH14-07	TH14-07
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G49	G50	G51	G52	G53	G54
Tare ID	Z112	A27	H3	E137	D26	A105
Mass of tare	8.4	8.2	8.4	8.3	8.5	8.4
Mass wet + tare	416.9	385.5	401.1	378.1	398.3	398.8
Mass dry + tare	344.2	297.0	317.4	292.8	322.9	319.6
Mass water	72.7	88.5	83.7	85.3	75.4	79.2
Mass dry soil	335.8	288.8	309.0	284.5	314.4	311.2
Moisture %	21.6%	30.6%	27.1%	30.0%	24.0%	25.4%



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Project 15-R-05, Neil Avenue

Sample Date 11-Dec-14
Test Date 19-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-07	TH14-07			
Depth (m)	2.0 - 2.1	2.9 - 3.0			
Sample #	G55	G56			
Tare ID	H19	N43			
Mass of tare	8.4	8.3			
Mass wet + tare	418.6	385.9			
Mass dry + tare	341.3	268.1			
Mass water	77.3	117.8			
Mass dry soil	332.9	259.8			
Moisture %	23.2%	45.3%			

Test Pit					
Depth (m)					
Sample #					
Tare ID					
Mass of tare					
Mass wet + tare					
Mass dry + tare					
Mass water					
Mass dry soil					
Moisture %					

Test Pit					
Depth (m)					
Sample #					
Tare ID					
Mass of tare					
Mass wet + tare					
Mass dry + tare					
Mass water					
Mass dry soil					
Moisture %					



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**Atterberg Limits
 ASTM D4318**

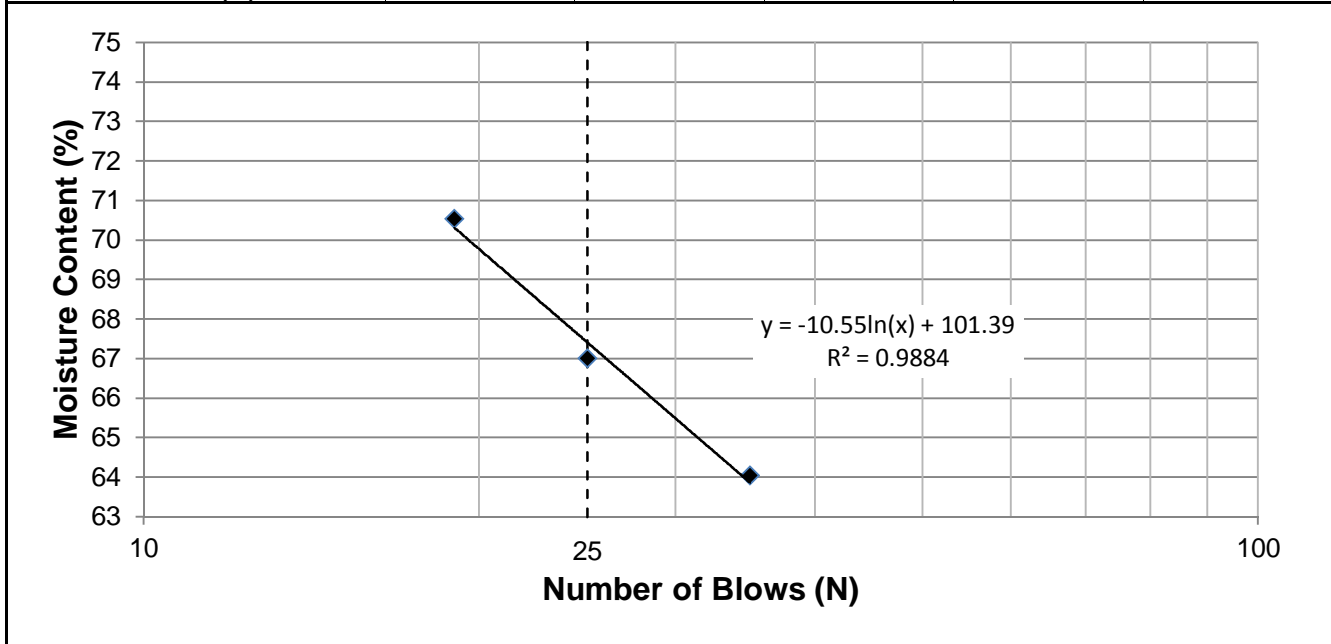
Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05,Neil

Test Hole TH14-01
Sample # G3
Depth (m) 0.8-0.9
Sample Date 11-Dec-14
Test Date 06-Feb-15
Technician Xin Xiong/ Junhui Wu

Liquid Limit	67
Plastic Limit	19
Plasticity Index	48

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	35	25	19		
Mass Wet Soil + Tare (g)	22.835	23.561	22.748		
Mass Dry Soil + Tare (g)	19.410	19.787	19.165		
Mass Tare (g)	14.062	14.155	14.085		
Mass Water (g)	3.425	3.774	3.583		
Mass Dry Soil (g)	5.348	5.632	5.080		
Moisture Content (%)	64.043	67.010	70.531		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.725	19.773			
Mass Dry Soil + Tare (g)	19.667	18.844			
Mass Tare (g)	13.995	14.074			
Mass Water (g)	1.058	0.929			
Mass Dry Soil (g)	5.672	4.770			
Moisture Content (%)	18.653	19.476			



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**Atterberg Limits
 ASTM D4318**

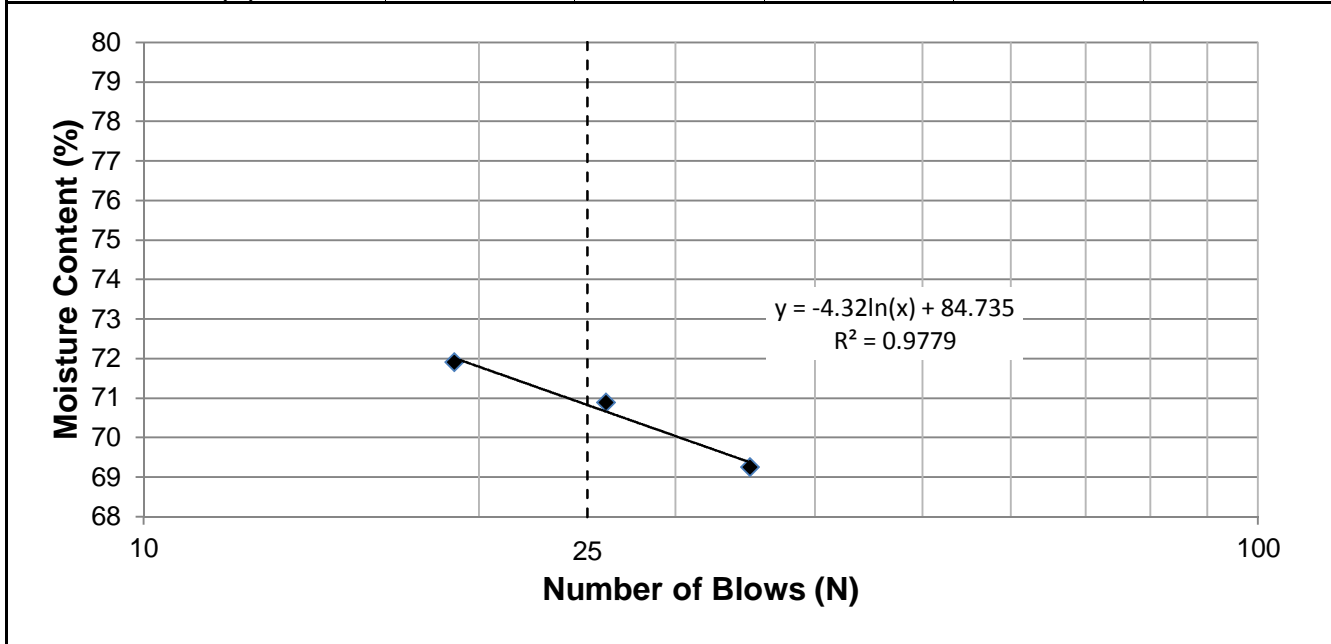
Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05,Neil

Test Hole TH14-03
Sample # G19
Depth (m) 0.8-0.9
Sample Date 11-Dec-14
Test Date 06-Feb-15
Technician Xin Xiong/ Junhui Wu

Liquid Limit	71
Plastic Limit	22
Plasticity Index	49

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	35	26	19		
Mass Wet Soil + Tare (g)	22.048	22.128	23.371		
Mass Dry Soil + Tare (g)	18.786	18.797	19.512		
Mass Tare (g)	14.076	14.098	14.145		
Mass Water (g)	3.262	3.331	3.859		
Mass Dry Soil (g)	4.710	4.699	5.367		
Moisture Content (%)	69.257	70.887	71.902		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	22.214	20.165			
Mass Dry Soil + Tare (g)	20.706	19.091			
Mass Tare (g)	13.883	14.089			
Mass Water (g)	1.508	1.074			
Mass Dry Soil (g)	6.823	5.002			
Moisture Content (%)	22.102	21.471			



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**Atterberg Limits
 ASTM D4318**

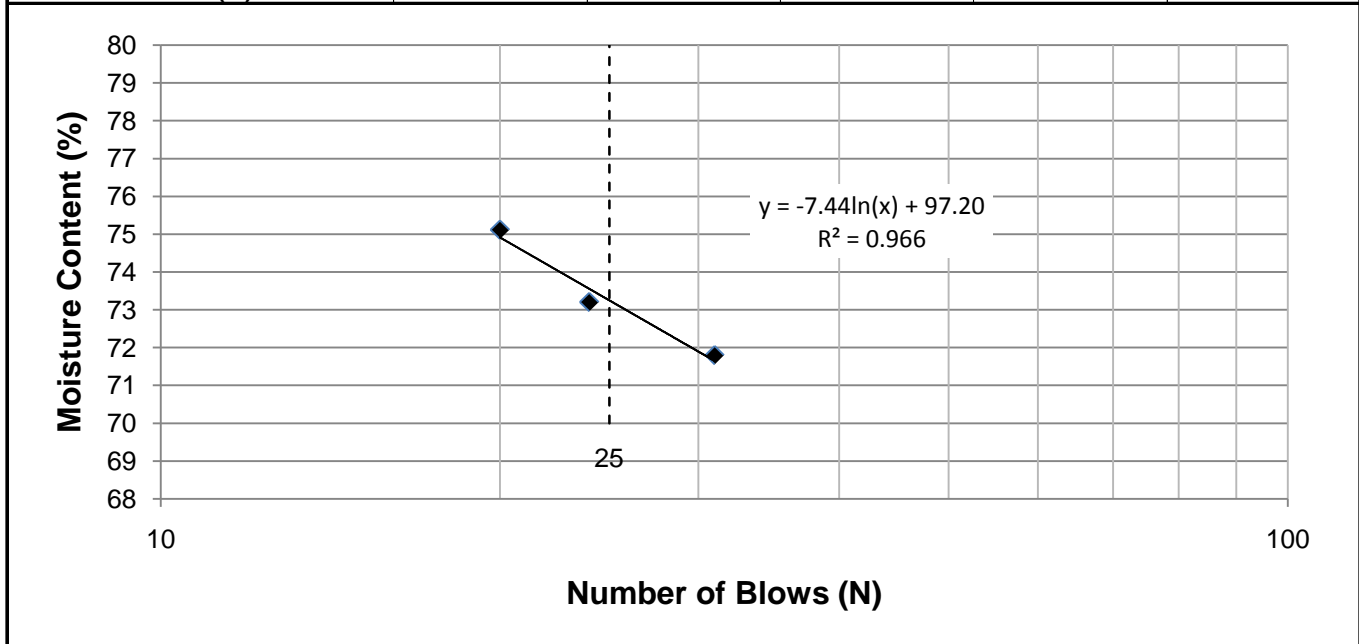
Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05,Neil

Test Hole TH14-07
Sample # G51
Depth (m) 1.1-1.2
Sample Date 11-Dec-14
Test Date 06-Feb-15
Technician Xin Xiong/ Junhui Wu

Liquid Limit	73
Plastic Limit	22
Plasticity Index	51

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	31	24	20		
Mass Wet Soil + Tare (g)	21.597	21.226	22.353		
Mass Dry Soil + Tare (g)	18.422	18.218	18.769		
Mass Tare (g)	14.000	14.109	13.998		
Mass Water (g)	3.175	3.008	3.584		
Mass Dry Soil (g)	4.422	4.109	4.771		
Moisture Content (%)	71.800	73.205	75.121		



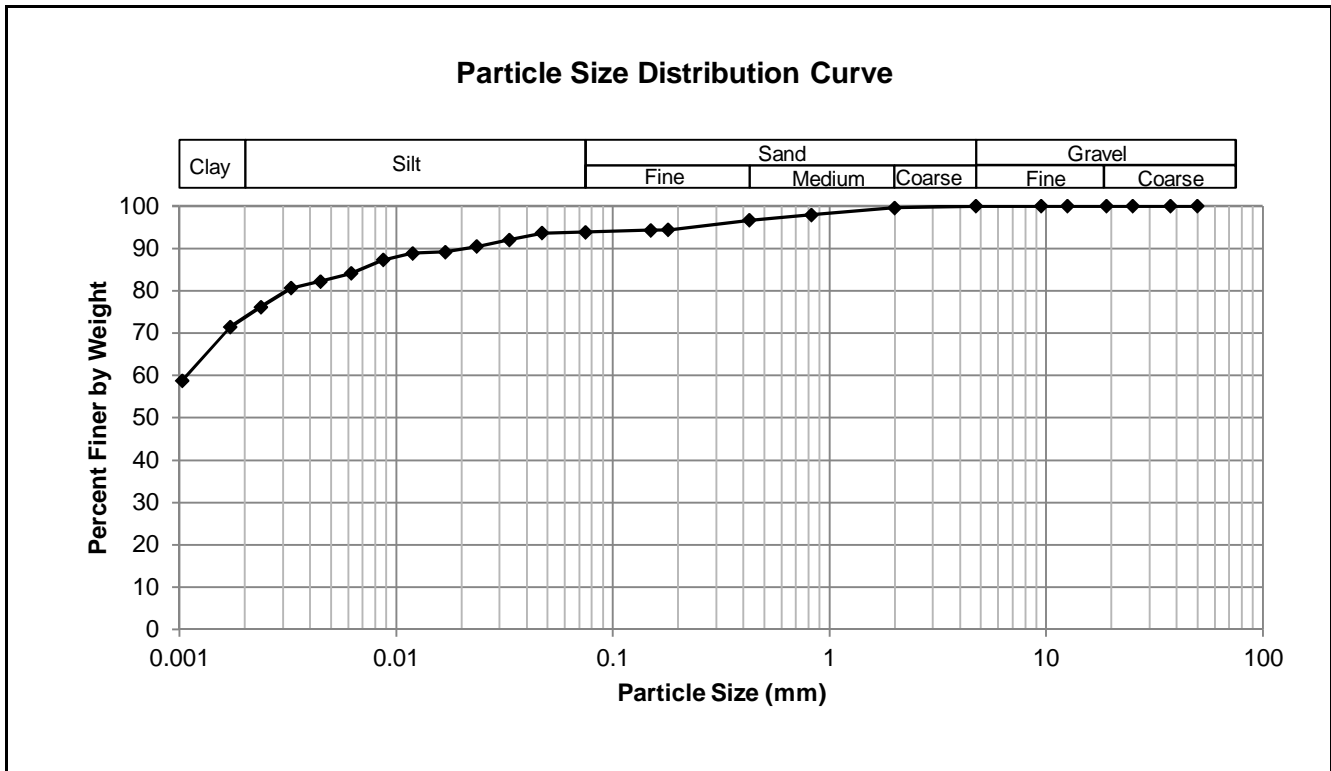
Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	22.214	20.165			
Mass Dry Soil + Tare (g)	20.706	19.091			
Mass Tare (g)	13.883	14.089			
Mass Water (g)	1.508	1.074			
Mass Dry Soil (g)	6.823	5.002			
Moisture Content (%)	22.102	21.471			

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Neil Avenue

Test Hole TH14-01
Sample # G3
Depth (m) 0.8 - 0.9
Sample Date 10-Dec-14
Test Date 10-Feb-15
Technician Xin Xiong/Junhui Wu

Gravel	0.0%
Sand	6.2%
Silt	20.3%
Clay	73.5%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	93.83
37.5	100.00	2.00	99.62	0.0471	93.61
25.0	100.00	0.825	97.97	0.0333	92.03
19.0	100.00	0.425	96.64	0.0236	90.44
12.5	100.00	0.180	94.40	0.0168	89.18
9.50	100.00	0.150	94.27	0.0119	88.86
4.75	100.00	0.075	93.83	0.0087	87.28
				0.0062	84.12
				0.0045	82.22
				0.0033	80.64
				0.0024	76.21
				0.0017	71.46
				0.0010	58.81



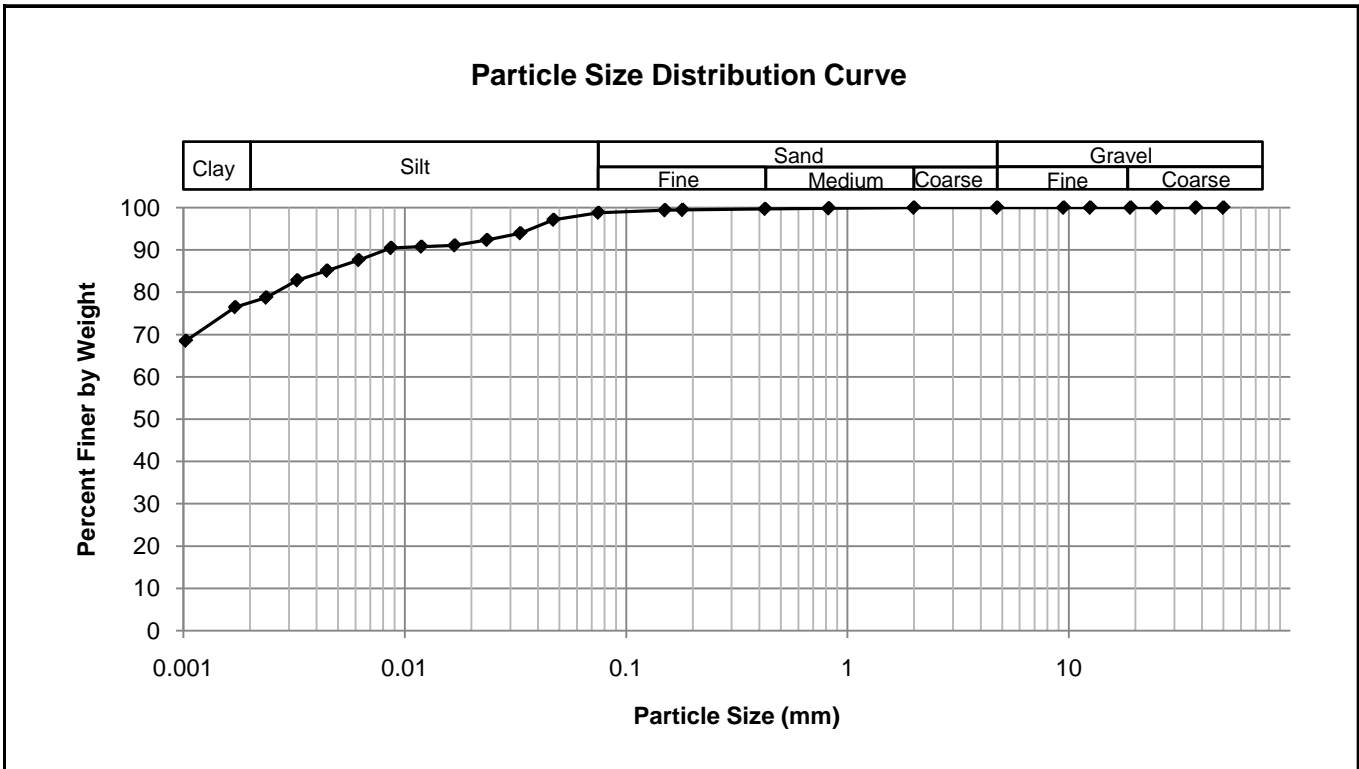
www.trekgeotechnical.ca
 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Neil Avenue

Test Hole TH14-03
Sample # G19
Depth (m) 0.8 - 0.9
Sample Date 10-Dec-14
Test Date 10-Feb-15
Technician Xin Xiong/Junhui Wu

Gravel	0.0%
Sand	1.2%
Silt	21.4%
Clay	77.5%



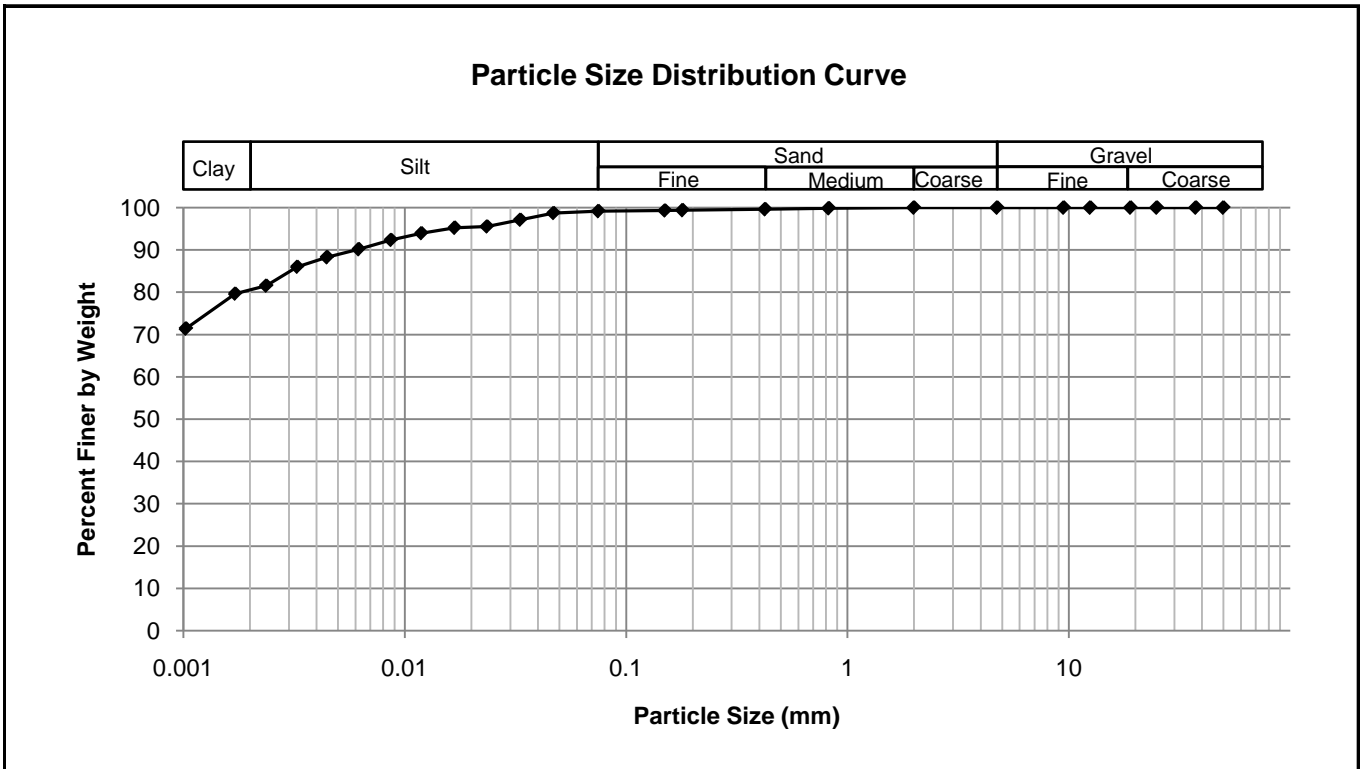
Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	98.82
37.5	100.00	2.00	100.00	0.0471	97.14
25.0	100.00	0.825	99.85	0.0333	93.97
19.0	100.00	0.425	99.71	0.0236	92.38
12.5	100.00	0.180	99.44	0.0168	91.11
9.50	100.00	0.150	99.38	0.0119	90.79
4.75	100.00	0.075	98.82	0.0087	90.47
				0.0062	87.62
				0.0045	85.07
				0.0033	82.85
				0.0024	78.72
				0.0017	76.50
				0.0010	68.56



Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Neil Avenue

Test Hole TH14-06
Sample # G51
Depth (m) 0.8 - 0.9
Sample Date 10-Dec-14
Test Date 10-Feb-15
Technician Xin Xiong/Junhui Wu

Gravel	0.0%
Sand	0.8%
Silt	18.7%
Clay	80.5%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	99.16
37.5	100.00	2.00	100.00	0.0471	98.73
25.0	100.00	0.825	99.85	0.0333	97.14
19.0	100.00	0.425	99.61	0.0236	95.55
12.5	100.00	0.180	99.39	0.0168	95.24
9.50	100.00	0.150	99.33	0.0119	93.97
4.75	100.00	0.075	99.16	0.0087	92.38
				0.0062	90.16
				0.0045	88.25
				0.0033	86.03
				0.0024	81.58
				0.0017	79.68
				0.0010	71.42

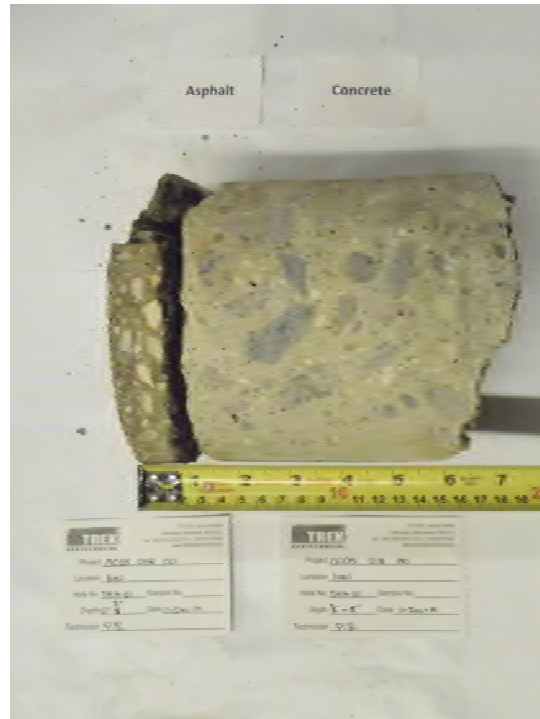


Photo 1: Concrete Core Sample From Test Hole TH14-01



Photo 2: Concrete Core Sample From Test Hole TH14-02

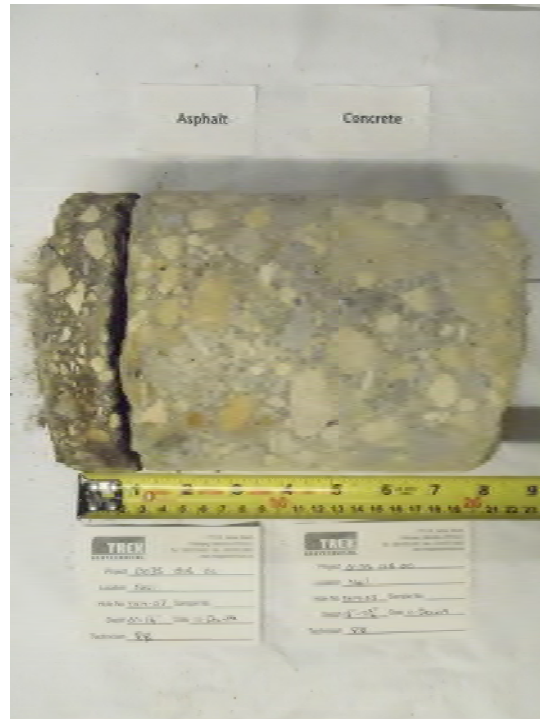


Photo 3: Concrete Core Sample From Test Hole TH14-03

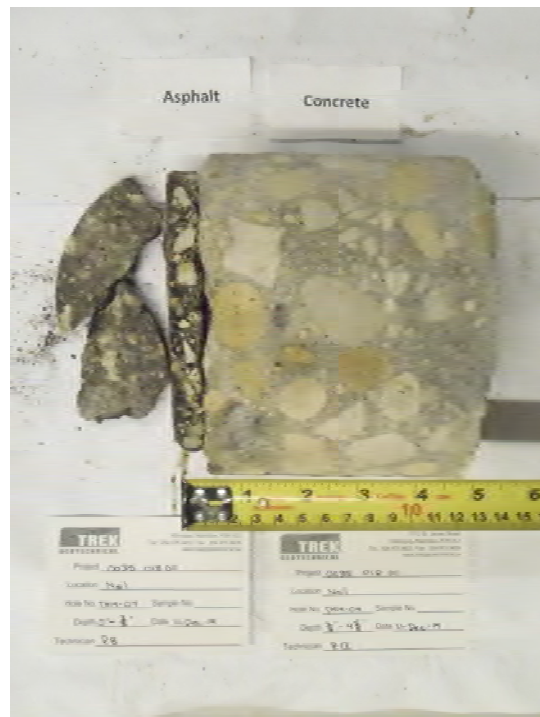


Photo 4: Concrete Core Sample From Test Hole TH14-04



Photo 5: Concrete Core Sample From Test Hole TH14-05



Photo 6: Concrete Core Sample From Test Hole TH14-06



Photo 7: Concrete Core Sample From Test Hole TH14-07

Appendix D

Ravenhill Rd., between Tomlinson Ave. and TuPelo Ave.



Sub-Surface Log

Test Hole TH14-01

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Ravenhill Rd. - between Tomlinson Ave. and Tu Pelo Ave.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)
 Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.15		CONCRETE - (152 mm thick)		C01												
0.15 - 0.45		CLAY (FILL) - silty, some gravel (<20mm diam.) - dark grey - frozen, moist and soft when thawed - intermediate plasticity		G1												
0.45 - 0.85		CLAY - silty - mottled brown and grey - frozen, moist and soft when thawed - high plasticity		G2												
0.85 - 1.05		CLAY - silty - mottled brown and grey - frozen, moist and soft when thawed - high plasticity		G3												
1.05 - 1.55		SILT - clayey - brown - moist, soft - low plasticity - 150 mm thick clay seam, moist, firm, high plasticity at 1.0 m		G4												
1.55 - 2.05		CLAY - silty - mottled brown and grey - moist, stiff - high plasticity		G5A												
2.05 - 2.55		CLAY - silty - mottled brown and grey - moist, stiff - high plasticity		G5												
2.55 - 3.05		CLAY - silty - mottled brown and grey - moist, stiff - high plasticity		G6												
3.05 - 3.55		- firm below 2.0 m		G7												
3.55 - 4.05		- firm below 2.0 m		G8												

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #21, 2.0m west from east curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0004 2015-02-25 RAVENHILL C. SP. 0035 018 00.GPJ TREK GEOTECHNICAL GDT 25/2/15



Sub-Surface Log

Test Hole TH14-02

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Ravenhill Rd. - between Tomlinson Ave. and Tu Pelo Ave.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.1		CONCRETE - (172 mm thick)		C02												
0.1 - 0.45		CLAY (FILL) - silty, some clay, trace sand, trace gravel (<40mm diam.) - dark grey - frozen, moist and firm when thawed - intermediate plasticity	Grab (G)	G9												
0.45 - 1.1		CLAY - silty - dark grey - frozen to 0.8 m, moist and soft when thawed, moist below - high plasticity	Grab (G)	G10												
1.1 - 1.5		- very stiff below 1.1 m	Grab (G)	G11												
1.5 - 2.0		- stiff below 1.5 m	Grab (G)	G12												
2.0 - 2.9		- mottled brown and grey below 2.0 m	Grab (G)	G13												
			Grab (G)	G14												
			Grab (G)	G15												
			Grab (G)	G16												

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #32, 1.5m east from west curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0004 2015-02-25 RAVENHILL_C.SP_0035 018 00.GPJ TREK GEOTECHNICAL GDT 25/2/15



Sub-Surface Log

Test Hole TH14-03

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Ravenhill Rd. - between Tomlinson Ave. and Tu Pelo Ave.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.15		CONCRETE - (155 mm thick)		C03												
0.15 - 0.45		CLAY (FILL) - silty, trace gravel (<10mm diam.) - dark grey - frozen, moist and firm when thawed - intermediate plasticity	<input checked="" type="checkbox"/>	G17												
0.45 - 1.0		CLAY - silty - mottled brown and grey - frozen to 0.7m, moist and soft when thawed, moist below - high plasticity	<input checked="" type="checkbox"/>	G18												
			<input checked="" type="checkbox"/>	G19												
1.0 - 1.5		SILT - clayey - light brown - moist, hard - low plasticity	<input checked="" type="checkbox"/>	G20												
1.5 - 2.0		CLAY - silty - mottled brown and grey - moist, stiff - high plasticity	<input checked="" type="checkbox"/>	G21												
			<input checked="" type="checkbox"/>	G22												
2.0 - 3.05		CLAY - silty - firm, trace silt inclusion (<5mm diam.)	<input checked="" type="checkbox"/>	G23												
			<input checked="" type="checkbox"/>	G24												

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located between house #49 & #51, 1.2m west from east curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0004 2015-02-25 RAVENHILL_C.SP_0035 018 00.GPJ TREK GEOTECHNICAL GDT 25/2/15



Sub-Surface Log

Test Hole TH14-04

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Ravenhill Rd. - between Tomlinson Ave. and Tu Pelo Ave.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)						
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.05		CONCRETE - (152 mm thick)		C04												
0.05 - 0.45		CLAY (FILL) - silty - dark grey - frozen, moist and soft when thawed - intermediate plasticity		G25												
0.45 - 1.1		CLAY - silty, trace silt inclusion (<10mm diam.) - mottled brown and grey - frozen to 0.8 m, moist and soft when thawed, moist below - high plasticity		G26												
1.1 - 1.4		- very stiff below 1.1 m		G27												
1.4 - 2.0		- stiff below 1.4 m		G28												
2.0 - 2.9		- firm below 2.0 m		G29												
				G30												
				G31												
				G32												

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #87, 1.5m south from north curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0004 2015-02-25 RAVENHILL_C.SP_0035 018 00.GPJ TREK GEOTECHNICAL GDT 25/2/15



Sub-Surface Log

Test Hole TH14-05

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Ravenhill Rd. - between Tomlinson Ave. and Tu Pelo Ave.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)								
					16	17	18	19	20	21	0	50	100	150	200	250	
0.0 - 0.05		CONCRETE - (152 mm thick)		C05													
0.05 - 0.45		CLAY (FILL) - silty - dark grey - frozen, moist and firm when thawed - intermediate plasticity	<input checked="" type="checkbox"/>	G33													
0.45 - 0.6		CLAY - silty - grey - frozen to 0.6 m, moist firm when thawed, moist below - high plasticity	<input checked="" type="checkbox"/>	G34													
0.6 - 1.0			<input checked="" type="checkbox"/>	G35													
1.0 - 1.4			<input checked="" type="checkbox"/>	G36													
1.4 - 1.8		- very stiff below 1.4 m	<input checked="" type="checkbox"/>	G37													
1.8 - 2.0		- 100 mm thick silt seam, brown, moist, soft, low plasticity at 1.8 m	<input checked="" type="checkbox"/>	G38													
2.0 - 2.05			<input checked="" type="checkbox"/>	G38A													
2.05 - 2.3		- mottled brown and grey stiff below 2.0 m	<input checked="" type="checkbox"/>	G39													
2.3 - 3.0			<input checked="" type="checkbox"/>	G40													

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #103, 1.5m north from south curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0004 2015-02-25 RAVENHILL_C.SP_0035 018 00.GPJ TREK GEOTECHNICAL GDT 25/2/15



Sub-Surface Log

Test Hole TH14-06

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Ravenhill Rd. - between Tomlinson Ave. and Tu Pelo Ave.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)
 Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.1		CONCRETE - (160 mm thick)		C06												
0.1 - 0.45		CLAY (FILL) - silty, trace gravel, trace sand - dark grey - frozen, wet and soft when thawed - intermediate plasticity		G41												
0.45 - 1.7		CLAY - silty - dark grey - frozen to 0.6 m, moist and soft when thawed, moist below - high plasticity		G42												
1.7 - 2.1		- 100 mm thick silt seam, light brown, moist, soft, low plasticity - mottled brown and grey below 1.2 m		G43												
2.1 - 2.5		- stiff below 1.7 m		G44												
2.5 - 3.05		- firm below 2.1 m		G45												
				G46												
				G47												
				G48												

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located between house #119 & #123, 1.4m south from north curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0004 2015-02-25 RAVENHILL_C.SP_0035 018 00.GPJ TREK GEOTECHNICAL GDT 25/2/15



Sub-Surface Log

Test Hole TH14-07

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Ravenhill Rd. - between Tomlinson Ave. and Tu Pelo Ave.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)								
					16	17	18	19	20	21	0	50	100	150	200	250	
0.0		CONCRETE - (140 mm thick)		C07													
0.1		CLAY (FILL) - silty, trace silt inclusions (<5mm diam.) - dark grey - frozen, moist and firm when thawed - intermediate plasticity		G49													
0.5		CLAY - silty, trace silt inclusion (<10mm diam.) - dark grey - frozen to 0.9 m, moist and firm when thawed, moist below - high plasticity - 150 mm thick silt seam, light brown, moist and hard when thawed, low plasticity - mottled brown and grey below 0.8 m		G50													
0.8				G51													
1.0				G52													
1.5				G53													
2.0				G54													
2.5				G55													
3.0				G56													

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #138, 2.0m north from south curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0004 2015-02-25 RAVENHILL_C.SP_0035 018 00.GPJ TREK GEOTECHNICAL GDT 25/2/15



Sub-Surface Log

Test Hole TH14-08

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Ravenhill Rd. - between Tomlinson Ave. and Tu Pelo Ave.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)
Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.1		CONCRETE - (160 mm thick)														
0.1 - 0.45		CLAY (FILL) - silty, sandy, trace gravel (<10mm diam.) - dark grey - frozen, moist and firm when thawed - intermediate plasticity	▲	G57												
0.45 - 1.0		CLAY - silty - dark grey - frozen to 0.9 m, moist and firm when thawed, moist below - high plasticity	▲	G58												
1.0 - 1.2		- very stiff below 0.9 m	▲	G59												
1.2 - 1.7		- mottled brown / grey below 1.2 m	▲	G60												
1.7 - 2.0		- stiff below 1.7 m	▲	G61												
2.0 - 2.4		- stiff below 1.7 m	▲	G62												
2.4 - 2.5		- firm below 2.4 m	▲	G63												
2.5 - 3.0		- firm below 2.4 m	▲	G64												

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located between house #166 & #170, 2.0m west from east curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0004 2015-02-25 RAVENHILL_C.SP_0035 018 00.GPJ TREK GEOTECHNICAL GDT 25/2/15



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 1712 St. James Street
 Winnipeg, MB R3H 0L3
 Tel: 204.975.9433 Fax: 204.975.9435

**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Ravenhill Road

Sample Date 10-Dec-14
Test Date 19-Jan-15
Technician Xin Xiong

Test Pit	TH14-01	TH14-01	TH14-01	TH14-01	TH14-01	TH14-01
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.9 - 1.0	1.1 - 1.2	1.0 - 1.2	1.4 - 1.5
Sample #	G1	G2	G3	G4	G5A	G5
Tare ID	Z85	D34	Z45	E46	D11	N52
Mass of tare	8.293	8.414	8.652	8.517	8.6	8.5
Mass wet + tare	431.0	375.1	396.0	384.8	405.7	410.2
Mass dry + tare	353.4	288.4	305.4	313.9	296.9	333.5
Mass water	77.6	86.7	90.6	70.9	108.8	76.7
Mass dry soil	345.1	280.0	296.7	305.4	288.3	325.0
Moisture %	22.5%	31.0%	30.5%	23.2%	37.7%	23.6%

Test Pit	TH14-01	TH14-01	TH14-01	TH14-02	TH14-02	TH14-02
Depth (m)	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9
Sample #	G6	G7	G8	G9	G10	G11
Tare ID	C4	Z42	E9	H73	Z15	W05
Mass of tare	8.342	8.242	8.455	8.401	8.404	8.432
Mass wet + tare	387.276	414.24	381.811	362.224	374.48	378.846
Mass dry + tare	268.9	275.3	259.1	279.4	287.3	276.3
Mass water	118.4	138.9	122.7	82.8	87.2	102.5
Mass dry soil	260.6	267.1	250.6	271.0	278.9	267.9
Moisture %	45.4%	52.0%	49.0%	30.6%	31.3%	38.3%

Test Pit	TH14-02	TH14-02	TH14-02	TH14-02	TH14-02	TH14-03
Depth (m)	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3
Sample #	G12	G13	G14	G15	G16	G17
Tare ID	A24	D48	P07	Z40	H68	E28
Mass of tare	8.5	8.4	8.5	8.4	8.4	8.4
Mass wet + tare	417.0	413.4	377.2	425.8	389.1	365.5
Mass dry + tare	313.8	312.2	274.0	299.9	261.3	276.3
Mass water	103.2	101.2	103.2	125.9	127.8	89.2
Mass dry soil	305.3	303.8	265.5	291.5	252.9	267.9
Moisture %	33.8%	33.3%	38.9%	43.2%	50.5%	33.3%



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Ravenhill Road

Sample Date 10-Dec-14
Test Date 19-Jan-15
Technician Xin Xiong

Test Pit	TH14-03	TH14-03	TH14-03	TH14-03	TH14-03	TH14-03
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1
Sample #	G18	G19	G20	G21	G22	G23
Tare ID	N74	W50	F73	W28	E6	E33
Mass of tare	8.4	8.2	8.4	8.3	8.3	8.4
Mass wet + tare	372.2	420.2	420.9	423.7	441.2	372
Mass dry + tare	290.7	317.2	347.3	309.4	313.9	253.7
Mass water	81.5	103.0	73.6	114.3	127.3	118.3
Mass dry soil	282.3	309.0	338.9	301.1	305.6	245.3
Moisture %	28.9%	33.3%	21.7%	38.0%	41.7%	48.2%

Test Pit	TH14-03	TH14-04	TH14-04	TH14-04	TH14-04	TH14-04
Depth (m)	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5
Sample #	G24	G25	G26	G27	G28	G29
Tare ID	F93	H37	E92	H20	F154	K35
Mass of tare	8.3	8.3	8.4	8.3	8.3	8.3
Mass wet + tare	391.7	392.7	393.4	415.8	378.169	358.2
Mass dry + tare	264.6	265.1	282.7	301.6	279.6	259
Mass water	127.1	127.6	110.7	114.2	98.6	99.2
Mass dry soil	256.3	256.8	274.3	293.3	271.3	250.7
Moisture %	49.6%	49.7%	40.4%	38.9%	36.3%	39.6%

Test Pit	TH14-04	TH14-04	TH14-04	TH14-05	TH14-05	TH14-05
Depth (m)	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9
Sample #	G30	G31	G32	G33	G34	G35
Tare ID	W111	K10	A25	D9	H59	E87
Mass of tare	8.3	8.3	8.6	8.5	8.5	8.5
Mass wet + tare	395.8	363.5	392.6	188.2	354.7	381.1
Mass dry + tare	275	241.3	260.9	145	276.4	296.4
Mass water	120.8	122.2	131.7	43.2	78.3	84.7
Mass dry soil	266.7	233.0	252.3	136.5	267.9	287.9
Moisture %	45.3%	52.4%	52.2%	31.6%	29.2%	29.4%



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Ravenhill Road

Sample Date 10-Dec-14
Test Date 19-Jan-15
Technician Xin Xiong

Test Pit	TH14-05	TH14-05	TH14-05	TH14-05	TH14-05	TH14-05
Depth (m)	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	1.8 - 1.9	2.0 - 2.1	2.9 - 3.0
Sample #	G36	G37	G38	G38A	G39	G40
Tare ID	P33	N03	Z48	Z117	Z99	F16
Mass of tare	8.4	8.5	8.4	8.4	8.281	8.2
Mass wet + tare	356.5	357.3	232	399.5	362.27	367.97
Mass dry + tare	271.2	270.3	169.9	281.5	251.4	241
Mass water	85.3	87.0	62.1	118.0	110.9	127.0
Mass dry soil	262.8	261.8	161.5	273.1	243.1	232.8
Moisture %	32.5%	33.2%	38.5%	43.2%	45.6%	54.5%

Test Pit	TH14-06	TH14-06	TH14-06	TH14-06	TH14-06	TH14-06
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G41	G42	G43	G44	G45	G46
Tare ID	E7	C22	Z139	D4	F100	P24
Mass of tare	8.5	8.4	8.6	8.4	8.5	8.7
Mass wet + tare	368.4	438.9	426.2	398.8	351.3	363.3
Mass dry + tare	252.7	321.8	347.9	310.8	256.3	249.2
Mass water	115.7	117.1	78.3	88.0	95.0	114.1
Mass dry soil	244.2	313.4	339.3	302.4	247.8	240.5
Moisture %	47.4%	37.4%	23.1%	29.1%	38.3%	47.4%

Test Pit	TH14-06	TH14-06	TH14-07	TH14-07	TH14-07	TH14-07
Depth (m)	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G47	G48	G49	G50	G51	G52
Tare ID	F79	F72	E60	K5	A26	Z27
Mass of tare	8.5	8.4	8.5	8.5	8.2	8.8
Mass wet + tare	404.0	361.5	393.8	399.5	358.0	408.0
Mass dry + tare	282.7	243.2	292.3	332.3	291.9	307.6
Mass water	121.3	118.3	101.5	67.2	66.1	100.4
Mass dry soil	274.2	234.8	283.8	323.8	283.7	298.8
Moisture %	44.2%	50.4%	35.8%	20.8%	23.3%	33.6%



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Ravenhill Road

Sample Date 10-Dec-14
Test Date 19-Jan-15
Technician Xin Xiong

Test Pit	TH14-07	TH14-07	TH14-07	TH14-07	TH14-08	TH14-08
Depth (m)	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6
Sample #	G53	G54	G55	G56	G57	G58
Tare ID	H54	H50	E21	W21	K21	Z81
Mass of tare	8.3	8.4	8.5	8.4	8.4	8.4
Mass wet + tare	379.6	373.7	410.3	396.0	407.0	373.1
Mass dry + tare	272.8	262.1	273.6	259.2	317.7	279.1
Mass water	106.8	111.6	136.7	136.8	89.3	94.0
Mass dry soil	264.5	253.7	265.1	250.8	309.3	270.7
Moisture %	40.4%	44.0%	51.6%	54.5%	28.9%	34.7%

Test Pit	TH14-08	TH14-08	TH14-08	TH14-08	TH14-08	TH14-08
Depth (m)	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0
Sample #	G59	G60	G61	G62	G63	G64
Tare ID	F37	H64	F14	W102	N01	W100
Mass of tare	8.4	8.4	8.4	8.3	8.5	8.3
Mass wet + tare	360.1	358.4	378.1	400.0	417.0	422.1
Mass dry + tare	263.8	265.0	269.6	280.3	282.6	278.6
Mass water	96.3	93.4	108.5	119.7	134.4	143.5
Mass dry soil	255.4	256.6	261.2	272.0	274.1	270.3
Moisture %	37.7%	36.4%	41.5%	44.0%	49.0%	53.1%

Test Pit						
Depth (m)						
Sample #						
Tare ID						
Mass of tare						
Mass wet + tare						
Mass dry + tare						
Mass water						
Mass dry soil						
Moisture %						



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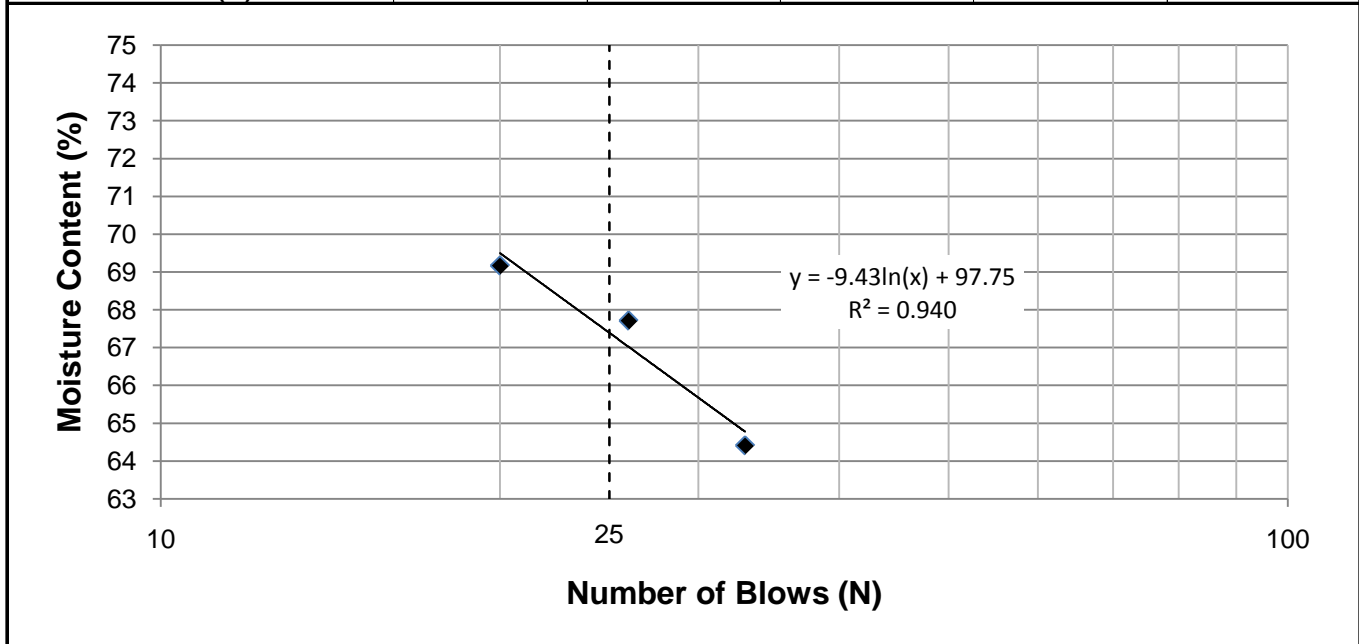
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Client Morrison Hershfield
Project Local Streets Package 15-R-05, Ravenhill Road

Test Hole TH14-01
Sample # G03
Depth (m) 0.9-1
Sample Date 12-Dec-14
Test Date 05-Feb-15
Technician Xin Xiong/ Junhui Wu

Liquid Limit	67
Plastic Limit	19
Plasticity Index	49

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	20	26	33		
Mass Wet Soil + Tare (g)	23.030	19.462	20.762		
Mass Dry Soil + Tare (g)	19.332	17.346	18.222		
Mass Tare (g)	13.986	14.221	14.279		
Mass Water (g)	3.698	2.116	2.540		
Mass Dry Soil (g)	5.346	3.125	3.943		
Moisture Content (%)	69.173	67.712	64.418		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	19.784	20.256			
Mass Dry Soil + Tare (g)	18.860	19.312			
Mass Tare (g)	14.074	14.085			
Mass Water (g)	0.924	0.944			
Mass Dry Soil (g)	4.786	5.227			
Moisture Content (%)	19.306	18.060			



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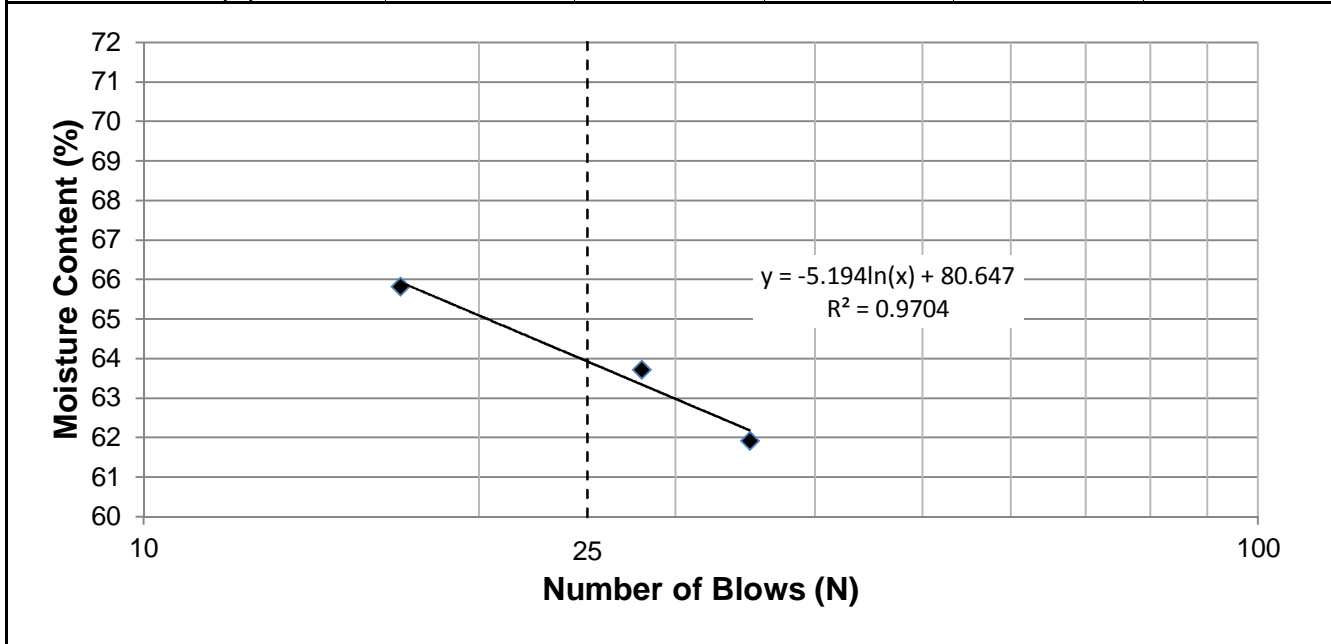
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Client Morrison Hershfield
Project Local Streets Package 15-R-05, Ravenhill Road

Test Hole TH14-02
Sample # G10
Depth (m) 0.5-0.6
Sample Date 12-Dec-14
Test Date 05-Feb-15
Technician Xin Xiong/ Junhui Wu

Liquid Limit	64
Plastic Limit	19
Plasticity Index	45

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	17	28	35		
Mass Wet Soil + Tare (g)	22.748	22.409	20.846		
Mass Dry Soil + Tare (g)	19.423	19.167	18.241		
Mass Tare (g)	14.371	14.079	14.034		
Mass Water (g)	3.325	3.242	2.605		
Mass Dry Soil (g)	5.052	5.088	4.207		
Moisture Content (%)	65.816	63.719	61.921		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	19.600	22.442			
Mass Dry Soil + Tare (g)	18.726	21.172			
Mass Tare (g)	13.986	14.364			
Mass Water (g)	0.874	1.270			
Mass Dry Soil (g)	4.740	6.808			
Moisture Content (%)	18.439	18.655			



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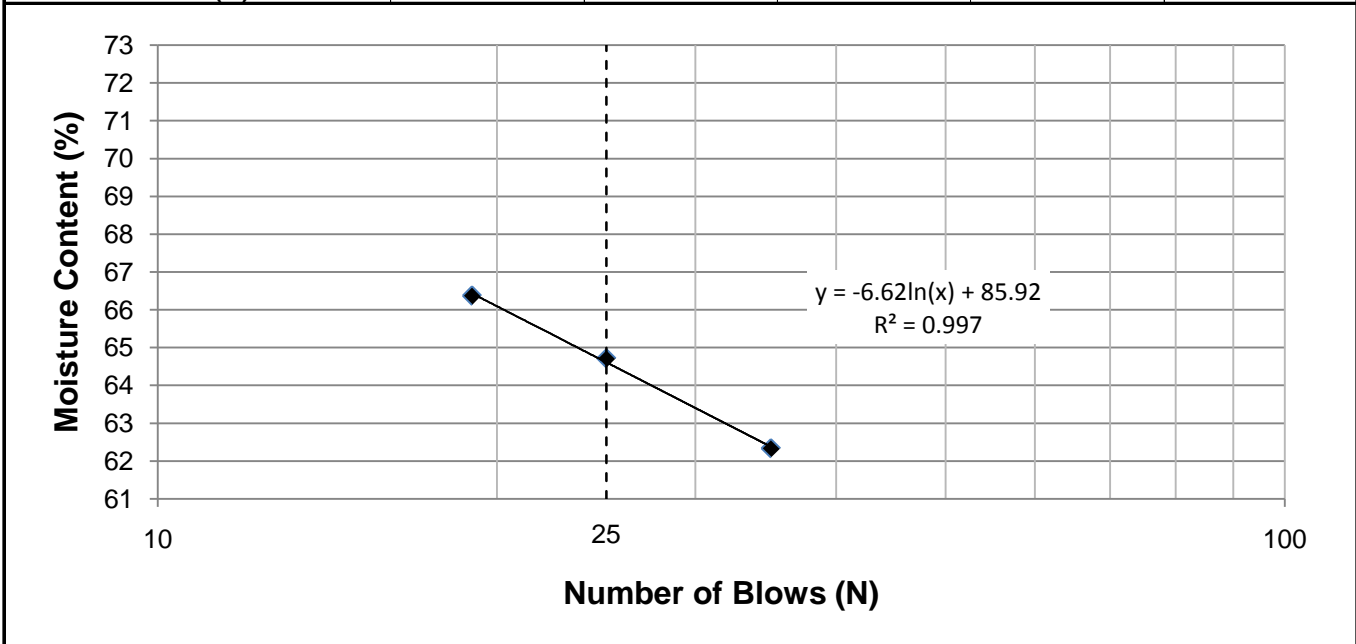
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Project Local Streets Package 15-R-05, Ravenhill Road

Test Hole TH14-05
Sample # G35
Depth (m) 0.8-0.9
Sample Date 12-Dec-14
Test Date 05-Feb-15
Technician Xin Xiong/ Junhui Wu

Liquid Limit	65
Plastic Limit	16
Plasticity Index	49

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	19	25	35		
Mass Wet Soil + Tare (g)	24.708	24.585	23.535		
Mass Dry Soil + Tare (g)	20.439	20.340	19.930		
Mass Tare (g)	14.007	13.781	14.147		
Mass Water (g)	4.269	4.245	3.605		
Mass Dry Soil (g)	6.432	6.559	5.783		
Moisture Content (%)	66.371	64.720	62.338		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	19.673	21.292			
Mass Dry Soil + Tare (g)	18.922	20.276			
Mass Tare (g)	14.075	13.831			
Mass Water (g)	0.751	1.016			
Mass Dry Soil (g)	4.847	6.445			
Moisture Content (%)	15.494	15.764			



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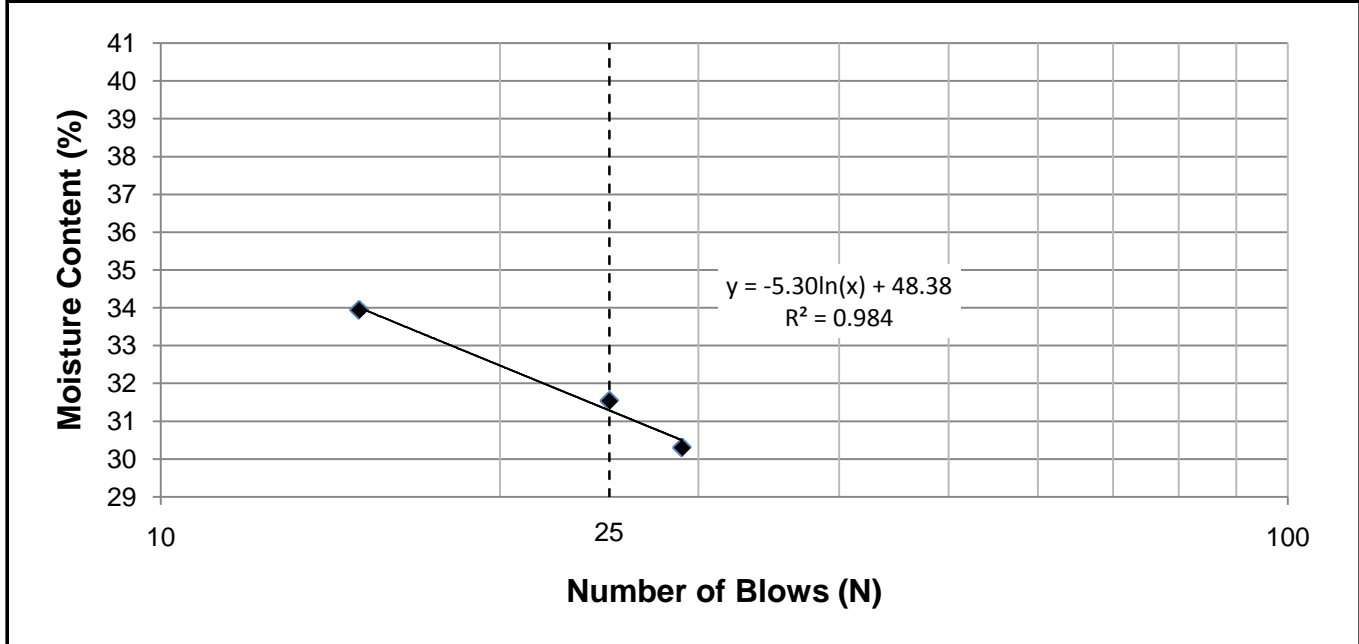
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Project Local Streets Package 15-R-05, Ravenhill Road

Test Hole TH14-07
Sample # G51
Depth (m) 0.8-0.9
Sample Date 12-Dec-14
Test Date 05-Feb-15
Technician Xin Xiong/ Junhui Wu

Liquid Limit	31
Plastic Limit	14
Plasticity Index	17

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	15	29	25		
Mass Wet Soil + Tare (g)	25.168	22.478	24.645		
Mass Dry Soil + Tare (g)	22.394	20.529	22.092		
Mass Tare (g)	14.222	14.098	13.998		
Mass Water (g)	2.774	1.949	2.553		
Mass Dry Soil (g)	8.172	6.431	8.094		
Moisture Content (%)	33.945	30.306	31.542		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.352	21.143			
Mass Dry Soil + Tare (g)	19.554	20.265			
Mass Tare (g)	14.093	14.039			
Mass Water (g)	0.798	0.878			
Mass Dry Soil (g)	5.461	6.226			
Moisture Content (%)	14.613	14.102			



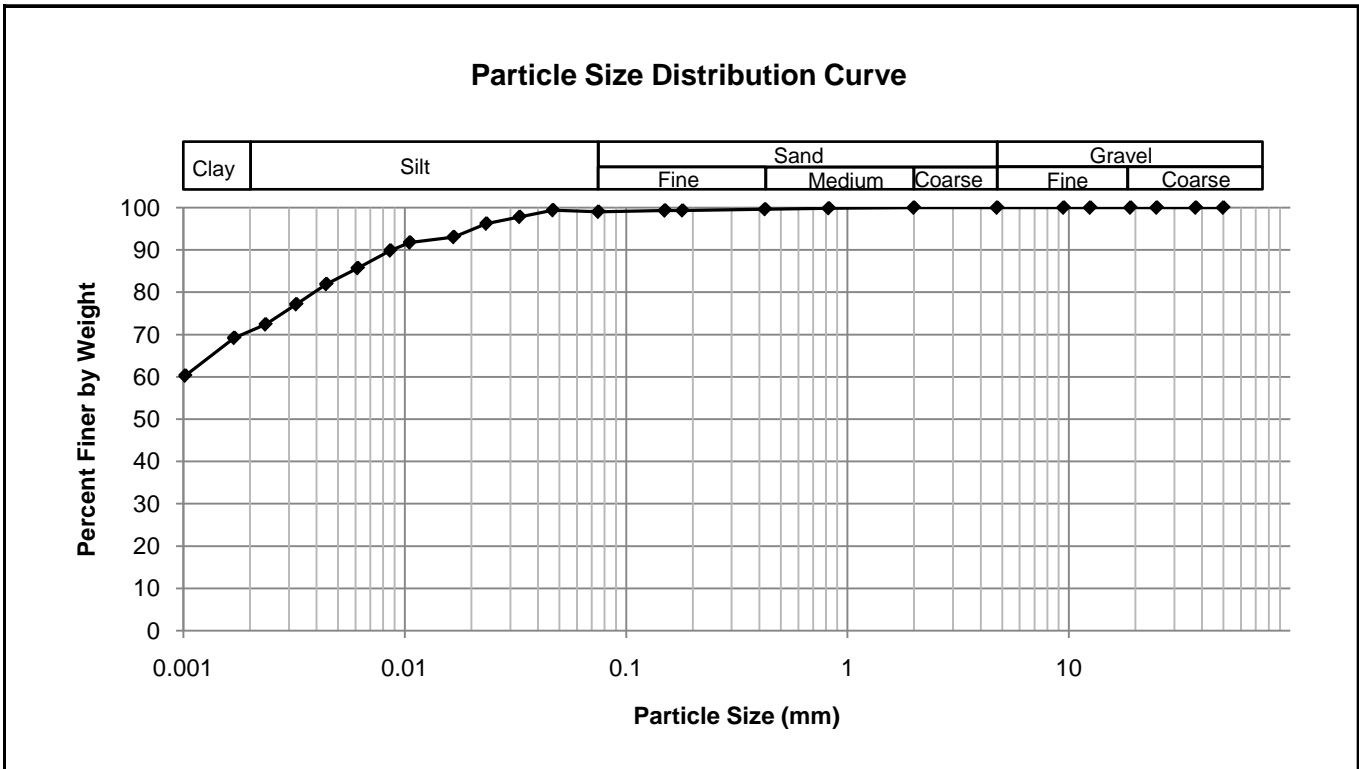
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Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Ravenhill Road

Test Hole TH14-01
Sample # G3
Depth (m) 0.9 - 1.0
Sample Date 4-Dec-14
Test Date 6-Feb-15
Technician Xin Xiong/Junhui Wu

Gravel	0.0%
Sand	1.0%
Silt	28.3%
Clay	70.7%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	98.99
37.5	100.00	2.00	100.00	0.0468	99.37
25.0	100.00	0.825	99.88	0.0331	97.78
19.0	100.00	0.425	99.65	0.0234	96.19
12.5	100.00	0.180	99.36	0.0167	93.02
9.50	100.00	0.150	99.30	0.0106	91.75
4.75	100.00	0.075	98.99	0.0086	89.84
				0.0062	85.71
				0.0044	81.90
				0.0032	77.14
				0.0024	72.38
				0.0017	69.20
				0.0010	60.31

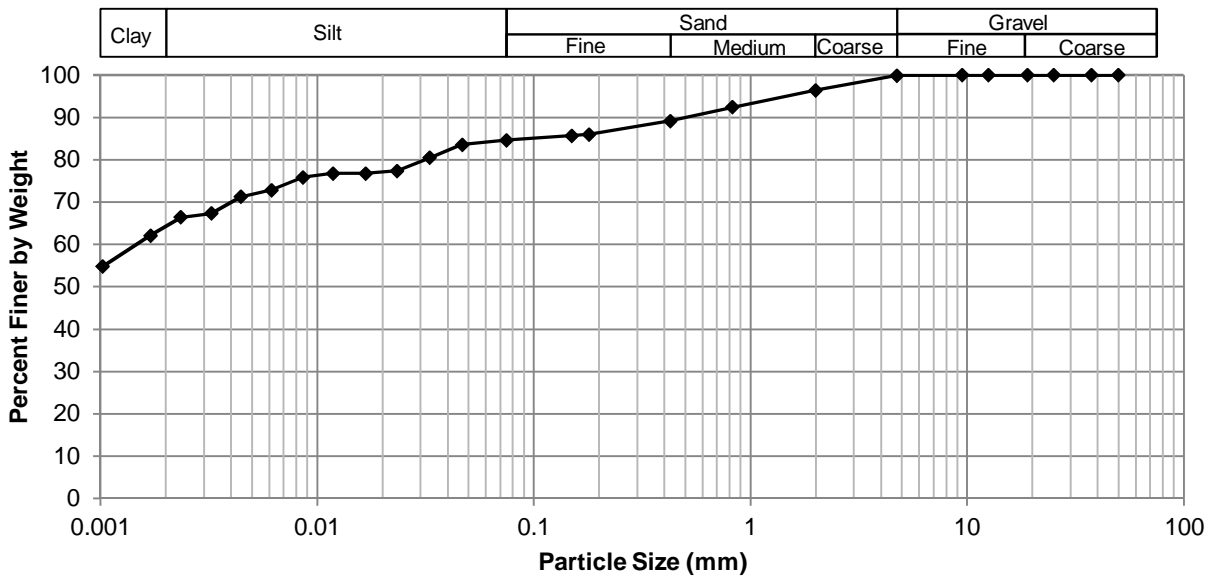


Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Ravenhill Road

Test Hole TH14-02
Sample # G10
Depth (m) 0.5 - 0.6
Sample Date 4-Dec-14
Test Date 5-Feb-15
Technician Xin Xiong/Junhui Wu

Gravel	0.1%
Sand	15.3%
Silt	20.5%
Clay	64.1%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	99.93	0.0750	84.61
37.5	100.00	2.00	96.39	0.0468	83.54
25.0	100.00	0.825	92.39	0.0331	80.48
19.0	100.00	0.425	89.16	0.0234	77.42
12.5	100.00	0.180	86.01	0.0167	76.80
9.50	100.00	0.150	85.67	0.0118	76.80
4.75	99.93	0.075	84.61	0.0086	75.89
				0.0062	72.83
				0.0044	71.29
				0.0032	67.32
				0.0024	66.40
				0.0017	62.11
				0.0010	54.77



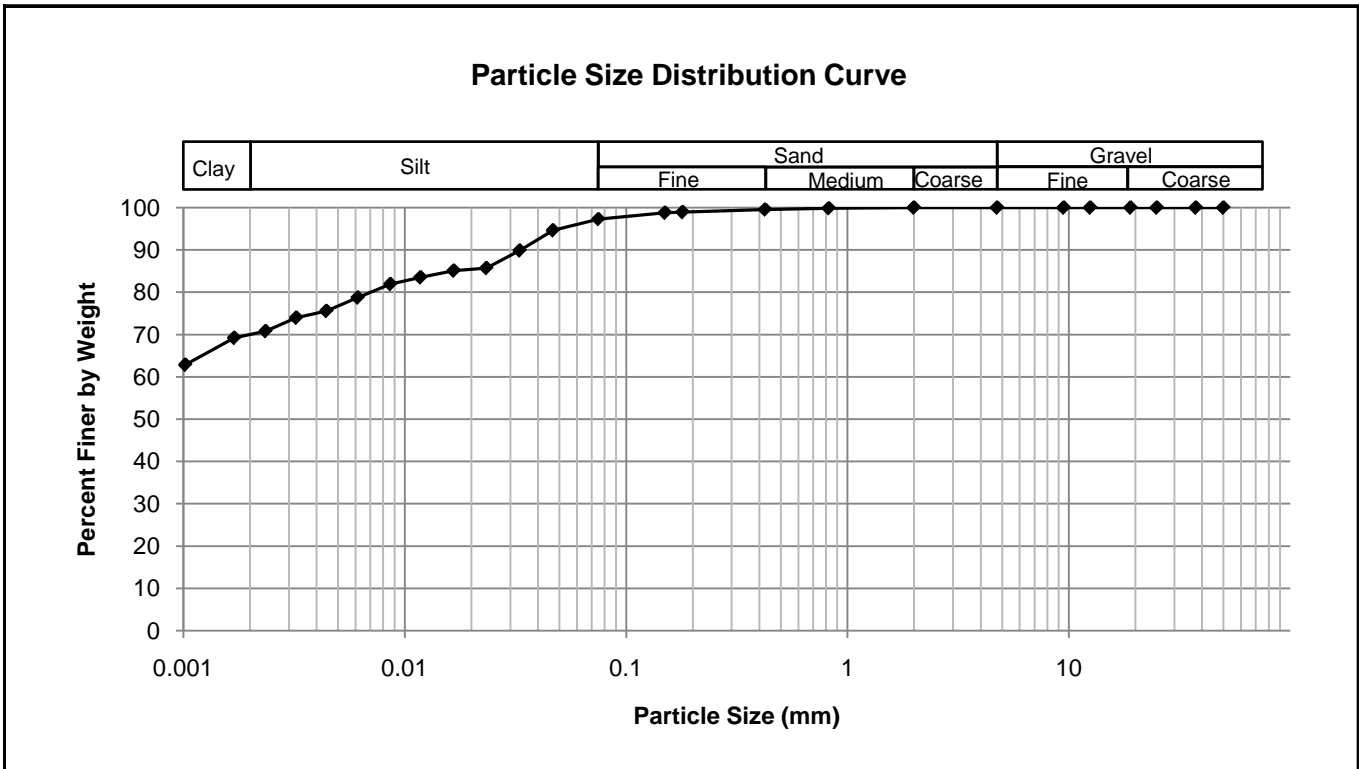
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Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Ravenhill Road

Test Hole TH14-05
Sample # G35
Depth (m) 0.8 - 0.9
Sample Date 4-Dec-14
Test Date 5-Feb-15
Technician Xin Xiong/Junhui Wu

Gravel	0.0%
Sand	2.7%
Silt	27.4%
Clay	69.9%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	97.31
37.5	100.00	2.00	100.00	0.0468	94.61
25.0	100.00	0.825	99.86	0.0331	89.84
19.0	100.00	0.425	99.57	0.0234	85.71
12.5	100.00	0.180	98.94	0.0167	85.08
9.50	100.00	0.150	98.79	0.0118	83.49
4.75	100.00	0.075	97.31	0.0086	81.90
				0.0062	78.73
				0.0044	75.55
				0.0032	73.96
				0.0024	70.79
				0.0017	69.20
				0.0010	62.85



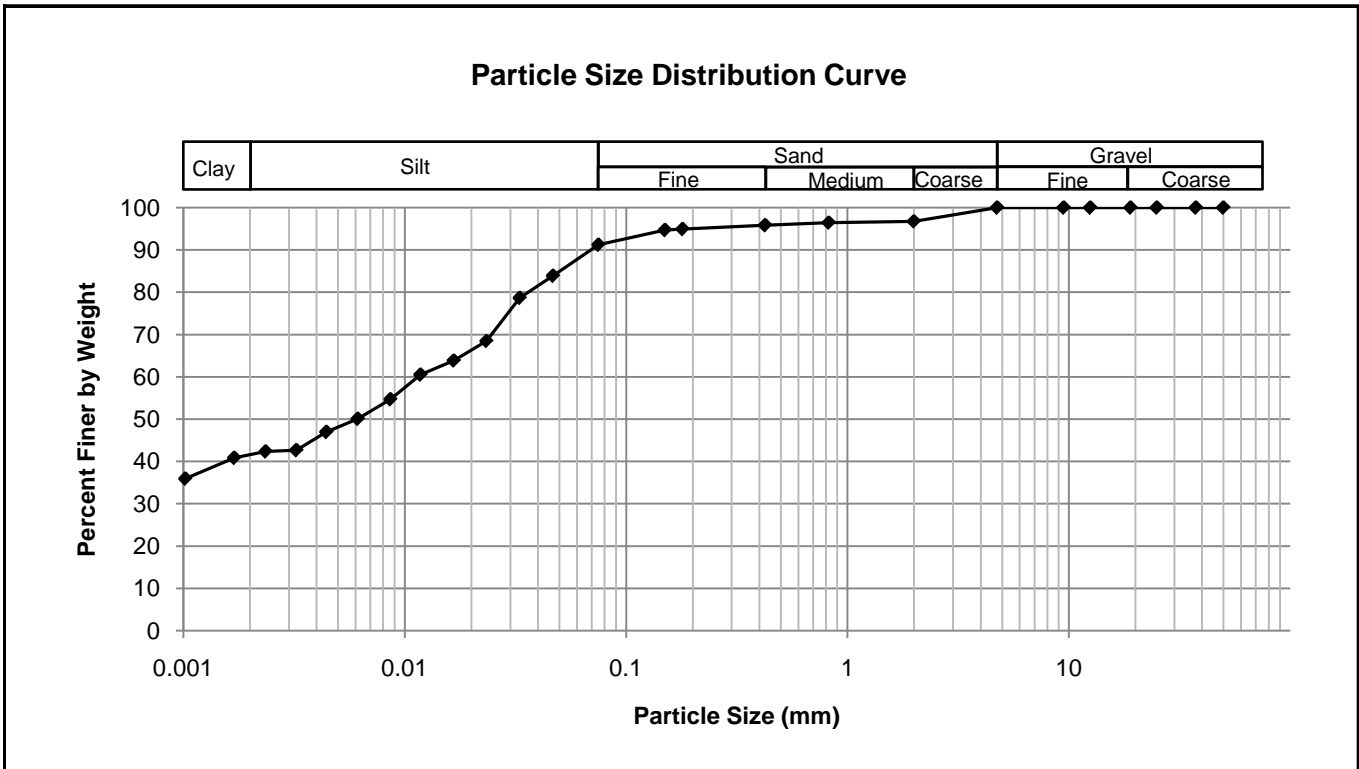
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Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Ravenhill Road

Test Hole TH14-07
Sample # G51
Depth (m) 0.8 - 0.9
Sample Date 4-Dec-14
Test Date 5-Feb-15
Technician Xin Xiong/Junhui Wu

Gravel	0.0%
Sand	8.8%
Silt	49.7%
Clay	41.5%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	91.22
37.5	100.00	2.00	96.76	0.0468	83.86
25.0	100.00	0.825	96.47	0.0331	78.64
19.0	100.00	0.425	95.84	0.0234	68.50
12.5	100.00	0.180	94.90	0.0167	63.89
9.50	100.00	0.150	94.69	0.0118	60.51
4.75	100.00	0.075	91.22	0.0086	54.67
				0.0062	50.06
				0.0044	46.99
				0.0032	42.69
				0.0024	42.38
				0.0017	40.84
				0.0010	35.93



Photo 1: Concrete Core Sample From Test Hole TH14-01

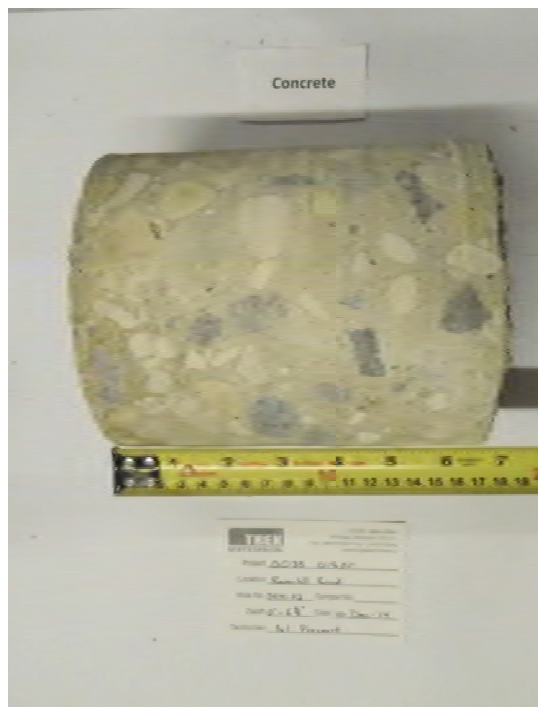


Photo 2: Concrete Core Sample From Test Hole TH14-02

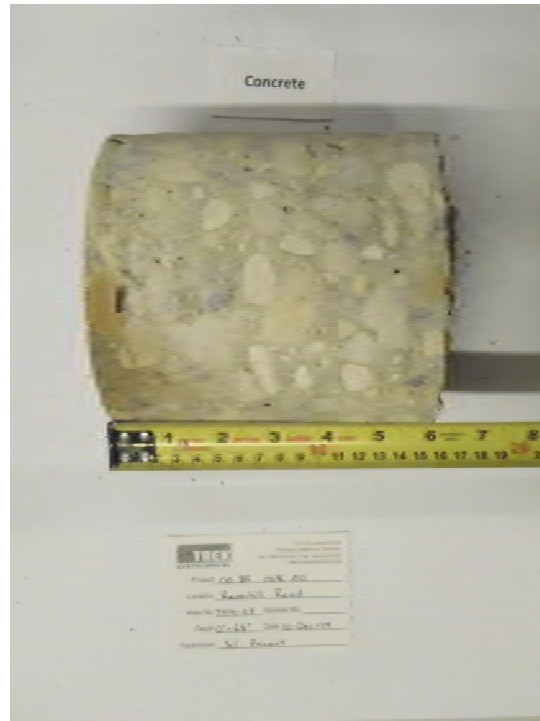


Photo 3: Concrete Core Sample From Test Hole TH14-03

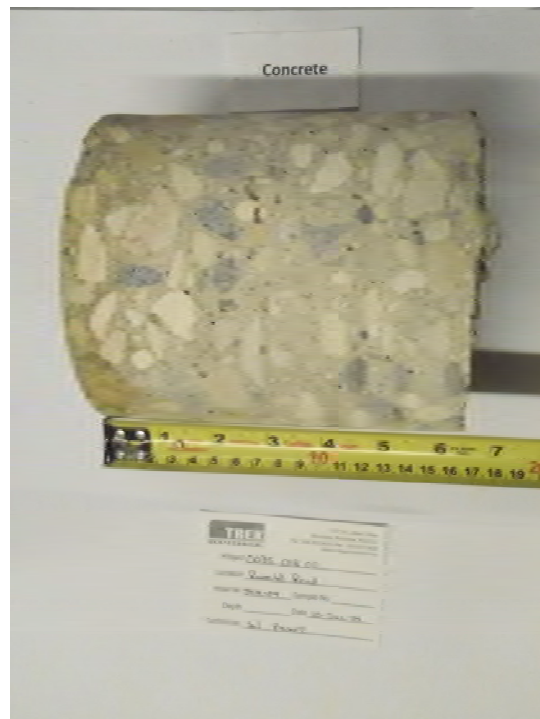


Photo 4: Concrete Core Sample From Test Hole TH14-04

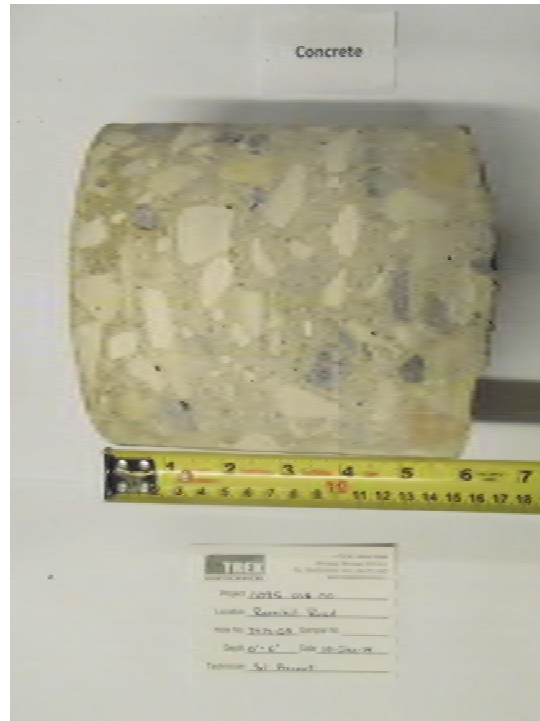


Photo 5: Concrete Core Sample From Test Hole TH14-05

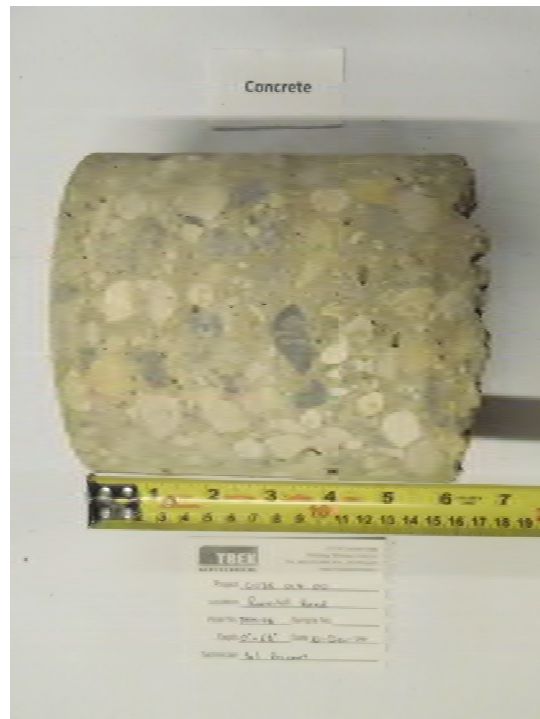


Photo 6: Concrete Core Sample From Test Hole TH14-06

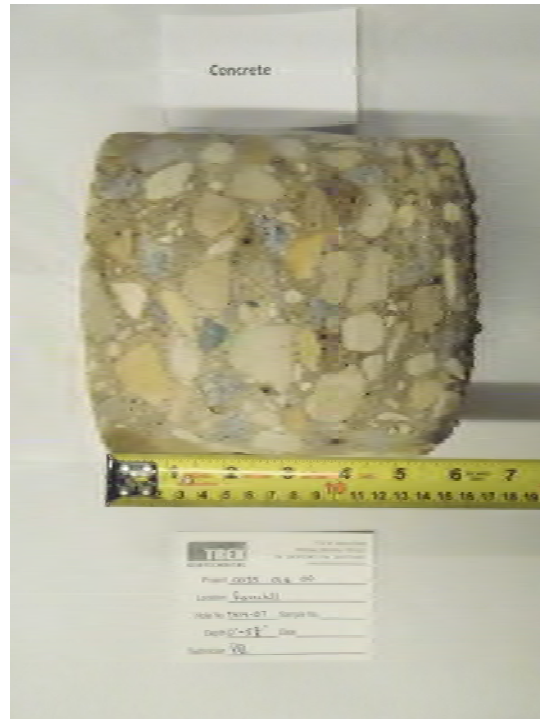


Photo 7: Concrete Core Sample From Test Hole TH14-07

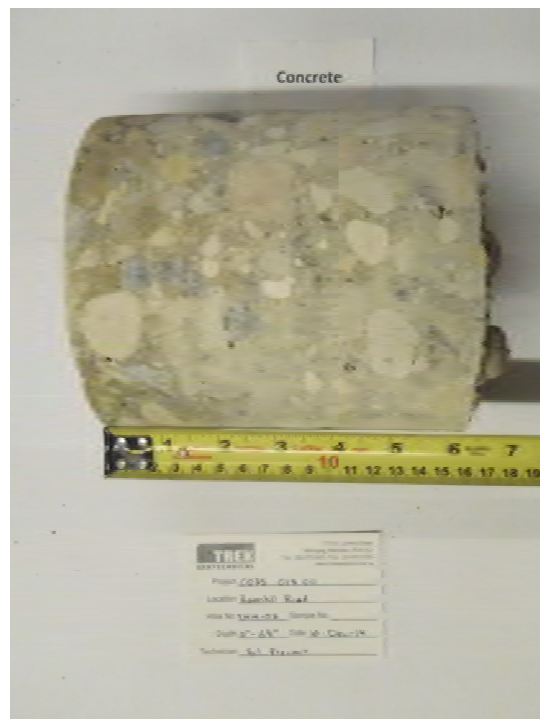


Photo 8: Concrete Core Sample From Test Hole TH14-08

Appendix E

Reay Cres., between Antrim Rd. and London St.



Sub-Surface Log

Test Hole TH14-01

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Reay Cres. - between Antrim Rd. and London St.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.15		CONCRETE - (152 mm thick)		C01												
0.15 - 0.45		CLAY (FILL) - silty, trace sand, trace gravel (<5mm diam.), silt inclusion (<10mm Diam.) - dark grey - frozen, moist and soft when thawed - intermediate plasticity	Grab (G)	G1												
0.45 - 1.5		CLAY - silty - dark grey - frozen to 1.1 m, moist and soft when thawed, moist and very stiff below - intermediate to high plasticity	Grab (G)	G2												
			Grab (G)	G3												
			Grab (G)	G4												
		- 75 mm thick silt seam, brown, moist, firm - mottled brown and grey, stiff below 1.5 m	Grab (G)	G5												
			Grab (G)	G6												
			Grab (G)	G7												
		- firm below 2.1 m	Grab (G)	G8												

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #10, 2m west from east curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0005 2015-02-25 REAY C. SP. 0035 018 00 GPJ TREK GEOTECHNICAL GDT. 25/2/15



Sub-Surface Log

Test Hole TH14-02

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Reay Cres. - between Antrim Rd. and London St.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.1		CONCRETE - (140 mm thick)		C02												
0.1 - 0.45		CLAY (FILL) - silty, trace sand, trace gravel (<5mm diam.), silt inclusion (<10mm diam.) - dark grey - frozen, moist and soft when thawed - intermediate plasticity		G9												
0.45 - 1.0		CLAY - silty - dark grey - frozen to 0.9 m, moist and firm when thawed, moist and very stiff below - intermediate to high plasticity		G10												
				G11												
				G12												
1.0 - 1.5		SILT - clayey - brown - moist, soft - low plasticity		G13												
				G14												
1.5 - 2.0		CLAY - silty - mottled brown and grey - moist, stiff - high plasticity		G15												
2.0 - 3.0		- firm below 2.9 m		G16												

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #22, 2m east from west curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0005 2015-02-25 REAY C. SP. 0035 018 00 GPJ TREK GEOTECHNICAL GDT. 25/2/15



Sub-Surface Log

Test Hole TH14-03

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Reay Cres. - between Antrim Rd. and London St.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)				Undrained Shear Strength (kPa)									
					16	17	18	19	20	21	0	20	40	60	80	100	0	50	100	150
		CONCRETE - (163 mm thick)		C03																
		CLAY (FILL) - silty, trace sand, trace gravel (<10mm diam.) - dark grey - frozen, moist and soft when thawed - intermediate plasticity		G17																
0.5				G18																
		CLAY - silty - dark grey - frozen to 0.8 m, moist and soft when thawed, moist and stiff below - intermediate to high plasticity		G19																
1.0				G20																
				G21																
1.5		- firm below 1.5 m		G22																
				G23																
2.0				G24																
		- trace silt inclusions (<15mm diam.)																		
2.5																				
3.0																				

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located at house #34, 2m west from east curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0005 2015-02-25 REAY C. SP. 0035 018 00 GPJ TREK GEOTECHNICAL GDT 25/2/15



Sub-Surface Log

Test Hole TH14-04

1 of 1

Client: Morrison Hershfield **Project Number:** 0035 018 00
Project Name: City of Winnipeg Local Streets Package 15-R-05 **Location:** Reay Cres. - between Antrim Rd. and London St.
Contractor: Paddock Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount **Date Drilled:** 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					0	20	40	60	80	100	0	50	100	150	200	250
0.0		CONCRETE - (140 mm thick)		C04												
0.05		CLAY (FILL) - silty, trace sand, trace gravel (<5mm diam.) - dark grey - frozen, moist and soft when thawed - intermediate plasticity	<input type="checkbox"/>	G25												
0.45		CLAY - silty, silt inclusions (<20mm diam.) - dark grey - frozen to 0.8 m, moist and firm when thawed, moist and very stiff below - intermediate to high plasticity	<input type="checkbox"/>	G26												
0.8		SILT - trace clay, trace sand, trace gravel (<10mm diam.) - brown - moist, soft - low plasticity - laminated clay	<input type="checkbox"/>	G27												
1.2			<input type="checkbox"/>	G28												
1.6			<input type="checkbox"/>	G29												
2.0		CLAY - silty - mottled brown and grey - moist, hard - intermediate to high plasticity	<input type="checkbox"/>	G30												
2.4		- stiff below 2.0 m	<input type="checkbox"/>	G31												
3.0		- firm below 2.9 m	<input type="checkbox"/>	G32												

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located between house #46 & #50, 2m east from west curb.

Logged By: Syl Precourt **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 0005 2015-02-25 REAY C. SP. 0035 018 00 GPJ TREK GEOTECHNICAL GDT 25/2/15



Sub-Surface Log

Test Hole TH14-05

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Reay Cres. - between Antrim Rd. and London St.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)							
					16	17	18	19	20	21	0	50	100	150	200	250
0.0 - 0.05		CONCRETE - (150 mm thick)		C05												
0.05 - 0.45		SAND (FILL) - some clay, trace sand, trace gravel - brown - frozen, moist when thawed, loose - intermediate plasticity		G33												
0.45 - 0.9		CLAY - silty - dark grey - frozen to 0.9 m, moist and firm when thawed, moist and very stiff below - intermediate to high plasticity		G34												
0.9 - 1.1		- mottled brown and grey, very stiff, high plasticity														
1.1 - 1.3		- 150 mm thick silt seam, brown, moist, soft low plasticity at 1.1 m		G35												
1.3 - 1.7		- grey, very stiff below 1.3 m		G36												
1.7 - 2.0		- 300 mm thick silt seam, brown, moist, soft low plasticity at 1.7 m		G37												
2.0 - 2.9		- stiff below 2.9 m		G38												
2.9 - 3.05				G39												
3.05 - 3.0				G40												

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located between house #59 & #63, 2m east from west curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0005 2015-02-25 REAY C. SP. 0035 018 00 GPJ TREK GEOTECHNICAL GDT. 25/2/15



Sub-Surface Log

Test Hole TH14-06

1 of 1

Client: Morrison Hershfield Project Number: 0035 018 00
 Project Name: City of Winnipeg Local Streets Package 15-R-05 Location: Reay Cres. - between Antrim Rd. and London St.
 Contractor: Paddock Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, Acker MP8 Truck Mount Date Drilled: 10 December 2014

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)							
					16	17	18	19	20	21	0	50	100	150	200	250
0.0		CONCRETE - (140 mm thick)		C06												
0.0		ORGANIC CLAY - silty, trace sand, trace gravel - dark grey - frozen, moist to wet and firm when thawed - intermediate plasticity		G41												
0.5		CLAY - silty - dark grey - frozen to 0.9 m, moist and firm when thawed, moist and very stiff below - intermediate to high plasticity		G42												
0.5				G43												
1.0		- 300 mm thick silt seam, brown, moist, soft low plasticity at 1.1 m		G44												
1.0		- mottled brown and grey, stiff below 1.2 m		G45												
1.5				G46												
2.0		SILT - clayey - brown - moist, soft - low plasticity		G47												
2.0		CLAY - silty - mottled brown and grey - moist, very stiff - high plasticity		G48												
2.5																
3.0																

END OF TEST HOLE AT 3.05 m IN CLAY

Notes:

- 1) No seepage or sloughing observed.
- 2) Test hole was backfilled with auger cuttings up to 0.45 m depth, 150 mm bentonite, 150 mm sand, 150 mm cold patch asphalt to surface.
- 3) Test hole located between house #67 & #71, west from east curb.

Logged By: Syl Precourt Reviewed By: N.J Ferreira Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 0005 2015-02-25 REAY C. SP. 0035 018 00 GPJ TREK GEOTECHNICAL GDT 25/2/15



CW Local Streets Package (PW File #: 15-R-05)
 Sub-Surface Investigation
 Reay Crescent

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
TH14-01	At house # 10, 2m west from east curb	N/A	-	Concrete	152											
						Clay(Fill)	0.2	0.3	38							
						Clay	0.5	0.6	37							
						Clay	0.8	0.9	40							
						Clay	1.1	1.2	30							
						Clay	1.4	1.5	25							
						Clay	1.7	1.8	42							
						Clay	2.0	2.1	45							
				Clay	2.9	3.0	50									
TH14-02	At house # 22, 2m east from west curb	N/A	-	Concrete	140											
						Clay(Fill)	0.2	0.3	36							
						Clay	0.5	0.6	36							
						Clay	0.8	0.9	28							
						Clay	1.1	1.2	28							
						Silt	1.2	1.4	24							
						Silt	1.7	1.8	23							
						Clay	2.0	2.1	44							
				Clay	2.9	3.0	58									
TH14-03	At house # 34, 2m west from east curb	N/A	-	Concrete	163											
						Clay(Fill)	0.2	0.3	28							
						Clay(Fill)	0.5	0.6	28							
						Clay	0.8	0.9	34							
						Clay	1.1	1.2	39							
						Clay	1.4	1.5	45							
						Clay	1.7	1.8	47							
						Clay	2.0	2.1	49							
				Clay	2.9	3.0	50									
TH14-04	Between house # 46 & # 50, 2m east from west curb	N/A	-	Concrete	140											
						Clay(Fill)	0.2	0.3	28							
						Clay	0.5	0.6	35							
						Silt	0.8	1.0	20	0	8	71	20	19	24	5
						Silt	1.1	1.2	35							
						Silt	1.4	1.5	24							
						Clay	1.7	1.8	34							
						Clay	2.0	2.1	47							
				Clay	2.9	3.0	49									



CW Local Streets Package (PW File #: 15-R-05)
Sub-Surface Investigation
Reay Crescent

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
TH14-05	Between house # 59 & #63, 2m east from west curb	N/A	-	Concrete	150											
						Sand(Fill)	0.2	0.3	18							
						Clay	0.5	0.6	35							
						Clay	0.8	0.9	38							
						Silt	1.1	1.2	21							
						Clay	1.4	1.5	31							
						Clay	1.7	1.8	26							
						Clay	2.0	2.1	38							
TH14-06	Between house # 67 & # 71, west from east curb	N/A	-	Concrete	140											
						Organic Clay	0.2	0.3	31							
						Clay	0.5	0.6	39	0	1	22	77	23	79	56
						Clay	0.8	0.9	30							
						Clay	1.1	1.2	23							
						Clay	1.4	1.5	39							
						Silt	1.7	1.8	26							
						Clay	2.0	2.1	36							
				Clay	2.9	3.0	45									



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Reay Crescent

Sample Date 10-Dec-14
Test Date 15-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-01	TH14-01	TH14-01	TH14-01	TH14-01	TH14-01
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.9 - 1.0	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G01	G02	G03	G04	G05	G06
Tare ID	Z41	F46	Z73	E48	W68	A35
Mass of tare	8.5	8.5	8.6	8.7	8.7	8.5
Mass wet + tare	462.0	400.7	408.2	476.4	282.7	423.5
Mass dry + tare	338.3	294.4	294.1	367.5	227.6	300
Mass water	123.7	106.3	114.1	108.9	55.1	123.5
Mass dry soil	329.8	285.9	285.5	358.8	218.9	291.5
Moisture %	37.5%	37.2%	40.0%	30.4%	25.2%	42.4%

Test Pit	TH14-01	TH14-01	TH14-02	TH14-02	TH14-02	TH14-02
Depth (m)	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G07	G08	G09	G10	G11	G12
Tare ID	W02	A22	A30	Z84	A9	E55
Mass of tare	8.4	8.7	8.2	8.4	8.1	8.6
Mass wet + tare	463.9	495	375.7	452.1	399.1	426.8
Mass dry + tare	322	332.2	279.1	334.5	313.9	336
Mass water	141.9	162.8	96.6	117.6	85.2	90.8
Mass dry soil	313.6	323.5	270.9	326.1	305.8	327.4
Moisture %	45.2%	50.3%	35.7%	36.1%	27.9%	27.7%

Test Pit	TH14-02	TH14-02	TH14-02	TH14-02	TH14-03	TH14-03
Depth (m)	1.2 - 1.4	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6
Sample #	G13	G14	G15	G16	G17	G18
Tare ID	H69	F84	F98	H48	Z111	N05
Mass of tare	8.6	8.4	8.5	8.3	8.4	8.5
Mass wet + tare	460.2	618.7	447.1	460.7	361.6	466.3
Mass dry + tare	372.5	505.0	313.0	304.0	284.4	367.5
Mass water	87.7	113.7	134.1	156.7	77.2	98.8
Mass dry soil	363.9	496.6	304.5	295.7	276.0	359.0
Moisture %	24.1%	22.9%	44.0%	53.0%	28.0%	27.5%



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Reay Crescent

Sample Date 10-Dec-14
Test Date 15-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-03	TH14-03	TH14-03	TH14-03	TH14-03	TH14-03
Depth (m)	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0
Sample #	G19	G20	G21	G22	G23	G24
Tare ID	H90	F83	D25	W05	F87	Z13
Mass of tare	8.5	8.7	8.6	8.2	8.3	8.5
Mass wet + tare	389.8	387.6	461.6	436.1	500.9	414.7
Mass dry + tare	292.2	281.3	320.3	300.1	338.1	278.7
Mass water	97.6	106.3	141.3	136.0	162.8	136.0
Mass dry soil	283.7	272.6	311.7	291.9	329.8	270.2
Moisture %	34.4%	39.0%	45.3%	46.6%	49.4%	50.3%

Test Pit	TH14-04	TH14-04	TH14-04	TH14-04	TH14-04	TH14-04
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 1.0	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G25	G26	G27	G28	G29	G30
Tare ID	W25	F136	P14	E36	Z105	F44
Mass of tare	8.4	8.4	8.4	8.3	8.4	8.4
Mass wet + tare	421.4	480.3	450.4	368.6	582.1	480.6
Mass dry + tare	331.2	356.8	376.8	275.8	473	360.6
Mass water	90.2	123.5	73.6	92.8	109.1	120.0
Mass dry soil	322.8	348.4	368.4	267.5	464.6	352.2
Moisture %	27.9%	35.4%	20.0%	34.7%	23.5%	34.1%

Test Pit	TH14-04	TH14-04	TH14-05	TH14-05	TH14-05	TH14-05
Depth (m)	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G31	G32	G33	G34	G35	G36
Tare ID	N61	K33	F90	K29	N111	A17
Mass of tare	8.4	8.4	8.3	8.3	8.4	8.5
Mass wet + tare	443.1	436.3	410.5	361.3	436.9	518.3
Mass dry + tare	304	295.9	350.1	269.5	320	428.8
Mass water	139.1	140.4	60.4	91.8	116.9	89.5
Mass dry soil	295.6	287.5	341.8	261.2	311.6	420.3
Moisture %	47.1%	48.8%	17.7%	35.1%	37.5%	21.3%



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**Moisture Content Report
 ASTM D2216-98**

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Reay Crescent

Sample Date 10-Dec-14
Test Date 15-Jan-15
Technician Daniel Wiebe

Test Pit	TH14-05	TH14-05	TH14-05	TH14-05	TH14-06	TH14-06
Depth (m)	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6
Sample #	G37	G38	G39	G40	G41	G42
Tare ID	K2	F8	W69	F38	N65	W48
Mass of tare	8.3	8.4	8.3	8.4	8.4	8.2
Mass wet + tare	368.5	584.2	497.5	554.1	397.5	435.7
Mass dry + tare	282.9	464.5	363.2	364.8	305.5	315
Mass water	85.6	119.7	134.3	189.3	92.0	120.7
Mass dry soil	274.6	456.1	354.9	356.4	297.1	306.8
Moisture %	31.2%	26.2%	37.8%	53.1%	31.0%	39.3%

Test Pit	TH14-06	TH14-06	TH14-06	TH14-06	TH14-06	TH14-06
Depth (m)	0.8 - 0.9	1.1 - 1.2	1.2 - 1.4	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0
Sample #	G43	G44	G45	G46	G47	G48
Tare ID	N57	N27	F135	W107	N18	K26
Mass of tare	8.4	8.3	8.3	8.4	8.4	8.4
Mass wet + tare	386.3	596.4	440.8	578.6	398.1	558.1
Mass dry + tare	298.8	487.6	320.4	462.0	295.3	387.3
Mass water	87.5	108.8	120.4	116.6	102.8	170.8
Mass dry soil	290.4	479.3	312.1	453.6	286.9	378.9
Moisture %	30.1%	22.7%	38.6%	25.7%	35.8%	45.1%

Test Pit						
Depth (m)						
Sample #						
Tare ID						
Mass of tare						
Mass wet + tare						
Mass dry + tare						
Mass water						
Mass dry soil						
Moisture %						



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**Atterberg Limits
 ASTM D4318**

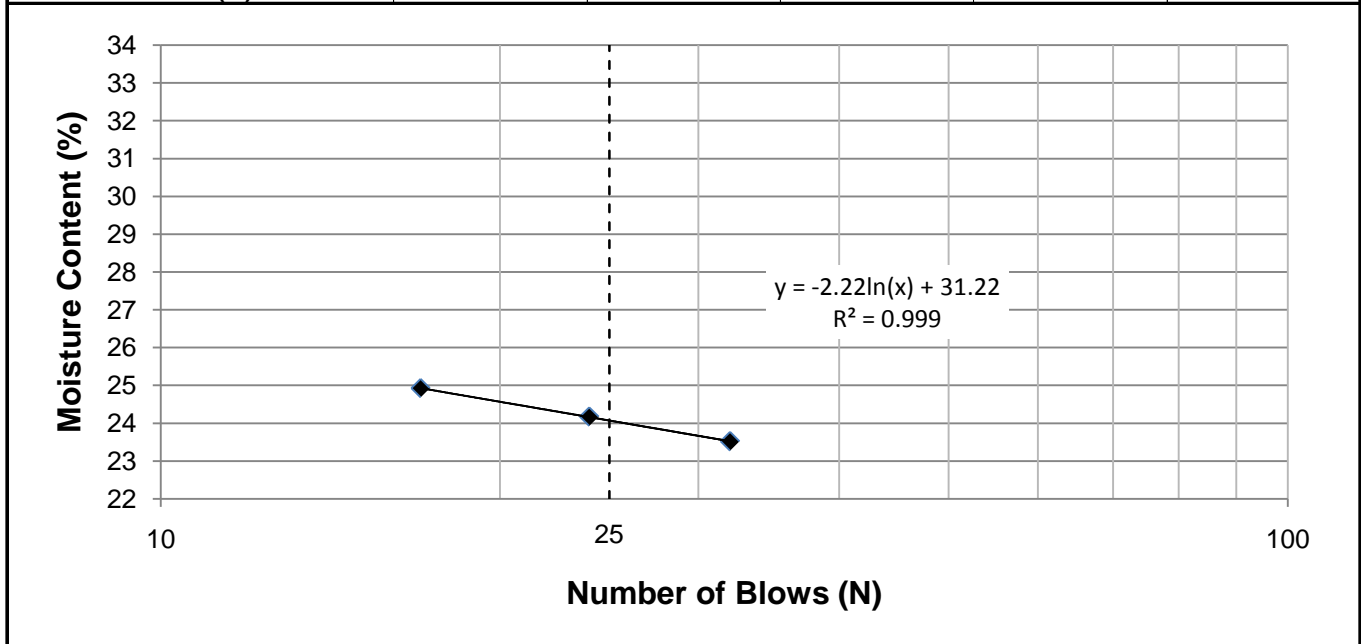
Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Reay

Test Hole TH14-04
Sample # G27
Depth (m) 0.8-1.0
Sample Date 11-Dec-14
Test Date 06-Feb-15
Technician Xin Xiong/ Junhui Wu

Liquid Limit	24
Plastic Limit	19
Plasticity Index	5

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	17	24	32		
Mass Wet Soil + Tare (g)	24.096	23.864	28.140		
Mass Dry Soil + Tare (g)	22.093	21.942	25.449		
Mass Tare (g)	14.058	13.992	14.009		
Mass Water (g)	2.003	1.922	2.691		
Mass Dry Soil (g)	8.035	7.950	11.440		
Moisture Content (%)	24.928	24.176	23.523		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	28.140	26.710			
Mass Dry Soil + Tare (g)	25.909	24.650			
Mass Tare (g)	13.935	13.957			
Mass Water (g)	2.231	2.060			
Mass Dry Soil (g)	11.974	10.693			
Moisture Content (%)	18.632	19.265			



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**Atterberg Limits
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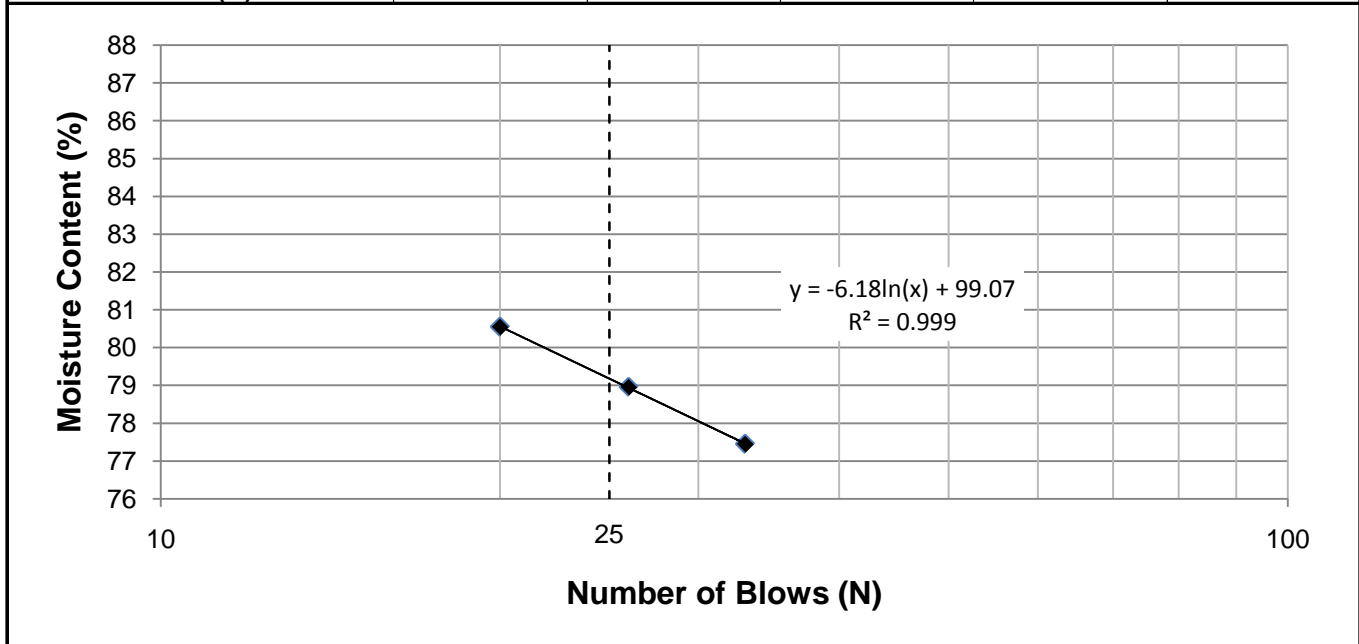
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Client Morrison Hershfield
Project Local Streets Package 15-R-05, Reay

Test Hole TH14-06
Sample # G42
Depth (m) 0.5-0.6
Sample Date 10-Dec-14
Test Date 06-Feb-15
Technician Xin Xiong/ Junhui Wu

Liquid Limit	79
Plastic Limit	23
Plasticity Index	56

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	33	26	20		
Mass Wet Soil + Tare (g)	22.667	21.973	22.715		
Mass Dry Soil + Tare (g)	18.977	18.381	18.892		
Mass Tare (g)	14.213	13.832	14.146		
Mass Water (g)	3.690	3.592	3.823		
Mass Dry Soil (g)	4.764	4.549	4.746		
Moisture Content (%)	77.456	78.962	80.552		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	19.954	20.236			
Mass Dry Soil + Tare (g)	18.847	19.053			
Mass Tare (g)	14.060	14.083			
Mass Water (g)	1.107	1.183			
Mass Dry Soil (g)	4.787	4.970			
Moisture Content (%)	23.125	23.803			



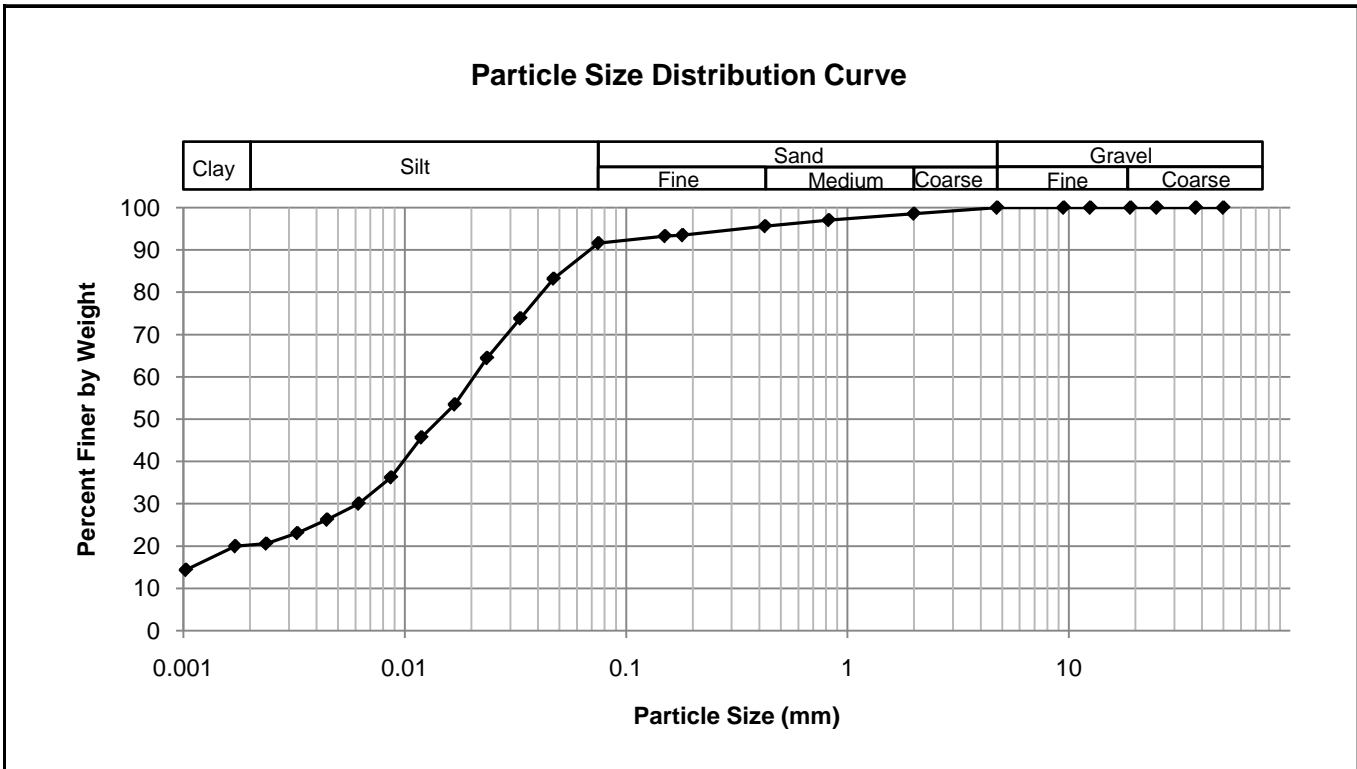
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Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Reay Crescent

Test Hole TH14-04
Sample # G27
Depth (m) 0.8 - 1.0
Sample Date 10-Dec-14
Test Date 10-Feb-15
Technician Xin Xiong/Junhui Wu

Gravel	0.0%
Sand	8.4%
Silt	71.4%
Clay	20.3%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	91.63
37.5	100.00	2.00	98.57	0.0471	83.24
25.0	100.00	0.825	97.09	0.0333	73.84
19.0	100.00	0.425	95.63	0.0236	64.45
12.5	100.00	0.180	93.49	0.0168	53.50
9.50	100.00	0.150	93.28	0.0119	45.67
4.75	100.00	0.075	91.63	0.0087	36.28
				0.0062	30.02
				0.0045	26.26
				0.0033	23.13
				0.0024	20.63
				0.0017	20.00
				0.0010	14.37



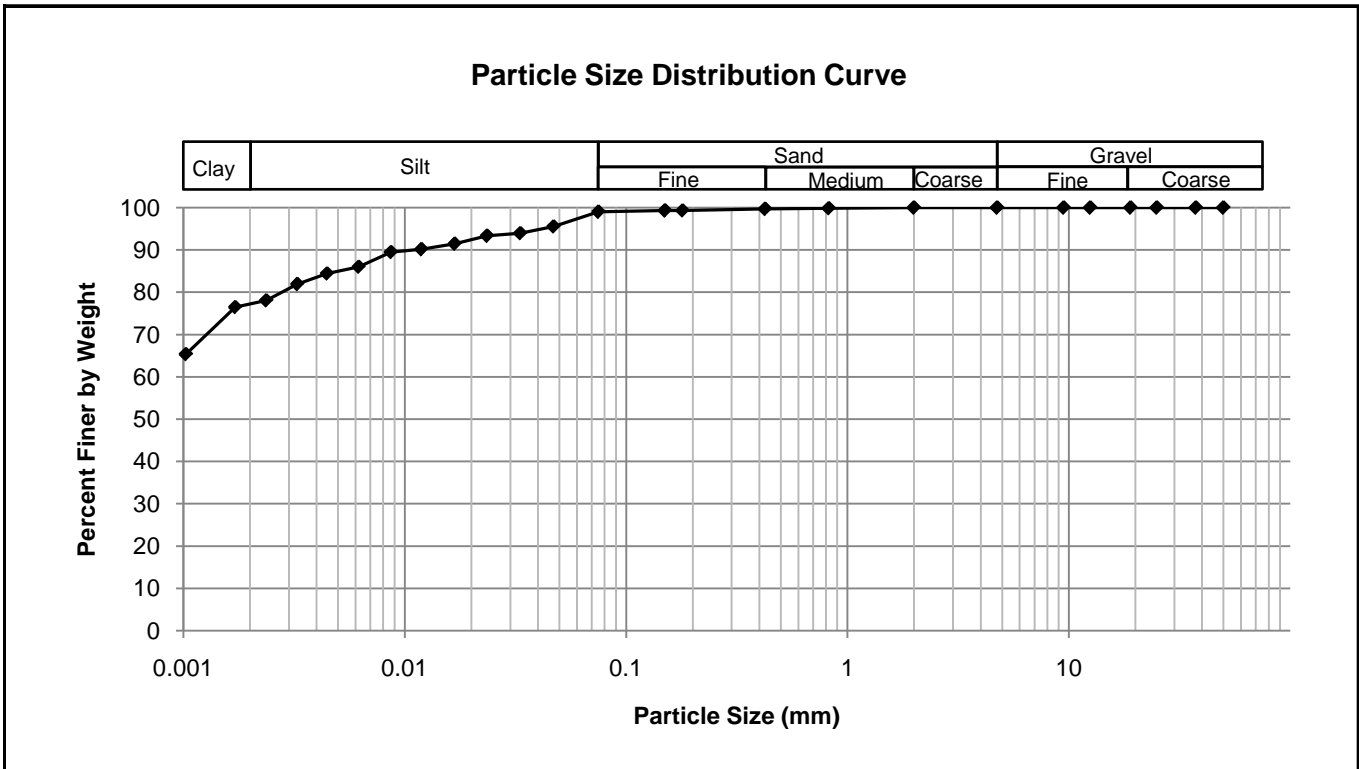
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Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No. 0035 018 00
Client Morrison Hershfield
Project Local Streets Package 15-R-05, Reay Crescent

Test Hole TH14-06
Sample # G42
Depth (m) 0.5 - 0.6
Sample Date 10-Dec-14
Test Date 10-Feb-15
Technician Xin Xiong/Junhui Wu

Gravel	0.0%
Sand	1.0%
Silt	21.8%
Clay	77.2%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	98.99
37.5	100.00	2.00	100.00	0.0471	95.55
25.0	100.00	0.825	99.86	0.0333	93.97
19.0	100.00	0.425	99.66	0.0236	93.33
12.5	100.00	0.180	99.34	0.0168	91.43
9.50	100.00	0.150	99.29	0.0119	90.16
4.75	100.00	0.075	98.99	0.0087	89.52
				0.0062	86.03
				0.0045	84.44
				0.0033	81.90
				0.0024	78.09
				0.0017	76.50
				0.0010	65.39



Photo 1: Concrete Core Sample From Test Hole TH14-01



Photo 2: Concrete Core Sample From Test Hole TH14-02



Photo 3: Concrete Core Sample From Test Hole TH14-03



Photo 4: Concrete Core Sample From Test Hole TH14-04

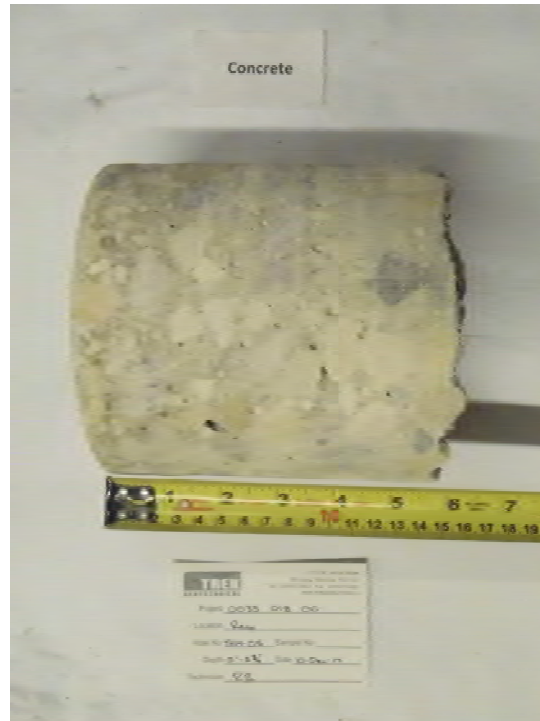


Photo 5: Concrete Core Sample From Test Hole TH14-05

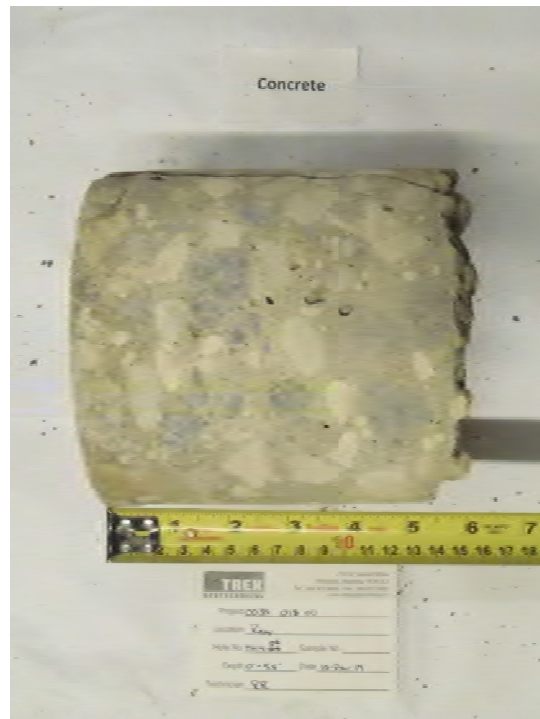


Photo 6: Concrete Core Sample From Test Hole TH14-06