APPENDIX 'A'

GEOTECHNICAL REPORT

TREK GEOTECHNICAL

2012 City of Winnipeg Alley Package

PW File #: 12-RL-01

Sub-Surface Investigation Report
February 2012

TREK GEOTECHNICAL Quality Engineering | Valued Relationships

2012 City of Winnipeg Alley Package
PW File #: 12-RL-01

Sub-Surface Investigation Report
February 2012

Our File No. 0035 004 00

Prepared for:

Morrison Hershfield
Suite 1, 25 Scurfield Blvd
Winnipeg, Manitoba
R3Y 1G4

Attn: Ron Bruce, P.Eng.

APEGM
Certificate of Authorization
Trek Geotechnical Inc.
No. 4877 Date: Feb. 27, 2012

Prepared by:

TREK Geotechnical Inc.
Per:

Stephen Renner

Stephen Renner
Geotechnical Technician

Reviewed by:

PROVINCE OF MANITOBA
Feb. 27, 2012
N. J.
FERREIRA
Member
22892
REGISTERED PROFESSIONAL ENGINEER

Nelson Ferreira, P.Eng.
Geotechnical Engineer, Principal

Table of Contents

List of Tables

List of Figures

List of Appendices (Sub-Surface Information)

1.0 Introduction

This report summarizes the results of the sub-surface investigation completed for the proposed 2012 City of Winnipeg Alley Package (PW File #: 12-RL-01). The project consists of reconstruction of six existing alleys in Winnipeg. Information regarding the concrete, asphalt, 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 31 test holes were drilled in 6 alley ways within the City of Winnipeg as part of the sub-surface investigation. The test holes drilled at each alley are listed in Table 1 and the test hole locations are shown on Figures 1 to 6.

Table 1. List of Test Holes Drilled at Each Alley

Alley Location	Test Holel
Alley behind Royal Crescent from Kingsbury Avenue to McGregor Street	ROY11-01 to ROY11-05
Alley between Langside St. and Young St. from Portage Ave. to Ellice Ave.	LY12-01 to LY12-05
Alley between Minto St. and Goulding St. from Portage Ave. to Wolever Ave.	MG12-01 to MG12-06
Alley between Strathcona St. and Ashburn St. from Ellice Ave. to Sargent Ave.	SA12-01 to SA12-05
Alley between Ash St. and Oak St. from Academy Rd. to Wellington Cr.	AO12-01 to AO12-07
Alley East of Pembina Hwy, between Killarney Ave and Summerside Ave	KIL12-01 to KIL12-03

The sub-surface investigation was conducted from January 24 to 26, 2012. The test holes were drilled to a depth of 3.1 m below road surface by Paddock Drilling Ltd. using their MP8 truck mounted drill rig equipped with 125 mm diameter solid stem augers. The pavement structure (asphalt or concrete) was cored by Quality Coring using a portable coring press equipped with a hollow 150 mm diameter diamond core drill bit. The sub-surface conditions were observed during drilling and visually classified by Stephen Renner of TREK Geotechnical Inc. (TREK). Other pertinent information such as groundwater and drilling conditions were also recorded during the drilling investigation.

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

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

Test hole locations noted on the test hole logs and shown on Figures 1 to 6 are based on measured distances from the nearest hydro pole.

Figures

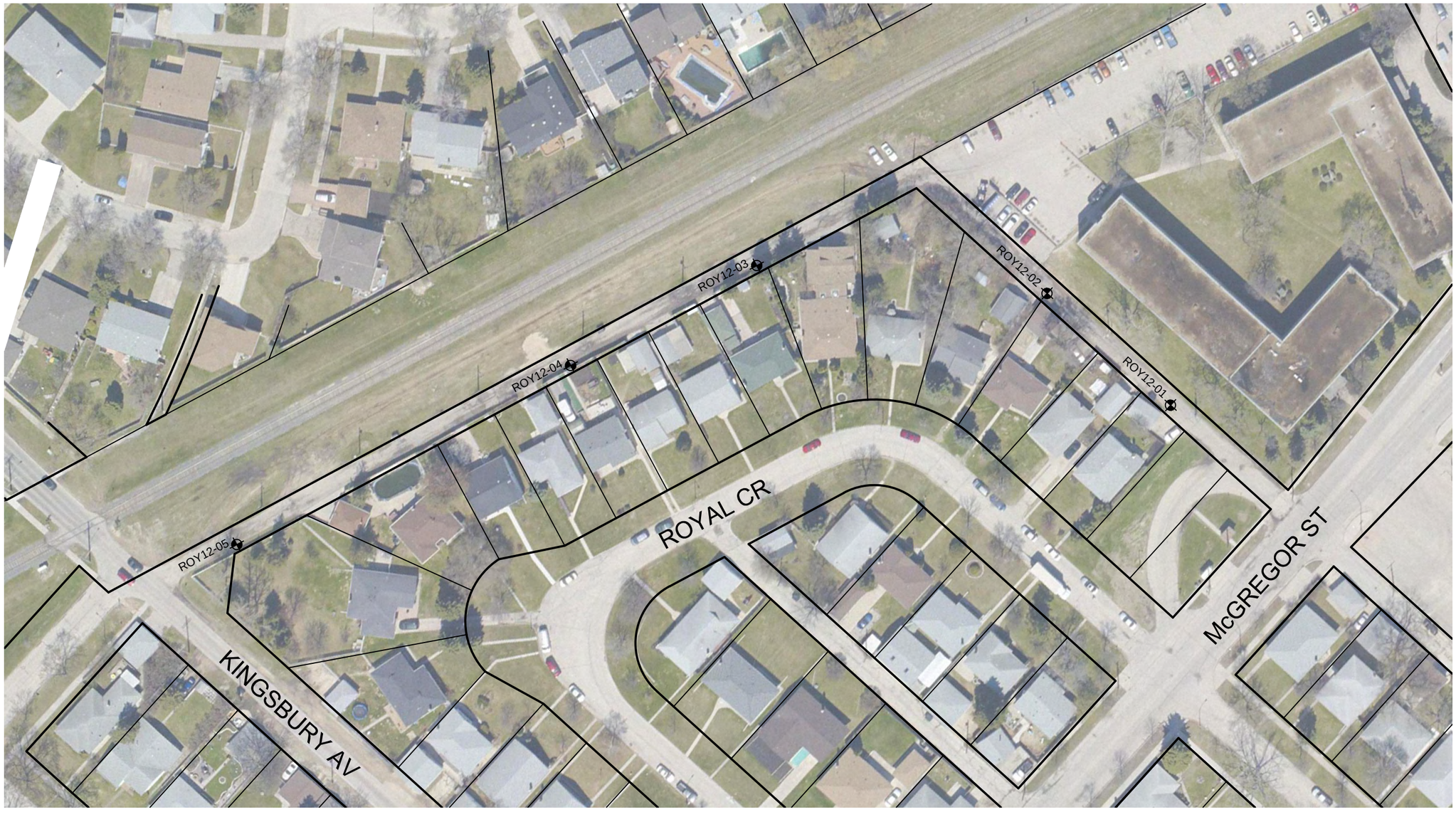
TREK GEOTECHNICAL

Morrison Hershfield
2012 City of Winnipeg Alley Package - PW File #:12-RL-01

11" x 17"

PLOT: 2/26/12 9:49:13 PM

FILE NAME: 0035-004-00_01_X.dwg



0 10 20 30 40m
SCALE 1:1000

Figure 01
Test Hole Location Plan
Alley Behind Royal Cr From Kingsbury Av To McGregor St

0 10 20 30 40m
SCALE 1:1000

Figure 02
Test Hole Location Plan
Alley Between Langside St And Young St From Portage Av To Ellice Av

TREK GEOTECHNICAL

Morrison Hershfield
2012 City of Winnipeg Alley Package - PW File #:12-RL-01

11" x 17"

PLOT: 2/27/12 4:44:46 PM

FILE NAME: 0035-004-00_01_X.dwg

0 10 20 30 40m
SCALE 1:1000

Figure 03
Test Hole Location Plan
Alley Between Minto St And Goulding St From Portage Av To Wolever Av

TREK GEOTECHNICAL

Morrison Hershfield
2012 City of Winnipeg Alley Package - PW File #:12-RL-01

0 10 20 30 40m
SCALE 1:1000

11" x 17"
PLOT: 2/26/12 9:49:25 PM
FILE NAME: 0035-004-00_01_X.dwg

Figure 04
Test Hole Location Plan
Alley Between Strathcona St And Ashburn St From Ellice Av To Sargent Av

TREK GEOTECHNICAL

Morrison Hershfield
2012 City of Winnipeg Alley Package - PW File #:12-RL-01

11" x 17"

PLOT: 2/26/12 9:49:28 PM

FILE NAME: 0035-004-00_01_X.dwg

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SCALE 1:1000

Figure 05
Test Hole Location Plan
Alley Between Ash St and Oak St From Academy Rd To Wellington Cr

TREK GEOTECHNICAL

Morrison Hershfield
2012 City of Winnipeg Alley Package - PW File #:12-RL-01

11" x 17"

PLOT: 2/26/12 9:49:32 PM

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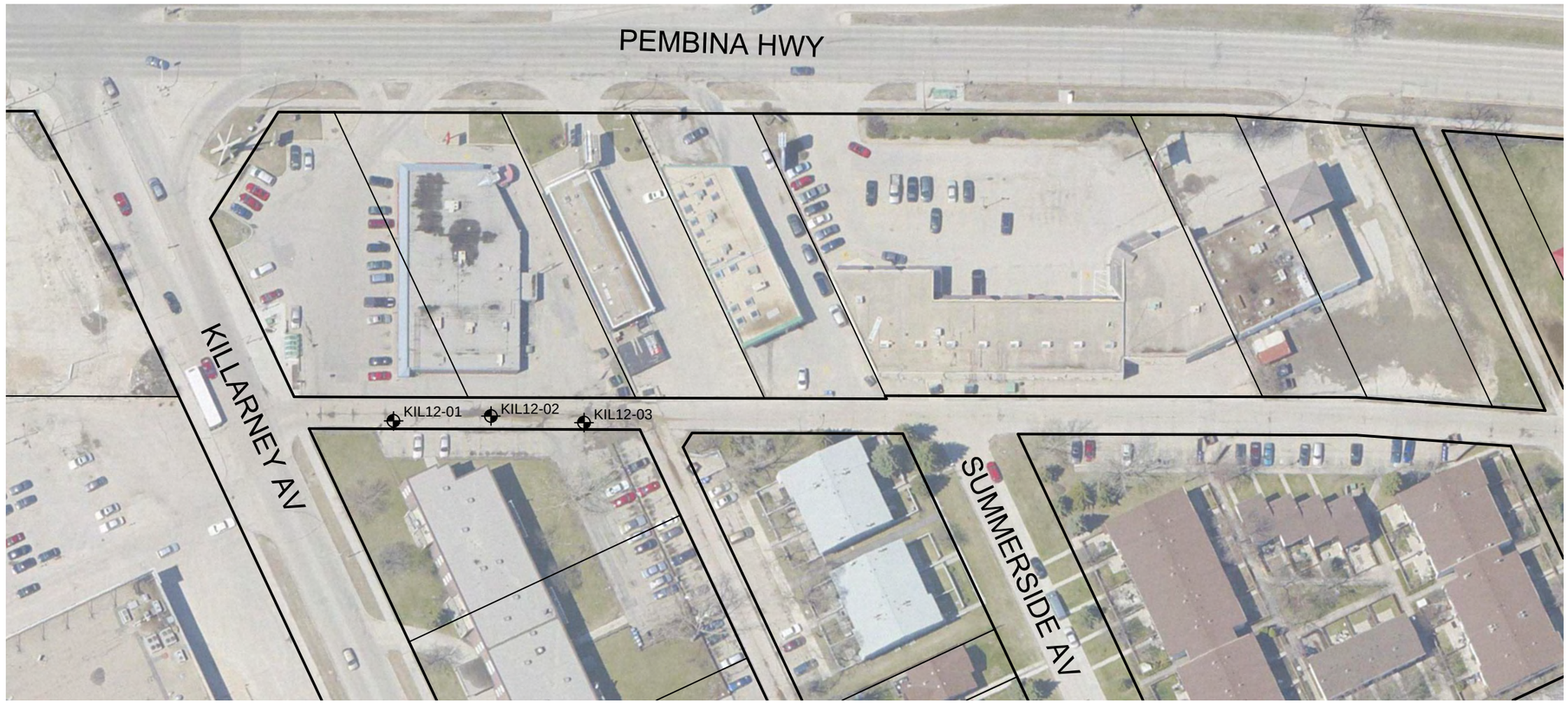

0 10 20 30 40m
SCALE 1:1000

Figure 06
Test Hole Location Plan
Alley East Of Pembina Hwy Between Killarney Av And Summerside Av

Appendix A

Alley behind Royal Cr from Kingsbury Ave to McGregor St

Sub-Surface Log

Test Hole ROY12-01

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Behind Royal Cr from Kingsbury Ave to McGregor St
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2011

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) 0 50 100 150 200 250 (△ Torvane △, ✤ Pocket Pen. ✤, ☒ Qu ☒, ○ Field Vane ○)
		ASPHALT (102 mm thick)		C1		
		SAND and GRAVEL (Fill) - light brown, frozen, moist to wet and compact when thawed, well graded, medium grained sand to fine grained gravel, subangular, 20 mm down "A" base		G2	●	
				G7	●	
		CLAY - silty, trace organics - dark brown to black - frozen, moist and firm when thawed - high plasticity				
0.5				G3	●	
		- firm to stiff below 0.8 m		G4	●	
1.0		SILT - clayey - light brown - moist, firm - low plasticity		G5	●	
		- some clay below 1.4 m		G6	●	
1.5				G8	●	
2.0		CLAY - some silt, trace silt inclusions (<10 mm dia.) - brown - moist, stiff to very stiff - high plasticity		G9	●	△ ✤
2.5		- stiff below 2.4 m				
3.0				G10	●	✤

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 6.5 m W, 3.5 m S of the 2nd hydro pole West of Mcgregor St.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS ROYAL TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/24/12

Sub-Surface Log

Test Hole ROY12-02

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Behind Royal Cr from Kingsbury Ave to McGregor St
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2011

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m^3) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT (95 mm thick)				
		SAND and GRAVEL (Fill) - light brown, frozen, moist to wet and compact when thawed, well graded, medium grained sand to fine grained gravel, subangular, 20 mm down "A" base		C11	●	
		CLAY - silty, trace to some organics - black - frozen, moist and soft when thawed - intermediate to high plasticity				
0.5				G12	●	
		- dark brown below 0.8 m				
		SILT - clayey, trace sand (coarse grained) - light brown - moist, firm - low plasticity		G13	●	
1.0				G14	●	
				G15		
1.5						
		CLAY - silty, trace sand (coarse grained), trace silt inclusions (<10 mm diam.) - grey - moist, stiff to very stiff - high plasticity		G16	●	△ ✤
2.0		- stiff below 2.0 m		G17	●	✤△
2.5						
3.0				G18	●	✤

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 17.2 m W, 3.5 m S of the 3rd hydro pole West of Mcgregor St.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS ROYAL TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/24/12

Sub-Surface Log

Test Hole ROY12-03

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Behind Royal Cr from Kingsbury Ave to McGregor St
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2011

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) 0 50 100 150 200 250
		ASPHALT (165 mm thick)		C19		
		SAND and GRAVEL (Fill) - light brown, frozen, moist to wet and compact when thawed, well graded, medium grained sand to fine grained gravel, subangular, 20 mm down "A" base		G20		
0.5		CLAY - silty, trace sand (medium and fine grained), trace organics - dark brown to black - frozen, moist and firm when thawed - high plasticity		G21		
		- stiff below 0.8 m		G22		
1.0		SILT - some clay - light brown - moist, soft - low plasticity		G23		
1.5				G24		
		CLAY - some silt, trace silt inclusions (<5 mm diam.), trace oxidation - brown - moist, very stiff - high plasticity		G25		
2.0		- stiff below 2.7 m		G26		
2.5						
		- firm to stiff below 2.7 m		G27		
3.0		END OF TEST HOLE AT 3.1 m IN CLAY				

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 16.5 m N, 4.1 m E of 5th hydro pole North of Kingsbury Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS ROYAL TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/24/12

Sub-Surface Log

Test Hole ROY12-04

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Behind Royal Cr from Kingsbury Ave to McGregor St
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2011

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT (127 mm thick)		C28		
		SAND and GRAVEL (Fill) - light brown, frozen, moist to wet and compact when thawed, well graded, medium grained sand to fine grained gravel, subangular, 20 mm down "A" base		G29		
0.5		CLAY (Fill) - silty, sandy (medium grained), some gravel (<20 mm diam.), trace oxidation - dark brown to black - frozen to 1.4 m, moist to wet and very soft when thawed - intermediate to high plasticity		G30		
		- moist, soft below 0.8 m		G31		
1.0				G32		
1.5				G33		△ ✤
				G34		△ ✤
2.0		CLAY - some silt, trace oxidation - brown - moist, firm to stiff - high plasticity		G35		✤
		- silt seam (50 mm thick) at 2.1 m				
2.5						
		- firm below 2.7 m				
3.0				G36		✤ △

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 6.6 m S, 4.1 m E of 4th hydro pole North of Kingsbury Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS ROYAL TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/24/12

Sub-Surface Log

Test Hole ROY12-05

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Behind Royal Cr from Kingsbury Ave to McGregor St
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2011

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT (80 mm thick)		C37		
		SAND and GRAVEL (Fill) - light brown, frozen, moist to wet and compact when thawed, well graded, medium grained sand to fine grained gravel, subangular, 20 mm down "A" base		G38		
				G39		
		CLAY (Fill) - silty, sandy (coarse and medium grained), some gravel (<25 mm diam.), trace organics, trace oxidation - dark brown to black - frozen, moist and soft when thawed - intermediate to high plasticity				
0.5				G40		
				G41		
1.0		- soft to firm below 1.1 m		G42		
		CLAY - silty, trace silt inclusions (<10 mm diam.) trace oxidation - brown - moist, firm to stiff - high plasticity		G43		△✤
1.5		- stiff below 1.7 m		G44		✤
2.0				G45		✤△
2.5		SILT - clayey, light brown, moist, soft, low to intermediate plasticity		G47		
		CLAY - some silt, trace silt inclusions (<10 mm diam.) trace oxidation - brown - moist, firm - high plasticity		G46		✤△
3.0		END OF TEST HOLE AT 3.1 m IN CLAY				

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 10.1 m S, 1.7 m E of 1st hydro pole North of Kingsbury Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS ROYAL TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/24/12

2012 City of Winnipeg Alley Package
PW File #: 12-RL-01
Sub-Surface Investigation

Test Hole No.	Test Hole Location (Street Name)	House No.	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
			Type	Thickness (mm)	Type	Thickness (mm)				Gravel (%)	Sand (%)`	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
ROY12-01	Alley behind Royal Crescent from Kingsbury Avenue to McGregor Street	31	Asphalt	102												
		Royal					Sand and Gravel	0.1	24							
							Clay	0.2	36							
							Clay	0.5	37							
							Clay	0.8	36							
							Silt	1.1	31							
							Silt	1.4	20							
							Silt	1.7	22							
							Clay	2.0	32							
							Clay	2.9	42							
ROY12-02	Alley behind Royal Crescent from Kingsbury Avenue to McGregor Street	26-27	Asphalt	95												
		Royal					Sand and Gravel	0.2	12							
							Clay	0.5	47							
							Silt	1.0	22	0	3	75	22	16	27	11
							Silt	1.1	21							
							Clay	1.7	28							
							Clay	2.0	34							
							Clay	2.9	43							
ROY12-03	Alley behind Royal Crescent from Kingsbury Avenue to McGregor Street	23	Asphalt	165												
		Royal					Sand and Gravel	0.3	28							
							Clay	0.5	38	0	4	40	56	21	71	50
							Clay	0.8	30							
							Silt	1.1	17							
							Silt	1.4	21							
							Clay	1.7	24							
							Clay	2.0	44							
							Clay	2.9	49							
ROY12-04	Alley behind Royal Crescent from Kingsbury Avenue to McGregor Street	20	Asphalt	127												
		Royal					Sand and Gravel	0.1	14							
							Clay(Fill)	0.2	37							
							Clay(Fill)	0.5	40							
							Clay(Fill)	0.8	35							
							Clay(Fill)	1.1	21							
							Clay(Fill)	1.4	32							
							Clay(Fill)	1.7	33							
							Clay	2.0	46							
							Clay	2.9	50							
ROY12-05	Alley behind Royal Crescent from Kingsbury Avenue to McGregor Street	16	Asphalt	80												
		Royal					Sand and Gravel	0.1	16							
							Clay(Fill)	0.2	25							
							Clay(Fill)	0.5	24	16	24	27	33	19	53	34
							Clay(Fill)	0.8	18							
							Clay(Fill)	1.1	15							
							Clay	1.4	34							
							Clay	1.7	41							
							Clay	2.0	45							
							Silt	2.6	27							
							Clay	2.9	49							

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley behind Royal Crescent from Kingsbury Avenue to McGregor Street

Sample Date Jan 24, 2012
Test Date Jan 25, 2012
Technician Lee Boughton

Test Hole	ROY12-01	ROY12-01	ROY12-01	ROY12-01	ROY12-01	ROY12-01
Depth (m)	0.1 - 0.2	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5
Sample #	G2	G7	G3	G4	G5	G6
Tare ID	F86	E134	C4	F23	E58	E50
Mass of tare	8.1	8.3	8.2	8.3	8.2	8.4
Mass wet + tare	273.9	295.1	318.9	342	355.1	410.9
Mass dry + tare	222.3	218.6	235.7	253.6	273.8	343.1
Mass water	51.6	76.5	83.2	88.4	81.3	67.8
Mass dry soil	214.2	210.3	227.5	245.3	265.6	334.7
Moisture %	24.1%	36.4%	36.6%	36.0%	30.6%	20.3%

Test Hole	ROY12-01	ROY12-01	ROY12-01	ROY12-02	ROY12-02	ROY12-02
Depth (m)	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.1 - 0.3	0.5 - 0.6	0.9 - 1.1
Sample #	G8	G9	G10	C11	G12	G13
Tare ID	E15	D20	F42	W53	E31	C30
Mass of tare	8.5	8.7	8.2	8.3	8.4	8.2
Mass wet + tare	465.8	464.8	453.4	378.6	342.8	403.3
Mass dry + tare	382.3	354.5	322.8	339.7	236.7	332.5
Mass water	83.5	110.3	130.6	38.9	106.1	70.8
Mass dry soil	373.8	345.8	314.6	331.4	228.3	324.3
Moisture %	22.3%	31.9%	41.5%	11.7%	46.5%	21.8%

Test Hole	ROY12-02	ROY12-02	ROY12-02	ROY12-02	ROY12-03	ROY12-03
Depth (m)	1.1 - 1.2	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.2 - 0.4	0.5 - 0.6
Sample #	G14	G16	G17	G18	G20	G21
Tare ID	K37	F78	E99	E1	W15	E11
Mass of tare	8.2	8.3	8.5	8.3	8	8.4
Mass wet + tare	397.8	333.4	320.3	342.7	231.8	345.9
Mass dry + tare	330.3	263.3	240.7	241.5	182.7	253.5
Mass water	67.5	70.1	79.6	101.2	49.1	92.4
Mass dry soil	322.1	255.0	232.2	233.2	174.7	245.1
Moisture %	21.0%	27.5%	34.3%	43.4%	28.1%	37.7%

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Winnipeg, MB R3H 0L3
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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley behind Royal Crescent from Kingsbury Avenue to McGregor Street

Sample Date Jan 24, 2012
Test Date Jan 25, 2012
Technician Lee Boughton

Test Hole	ROY12-03	ROY12-03	ROY12-03	ROY12-03	ROY12-03	ROY12-03
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 #	G22	G23	G24	G25	G26	G27
Tare ID	H14	K25	E84	F120	A21	N19
Mass of tare	8	8.3	8.4	8.1	8.5	8.4
Mass wet + tare	367.3	422	457.3	406.2	346.6	337.2
Mass dry + tare	284.5	361.4	379.7	328.3	242.6	229.2
Mass water	82.8	60.6	77.6	77.9	104.0	108.0
Mass dry soil	276.5	353.1	371.3	320.2	234.1	220.8
Moisture %	29.9%	17.2%	20.9%	24.3%	44.4%	48.9%

Test Hole	ROY12-04	ROY12-04	ROY12-04	ROY12-04	ROY12-04	ROY12-04
Depth (m)	0.1 - 0.2	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5
Sample #	C28	G29	G30	G31	G32	G33
Tare ID	Z39	F113	K26	N18	H54	F107
Mass of tare	8.2	8.2	8.3	8.4	8.3	8.1
Mass wet + tare	513.3	453.5	399.3	350.4	309.7	369
Mass dry + tare	450.2	333.8	288.1	261.2	256.7	282.3
Mass water	63.1	119.7	111.2	89.2	53.0	86.7
Mass dry soil	442.0	325.6	279.8	252.8	248.4	274.2
Moisture %	14.3%	36.8%	39.7%	35.3%	21.3%	31.6%

Test Hole	ROY12-04	ROY12-04	ROY12-04	ROY12-05	ROY12-05	ROY12-05
Depth (m)	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.1 - 0.2	0.2 - 0.3	0.5 - 0.6
Sample #	G34	G35	G36	G38	G39	G40
Tare ID	N17	N20	F5	N10	N14	N16
Mass of tare	8.4	8.2	8.4	8.2	8.2	8.3
Mass wet + tare	391.2	334.8	342	452.7	214.5	251.4
Mass dry + tare	296.2	232	231.5	391.9	173.9	204.7
Mass water	95.0	102.8	110.5	60.8	40.6	46.7
Mass dry soil	287.8	223.8	223.1	383.7	165.7	196.4
Moisture %	33.0%	45.9%	49.5%	15.8%	24.5%	23.8%

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley behind Royal Crescent from Kingsbury Avenue to McGregor Street

Sample Date Jan 24, 2012
Test Date Jan 25, 2012
Technician Lee Boughton

Test Hole	ROY12-05	ROY12-05	ROY12-05	ROY12-05	ROY12-05	ROY12-05
Depth (m)	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.6 - 2.7
Sample #	G41	G42	G43	G44	G45	G47
Tare ID	N9	N13	N15	N11	N12	N7
Mass of tare	8.5	8.1	8.4	8.2	8.1	8.5
Mass wet + tare	336.3	385.5	371	297.2	337.1	418.9
Mass dry + tare	286.7	335.4	279	213.5	234.3	332.4
Mass water	49.6	50.1	92.0	83.7	102.8	86.5
Mass dry soil	278.2	327.3	270.6	205.3	226.2	323.9
Moisture %	17.8%	15.3%	34.0%	40.8%	45.4%	26.7%

Test Hole	ROY12-05					
Depth (m)	2.9 - 3.0					
Sample #	G46					
Tare ID	N8					
Mass of tare	8.5					
Mass wet + tare	412.5					
Mass dry + tare	279.1					
Mass water	133.4					
Mass dry soil	270.6					
Moisture %	49.3%					

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Atterberg Limits
ASTM D4318

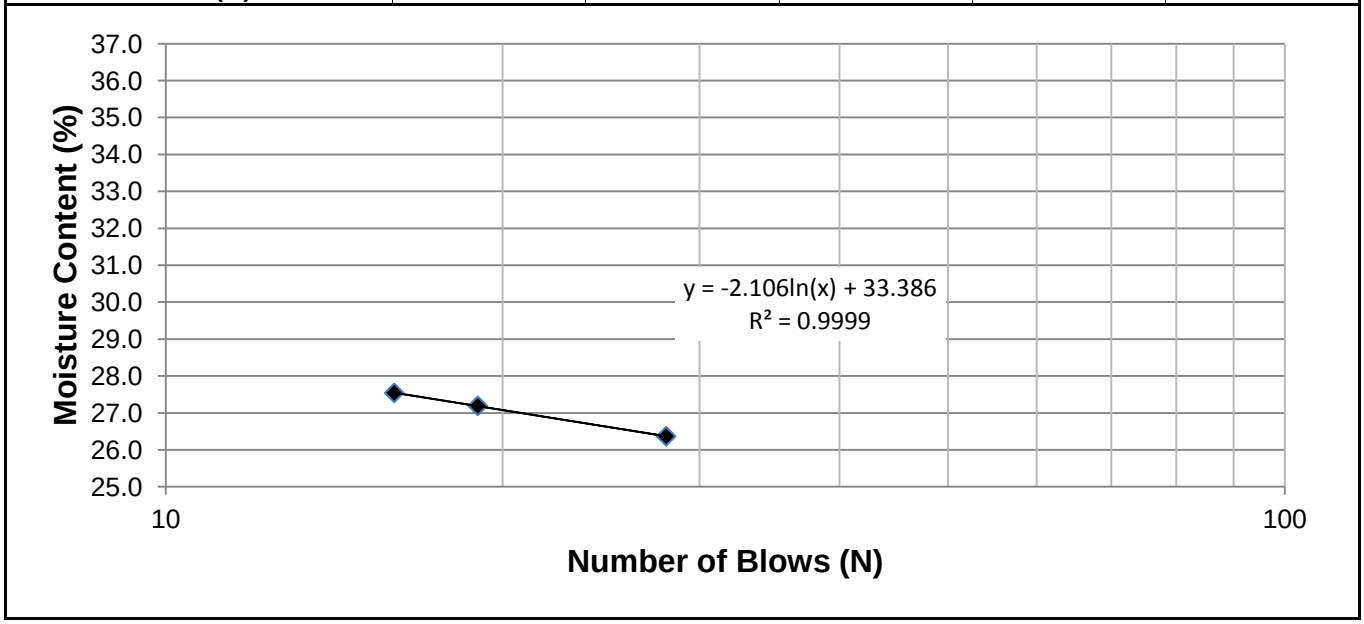
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley behind Royal Crescent from Kingsbury Avenue to McGregor Street

Test Hole	ROY12-02
Sample #	G13
Depth (m)	0.9 - 1.1
Sample Date	24-Jan-12
Test Date	16-Feb-12
Technician	Lee Boughton

Liquid Limit	26.6
Plastic Limit	16.1
Plasticity Index	10.5

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	28	19	16		
Mass Wet Soil + Tare (g)	26.618	24.948	25.450		
Mass Dry Soil + Tare (g)	23.946	22.606	22.983		
Mass Tare (g)	13.812	13.993	14.026		
Mass Water (g)	2.672	2.342	2.467		
Mass Dry Soil (g)	10.134	8.613	8.957		
Moisture Content (%)	26.367	27.191	27.543		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.086	20.507			
Mass Dry Soil + Tare (g)	19.254	19.600			
Mass Tare (g)	14.047	13.995			
Mass Water (g)	0.832	0.907			
Mass Dry Soil (g)	5.207	5.605			
Moisture Content (%)	15.978	16.182			

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Atterberg Limits
ASTM D4318

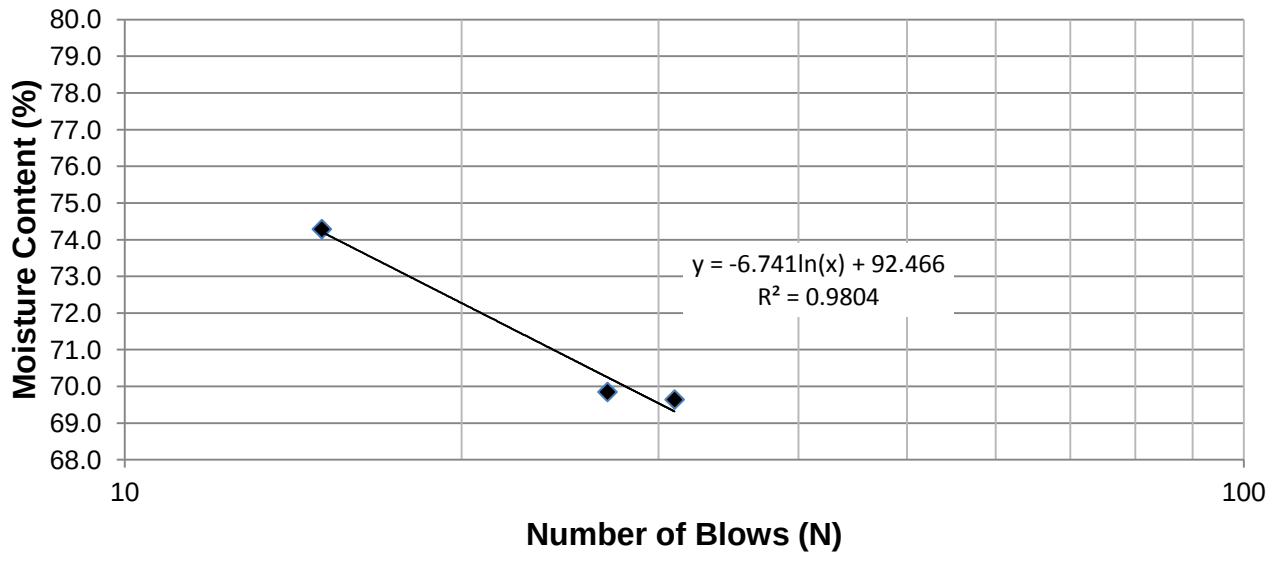
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley behind Royal Crescent from Kingsbury Avenue to McGregor Street

Test Hole	ROY12-03
Sample #	G21
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	09-Feb-12
Technician	Tom Hildahl

Liquid Limit	70.8
Plastic Limit	20.6
Plasticity Index	50.2

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	31	27	15		
Mass Wet Soil + Tare (g)	25.478	25.000	24.466		
Mass Dry Soil + Tare (g)	20.778	20.499	19.913		
Mass Tare (g)	14.029	14.055	13.784		
Mass Water (g)	4.700	4.501	4.553		
Mass Dry Soil (g)	6.749	6.444	6.129		
Moisture Content (%)	69.640	69.848	74.286		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.151	20.202			
Mass Dry Soil + Tare (g)	19.061	19.157			
Mass Tare (g)	13.809	14.028			
Mass Water (g)	1.090	1.045			
Mass Dry Soil (g)	5.252	5.129			
Moisture Content (%)	20.754	20.374			

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Atterberg Limits
ASTM D4318

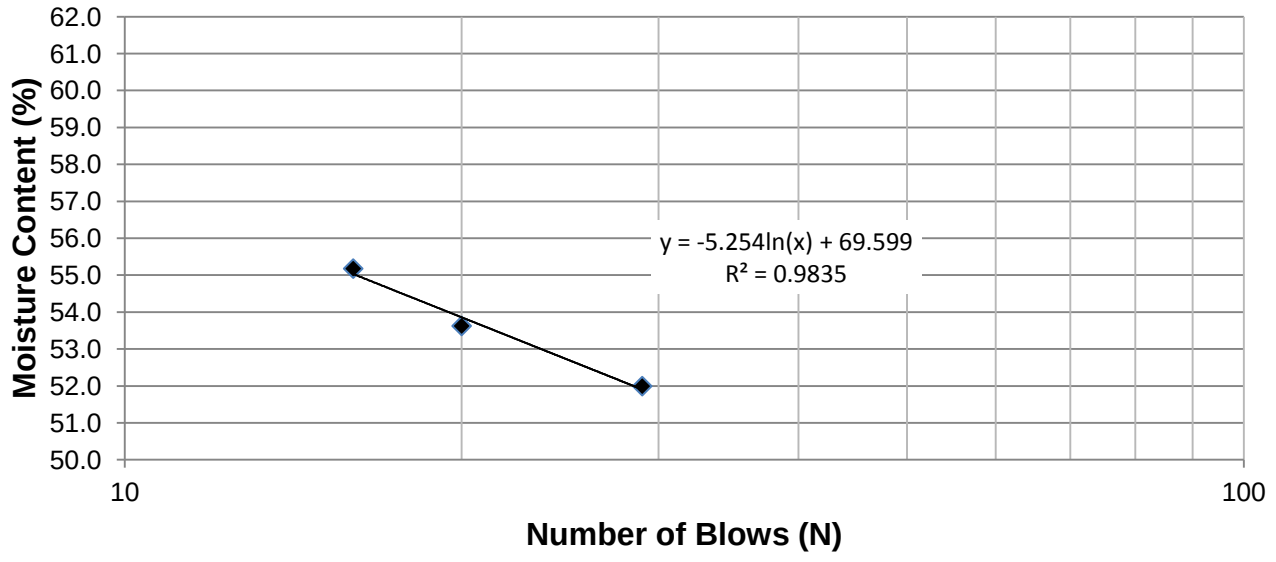
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley behind Royal Crescent from Kingsbury Avenue to McGregor Street

Test Hole	ROY12-05
Sample #	G40
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	16-Feb-12
Technician	Lee Boughton

Liquid Limit	52.7
Plastic Limit	18.5
Plasticity Index	34.2

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	29	20	16		
Mass Wet Soil + Tare (g)	25.180	26.531	25.066		
Mass Dry Soil + Tare (g)	21.294	22.129	21.117		
Mass Tare (g)	13.820	13.920	13.960		
Mass Water (g)	3.886	4.402	3.949		
Mass Dry Soil (g)	7.474	8.209	7.157		
Moisture Content (%)	51.994	53.624	55.177		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.284	20.234			
Mass Dry Soil + Tare (g)	19.314	19.277			
Mass Tare (g)	14.048	14.114			
Mass Water (g)	0.970	0.957			
Mass Dry Soil (g)	5.266	5.163			
Moisture Content (%)	18.420	18.536			

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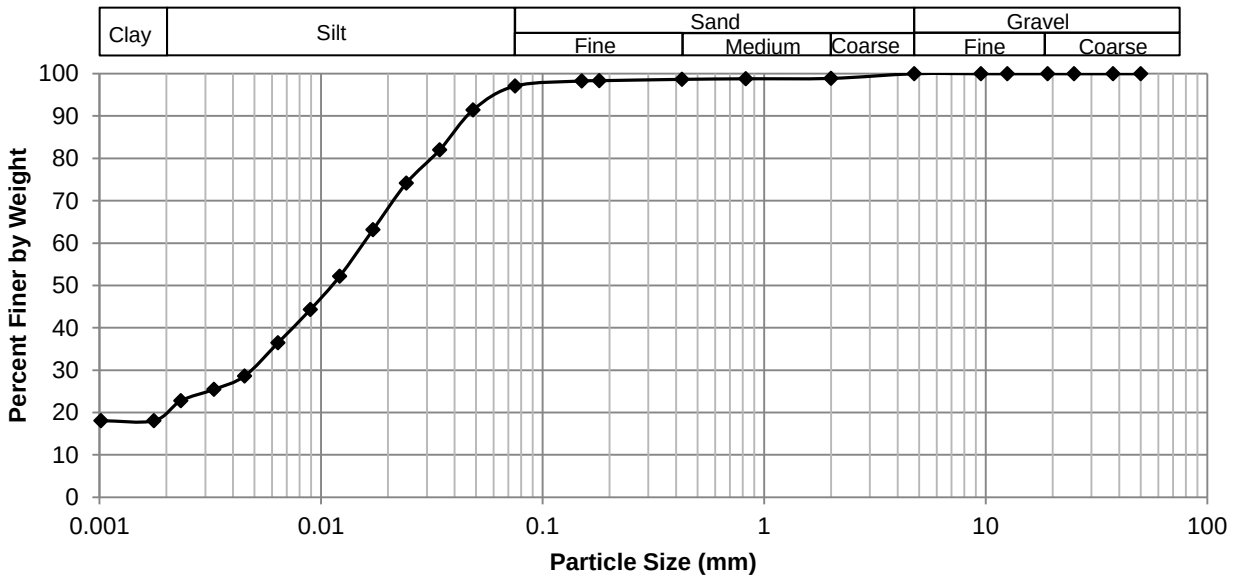
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Royal
Test Hole	ROY12-02
Sample #	G13
Depth (m)	0.9 - 1.1
Sample Date	24-Jan-12
Test Date	7-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	2.9%
Silt	75.2%
Clay	21.9%

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	97.10
37.5	100.00	2.00	98.90	0.0484	91.45
25.0	100.00	0.825	98.81	0.0343	82.02
19.0	100.00	0.425	98.68	0.0242	74.17
12.5	100.00	0.180	98.36	0.0171	63.17
9.50	100.00	0.150	98.28	0.0121	52.18
4.75	100.00	0.075	97.10	0.0089	44.32
				0.0064	36.47
				0.0045	28.61
				0.0033	25.47
				0.0023	22.79
				0.0018	18.07
				0.0010	18.07

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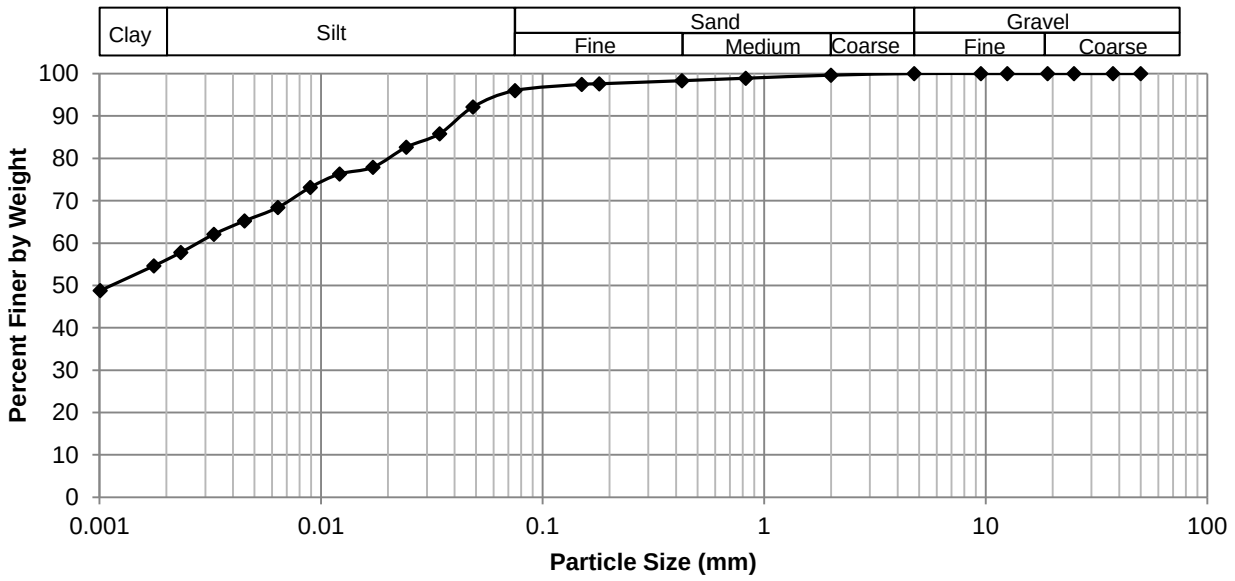
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Royal
Test Hole	ROY12-03
Sample #	G21
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	8-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	4.0%
Silt	39.7%
Clay	56.3%

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	95.99
37.5	100.00	2.00	99.62	0.0484	92.12
25.0	100.00	0.825	98.90	0.0343	85.79
19.0	100.00	0.425	98.32	0.0242	82.63
12.5	100.00	0.180	97.59	0.0171	77.88
9.50	100.00	0.150	97.45	0.0121	76.30
4.75	100.00	0.075	95.99	0.0089	73.13
				0.0064	68.38
				0.0045	65.22
				0.0033	62.06
				0.0023	57.77
				0.0018	54.60
				0.0010	48.77

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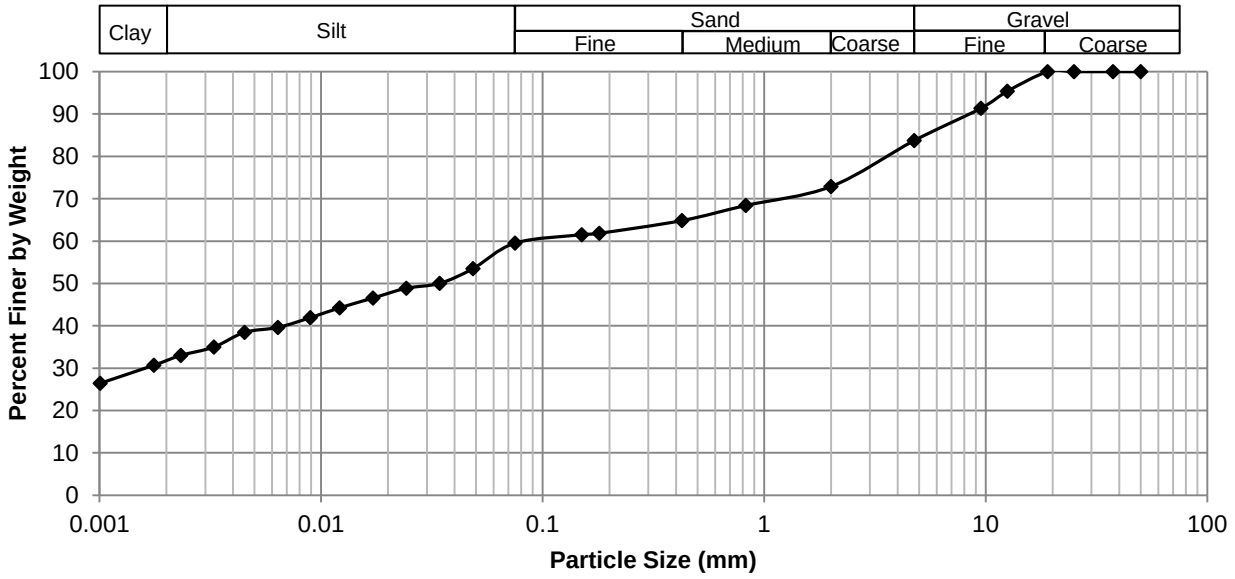
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Royal
Test Hole	ROY12-05
Sample #	G40
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	8-Feb-12
Technician	Lee Boughton

Gravel	16.3%
Sand	24.2%
Silt	27.2%
Clay	32.3%

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	83.73	0.0750	59.52
37.5	100.00	2.00	72.88	0.0484	53.48
25.0	100.00	0.825	68.40	0.0343	50.01
19.0	100.00	0.425	64.84	0.0242	48.85
12.5	95.38	0.180	61.83	0.0171	46.54
9.50	91.35	0.150	61.50	0.0121	44.22
4.75	83.73	0.075	59.52	0.0089	41.91
				0.0064	39.60
				0.0045	38.44
				0.0033	34.97
				0.0023	32.99
				0.0018	30.67
				0.0010	26.41

Photo 1: Asphalt core sample from Test Hole ROY12-01

Photo 2: Asphalt core sample from Test Hole ROY12-02

Photo 3: Asphalt core sample from Test Hole ROY12-03

Photo 4: Asphalt core sample from Test Hole ROY12-04

Photo 5: Asphalt core sample from Test Hole ROY12-05

Appendix B

Alley between Langside St and Young St from Portage Ave to Ellice Ave

Sub-Surface Log

Test Hole LY12-01
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Langside/Young from Portage to Ellice
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		CONCRETE (178 mm thick)		C48		
		CLAY (Fill) - silty, trace organics, trace gravel (<10 mm diam.) - dark brown - frozen, moist and very soft when thawed - intermediate to high plasticity		G49		
0.5		- firm below 0.5 m		G50		
				G51		
1.0		SILT - some clay, trace to some sand (fine grained) - light brown - frozen to 1.1 m, moist and soft to firm when thawed - low plasticity		G52		
		CLAY - some silt, trace silt inclusions (<2 mm diam.) - brown - moist, stiff - high plasticity		G53		
1.5		- stiff below 1.7 m		G54		
2.0		- stiff below		G55		
2.5						
3.0				G56		

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 5.0 m N, 3.5 m W of 2nd hydro pole N of S Alley.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS LANGSIDE-YOUNG TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/24/12

Sub-Surface Log

Test Hole LY12-02
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Langside/Young from Portage to Ellice
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		CONCRETE (228 mm thick)		C57		
		CLAY (Fill) - silty, trace sand (fine grained) - dark brown to black - frozen, moist and firm when thawed - high plasticity		G58		
0.5				G59		
		- firm to stiff below 0.8 m		G60		
1.0		SILT - some clay, trace to some sand (fine grained) - light brown - frozen to 1.1 m, moist and firm to stiff when thawed - low plasticity		G61		
		- firm below 1.4 m		G62		
1.5		CLAY - some silt - brown - moist, stiff to very stiff - high plasticity		G63		△ ✤
2.0				G64		✤
2.5						
		- firm, trace oxiadation below 2.7 m				
3.0				G65		✤

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 7.9 m S, 3.7 m W of 5th hydro pole N of S Alley.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS LANGSIDE-YOUNG TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/24/12

Sub-Surface Log

Test Hole LY12-03
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Langside/Young from Portage to Ellice
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) 0 50 100 150 200 250
		CONCRETE (203 mm thick)		C66		
		ORGANIC CLAY (Fill) - silty, some sand (medium and coarse grained), some oxidation, some organics, trace metal debris (nails) - dark brown to black - dry to damp, soft - high plasticity		G67		
0.5				G68		
				G69		
1.0				G70		
		SILT and CLAY - trace organics - light brown, moist, firm, intermediate plasticity		G71		
1.5		CLAY - some silt, trace sand (fine and medium grained), trace silt cinlusions (<10 mm dia.), trace oxidation, trace organics - brown - moist, very stiff - high plasticity		G72		△ ✤
2.0				G73		✤
2.5		- firm below 2.7 m				
3.0				G74		△ ✤

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 6.3 m N, 3.5 m W of 7th hydro pole N of S Alley.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS LANGSIDE-YOUNG TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/24/12

Sub-Surface Log

Test Hole LY12-04
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Langside/Young from Portage to Ellice
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		CONCRETE (175 mm thick)		C75		
		CLAY (Fill) - silty, trace sand (medium grained), trace gravel (<12.5 mm dia.) - dark brown - frozen to 0.9 m, moist and soft when thawed - intermediate to high plasticity		G76	●	
0.5				G77	●	
		- firm below 0.8 m		G78	●	
1.0		- stiff to very stiff below 1.1 m		G79	●	△ ✤
				G80	●	△ ✤
1.5		SILT - some clay, trace organics - light brown, moist, soft to firm, low plasticity		G81	●	
		CLAY - some silt, trace silt inclusions (<5 mm dia.), trace oxidation - brown - moist, stiff to very stiff - high plasticity		G82	●	△ ✤
2.5		- firm below 2.7 m				
		- silt seam (<100 mm thick) at 2.9 m		G83	●	✤
3.0		END OF TEST HOLE AT 3.1 m IN CLAY				

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 11.9 m S, 3.4 m W of 4th hydro pole S of N Alley.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS LANGSIDE-YOUNG TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/24/12

Sub-Surface Log

Test Hole LY12-05
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Langside/Young from Portage to Ellice
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) 0 50 100 150 200 250
		CONCRETE (165 mm thick)		C84		
		CLAY (Fill) - silty, trace sand (fine grained), trace organics - dark brown - frozen to 0.9 m, moist and firm when thawed - high plasticity		G85		
0.5				G86		
				G87		
1.0				G88		
		CLAY - some silt - brown - moist, very stiff - high plasticity		G89		
1.5				G90		
2.0		SILT - some clay, trace sand (fine grained) - light brown - moist, soft to firm - low plasticity		G91		
2.5						
		CLAY - some silt - brown - moist, stiff to very stiff - high plasticity		G92		
3.0		END OF TEST HOLE AT 3.1 m IN CLAY				

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 4.5 m N, 3.7 m W of 2nd hydro pole S of N Alley.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS LANGSIDE-YOUNG TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/24/12

2012 City of Winnipeg Alley Package
PW File #: 12-RL-01
Sub-Surface Investigation

Test Hole No.	Test Hole Location (Street Name)	House No.	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
			Type	Thickness (mm)	Type	Thickness (mm)				Gravel (%)	Sand (%)`	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
LY12-01	Alley between Langside Street and Young Street from Portage Avenue to Ellice Avenue	324	Concrete	178												
		Young					Clay(Fill)	0.2	36							
							Clay(Fill)	0.5	45							
							Clay(Fill)	0.8	33							
							Silt	1.1	21	0	8	72	20	16	25	10
							Silt	1.4	24							
							Clay	1.7	33							
							Clay	2.0	39							
							Clay	2.9	45							
LY12-02	Alley between Langside Street and Young Street from Portage Avenue to Ellice Avenue	377	Concrete	228												
		Langside					Clay(Fill)	0.2	36							
							Clay(Fill)	0.5	34	0	6	37	57	20	61	41
							Silt	0.8	26							
							Silt	1.1	22							
							Silt	1.4	22							
							Clay	1.7	31							
							Clay	2.0	42							
							Clay	2.9	49							
LY12-03	Alley between Langside Street and Young Street from Portage Avenue to Ellice Avenue	470	Concrete	203												
		Langside					Clay(Topsoil)	0.2	28							
							Clay(Topsoil)	0.5	28							
							Clay(Topsoil)	0.8	40	0	15	51	34	42	72	30
							Clay(Topsoil)	1.1	28							
							Silt and Clay	1.4	22							
							Clay	1.7	27							
							Clay	2.0	35							
							Clay	2.9	47							
LY12-04	Alley between Langside Street and Young Street from Portage Avenue to Ellice Avenue	423	Concrete	228												
		Langside					Clay(Fill)	0.2	27							
							Clay(Fill)	0.5	33							
							Clay(Fill)	0.8	33							
							Clay(Fill)	1.1	32							
							Silt	1.4	26							
							Clay	1.6	24							
							Clay	2.0	33							
							Clay	2.9	39							
LY12-05	Alley between Langside Street and Young Street from Portage Avenue to Ellice Avenue	449	Concrete	165												
		Langside					Clay	0.2	32							
							Clay	0.5	36	0	7	29	64	16	72	56
							Clay	0.8	35							
							Clay	1.1	32							
							Clay	1.4	30							
							Clay	1.7	30							
							Silt	2.0	24							
							Clay	2.9	39							

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley between Langside Street and Young Street from Portage Avenue to Ellice Avenue

Sample Date Jan 24, 2012
Test Date Jan 25, 2012
Technician Lee Boughton

Test Hole	LY12-01	LY12-01	LY12-01	LY12-01	LY12-01	LY12-01
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 #	G44	G50	G51	G52	G53	G50
Tare ID	E131	K24	D31	E16	A7	E111
Mass of tare	8.3	8.3	8.2	8.3	8	8.3
Mass wet + tare	367.4	359	317.8	417.3	483.9	363.4
Mass dry + tare	271.6	249.9	241.5	347.4	391.4	274.7
Mass water	95.8	109.1	76.3	69.9	92.5	88.7
Mass dry soil	263.3	241.6	233.3	339.1	383.4	266.4
Moisture %	36.4%	45.2%	32.7%	20.6%	24.1%	33.3%

Test Hole	LY12-01	LY12-01	LY12-02	LY12-02	LY12-02	LY12-02
Depth (m)	2.0 - 2.1	2.9 - 3.0	0.1 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G55	G56	G58	G59	G60	G61
Tare ID	A10	E27	E35	E51	D24	E113
Mass of tare	8	8.3	8.2	8.3	8.2	8.3
Mass wet + tare	347.2	349.4	348	354.4	423.4	364.3
Mass dry + tare	251.5	243.1	258.4	265.9	337.9	299.1
Mass water	95.7	106.3	89.6	88.5	85.5	65.2
Mass dry soil	243.5	234.8	250.2	257.6	329.7	290.8
Moisture %	39.3%	45.3%	35.8%	34.4%	25.9%	22.4%

Test Hole	LY12-02	LY12-02	LY12-02	LY12-02	LY12-03	LY12-03
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 #	G62	G63	G64	G65	G67	G68
Tare ID	D5	E36	A8	C7	E114	A9
Mass of tare	8.1	8.2	8	8.2	8.3	8
Mass wet + tare	390.9	360	430.4	387.6	205.2	292.7
Mass dry + tare	322.4	276	306	263.3	162.7	230.6
Mass water	68.5	84.0	124.4	124.3	42.5	62.1
Mass dry soil	314.3	267.8	298.0	255.1	154.4	222.6
Moisture %	21.8%	31.4%	41.7%	48.7%	27.5%	27.9%

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley between Langside Street and Young Street from Portage Avenue to Ellice Avenue

Sample Date Jan 24, 2012
Test Date Jan 25, 2012
Technician Lee Boughton

Test Hole	LY12-03	LY12-03	LY12-03	LY12-03	LY12-03	LY12-03
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 #	G69	G70	G71	G72	G73	G74
Tare ID	A16	A30	E120	E112	E130	E39
Mass of tare	8.5	8	8.3	8.4	8.2	8.4
Mass wet + tare	142.8	357.6	295.9	340.9	379.5	400.6
Mass dry + tare	104.5	281	244.7	269.6	284.2	274.5
Mass water	38.3	76.6	51.2	71.3	95.3	126.1
Mass dry soil	96.0	273.0	236.4	261.2	276.0	266.1
Moisture %	39.9%	28.1%	21.7%	27.3%	34.5%	47.4%

Test Hole	LY12-04	LY12-04	LY12-04	LY12-04	LY12-04	LY12-04
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.5 - 1.7
Sample #	G76	G77	G78	G79	G80	G81
Tare ID	E25	E29	E60	E127	A35	E86
Mass of tare	8.5	8.3	8.4	8.4	8.5	8.3
Mass wet + tare	420.1	340.1	345.9	412.1	374.2	533
Mass dry + tare	334	257.8	262	313.8	298.3	431.7
Mass water	86.1	82.3	83.9	98.3	75.9	101.3
Mass dry soil	325.5	249.5	253.6	305.4	289.8	423.4
Moisture %	26.5%	33.0%	33.1%	32.2%	26.2%	23.9%

Test Hole	LY12-01	LY12-04	LY12-04	LY12-05	LY12-05	LY12-05
Depth (m)	0.2 - 0.2	2.0 - 2.1	2.9 - 3.0	0.2 - 0.2	0.2 - 0.3	0.5 - 0.6
Sample #	C48	G82	G83	C84	G85	G86
Tare ID	W18	D42	D44	Z113	C8	H25
Mass of tare	8.3	8.4	8.3	8.3	8.1	8.1
Mass wet + tare	327.7	376.9	397.2	329.1	369.9	335.8
Mass dry + tare	245.6	286.2	287.3	243.3	283.3	248.8
Mass water	82.1	90.7	109.9	85.8	86.6	87.0
Mass dry soil	237.3	277.8	279.0	235.0	275.2	240.7
Moisture %	34.6%	32.6%	39.4%	36.5%	31.5%	36.1%

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley between Langside Street and Young Street from Portage Avenue to Ellice Avenue

Sample Date Jan 24, 2012
Test Date Jan 25, 2012
Technician Lee Boughton

Test Hole	LY12-05	LY12-05	LY12-05	LY12-05	LY12-05	LY12-05
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 #	G87	G88	G89	G90	G91	G92
Tare ID	K20	E28	E94	H39	E98	A6
Mass of tare	8.4	8.1	8.4	8.4	8.5	8.1
Mass wet + tare	318.2	328.6	362.9	470.7	425.8	350.8
Mass dry + tare	238.7	251.4	281.2	363.7	345.6	254.2
Mass water	79.5	77.2	81.7	107.0	80.2	96.6
Mass dry soil	230.3	243.3	272.8	355.3	337.1	246.1
Moisture %	34.5%	31.7%	29.9%	30.1%	23.8%	39.3%

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Atterberg Limits
ASTM D4318

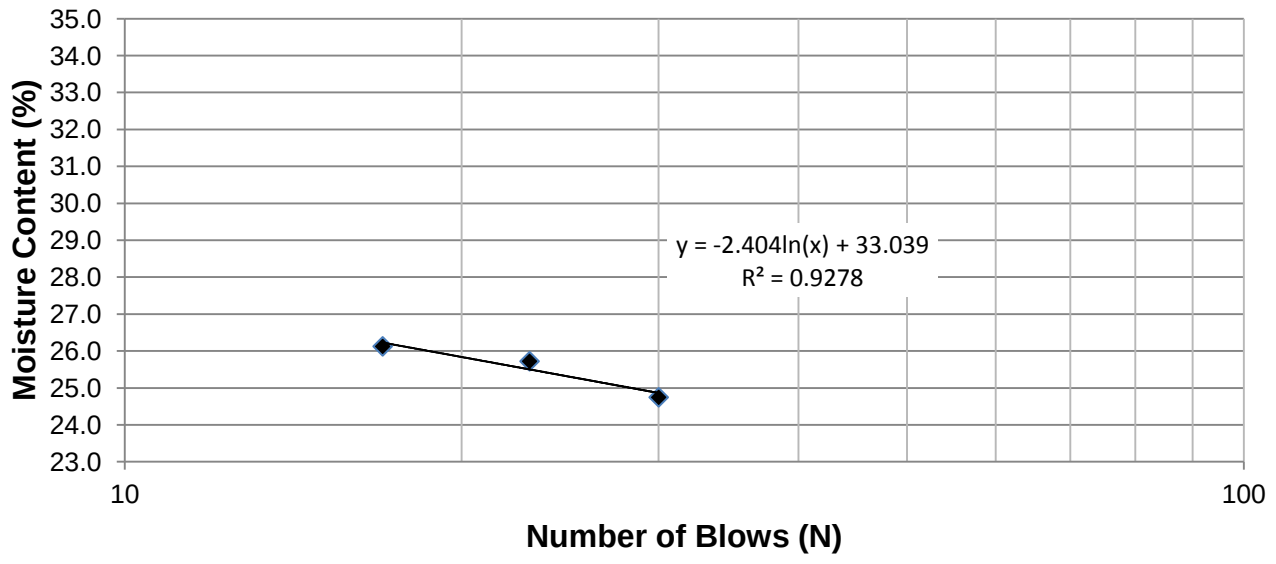
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Langside Street and Young Street from Portage Avenue to Ellice Avenue

Test Hole	LY12-01
Sample #	G52
Depth (m)	1.1 - 1.2
Sample Date	24-Jan-12
Test Date	15-Feb-12
Technician	Daniel Morz

Liquid Limit	25.3
Plastic Limit	15.6
Plasticity Index	9.7

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	30	23	17		
Mass Wet Soil + Tare (g)	28.404	26.555	27.938		
Mass Dry Soil + Tare (g)	25.559	23.987	25.024		
Mass Tare (g)	14.062	14.003	13.870		
Mass Water (g)	2.845	2.568	2.914		
Mass Dry Soil (g)	11.497	9.984	11.154		
Moisture Content (%)	24.746	25.721	26.125		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.096	20.235			
Mass Dry Soil + Tare (g)	19.287	19.396			
Mass Tare (g)	14.067	14.062			
Mass Water (g)	0.809	0.839			
Mass Dry Soil (g)	5.220	5.334			
Moisture Content (%)	15.498	15.729			

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Atterberg Limits
ASTM D4318

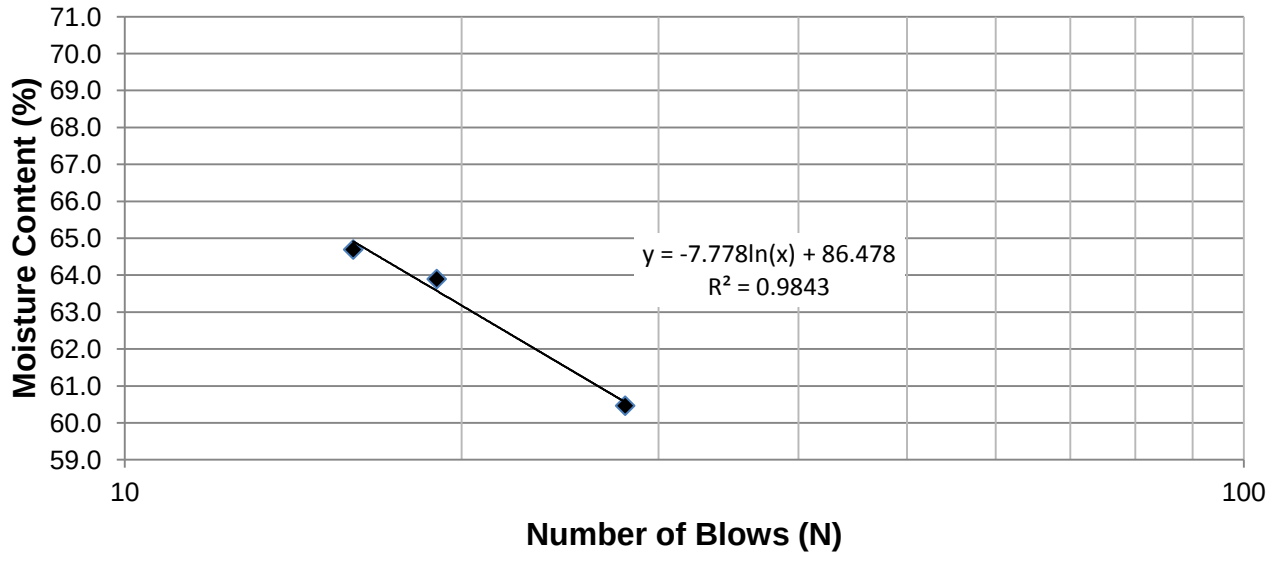
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Langside Street and Young Street from Portage Avenue to Ellice Avenue

Test Hole	LY12-02
Sample #	G59
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	16-Feb-12
Technician	Lee Boughton

Liquid Limit	61.4
Plastic Limit	20.2
Plasticity Index	41.2

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	28	19	16		
Mass Wet Soil + Tare (g)	27.090	26.486	25.139		
Mass Dry Soil + Tare (g)	22.184	21.678	20.778		
Mass Tare (g)	14.070	14.153	14.037		
Mass Water (g)	4.906	4.808	4.361		
Mass Dry Soil (g)	8.114	7.525	6.741		
Moisture Content (%)	60.463	63.894	64.694		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.055	20.363			
Mass Dry Soil + Tare (g)	19.044	19.297			
Mass Tare (g)	14.038	14.034			
Mass Water (g)	1.011	1.066			
Mass Dry Soil (g)	5.006	5.263			
Moisture Content (%)	20.196	20.255			

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Atterberg Limits
ASTM D4318

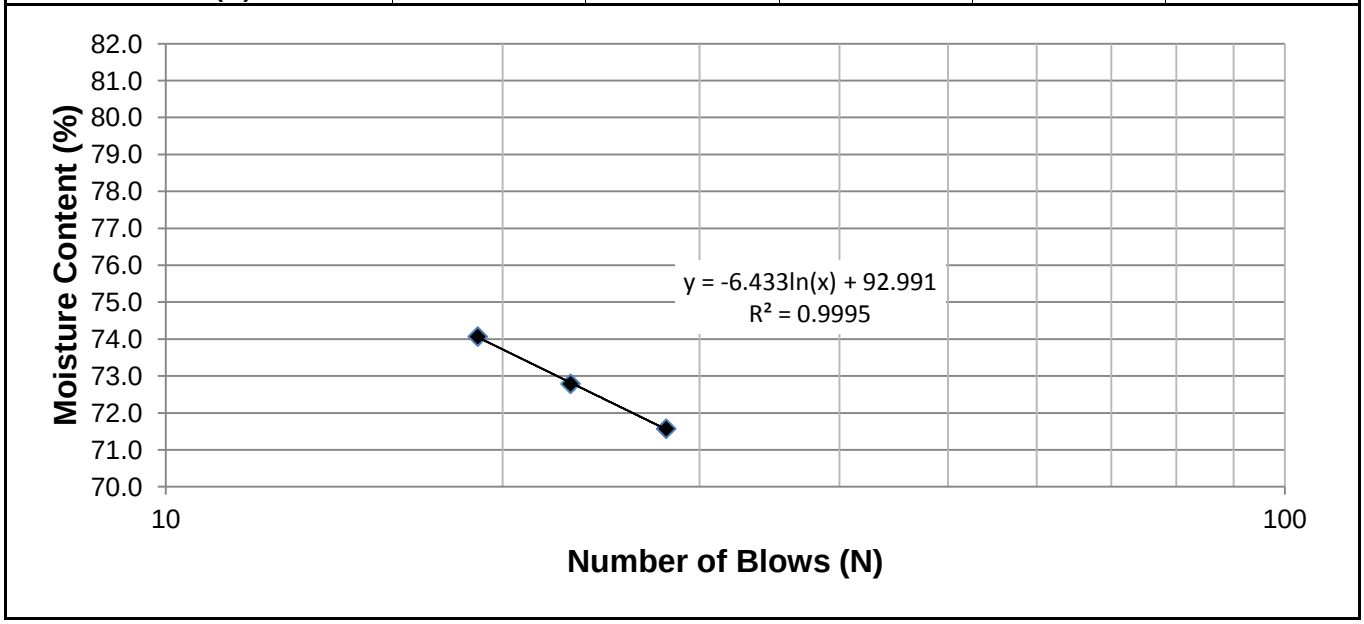
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Langside Street and Young Street from Portage Avenue to Ellice Avenue

Test Hole	LY12-03
Sample #	G69
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	16-Feb-12
Technician	Lee Boughton

Liquid Limit	72.3
Plastic Limit	42.3
Plasticity Index	29.9

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	28	23	19		
Mass Wet Soil + Tare (g)	25.348	25.026	25.138		
Mass Dry Soil + Tare (g)	20.625	20.273	20.477		
Mass Tare (g)	14.026	13.743	14.184		
Mass Water (g)	4.723	4.753	4.661		
Mass Dry Soil (g)	6.599	6.530	6.293		
Moisture Content (%)	71.571	72.787	74.066		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.142	20.252			
Mass Dry Soil + Tare (g)	18.346	18.386			
Mass Tare (g)	14.077	14.008			
Mass Water (g)	1.796	1.866			
Mass Dry Soil (g)	4.269	4.378			
Moisture Content (%)	42.071	42.622			

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Atterberg Limits
ASTM D4318

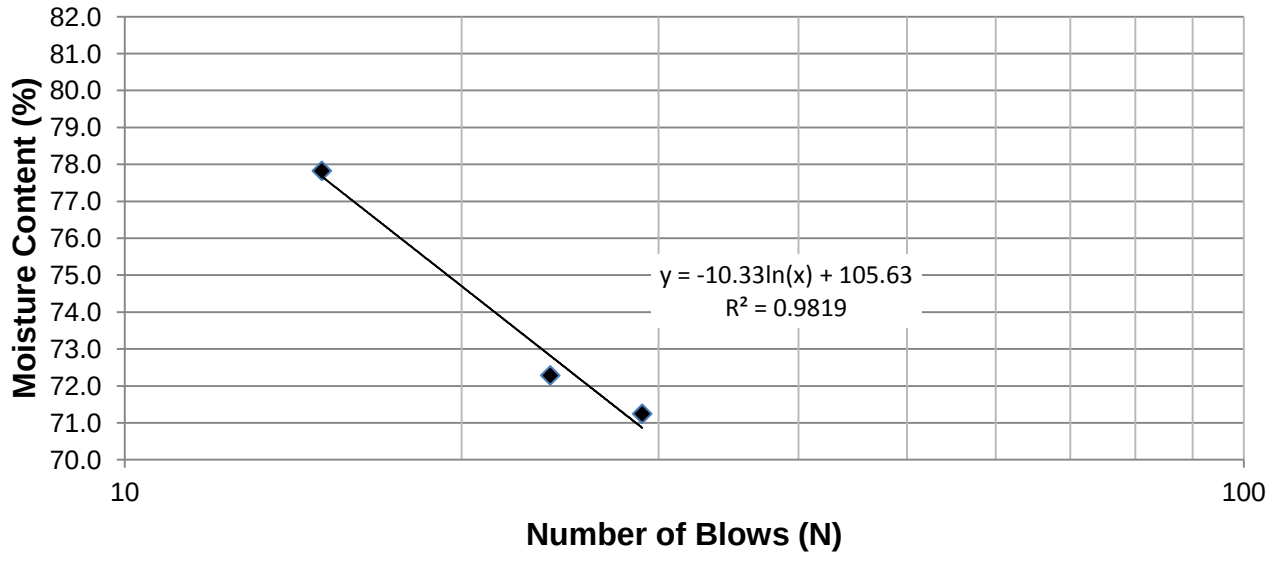
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Langside Street and Young Street from Portage Avenue to Ellice Avenue

Test Hole	LY12-05
Sample #	G86
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	16-Feb-12
Technician	Lee Boughton

Liquid Limit	72.4
Plastic Limit	16.0
Plasticity Index	56.4

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	29	24	15		
Mass Wet Soil + Tare (g)	24.952	26.050	25.658		
Mass Dry Soil + Tare (g)	20.403	20.946	20.527		
Mass Tare (g)	14.018	13.885	13.934		
Mass Water (g)	4.549	5.104	5.131		
Mass Dry Soil (g)	6.385	7.061	6.593		
Moisture Content (%)	71.245	72.284	77.825		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.180	20.613			
Mass Dry Soil + Tare (g)	19.329	19.696			
Mass Tare (g)	14.037	13.954			
Mass Water (g)	0.851	0.917			
Mass Dry Soil (g)	5.292	5.742			
Moisture Content (%)	16.081	15.970			

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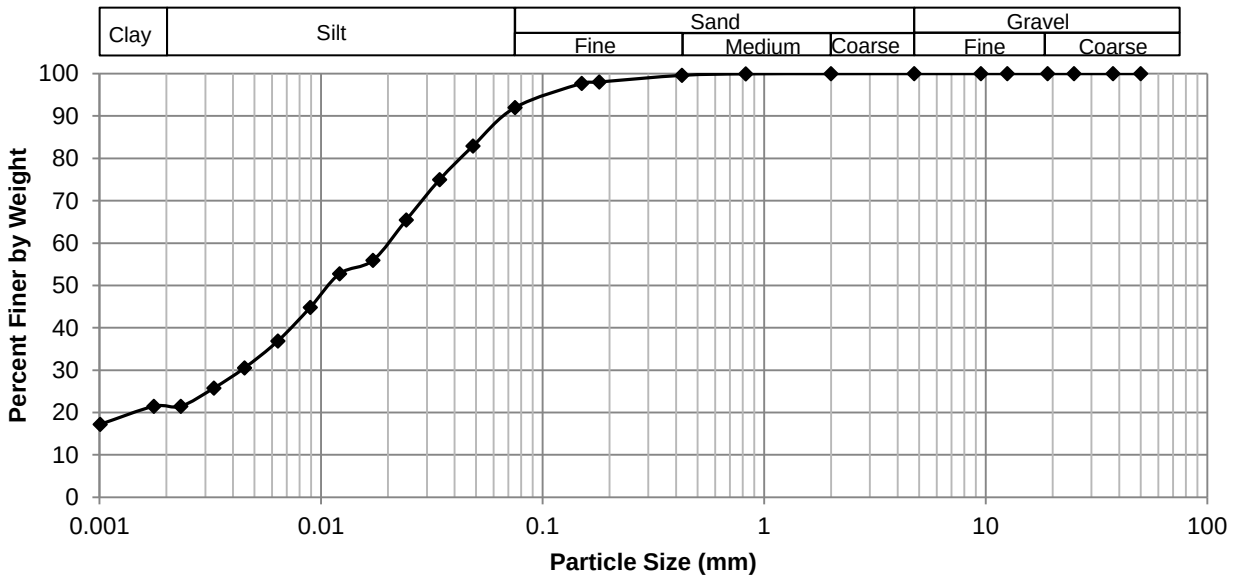
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Langside-Young
Test Hole	LY12-01
Sample #	G52
Depth (m)	1.1 - 1.2
Sample Date	24-Jan-12
Test Date	8-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	8.0%
Silt	72.0%
Clay	20.0%

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	91.99
37.5	100.00	2.00	99.99	0.0484	82.91
25.0	100.00	0.825	99.94	0.0343	74.97
19.0	100.00	0.425	99.60	0.0242	65.44
12.5	100.00	0.180	98.03	0.0171	55.92
9.50	100.00	0.150	97.69	0.0121	52.74
4.75	100.00	0.075	91.99	0.0089	44.80
				0.0064	36.86
				0.0045	30.51
				0.0033	25.75
				0.0023	21.44
				0.0018	21.44
				0.0010	17.19

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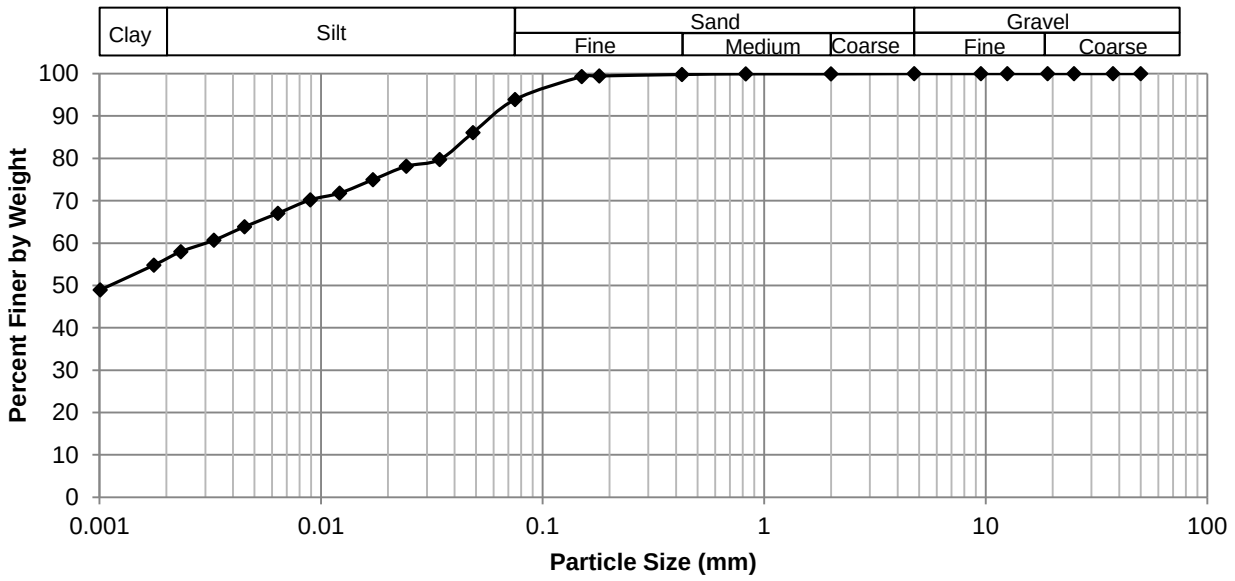
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Langside-Young
Test Hole	LY12-02
Sample #	G59
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	8-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	6.1%
Silt	36.9%
Clay	57.0%

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	93.89
37.5	100.00	2.00	99.95	0.0484	86.07
25.0	100.00	0.825	99.95	0.0343	79.72
19.0	100.00	0.425	99.80	0.0242	78.14
12.5	100.00	0.180	99.46	0.0171	74.96
9.50	100.00	0.150	99.31	0.0121	71.79
4.75	100.00	0.075	93.89	0.0089	70.20
				0.0064	67.02
				0.0045	63.85
				0.0033	60.67
				0.0023	57.96
				0.0018	54.78
				0.0010	48.93

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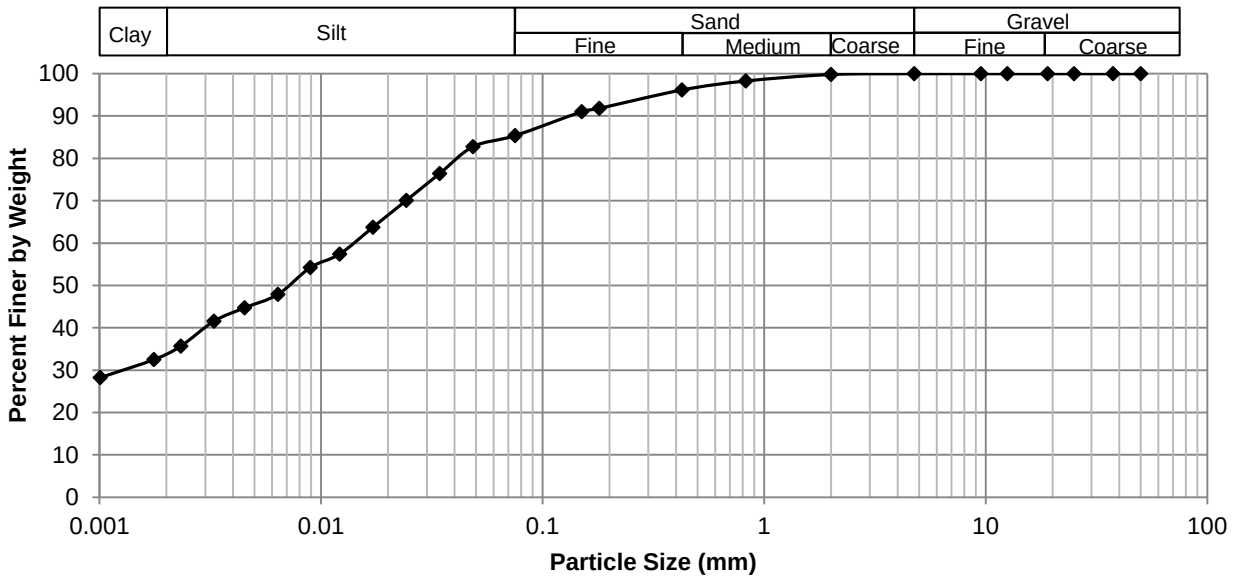
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Langside-Young
Test Hole	LY12-03
Sample #	G69
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	8-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	14.6%
Silt	51.7%
Clay	33.7%

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	85.38
37.5	100.00	2.00	99.81	0.0484	82.76
25.0	100.00	0.825	98.28	0.0343	76.42
19.0	100.00	0.425	96.16	0.0242	70.08
12.5	100.00	0.180	91.82	0.0171	63.74
9.50	100.00	0.150	91.03	0.0121	57.40
4.75	100.00	0.075	85.38	0.0089	54.23
				0.0064	47.89
				0.0045	44.72
				0.0033	41.55
				0.0023	35.67
				0.0018	32.50
				0.0010	28.25

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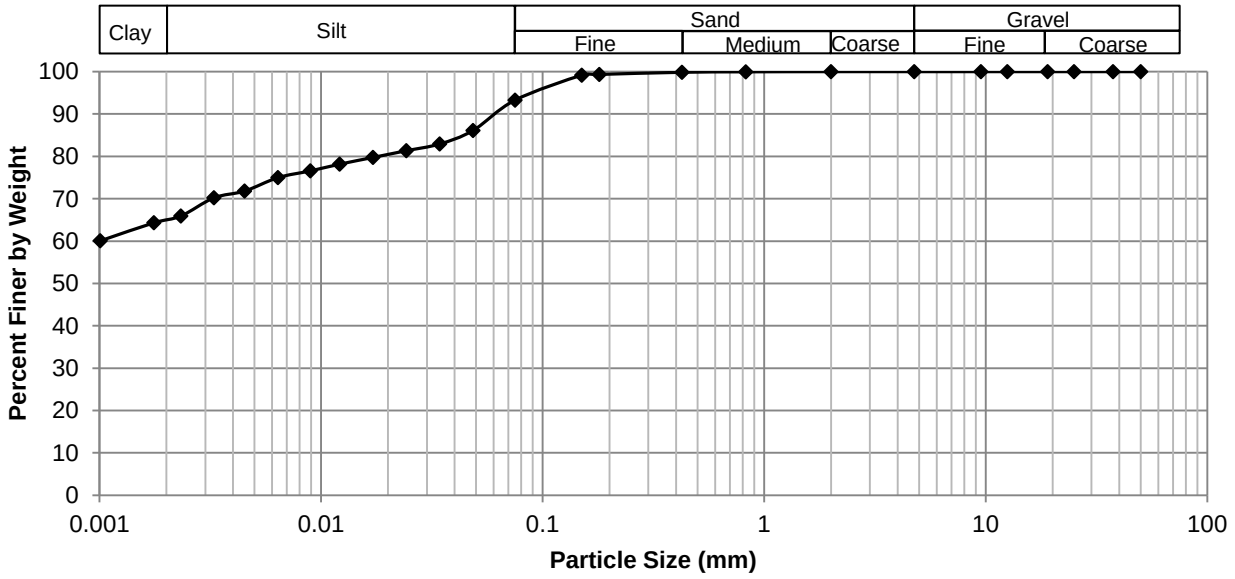
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Langside-Young

Test Hole	LY12-05
Sample #	G86
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	7-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	6.7%
Silt	28.8%
Clay	64.5%

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	93.27
37.5	100.00	2.00	100.00	0.0484	86.11
25.0	100.00	0.825	99.96	0.0343	82.93
19.0	100.00	0.425	99.85	0.0242	81.34
12.5	100.00	0.180	99.34	0.0171	79.76
9.50	100.00	0.150	99.16	0.0121	78.17
4.75	100.00	0.075	93.27	0.0089	76.58
				0.0064	74.99
				0.0045	71.81
				0.0033	70.23
				0.0023	65.92
				0.0018	64.33
				0.0010	60.07

Photo 6: Concrete core sample from Test Hole LY12-01

Photo 7: Concrete core sample from Test Hole LY12-02

Photo 8: Concrete core sample from Test Hole LY12-02

Photo 9: Concrete core sample from Test Hole LY12-03

Photo 10: Concrete core sample from Test Hole LY12-04

Photo 11: Concrete core sample from Test Hole LY12-05

Appendix C

Alley between Minto St and Goulding St from Portage Ave to Wolever Ave

Sub-Surface Log

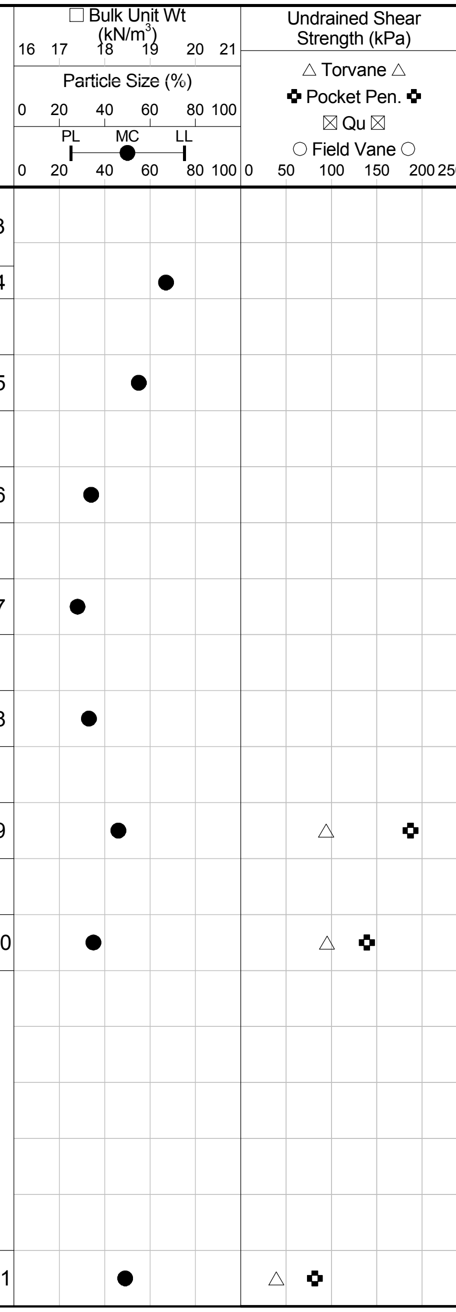
TREK GEOTECHNICAL

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Minto/Goulding from Portage to Wolever
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 25, 2012

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

Particle Size Legend: Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
0.0 – 0.22		CONCRETE (222 mm thick)	Core	C93
0.22 – 1.1		CLAY (Fill) - silty, trace sand (medium and coarse grained), trace gravel (<10 mm diam.) - dark brown to black - frozen, moist and very soft when thawed - intermediate to high plasticity - very soft to soft below 0.8 m	Grab	G94, G95, G96
1.1 – 1.5		SILT and CLAY - trace sand (fine grained), trace organics - light brown to brown - moist, soft - low to intermediate plasticity	Grab	G97, G98
1.5 – 3.1		CLAY - some silt, trace silt inclusions (<5 mm diam.) - brown - moist, very stiff - high plasticity - firm to stiff below 2.7 m	Grab	G99, G100, G101



END OF TEST HOLE AT 3.1 m IN CLAY
Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 18.3 m S, 3.7 m W of 2nd hydro pole North of Portage Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

Sub-Surface Log

Test Hole MG12-02
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Minto/Goulding from Portage to Wolever
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 25, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		CONCRETE (215 mm thick)		C102		
		CLAY - silty, trace sand (fine and medium grained), trace gravel (<10 mm diam.) - dark brown to black - frozen, moist and soft when thawed - high plasticity		G103		
0.5				G104		
				G105		
1.0		SILT - clayey, trace sand (fine grained) - light brown - moist, firm - low plasticity		G106		
				G107		
1.5		CLAY - some silt, trace silt inclusions (<10 mm diam.), trace gravel (<12.5 mm diam.), trace oxidation - brown - moist, stiff to very stiff - high plasticity		G108		△ ✤
2.0		- stiff below 2.0 m		G109		✤ △
2.5		- firm to stiff below 2.6 m				
3.0				G110		✤ △

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 4.9 m N, 3.2 m W of 3rd hydro pole North of Portage Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS MINTO-GOULDING TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole MG12-03

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Minto/Goulding from Portage to Wolever
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 25, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) △ Torvane △ ✿ Pocket Pen. ✿ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		CONCRETE (255 mm thick)		C111		
		CLAY - silty, trace to some organics - dark brown, frozen, moist and very soft when thawed, high plasticity		G112		
0.5		SILT - clayey, trace sand (fine grained) - light brown - frozen to 0.8 m, moist to wet and very soft when thawed - low plasticity		G113		
		- moist, soft below 0.8 m		G114		
1.0				G115		
				G116		
1.5		CLAY - some silt, trace silt inclusions (<5 mm diam.), trace oxidation - brown - moist, stiff - high plasticity		G117		
2.0				G118		
		- firm to stiff below 2.7 m				
2.5						
3.0				G119		

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 4.7 m N, 3.0 m W of 5th hydro pole North of Portage Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS MINTO-GOULDING TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole MG12-04
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Minto/Goulding from Portage to Wolever
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 25, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) 0 50 100 150 200 250
		CONCRETE (180 mm thick)		C120		
		CLAY - silty, trace to some organics, trace sand (fine and medium grained) - dark brown - frozen to 0.9 m, moist and soft when thawed - high plasticity		G121		
0.5				G122		
		- brown below 0.6 m		G123		
1.0						
		- stiff to very stiff below 1.1 m		G124		
				G125		
1.5						
		- stiff below 1.7 m		G126		
2.0		- firm to stiff below 2.0 m		G127		
		- some oxidation at 2.1 m				
2.5		- grey, firm, trace silt inclusions (<2 mm diam.) below 2.4 m				
3.0				G128		

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 4.8 m S, 3.4 m W of 7th hydro pole North of Portage Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS MINTO-GOULDING TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole MG12-05
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Minto/Goulding from Portage to Wolever
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 25, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Material Description	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21	Particle Size (%) 0 20 40 60 80 100	PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) 0 50 100 150 200 250
	CONCRETE (222 mm thick)		C129				
	CLAY - silty, trace gravel (<10 mm diam.), trace organics - dark grey - frozen to 0.9 m, moist and soft when thawed - intermediate to high plasticity		G130				
0.5	- firm to stiff below 0.5 m		G131				
			G132				
1.0	- brown below 0.9 m		G133				
	SILT - clayey, trace sand (fine grained) - light brown, moist, soft, low plasticity						
	CLAY - silty - brown, moist, stiff to very stiff, high plasticity		G134				
1.5	SILT - clayey, trace sand (fine grained) - light brown - moist, firm - low plasticity		G135				
2.0							
	CLAY - some silt - brown - moist, stiff to very stiff - high plasticity		G136				
2.5	- silt seam (<50 mm thick) at 2.5 m						
	SILT - some clay - light brown - moist, soft to firm - low plasticity		G137				
3.0	END OF TEST HOLE AT 3.1 m IN SILT						

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 9.1 m N, 3.4 m W of 4th hydro pole South of Wolever Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS MINTO-GOULDING TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole MG12-06

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Minto/Goulding from Portage to Wolever
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 25, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) 0 50 100 150 200 250 (△ Torvane △, ✤ Pocket Pen. ✤, ☒ Qu ☒, ○ Field Vane ○)
		CONCRETE (215 mm thick)		C138		
		CLAY - silty, trace sand (medium and coarse grained), trace gravel (<10 mm diam.), trace organics - dark grey - frozen to 0.9 m, moist and soft when thawed - intermediate to high plasticity		G139		
0.5				G140		
		- brown below 0.6 m				
				G141		
1.0		- firm below 0.9 m				
				G142		
		SILT - some clay, trace sand (fine grained) - light brown - moist, soft - low plasticity		G143		
1.5						
		CLAY - some silt, trace silt inclusions (<10 mm diam.), trace oxidation - brown - moist, stiff - high plasticity		G144		
2.0				G145		
		- trace to some oxidation, firm to stiff below 2.3 m				
2.5		- firm to stiff below 2.7 m				
				G146		
3.0		END OF TEST HOLE AT 3.1 m IN CLAY				

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 11.2 m S, 3.4 m W of 2nd hydro pole South of Wolever Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

2012 City of Winnipeg Alley Package
PW File #: 12-RL-01
Sub-Surface Investigation

Test Hole No.	Test Hole Location (Street Name)	House No.	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
			Type	Thickness (mm)	Type	Thickness (mm)				Gravel (%)	Sand (%)`	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
MG12-01	Alley between Minto Street and Goulding Street from Portage Avenue to Wolever Avenue	557	Concrete	222												
		Goulding					Clay (Fill)	0.2	67							
							Clay (Fill)	0.5	55							
							Clay (Fill)	0.8	46							
							Silt and Clay	1.1	34							
							Silt and Clay	1.4	28							
							Clay	1.7	33							
							Clay	2.0	35							
							Clay	2.9	49							
MG12-02	Alley between Minto Street and Goulding Street from Portage Avenue to Wolever Avenue	591	Concrete	215												
		Goulding					Clay	0.2	43							
							Clay	0.5	40							
							Clay	0.8	40	1	6	35	58	18	57	39
							Silt	1.1	25							
							Silt	1.4	21							
							Clay	1.7	34							
							Clay	2.0	46							
							Clay	2.9	52							
MG12-03	Alley between Minto Street and Goulding Street from Portage Avenue to Wolever Avenue	609	Concrete	255												
		Goulding					Clay	0.2	43							
							Silt	0.5	40							
							Silt	0.8	36	0	6	68	26	14	29	15
							Silt	1.1	30							
							Silt	1.4	33							
							Clay	1.7	43							
							Clay	2.0	40							
							Clay	2.9	52							
MG12-04	Alley between Minto Street and Goulding Street from Portage Avenue to Wolever Avenue	623	Concrete	180												
		Goulding					Clay	0.2	49							
							Clay	0.5	43							
							Clay	0.8	38	0	3	28	69	19	67	48
							Clay	1.1	35							
							Clay	1.4	31							
							Clay	1.7	41							
							Clay	2.0	49							
							Clay	2.9	55							
MG12-05	Alley between Minto Street and Goulding Street from Portage Avenue to Wolever Avenue	635	Concrete	222												
		Goulding					Clay	0.2	51							
							Clay	0.5	31							
							Clay	0.8	38							
							Clay	1.1	26							
							Clay	1.4	31							
							Silt	1.6	26							
							Clay	2.2	28							
							Silt	2.9	23							

2012 City of Winnipeg Alley Package
PW File #: 12-RL-01
Sub-Surface Investigation

Test Hole No.	Test Hole Location (Street Name)	House No.	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
			Type	Thickness (mm)	Type	Thickness (mm)				Gravel (%)	Sand (%)`	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
MG12-06	Alley between Minto Street and Goulding Street from Portage Avenue to Wolever Avenue	647	Concrete	215												
		Goulding					Clay	0.2	46							
							Clay	0.5	38							
							Clay	0.8	38							
							Clay	1.1	33							
							Silt	1.4	27							
							Clay	1.7	42							
							Clay	2.0	41							
							Clay	2.9	48							

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley between Minto Street and Goulding Street from Portage Avenue to Wolever Avenue

Sample Date Jan 25, 2012
Test Date Jan 26, 2012
Technician Lee Boughton

Test Hole	MG12-01	MG12-01	MG12-01	MG12-01	MG12-01	MG12-01
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 #	G94	G95	G96	G97	G98	G99
Tare ID	N115	N98	N102	N114	N111	N113
Mass of tare	8.4	8.3	8.2	8.3	8.3	8.3
Mass wet + tare	368.5	325.5	358.9	412.2	365.2	368
Mass dry + tare	224	213.5	248.6	308.8	287	279.7
Mass water	144.5	112.0	110.3	103.4	78.2	88.3
Mass dry soil	215.6	205.2	240.4	300.5	278.7	271.4
Moisture %	67.0%	54.6%	45.9%	34.4%	28.1%	32.5%

Test Hole	MG12-01	MG12-01	MG12-02	MG12-02	MG12-02	MG12-02
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 #	G100	G101	G103	G104	G105	G106
Tare ID	N104	N03	N01	N02	N108	N110
Mass of tare	8.3	8.5	8.3	8.3	8.3	8.3
Mass wet + tare	507.6	340.1	339.4	338	352.1	429.4
Mass dry + tare	378.4	230.9	240.7	244.7	253.9	344.6
Mass water	129.2	109.2	98.7	93.3	98.2	84.8
Mass dry soil	370.1	222.4	232.4	236.4	245.6	336.3
Moisture %	34.9%	49.1%	42.5%	39.5%	40.0%	25.2%

Test Hole	MG12-02	MG12-02	MG12-02	MG12-02	MG12-03	MG12-03
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 #	G107	G108	G109	G110	G112	G113
Tare ID	N106	N109	N105	N100	N99	N112
Mass of tare	8.3	8.3	8.3	8.3	8.3	8.2
Mass wet + tare	425.2	390.7	414.8	442.2	396.1	362.8
Mass dry + tare	351.6	293.2	286.3	294.4	279.1	261.7
Mass water	73.6	97.5	128.5	147.8	117.0	101.1
Mass dry soil	343.3	284.9	278.0	286.1	270.8	253.5
Moisture %	21.4%	34.2%	46.2%	51.7%	43.2%	39.9%

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley between Minto Street and Goulding Street from Portage Avenue to Wolever Avenue

Sample Date Jan 25, 2012
Test Date Jan 26, 2012
Technician Lee Boughton

Test Hole	MG12-03	MG12-03	MG12-03	MG12-03	MG12-03	MG12-03
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 #	G114	G113	G116	G117	G118	G119
Tare ID	N97	N107	N103	N96	N101	N95
Mass of tare	8.2	8.3	8.2	8.3	8.2	8.3
Mass wet + tare	350.9	428.5	429.6	401	428.6	400.8
Mass dry + tare	259.9	331.4	324.1	283.5	308.8	266.1
Mass water	91.0	97.1	105.5	117.5	119.8	134.7
Mass dry soil	251.7	323.1	315.9	275.2	300.6	257.8
Moisture %	36.2%	30.1%	33.4%	42.7%	39.9%	52.2%

Test Hole	MG12-04	MG12-04	MG12-04	MG12-04	MG12-04	MG12-04
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 #	G121	G122	G123	G124	G125	G126
Tare ID	N92	N78	N84	N94	N89	N73
Mass of tare	8.3	8.3	8.3	8.3	8.2	8.3
Mass wet + tare	398.1	341.4	364.9	437.6	422.7	390.2
Mass dry + tare	270.1	241.3	266.3	327.2	323.6	278.8
Mass water	128.0	100.1	98.6	110.4	99.1	111.4
Mass dry soil	261.8	233.0	258.0	318.9	315.4	270.5
Moisture %	48.9%	43.0%	38.2%	34.6%	31.4%	41.2%

Test Hole	MG12-04	MG12-04	MG12-05	MG12-05	MG12-05	MG12-05
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 #	G127	G128	G130	G131	G132	G133
Tare ID	N93	N86	N83	N74	N87	N80
Mass of tare	8.3	8.3	8.4	8.3	8.3	8.3
Mass wet + tare	467.6	479.4	341.7	421.1	363.4	369.7
Mass dry + tare	316.1	311.6	229.8	322.9	266	295
Mass water	151.5	167.8	111.9	98.2	97.4	74.7
Mass dry soil	307.8	303.3	221.4	314.6	257.7	286.7
Moisture %	49.2%	55.3%	50.5%	31.2%	37.8%	26.1%

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley between Minto Street and Goulding Street from Portage Avenue to Wolever Avenue

Sample Date Jan 25, 2012
Test Date Jan 26, 2012
Technician Lee Boughton

Test Hole	MG12-05	MG12-05	MG12-05	MG12-05	MG12-06	MG12-06
Depth (m)	1.4 - 1.5	1.7 - 1.8	2.1 - 2.3	2.9 - 3.0	0.2 - 0.3	0.5 - 0.6
Sample #	G134	G135	G136	G137	G139	G140
Tare ID	N85	N88	N76	N82	N72	N71
Mass of tare	8.3	8.2	8.3	8.3	8.3	8.3
Mass wet + tare	431.9	497.3	415.7	613.3	231.7	322.2
Mass dry + tare	332.4	398	326	501.6	161	235.1
Mass water	99.5	99.3	89.7	111.7	70.7	87.1
Mass dry soil	324.1	389.8	317.7	493.3	152.7	226.8
Moisture %	30.7%	25.5%	28.2%	22.6%	46.3%	38.4%

Test Hole	MG12-06	MG12-06	MG12-06	MG12-06	MG12-06	MG12-06
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 #	G141	G142	G143	G144	G145	G145
Tare ID	N81	N91	N77	N79	N75	N90
Mass of tare	8.2	8.3	8.3	8.3	8.3	8.3
Mass wet + tare	305	348	386.1	483.6	531.2	359.5
Mass dry + tare	223.3	263.8	306.3	343.7	380.5	245.9
Mass water	81.7	84.2	79.8	139.9	150.7	113.6
Mass dry soil	215.1	255.5	298.0	335.4	372.2	237.6
Moisture %	38.0%	33.0%	26.8%	41.7%	40.5%	47.8%

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Atterberg Limits
ASTM D4318

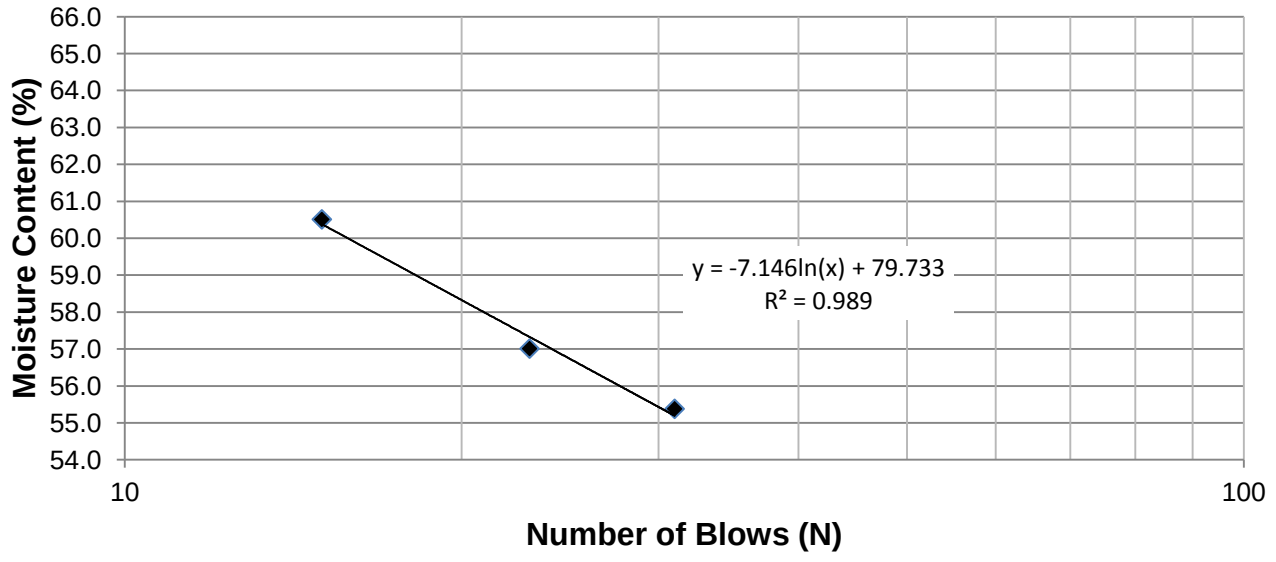
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Minto Street and Goulding Street from Portage Avenue to Wolever Avenue

Test Hole	MG12-02
Sample #	G105
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	08-Feb-12
Technician	Daniel Morz

Liquid Limit	56.7
Plastic Limit	17.6
Plasticity Index	39.1

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	31	23	15		
Mass Wet Soil + Tare (g)	24.075	25.166	24.953		
Mass Dry Soil + Tare (g)	20.451	21.059	20.828		
Mass Tare (g)	13.907	13.855	14.011		
Mass Water (g)	3.624	4.107	4.125		
Mass Dry Soil (g)	6.544	7.204	6.817		
Moisture Content (%)	55.379	57.010	60.510		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.202	20.113			
Mass Dry Soil + Tare (g)	19.303	19.186			
Mass Tare (g)	14.178	13.955			
Mass Water (g)	0.899	0.927			
Mass Dry Soil (g)	5.125	5.231			
Moisture Content (%)	17.541	17.721			

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Atterberg Limits
ASTM D4318

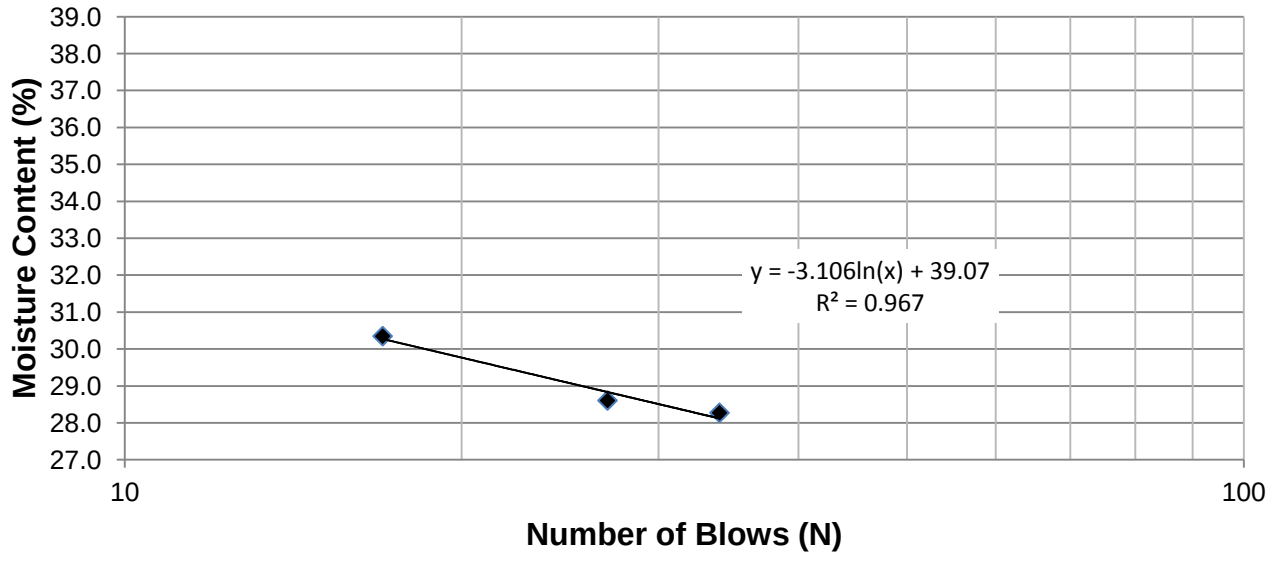
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Minto Street and Goulding Street from Portage Avenue to Wolever Avenue

Test Hole	MG12-03
Sample #	G114
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	08-Feb-12
Technician	Daniel Morz

Liquid Limit	29.1
Plastic Limit	13.8
Plasticity Index	15.3

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	34	27	17		
Mass Wet Soil + Tare (g)	27.605	28.895	26.091		
Mass Dry Soil + Tare (g)	24.617	25.582	23.320		
Mass Tare (g)	14.048	14.000	14.189		
Mass Water (g)	2.988	3.313	2.771		
Mass Dry Soil (g)	10.569	11.582	9.131		
Moisture Content (%)	28.271	28.605	30.347		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.156	20.436			
Mass Dry Soil + Tare (g)	19.421	19.655			
Mass Tare (g)	14.119	13.929			
Mass Water (g)	0.735	0.781			
Mass Dry Soil (g)	5.302	5.726			
Moisture Content (%)	13.863	13.640			

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Atterberg Limits
ASTM D4318

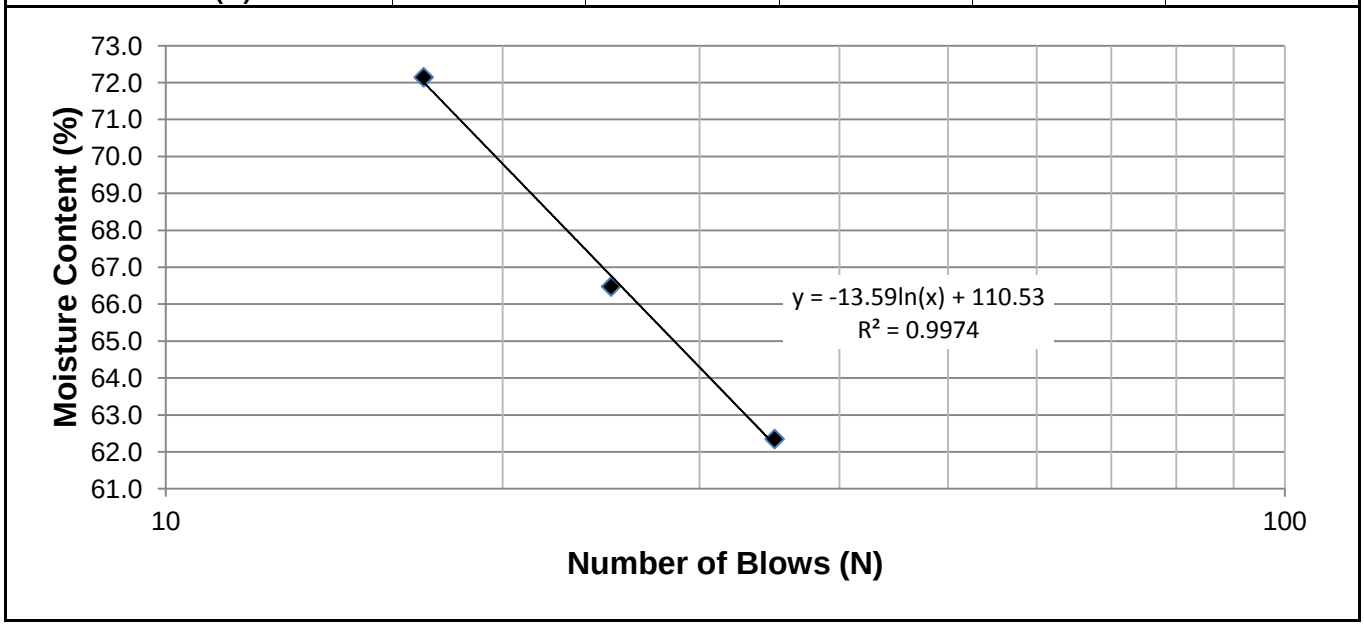
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Minto Street and Goulding Street from Portage Avenue to Wolever Avenue

Test Hole	MG12-04
Sample #	G123
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	08-Feb-12
Technician	Daniel Morz

Liquid Limit	66.8
Plastic Limit	18.6
Plasticity Index	48.1

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	35	25	17		
Mass Wet Soil + Tare (g)	24.738	26.475	24.847		
Mass Dry Soil + Tare (g)	20.620	21.587	20.281		
Mass Tare (g)	14.015	14.234	13.952		
Mass Water (g)	4.118	4.888	4.566		
Mass Dry Soil (g)	6.605	7.353	6.329		
Moisture Content (%)	62.347	66.476	72.144		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.311	20.159			
Mass Dry Soil + Tare (g)	19.370	19.175			
Mass Tare (g)	14.248	13.960			
Mass Water (g)	0.941	0.984			
Mass Dry Soil (g)	5.122	5.215			
Moisture Content (%)	18.372	18.869			

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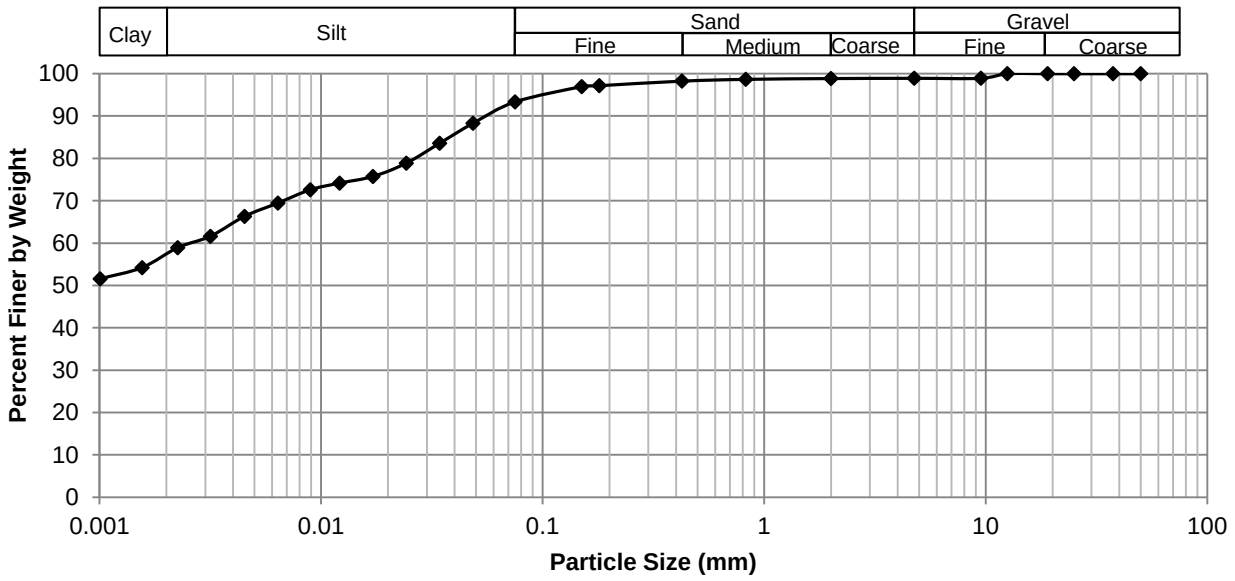
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Minto-Goulding
Test Hole	MG12-02
Sample #	G105
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	16-Feb-12
Technician	Lee Boughton

Gravel	1.1%
Sand	5.6%
Silt	35.2%
Clay	58.2%

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	98.92	0.0750	93.33
37.5	100.00	2.00	98.86	0.0484	88.28
25.0	100.00	0.825	98.67	0.0343	83.57
19.0	100.00	0.425	98.25	0.0242	78.86
12.5	100.00	0.180	97.17	0.0171	75.72
9.50	98.92	0.150	96.94	0.0121	74.15
4.75	98.92	0.075	93.33	0.0089	72.58
				0.0064	69.44
				0.0045	66.30
				0.0032	61.59
				0.0023	58.90
				0.0016	54.19
				0.0010	51.55

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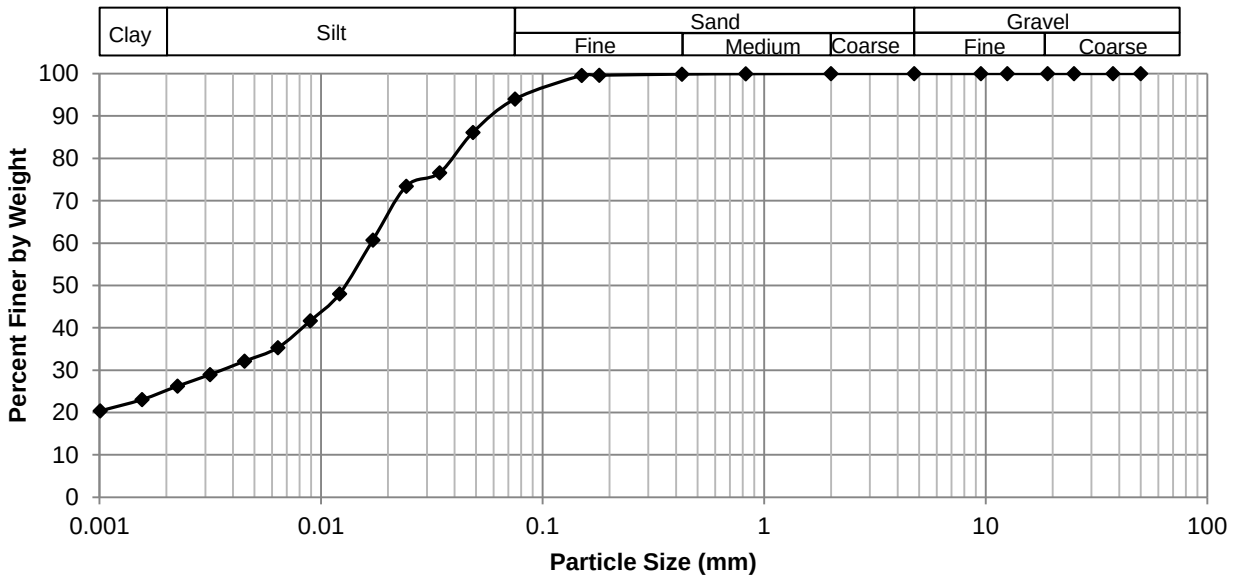
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Minto-Goulding
Test Hole	MG12-03
Sample #	G114
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	10-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	6.0%
Silt	68.5%
Clay	25.5%

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	94.00
37.5	100.00	2.00	100.00	0.0484	86.11
25.0	100.00	0.825	99.96	0.0343	76.58
19.0	100.00	0.425	99.87	0.0242	73.40
12.5	100.00	0.180	99.61	0.0171	60.70
9.50	100.00	0.150	99.57	0.0121	47.99
4.75	100.00	0.075	94.00	0.0089	41.64
				0.0064	35.29
				0.0045	32.11
				0.0032	28.93
				0.0022	26.21
				0.0016	23.04
				0.0010	20.37

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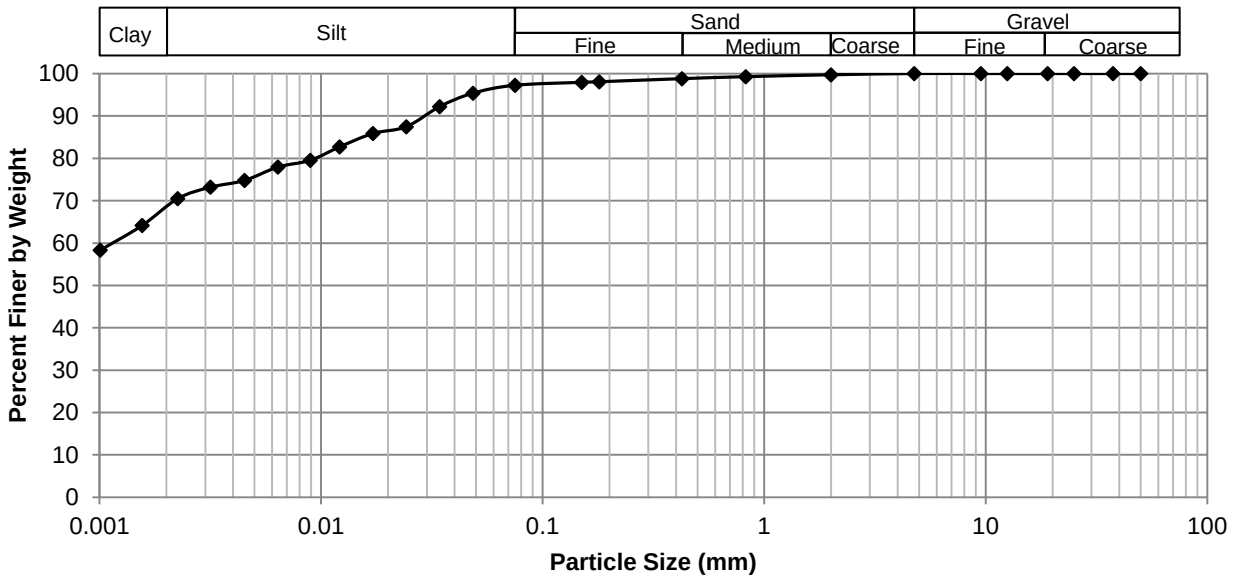
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Minto-Goulding
Test Hole	MG12-04
Sample #	G123
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	10-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	2.8%
Silt	27.5%
Clay	69.7%

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	97.23
37.5	100.00	2.00	99.71	0.0484	95.36
25.0	100.00	0.825	99.26	0.0343	92.19
19.0	100.00	0.425	98.79	0.0242	87.44
12.5	100.00	0.180	98.06	0.0171	85.86
9.50	100.00	0.150	97.92	0.0121	82.69
4.75	100.00	0.075	97.23	0.0089	79.53
				0.0064	77.94
				0.0045	74.77
				0.0032	73.19
				0.0023	70.48
				0.0016	64.15
				0.0010	58.32

Photo 12: Concrete core sample from Test Hole MG12-01

Photo 13: Asphalt core sample from Test Hole MG12-02

Photo 14: Concrete core sample from Test Hole MG12-03

Photo 15: Concrete core sample from Test Hole MG12-04

Photo 16: Concrete core sample from Test Hole MG12-05

Photo 17: Concrete core sample from Test Hole MG12-06

Appendix D

Alley between Strathcona St and Ashburn St from Ellice Ave to Sargent Ave

Sub-Surface Log

Test Hole SA12-01
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Strathcona/Ashburn from Ellice to Sargent
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 25, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		CONCRETE (178 mm thick)		C147		
		CLAY - silty, trace sand (coarse grained), trace organics - dark brown - frozen, moist and soft when thawed - intermediate plasticity		G148		
0.5				G149		
		SILT and CLAY - trace sand (fine grained) - mottled light brown and brown - frozen to 0.9 m, moist and soft to firm when thawed - intermediate plasticity		G150		
1.0		- firm below 1.1 m		G151		
				G152		
		CLAY - some silt, trace silt inclusions (<15 mm diam.) - brown - moist, stiff to very stiff - high plasticity				
1.5				G153		
2.0		- stiff below 2.7 m		G154		
2.5		- trace oxidation below 2.6 m - silt seam (25 mm thick) at 2.6 m - firm to stiff below 2.7 m		G155		
3.0		END OF TEST HOLE AT 3.1 m IN CLAY				

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 15.6 m S, 4.5 m W of 3rd hydro pole North of Ellice Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS STRATHCONA-ASHBURN TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole SA12-02

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Strathcona/Ashburn from Ellice to Sargent
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 25, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		CONCRETE (245 mm thick)		C156		
		CLAY - silty, trace organics - dark brown, frozen, moist and soft when thawed, intermediate plasticity		G157		
0.5		SILT - clayey, some sand (fine grained) - light brown - frozen, moist and soft when thawed - low plasticity		G158		
				G159		
1.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace sand (medium grained) - brown - frozen to 1.3 m, moist and firm to stiff when thawed - high plasticity		G160		
1.5		SILT - clayey, some sand (fine grained) - light brown - moist, soft - low plasticity		G161		
				G162		
2.0		CLAY - some silt - brown - moist - high plasticity		G163		△ ✤
2.5		SILT - clayey - light brown - moist, soft - low to intermediate plasticity				
3.0				G164		

END OF TEST HOLE AT 3.1 m IN SILT

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 8.2 m N, 3.8 m W of 5th hydro pole North of Ellice Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS STRATHCONA-ASHBURN TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole SA12-03
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Strathcona/Ashburn from Ellice to Sargent
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 25, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		CONCRETE (255 mm thick)		C165		
		SILT and CLAY - sandy (fine grained), trace to some organics - light brown - frozen, moist to wet and very soft - intermediate to high plasticity		G166		
0.5		- moist, soft below 0.5 m		G167		
				G168		
1.0		CLAY - some silt, trace gravel (<10 mm diam.) - brown - frozen, moist and stiff - high plasticity		G169		
1.5		SILT - clayey, some sand (fine grained) - light brown - moist, soft - low plasticity		G170		
				G171		
2.0		CLAY - some silt, trace gravel (<10 mm diam.) - brown - moist, stiff to very stiff - high plasticity		G172		△ ✤
2.5		- firm to stiff below 2.7 m - trace oxidation at 2.7 m				
				G173		✤
3.0		END OF TEST HOLE AT 3.1 m IN CLAY				

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 9.6 m N, 4.5 m W of 8th hydro pole South of Sargent Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS STRATHCONA-ASHBURN TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole SA12-04
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Strathcona/Ashburn from Ellice to Sargent
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 25, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) 0 50 100 150 200 250
		CONCRETE (235 mm thick)		C174		
		CLAY - silty, trace to some organics, dark brown, frozen to 0.9 m, moist and soft to firm when thawed, high plasticity		G175		
0.5		SILT - clayey, some sand - light brown - frozen, moist and soft when thawed - intermediate plasticity		G176		
				G177		
1.0		CLAY - some silt, trace sand (coarse grained), trace silt inclusions (<15 mm diam.) - brown - frozen to 1.1 m, moist and stiff to very stiff when thawed - high plasticity		G178		
1.5				G179		
		- firm to stiff below 1.7 m		G180		
2.0				G181		
2.5		- grey, firm, trace silt inclusions (<2 mm diam.) below 2.4 m - trace oxidation at 2.4 m				
3.0				G182		

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 10.5 m S, 4.4 m W of 5th hydro pole South of Sargent Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS STRATHCONA-ASHBURN TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole SA12-05
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Strathcona/Ashburn from Ellice to Sargent
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 25, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT (35 mm thick)		C183		
		CONCRETE (190 mm thick)		C184		
		CLAY - silty, trace organics, dark brown to black, frozen, moist and soft when thawed, intermediate to ghigh plasticity		G185		
0.5		SILT - clayey, some sand (fine grained) - light brown - frozen to 0.8 m, moist and verysoft when thawed - intermediate plasticity		G186		
		- firm below 0.8 m		G187		
1.0				G188		
				G189		
1.5		CLAY - some silt, trace silt inclusions (<15 mm diam.) - brown - moist, very stiff - high plasticity		G190		△ ✤
2.0				G91		△ ✤
2.5		- firm to stiff below 2.4 m				
		- trace silt seams (<25 mm thick) 2.9 m		G192		✤ △
3.0		END OF TEST HOLE AT 3.1 m IN CLAY				

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 7.4 m S, 4.2 m W of 3rd hydro pole South of Sargent Ave.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS STRATHCONA-ASHBURN TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

2012 City of Winnipeg Alley Package
PW File #: 12-RL-01
Sub-Surface Investigation

Test Hole No.	Test Hole Location (Street Name)	House No.	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
			Type	Thickness (mm)	Type	Thickness (mm)				Gravel (%)	Sand (%)`	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
SA12-01	Alley between Strathcona Street and Ashburn Street from Ellice Avenue to Sargent Avenue	1073	Concrete	178												
		Strathcona					Clay	0.2	30							
							Clay	0.5	35							
							Silt and Clay	0.8	40	0	9	47	44	14	39	25
							Silt and Clay	1.1	23							
							Silt and Clay	1.3	22							
							Clay	1.7	34							
							Clay	2.0	46							
							Clay	2.8	53							
SA12-02	Alley between Strathcona Street and Ashburn Street from Ellice Avenue to Sargent Avenue	1093	Concrete	245												
		Strathcona					Clay	0.2	41							
							Silt	0.5	26	0	20	46	34	11	36	25
							Silt	0.8	23							
							Clay	1.1	35							
							Silt	1.4	26							
							Silt	1.7	27							
							Clay	2.0	41							
							Silt	2.9	25							
SA12-03	Alley between Strathcona Street and Ashburn Street from Ellice Avenue to Sargent Avenue	1133	Concrete	255												
		Strathcona					Silt and Clay	0.2	52							
							Silt and Clay	0.5	36							
							Silt and Clay	0.8	25	0	24	39	37	13	46	33
							Clay	1.1	27							
							Silt	1.4	35							
							Silt	1.7	25							
							Clay	2.0	41							
							Clay	2.9	48							
SA12-04	Alley between Strathcona Street and Ashburn Street from Ellice Avenue to Sargent Avenue	1149	Concrete	235												
		Strathcona					Clay	0.2	40							
							Silt	0.5	30							
							Silt	0.8	26							
							Clay	1.1	36							
							Clay	1.4	38							
							Clay	1.7	43							
							Clay	2.0	53							
							Clay	2.9	56							
SA12-05	Alley between Strathcona Street and Ashburn Street from Ellice Avenue to Sargent Avenue	1169	Asphalt	35	Concrete	190										
		Strathcona					Clay	0.2	33							
							Silt	0.5	29							
							Silt	0.8	20							
							Silt	1.1	20							
							Silt	1.4	21							
							Clay	1.7	33							
							Clay	2.0	42							
							Clay	2.9	43							

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley between Strathcona Street and Ashburn Street from Ellice Avenue to Sargent Avenue

Sample Date Jan 25, 2012
Test Date Jan 26, 2012
Technician Lee Boughton

Test Hole	SA12-01	SA12-01	SA12-01	SA12-01	SA12-01	SA12-01
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.2 - 1.4	1.7 - 1.8
Sample #	G148	G149	G150	G151	G152	G153
Tare ID	N48	N51	N67	N60	N56	N59
Mass of tare	8.2	8.3	8.2	8.2	8.3	8.2
Mass wet + tare	347.2	305.4	313.4	354.9	444	465
Mass dry + tare	269.4	228.8	226.6	291.3	364.7	349.7
Mass water	77.8	76.6	86.8	63.6	79.3	115.3
Mass dry soil	261.2	220.5	218.4	283.1	356.4	341.5
Moisture %	29.8%	34.7%	39.7%	22.5%	22.3%	33.8%

Test Hole	SA12-01	SA12-01	SA12-02	SA12-02	SA12-02	SA12-02
Depth (m)	2.0 - 2.1	2.7 - 2.9	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G154	G155	G157	G158	G159	G160
Tare ID	N66	N52	N62	N65	N61	N70
Mass of tare	8.2	8.3	8.3	8.3	8.3	8.3
Mass wet + tare	359.4	356.2	328.4	457.8	423.4	500.3
Mass dry + tare	249.5	235.6	235.5	365.6	346.6	373.7
Mass water	109.9	120.6	92.9	92.2	76.8	126.6
Mass dry soil	241.3	227.3	227.2	357.3	338.3	365.4
Moisture %	45.5%	53.1%	40.9%	25.8%	22.7%	34.6%

Test Hole	SA12-02	SA12-02	SA12-02	SA12-02	SA12-03	SA12-03
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 #	G161	G162	G163	G164	G166	G167
Tare ID	N53	N54	N57	N55	N47	N49
Mass of tare	8.3	8.3	8.3	8.3	8.2	8.2
Mass wet + tare	358.7	398.4	522	485.4	429	346.5
Mass dry + tare	287.5	315.7	373.7	389.5	285.7	257.3
Mass water	71.2	82.7	148.3	95.9	143.3	89.2
Mass dry soil	279.2	307.4	365.4	381.2	277.5	249.1
Moisture %	25.5%	26.9%	40.6%	25.2%	51.6%	35.8%

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley between Strathcona Street and Ashburn Street from Ellice Avenue to Sargent Avenue

Sample Date Jan 25, 2012
Test Date Jan 26, 2012
Technician Lee Boughton

Test Hole	SA12-03	SA12-03	SA12-03	SA12-03	SA12-03	SA12-03
Depth (m)	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.7 - 7.0
Sample #	G168	G169	G170	G171	G172	G173
Tare ID	N63	N58	N64	N69	N68	N50
Mass of tare	8.2	8.2	8.3	8.3	8.2	8.3
Mass wet + tare	395.4	454.9	411.2	389.8	396.7	399.2
Mass dry + tare	317.2	361.3	306.6	312.8	283.1	271.1
Mass water	78.2	93.6	104.6	77.0	113.6	128.1
Mass dry soil	309.0	353.1	298.3	304.5	274.9	262.8
Moisture %	25.3%	26.5%	35.1%	25.3%	41.3%	48.7%

Test Hole	SA12-04	SA12-04	SA12-04	SA12-04	SA12-04	SA12-04
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 #	G175	G176	G177	G178	G179	G180
Tare ID	N41	N38	N33	N46	N44	N45
Mass of tare	8.2	8.2	8.2	8.2	8.2	8.2
Mass wet + tare	368.1	400.4	414.4	354.7	375.4	491.3
Mass dry + tare	265.7	310.4	331.1	263.3	273.9	346.6
Mass water	102.4	90.0	83.3	91.4	101.5	144.7
Mass dry soil	257.5	302.2	322.9	255.1	265.7	338.4
Moisture %	39.8%	29.8%	25.8%	35.8%	38.2%	42.8%

Test Hole	SA12-04	SA12-04	SA12-05	SA12-05	SA12-05	SA12-05
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 #	G181	G182	G185	G186	G187	G188
Tare ID	N31	N36	N32	N39	N37	N40
Mass of tare	8.3	8.2	8.2	8.2	8.3	8.2
Mass wet + tare	444.8	333.5	349.4	523.6	402.2	355.2
Mass dry + tare	293.9	216.8	264.9	406.7	335.8	298.1
Mass water	150.9	116.7	84.5	116.9	66.4	57.1
Mass dry soil	285.6	208.6	256.7	398.5	327.5	289.9
Moisture %	52.8%	55.9%	32.9%	29.3%	20.3%	19.7%

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Moisture Content Report
ASTM D2216-98

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Strathcona Street and Ashburn Street from Ellice Avenue to Sargent Avenue
Sample Date	Jan 25, 2012
Test Date	Jan 26, 2012
Technician	Lee Boughton

Test Hole	SA12-05	SA12-05	SA12-05	SA12-05		
Depth (m)	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0		
Sample #	G89	G190	G191	G192		
Tare ID	N34	N35	N42	N43		
Mass of tare	8.2	8.3	8.3	8.1		
Mass wet + tare	414.5	413.8	419.6	363.5		
Mass dry + tare	344.8	314.1	297.1	257.1		
Mass water	69.7	99.7	122.5	106.4		
Mass dry soil	336.6	305.8	288.8	249.0		
Moisture %	20.7%	32.6%	42.4%	42.7%		

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Atterberg Limits
ASTM D4318

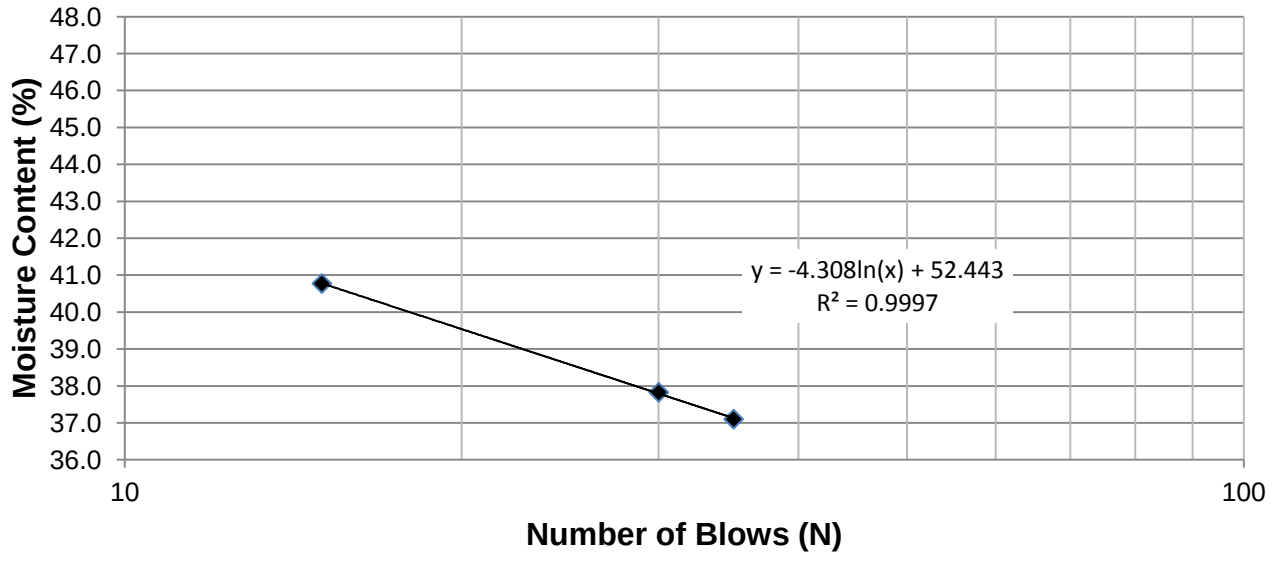
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Strathcona Street and Ashburn Street from Ellice Avenue to Sargent Avenue

Test Hole	SA12-01
Sample #	G150
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	21-Feb-12
Technician	Lee Boughton

Liquid Limit	38.6
Plastic Limit	13.5
Plasticity Index	25.1

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	35	30	15		
Mass Wet Soil + Tare (g)	27.818	26.565	26.762		
Mass Dry Soil + Tare (g)	23.993	23.091	23.106		
Mass Tare (g)	13.683	13.907	14.139		
Mass Water (g)	3.825	3.474	3.656		
Mass Dry Soil (g)	10.310	9.184	8.967		
Moisture Content (%)	37.100	37.827	40.772		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.211	21.800			
Mass Dry Soil + Tare (g)	19.491	20.875			
Mass Tare (g)	14.139	14.001			
Mass Water (g)	0.720	0.925			
Mass Dry Soil (g)	5.352	6.874			
Moisture Content (%)	13.453	13.457			

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Atterberg Limits
ASTM D4318

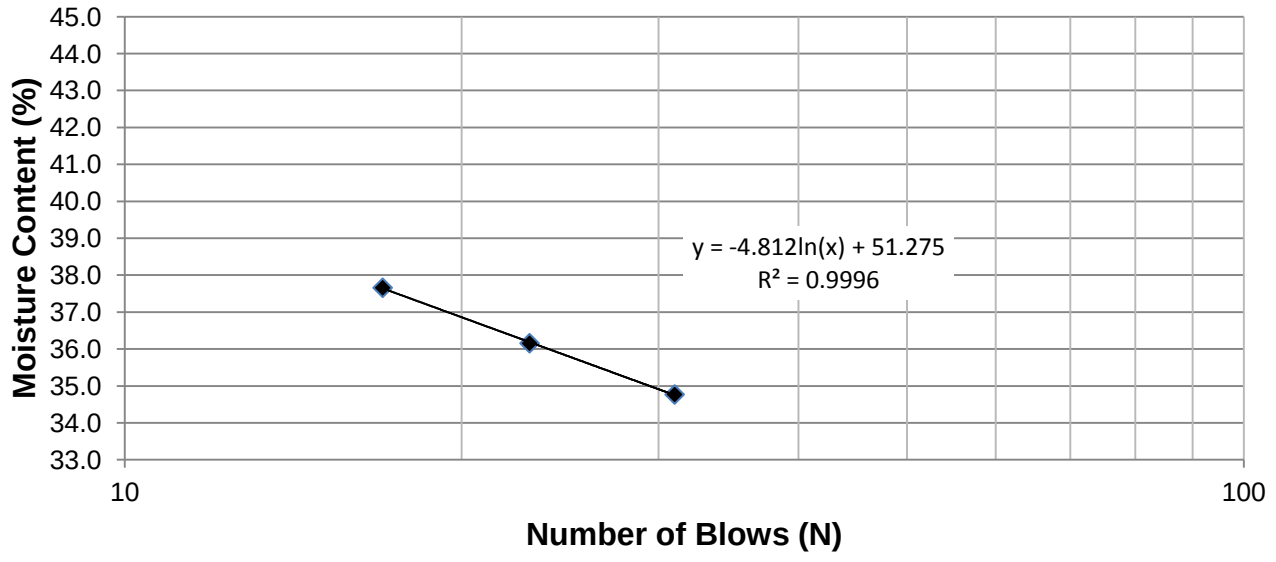
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Strathcona Street and Ashburn Street from Ellice Avenue to Sargent Avenue

Test Hole	SA12-02
Sample #	G158
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	08-Feb-12
Technician	Daniel Morz

Liquid Limit	35.8
Plastic Limit	10.8
Plasticity Index	25.0

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	31	23	17		
Mass Wet Soil + Tare (g)	27.791	26.445	26.423		
Mass Dry Soil + Tare (g)	24.250	23.131	23.018		
Mass Tare (g)	14.065	13.965	13.976		
Mass Water (g)	3.541	3.314	3.405		
Mass Dry Soil (g)	10.185	9.166	9.042		
Moisture Content (%)	34.767	36.155	37.658		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.090	20.163			
Mass Dry Soil + Tare (g)	19.507	19.568			
Mass Tare (g)	14.052	14.145			
Mass Water (g)	0.583	0.595			
Mass Dry Soil (g)	5.455	5.423			
Moisture Content (%)	10.687	10.972			

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Atterberg Limits
ASTM D4318

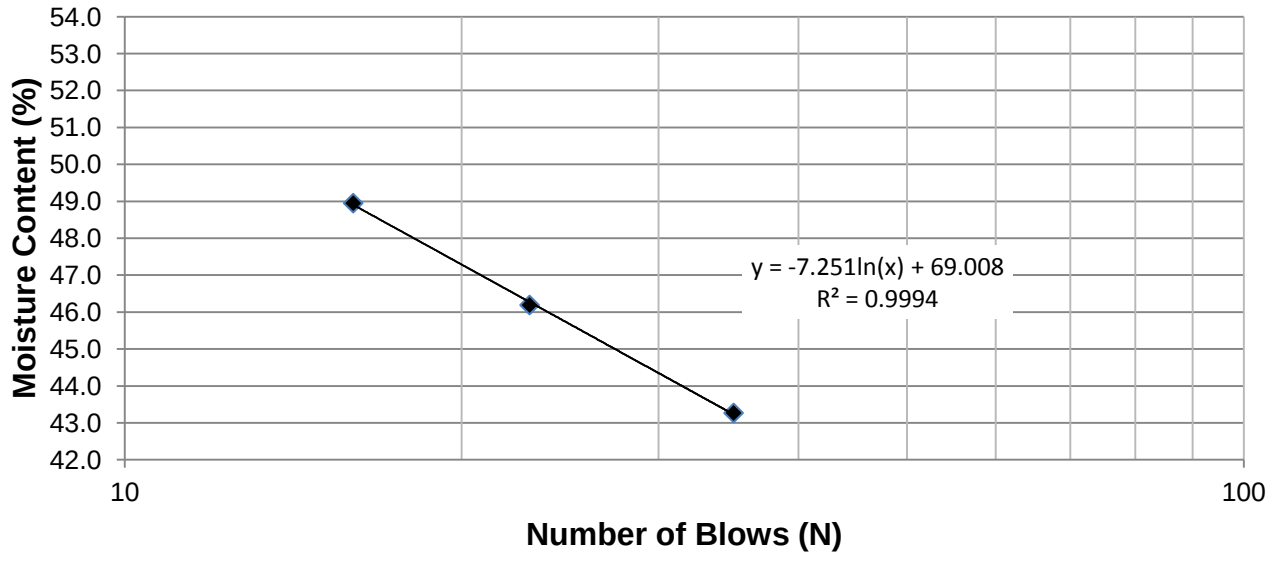
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Strathcona Street and Ashburn Street from Ellice Avenue to Sargent Avenue

Test Hole	SA12-03
Sample #	G168
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	16-Feb-12
Technician	Lee Boughton

Liquid Limit	45.7
Plastic Limit	13.2
Plasticity Index	32.5

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	35	23	16		
Mass Wet Soil + Tare (g)	24.482	25.576	26.186		
Mass Dry Soil + Tare (g)	21.349	21.914	22.227		
Mass Tare (g)	14.108	13.986	14.139		
Mass Water (g)	3.133	3.662	3.959		
Mass Dry Soil (g)	7.241	7.928	8.088		
Moisture Content (%)	43.268	46.191	48.949		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.528	20.267			
Mass Dry Soil + Tare (g)	19.768	19.554			
Mass Tare (g)	14.052	14.087			
Mass Water (g)	0.760	0.713			
Mass Dry Soil (g)	5.716	5.467			
Moisture Content (%)	13.296	13.042			

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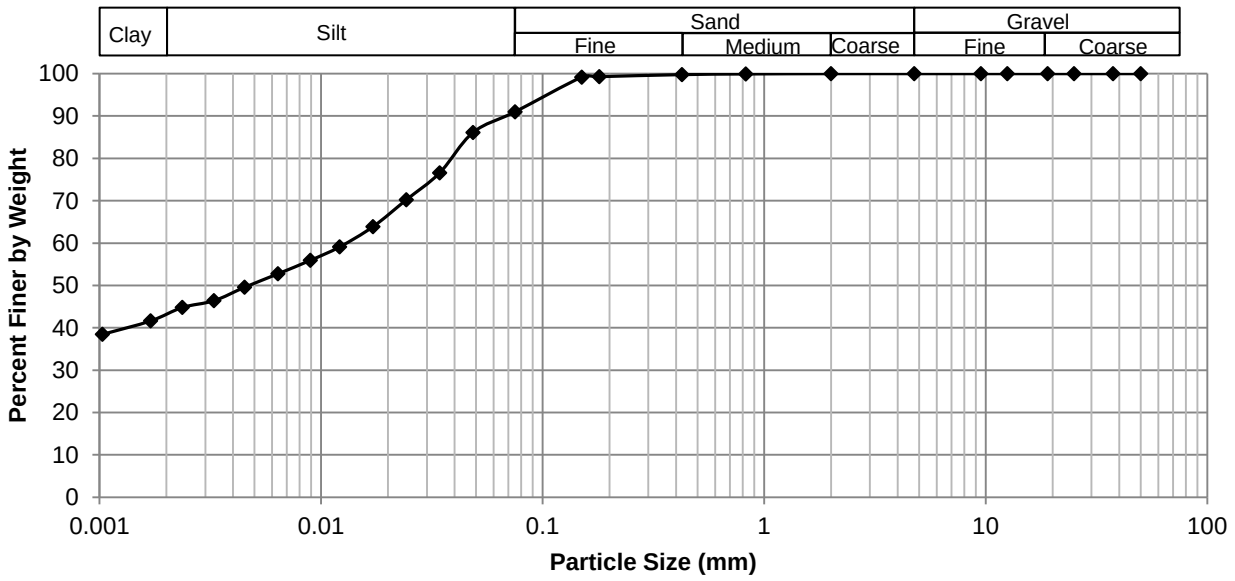
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Strathcona-Ashburn
Test Hole	SA12-01
Sample #	G150
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	14-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	9.0%
Silt	46.8%
Clay	44.2%

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	90.99
37.5	100.00	2.00	100.00	0.0484	86.11
25.0	100.00	0.825	99.93	0.0343	76.58
19.0	100.00	0.425	99.78	0.0242	70.23
12.5	100.00	0.180	99.30	0.0171	63.87
9.50	100.00	0.150	99.17	0.0121	59.11
4.75	100.00	0.075	90.99	0.0089	55.93
				0.0064	52.76
				0.0045	49.58
				0.0033	46.40
				0.0024	44.81
				0.0017	41.64
				0.0010	38.46

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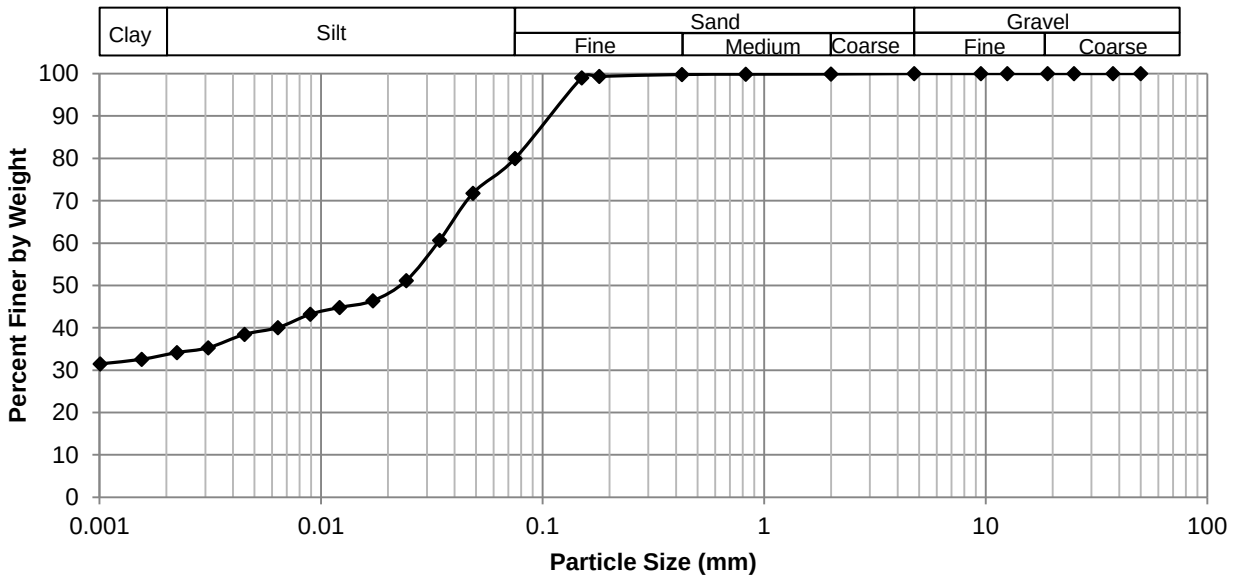
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Strathcona-Ashburn
Test Hole	SA12-02
Sample #	G158
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	10-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	20.0%
Silt	46.1%
Clay	33.8%

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	79.95
37.5	100.00	2.00	99.90	0.0484	71.74
25.0	100.00	0.825	99.86	0.0343	60.64
19.0	100.00	0.425	99.79	0.0242	51.12
12.5	100.00	0.180	99.34	0.0171	46.36
9.50	100.00	0.150	99.00	0.0121	44.77
4.75	100.00	0.075	79.95	0.0089	43.18
				0.0064	40.01
				0.0045	38.42
				0.0031	35.25
				0.0022	34.12
				0.0015	32.54
				0.0010	31.45

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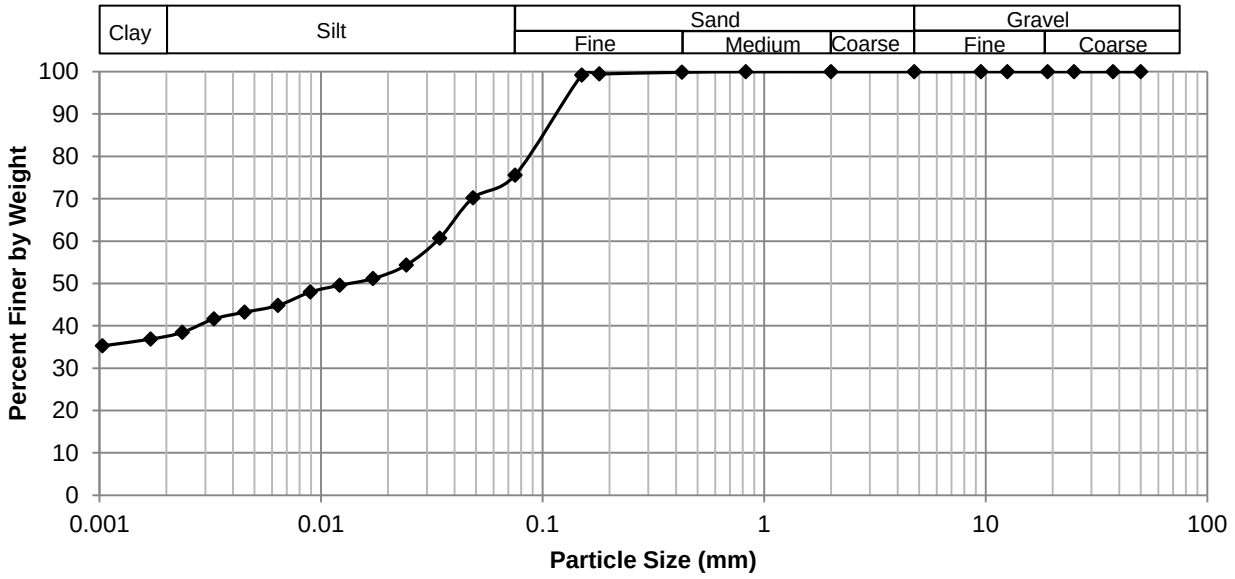
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Strathcona-Ashburn
Test Hole	SA12-03
Sample #	G168
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	16-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	24.4%
Silt	38.4%
Clay	37.2%

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	75.57
37.5	100.00	2.00	100.00	0.0484	70.23
25.0	100.00	0.825	100.00	0.0343	60.70
19.0	100.00	0.425	99.89	0.0242	54.34
12.5	100.00	0.180	99.49	0.0171	51.17
9.50	100.00	0.150	99.21	0.0121	49.58
4.75	100.00	0.075	75.57	0.0089	47.99
				0.0064	44.81
				0.0045	43.23
				0.0033	41.64
				0.0024	38.46
				0.0017	36.87
				0.0010	35.29

Photo 18: Concrete core sample from Test Hole SA12-01

Photo 19: Concrete core sample from Test Hole SA12-02

Photo 20: Concrete core sample from Test Hole SA12-03

Photo 21: Concrete core sample from Test Hole SA12-04

Photo 22: Asphalt core sample from Test Hole SA12-05

Photo 23: Concrete core sample from Test Hole SA12-05

Appendix E

Alley between Ash St and Oak St from Academy Rd to Wellington Cr

Sub-Surface Log

Test Hole AO12-01
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Ash/Oak from Academy to Wellington
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21	Particle Size (%) 0 20 40 60 80 100	PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) 0 50 100 150 200 250
		ASPHALT (45 mm thick)		C193				
		CONCRETE (178 mm thick)		C194				
		CLAY (Fill) - silty, trace to some sand (medium and coarse grained), trace organics - dark brown - frozen, moist and stiff to very stiff when thawed - intermediate to high plasticity		G195				
0.5				G196				
		SAND (Fill) - some silt, some clay, trace gravel (<12.5 mm dia.), trace debris (paper, nails) - light brown - well graded medium and coarse grained sand, loose to compact - well graded, angular - low plasticity		G197				
1.0		- trace clay, light brown below 1.2 m						
				G198				
1.5		SILT - sandy (fine and medium grained) - light brown - dry, loose - no to low plasticity		G199				
		CLAY - silty, trace sand (fine grained), trace organics - brown, moist, very stiff, high plasticity						
2.0		SILT - sandy (fine and medium grained) - light brown - dry, loose - no to low plasticity		G200				
2.5		CLAY - silty, trace silt inclusions (<20 mm dia.) - brown - moist, stiff - high plasticity		G201				△
3.0		END OF TEST HOLE AT 3.1 m IN CLAY						

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 9.2 m N, 3.8 m E of 2nd hydro pole North of Academy Rd.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS ASH-OAK TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole AO12-02

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Ash/Oak from Academy to Wellington
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) 0 50 100 150 200 250
		ASPHALT (50 mm thick)				
		CONCRETE (175 mm thick)		C202		
		CLAY (Fill) - silty, trace sand (medium grained), trace gravel (<12.5 mm dia.), trace organics - dark brown - frozen, moist and firm to stiff when thawed - intermediate to high plasticity		G203	●	
0.5				G204	●	
		SAND (Fill) - some silt, some clay, trace gravel (<12.5 mm dia.), trace debris (paper, nails) - light brown - well graded medium and coarse grained sand, loose to compact - well graded, angular - low plasticity		G205	●	
1.0		- trace clay, light brown below 1.2 m				
				G206	●	
1.5		SILT - some sand (fine grained) - light brown - dry, firm to stiff - low plasticity		G207	●	
2.0		CLAY - silty - brown - moist, very stiff - high plasticity		G208	●	△ ✤
		SILT - clayey - mottled light brown and grey - moist, soft - low plasticity				
2.5				G209	●	
3.0						

END OF TEST HOLE AT 3.1 m IN SILT

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 7.6 m S, 4.3 m E of 4th hydro pole North of Academy Rd.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS ASH-OAK TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole AO12-03
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Ash/Oak from Academy to Wellington
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT (51 mm thick)		C210		
		CONCRETE (102 mm thick)				
		CLAY (Fill) - silty - dark brown - frozen, moist and soft to firm when thawed - intermediate to high plasticity		G211		
0.5				G212		
		SAND (Fill) - some silt, some clay, trace gravel (<12.5 mm dia.), trace debris (paper, nails) - light brown - well graded medium and coarse grained sand, loose to compact - well graded, angular - low plasticity		G213		
1.0				G214		
		SILT - some clay - light brown, moist, soft, low to intermediate plasticity		G215		
1.5		CLAY - silty, trace silt inclusions (<20 mm dia.) - brown - moist, very stiff - high plasticity		G216		△ ✤
2.0		SILT - trace clay - light brown - moist, soft - low plasticity		G217		
2.5		CLAY - silty, trace oxidation - brown - moist, stiff - high plasticity		G218		△ ✤
3.0		END OF TEST HOLE AT 3.1 m IN CLAY				

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 11.6 m N, 4.3 m E of 5th hydro pole North of Academy Rd.
4. Atterberg test results for sample G213 may not be indicative of behaviour of material since the Atterberg test does not include material larger than fine sand (0.425 mm diameter.)

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS ASH-OAK TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole AO12-04
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Ash/Oak from Academy to Wellington
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		CONCRETE (229 mm thick)		C218		
		CLAY (Fill) - gravelly (<25 mm diam.), trace to some sand (coarse and medium grained) - dark brown to black, moist, firm, intermediate to high plasticity				
0.5		CLAY - silty, some organics, trace sand (medium grained) - dark brown - frozen, moist and firm when thawed - high plasticity		G219		
		SILT AND CLAY - trace sand, trace to some organics - light grey to black - frozen to 0.9 m, moist and soft when thawed - intermediate plasticity		G220		
1.0				G221		
		- light brown, trace to some clay below 1.4 m		G222		
1.5		CLAY - silty, trace silt inclusions (<20 mm dia.) - brown - moist, stiff to very stiff - high plasticity		G223		
2.0				G224		
2.5		- trace oxidation, firm below 2.4 m - silt seam (50 mm thick) at 2.4 m		G225		
3.0		END OF TEST HOLE AT 3.1 m IN CLAY				

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 7.3 m S, 3.8 m E of 7th hydro pole North of Academy Rd.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS ASH-OAK TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole AO12-05
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Ash/Oak from Academy to Wellington
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT (51 mm thick)		C226
		CONCRETE (280 mm thick)		C227
		CLAY (Fill) - silty, dark brown - frozen, moist and firm when thawed, intermediate to high plasticity		
0.5		SAND (Fill) - some silt, some clay, trace gravel (<12.5 mm dia.), trace debris (paper, nails) - light brown - well graded medium and coarse grained sand, loose to compact - well graded, angular - low plasticity		G228
				G229
1.0				G230
		- trace clay, light brown below 1.2 m		
		CLAY - silty, trace silt inclusions (<5 mm dia.) - brown - moist, stiff - high plasticity		G231
1.5				G232
		- trace silt seam (75 mm thick) at 1.8 m		
2.0				G233
2.5				
				G234
3.0				

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21
Particle Size (%): 0 20 40 60 80 100
PL MC LL: 0 20 40 60 80 100
Undrained Shear Strength (kPa): 0 50 100 150 200 250
△ Torvane △ | ✤ Pocket Pen. ✤ | ☒ Qu ☒ | ○ Field Vane ○

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 11.8 m S, 3.8 m E of 9th hydro pole North of Academy Rd.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS ASH-OAK TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole AO12-06
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Ash/Oak from Academy to Wellington
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT (102 mm thick)		C235		
		CONCRETE (102 mm thick)		G236	●	
		CLAY (Fill) - silty, sandy (medium grained), trace organics - dark brown - frozen to 1.1 m, moist and firm when thawed - high plasticity		G237	●	
0.5		- trace to some sand (medium grained), dark brown to black below 0.5 m		G238	●	
				G239	●	
1.0		- trace gravel (<10 mm dia.), firm to stiff, high plasticity below 1.5 m		G240	●	
1.5				G241	●	✤
		CLAY - silty, trace silt inclusions (<5 mm dia.) - brown - moist, stiff to very stiff - high plasticity		G242	●	
2.0				G243	●	△ ✤
2.5						
		- stiff, trace oxidation below 2.7 m - silt seam (50 mm thick) at 2.7 m				
3.0				G244	●	△

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 2.8 m N, 3.5 m E of 10th hydro pole North of Academy Rd.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS ASH-OAK TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole AO12-07
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley Ash/Oak from Academy to Wellington
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 24, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) 0 50 100 150 200 250
		CONCRETE (190 mm thick)		C245		
		CLAY - silty, trace sand (fine grained), trace organics - dark brown - frozen to 1.2 m, moist and firm when thawed - high plasticity		G246		
0.5				G247		
		- very stiff below 0.8 m		G248		
1.0				G249		
				G250		
1.5		- trace oxidation below 1.7 m		G251		
				G252		
2.0						
2.5						
		- firm to stiff, trace silt inclusions (<20 mm dia.) below 2.7 m				
3.0				G253		

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 6.4 m E, 4.1 m N of 2nd hydro pole East of Ash St.

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS ASH-OAK TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

2012 City of Winnipeg Alley Package
PW File #: 12-RL-01
Sub-Surface Investigation

Test Hole No.	Test Hole Location (Street Name)	House No.	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
			Type	Thickness (mm)	Type	Thickness (mm)				Gravel (%)	Sand (%)`	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
AO12-01	Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent	156	Asphalt	45	Concrete	178										
		Ash					Clay(Fill)	0.2	21							
							Clay(Fill)	0.5	21							
							Sand(Fill)	0.8	19							
							Sand(Fill)	1.4	9							
							Silt	1.7	7							
							Silt	2.0	11							
							Clay	2.6	32							
AO12-02	Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent	144	Asphalt	50	Concrete	175										
		Ash					Clay(Fill)	0.2	26							
							Sand(Fill)	0.5	22							
							Sand(Fill)	1.4	21							
							Silt	1.7	10							
							Clay	2.0	33							
							Silt	2.6	20							
AO12-03	Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent	130	Asphalt	51	Concrete	102										
		Ash					Clay(Fill)	0.2	39							
							Clay(Fill)	0.5	32							
							Sand(Fill)	0.8	27	9	50	22	19	18	37	19
							Sand(Fill)	1.1	19							
							Silt	1.4	28							
							Clay	1.7	36							
							Silt	2.0	20							
							Clay	2.8	40							
AO12-04	Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent	122	Concrete	229												
		Ash					Clay(Fill)	0.3	20							
							Clay	0.5	42							
							Silt and Clay	0.8	37	0	4	52	44	16	42	26
							Silt and Clay	1.1	35							
							Silt and Clay	1.4	22							
							Clay	1.7	40							
							Clay	2.0	44							
							Clay	2.8	50							
AO12-05	Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent	84	Asphalt	51	Concrete	280										
		Ash					Sand(Fill)	0.5	30							
							Sand(Fill)	0.8	28							
							Sand(Fill)	1.1	14							
							Clay	1.4	37							
							Clay	1.7	41							
							Clay	2.0	45							
							Clay	2.8	48							

2012 City of Winnipeg Alley Package
PW File #: 12-RL-01
Sub-Surface Investigation

Test Hole No.	Test Hole Location (Street Name)	House No.	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
			Type	Thickness (mm)	Type	Thickness (mm)				Gravel (%)	Sand (%)`	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
AO12-06	Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent	68	Asphalt	102	Concrete	102										
		Ash					Clay(Fill)	0.1	10							
							Clay(Fill)	0.2	28							
							Clay(Fill)	0.5	31	1	25	31	43	20	55	35
							Clay(Fill)	0.8	29							
							Clay(Fill)	1.1	28							
							Clay(Fill)	1.4	34							
							Clay	1.7	36							
							Clay	2.0	34							
							Clay	2.9	46							
AO12-07	Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent	58	Concrete	190												
		Ash					Clay	0.2	40							
							Clay	0.5	37							
							Clay	0.8	29	0	8	25	67	18	64	46
							Clay	1.1	32							
							Clay	1.4	33							
							Clay	1.7	38							
							Clay	2.0	42							
							Clay	2.9	45							

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent

Sample Date Jan 26, 2012
Test Date Jan 31, 2012
Technician Lee Boughton

Test Hole	AO12-01	AO12-01	AO12-01	AO12-01	AO12-01	AO12-01
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1
Sample #	G195	G196	G197	G198	G199	G200
Tare ID	Z66	Z72	Z61	Z64	Z69	Z56
Mass of tare	8.2	8.4	8.3	8.2	8.3	8.2
Mass wet + tare	312.2	334.2	255	247.8	301.5	427.8
Mass dry + tare	260	278.7	215.7	228.4	281.2	385.8
Mass water	52.2	55.5	39.3	19.4	20.3	42.0
Mass dry soil	251.8	270.3	207.4	220.2	272.9	377.6
Moisture %	20.7%	20.5%	18.9%	8.8%	7.4%	11.1%

Test Hole	AO12-01	AO12-02	AO12-02	AO12-02	AO12-02	AO12-02
Depth (m)	2.6 - 2.7	0.2 - 0.3	0.5 - 0.6	1.4 - 1.5	1.7 - 1.8	1.7 - 1.8
Sample #	G201	G203	G204	G206	G207	G207
Tare ID	Z71	Z62	Z68	Z60	Z65	Z55
Mass of tare	8.4	8.2	8.3	8.2	8.3	8.3
Mass wet + tare	349.3	369.9	300.2	229.6	268.2	336.9
Mass dry + tare	266.7	295.7	246.8	191.7	244.5	308.4
Mass water	82.6	74.2	53.4	37.9	23.7	28.5
Mass dry soil	258.3	287.5	238.5	183.5	236.2	300.1
Moisture %	32.0%	25.8%	22.4%	20.7%	10.0%	9.5%

Test Hole	AO12-02	AO12-02	AO12-03	AO12-03	AO12-03	AO12-03
Depth (m)	2.0 - 2.1	2.7 - 2.9	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G202	G209	G211	G212	G213	G214
Tare ID	Z59	Z63	Z70	Z57	Z51	Z54
Mass of tare	8.2	8.3	8.4	8.2	8.4	8.2
Mass wet + tare	438.5	460	366.6	362.7	380.6	418
Mass dry + tare	331.5	383.7	266.6	277.1	301.4	351.4
Mass water	107.0	76.3	100.0	85.6	79.2	66.6
Mass dry soil	323.3	375.4	258.2	268.9	293.0	343.2
Moisture %	33.1%	20.3%	38.7%	31.8%	27.0%	19.4%

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent

Sample Date Jan 26, 2012
Test Date Jan 31, 2012
Technician Lee Boughton

Test Hole	AO12-03	AO12-03	AO12-03	AO12-03	AO12-04	AO12-04
Depth (m)	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.7 - 2.9	0.2 - 0.4	0.5 - 0.6
Sample #	G215	G216	G217	G218	C218	G219
Tare ID	Z52	Z67	Z53	Z58	W08	F127
Mass of tare	8.2	8.3	8.2	8.3	8.2	8.2
Mass wet + tare	341.2	422.5	401.2	425.6	281.9	319.9
Mass dry + tare	267.6	312.3	336.7	306.3	237.3	228.4
Mass water	73.6	110.2	64.5	119.3	44.6	91.5
Mass dry soil	259.4	304.0	328.5	298.0	229.1	220.2
Moisture %	28.4%	36.3%	19.6%	40.0%	19.5%	41.6%

Test Hole	AO12-04	AO12-04	AO12-04	AO12-04	AO12-04	AO12-04
Depth (m)	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.7 - 2.9
Sample #	G220	G221	G222	G223	G224	G225
Tare ID	K38	N06	H70	Z73	H71	F122
Mass of tare	8.3	8.3	8.6	8.3	8.3	8.3
Mass wet + tare	366.9	372.3	526.1	453	419.3	383.5
Mass dry + tare	270.8	278.5	433.3	326	294	258.6
Mass water	96.1	93.8	92.8	127.0	125.3	124.9
Mass dry soil	262.5	270.2	424.7	317.7	285.7	250.3
Moisture %	36.6%	34.7%	21.9%	40.0%	43.9%	49.9%

Test Hole	AO12-05	AO12-05	AO12-05	AO12-05	AO12-05	AO12-05
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 #	G228	G229	G230	G231	G232	G233
Tare ID	K34	F4	F100	N04	Z74	N05
Mass of tare	8.4	8.4	8.4	8.4	8.2	8.4
Mass wet + tare	207.2	205	120.4	447.9	318.6	409.8
Mass dry + tare	161.1	161.5	106.5	329.6	228.5	286.1
Mass water	46.1	43.5	13.9	118.3	90.1	123.7
Mass dry soil	152.7	153.1	98.1	321.2	220.3	277.7
Moisture %	30.2%	28.4%	14.2%	36.8%	40.9%	44.5%

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent

Sample Date Jan 26, 2012
Test Date Jan 31, 2012
Technician Lee Boughton

Test Hole	AO12-05	AO12-06	AO12-06	AO12-06	AO12-06	AO12-06
Depth (m)	2.7 - 2.9	0.1 - 0.2	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G234	G236	G237	G238	G239	G240
Tare ID	Z75	F6	E100	F9	E116	N25
Mass of tare	8.3	8.4	8.4	8.5	8.4	8.2
Mass wet + tare	410	190.3	397.6	315.8	307.6	345.7
Mass dry + tare	279.6	173.1	311.5	243.1	239.7	271.5
Mass water	130.4	17.2	86.1	72.7	67.9	74.2
Mass dry soil	271.3	164.7	303.1	234.6	231.3	263.3
Moisture %	48.1%	10.4%	28.4%	31.0%	29.4%	28.2%

Test Hole	AO12-06	AO12-06	AO12-06	AO12-06	AO12-07	AO12-07
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 #	G241	G242	G243	G244	G246	G247
Tare ID	K23	F54	H40	N21	H44	F8
Mass of tare	8.3	8.3	8.3	8.3	8.2	8.4
Mass wet + tare	374.3	583.4	427.8	400.7	413.8	376.8
Mass dry + tare	281.8	430.5	322.4	277.8	298.4	278.2
Mass water	92.5	152.9	105.4	122.9	115.4	98.6
Mass dry soil	273.5	422.2	314.1	269.5	290.2	269.8
Moisture %	33.8%	36.2%	33.6%	45.6%	39.8%	36.5%

Test Hole	AO12-07	AO12-07	AO12-07	AO12-07	AO12-07	AO12-07
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 #	G248	G249	G250	G251	G252	G253
Tare ID	H9	F114	N23	N22	N24	N26
Mass of tare	8.4	8.2	8.4	8.1	8.4	8.2
Mass wet + tare	378.4	402.4	469.2	425.7	375.5	530.9
Mass dry + tare	294.4	306.8	354.3	310.6	266.3	367.9
Mass water	84.0	95.6	114.9	115.1	109.2	163.0
Mass dry soil	286.0	298.6	345.9	302.5	257.9	359.7
Moisture %	29.4%	32.0%	33.2%	38.0%	42.3%	45.3%

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Atterberg Limits
ASTM D4318

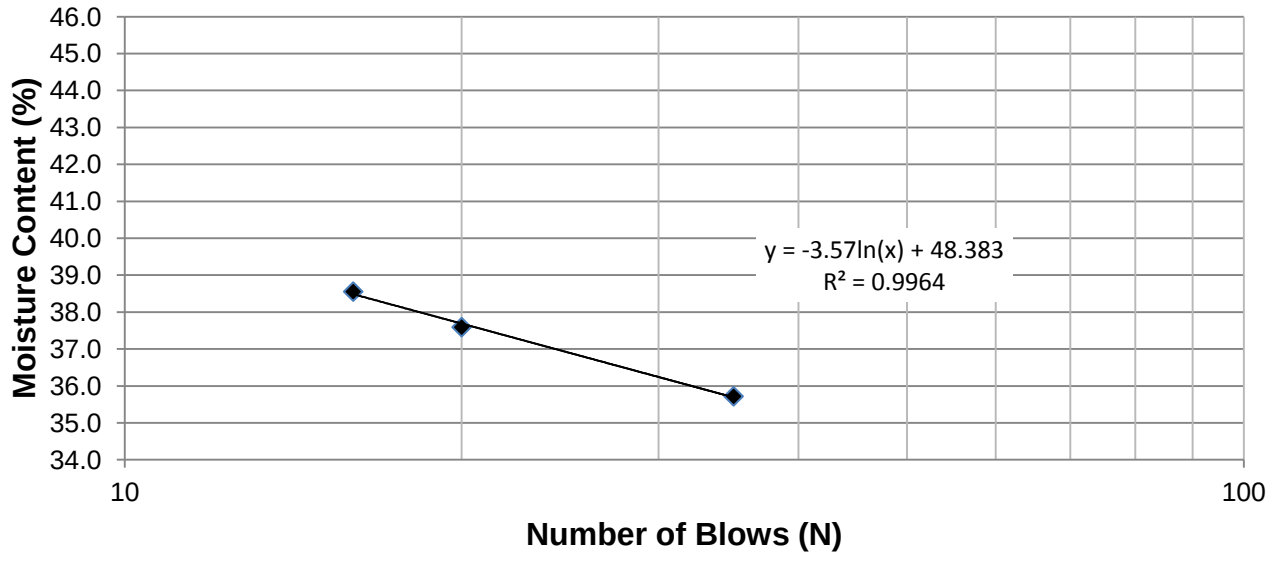
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent

Test Hole	AO12-03
Sample #	G213
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	21-Feb-12
Technician	Lee Boughton

Liquid Limit	36.9
Plastic Limit	17.7
Plasticity Index	19.2

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	35	20	16		
Mass Wet Soil + Tare (g)	25.562	26.345	25.142		
Mass Dry Soil + Tare (g)	22.516	22.990	22.060		
Mass Tare (g)	13.988	14.065	14.066		
Mass Water (g)	3.046	3.355	3.082		
Mass Dry Soil (g)	8.528	8.925	7.994		
Moisture Content (%)	35.718	37.591	38.554		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.456	21.273			
Mass Dry Soil + Tare (g)	19.501	20.174			
Mass Tare (g)	14.051	14.001			
Mass Water (g)	0.955	1.099			
Mass Dry Soil (g)	5.450	6.173			
Moisture Content (%)	17.523	17.803			

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Atterberg Limits
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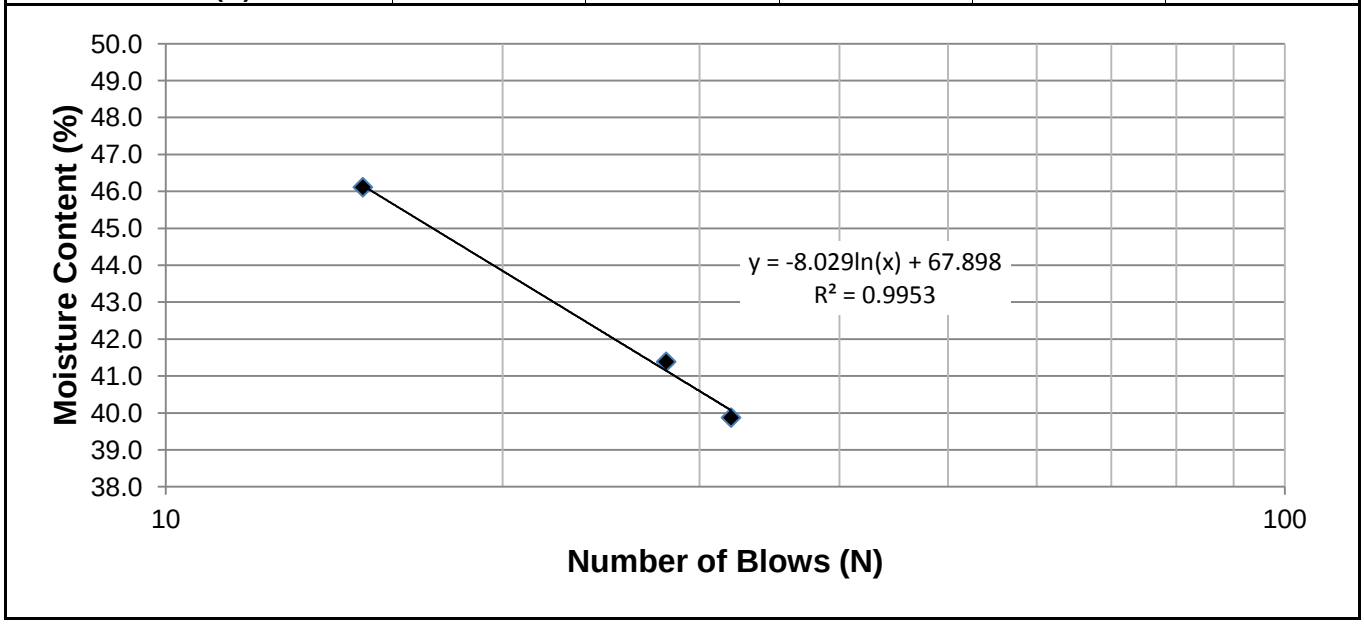
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent

Test Hole	AO12-04
Sample #	G220
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	21-Feb-12
Technician	Lee Boughton

Liquid Limit	42.1
Plastic Limit	15.6
Plasticity Index	26.4

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	32	28	15		
Mass Wet Soil + Tare (g)	27.283	25.445	25.457		
Mass Dry Soil + Tare (g)	23.527	22.080	21.857		
Mass Tare (g)	14.107	13.949	14.050		
Mass Water (g)	3.756	3.365	3.600		
Mass Dry Soil (g)	9.420	8.131	7.807		
Moisture Content (%)	39.873	41.385	46.112		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.455	20.124			
Mass Dry Soil + Tare (g)	19.583	19.284			
Mass Tare (g)	14.005	13.921			
Mass Water (g)	0.872	0.840			
Mass Dry Soil (g)	5.578	5.363			
Moisture Content (%)	15.633	15.663			

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Atterberg Limits
ASTM D4318

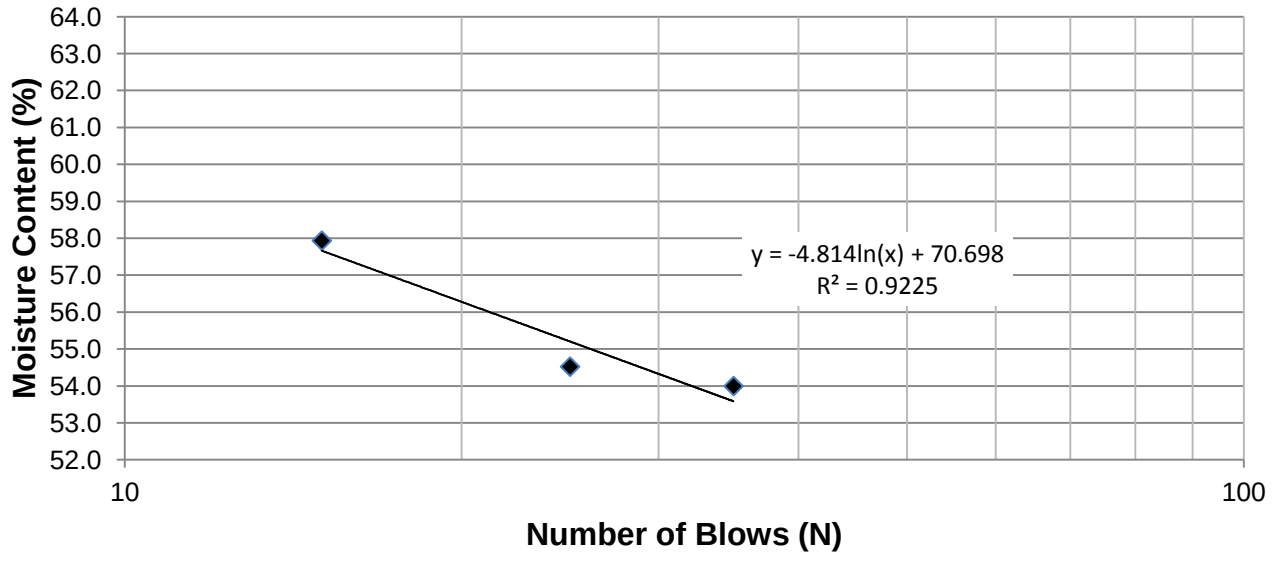
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent

Test Hole	AO12-06
Sample #	G238
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	21-Feb-12
Technician	Lee Boughton

Liquid Limit	55.2
Plastic Limit	19.8
Plasticity Index	35.4

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	35	25	15		
Mass Wet Soil + Tare (g)	25.469	25.214	25.971		
Mass Dry Soil + Tare (g)	21.434	21.282	21.633		
Mass Tare (g)	13.961	14.070	14.145		
Mass Water (g)	4.035	3.932	4.338		
Mass Dry Soil (g)	7.473	7.212	7.488		
Moisture Content (%)	53.994	54.520	57.933		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.067	19.927			
Mass Dry Soil + Tare (g)	19.089	18.930			
Mass Tare (g)	14.217	13.800			
Mass Water (g)	0.978	0.997			
Mass Dry Soil (g)	4.872	5.130			
Moisture Content (%)	20.074	19.435			

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Atterberg Limits
ASTM D4318

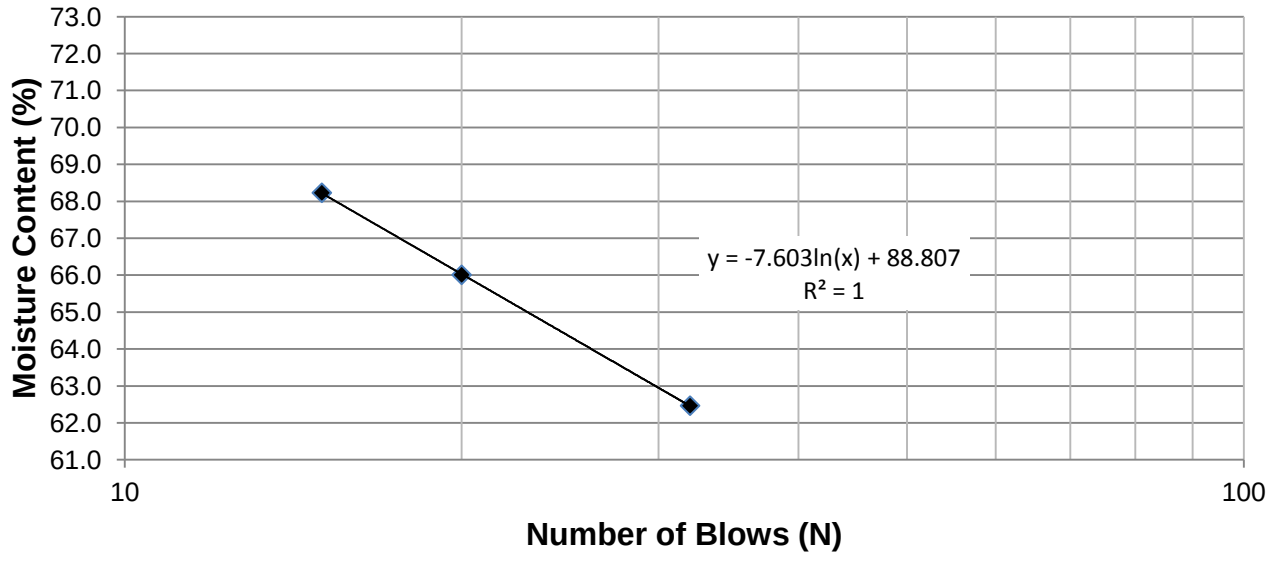
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley between Ash Street and Oak Street from Academy Road to Wellington Crescent

Test Hole	AO12-07
Sample #	G248
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	08-Feb-12
Technician	Lee Boughton

Liquid Limit	64.3
Plastic Limit	18.2
Plasticity Index	46.1

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	32	20	15		
Mass Wet Soil + Tare (g)	25.724	24.144	25.454		
Mass Dry Soil + Tare (g)	21.191	20.066	20.813		
Mass Tare (g)	13.934	13.888	14.011		
Mass Water (g)	4.533	4.078	4.641		
Mass Dry Soil (g)	7.257	6.178	6.802		
Moisture Content (%)	62.464	66.008	68.230		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.112	20.266			
Mass Dry Soil + Tare (g)	19.169	19.328			
Mass Tare (g)	13.939	14.227			
Mass Water (g)	0.943	0.938			
Mass Dry Soil (g)	5.230	5.101			
Moisture Content (%)	18.031	18.389			

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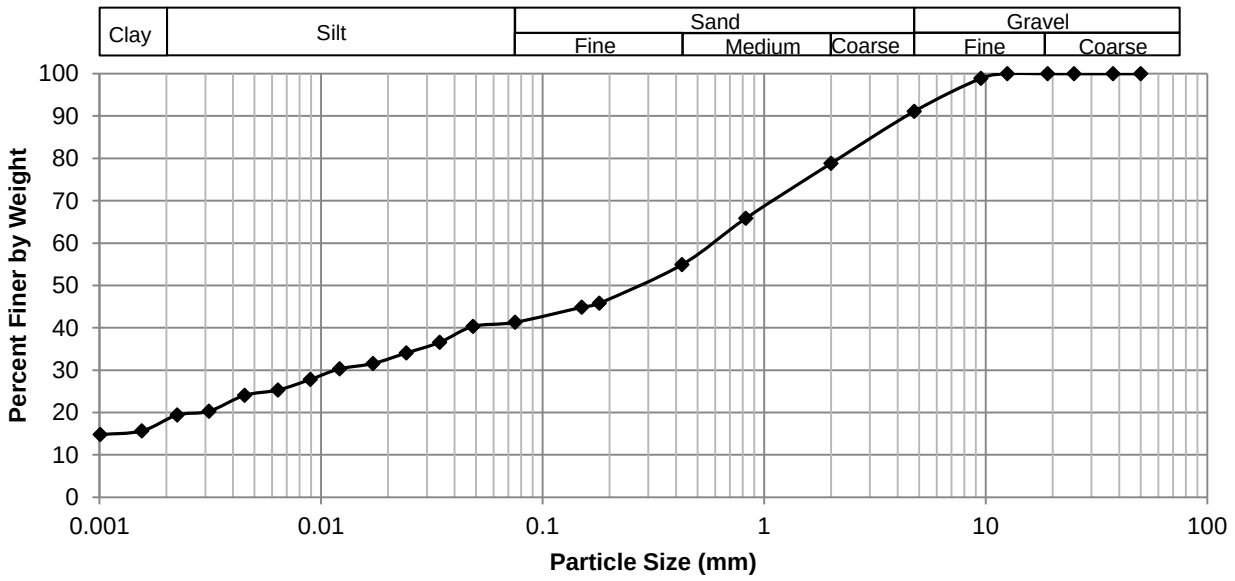
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Ash-Oak
Test Hole	AO12-03
Sample #	G213
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	10-Feb-12
Technician	Lee Boughton

Gravel	8.9%
Sand	49.8%
Silt	22.1%
Clay	19.2%

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	91.11	0.0750	41.31
37.5	100.00	2.00	78.83	0.0484	40.33
25.0	100.00	0.825	65.86	0.0343	36.57
19.0	100.00	0.425	54.91	0.0242	34.07
12.5	100.00	0.180	45.80	0.0171	31.56
9.50	98.90	0.150	44.86	0.0121	30.31
4.75	91.11	0.075	41.31	0.0089	27.81
				0.0064	25.30
				0.0045	24.05
				0.0031	20.30
				0.0022	19.41
				0.0016	15.65
				0.0010	14.80

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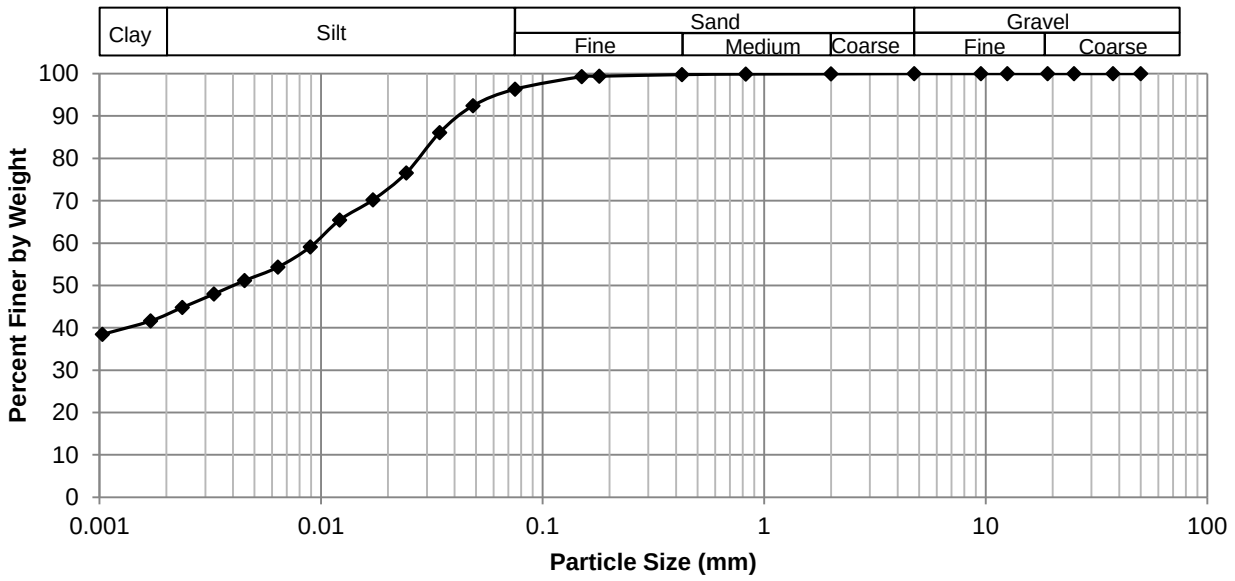
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Ash-Oak
Test Hole	AO12-04
Sample #	G220
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	14-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	3.7%
Silt	52.8%
Clay	43.5%

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	96.33
37.5	100.00	2.00	99.95	0.0484	92.43
25.0	100.00	0.825	99.90	0.0343	86.07
19.0	100.00	0.425	99.78	0.0242	76.55
12.5	100.00	0.180	99.40	0.0171	70.20
9.50	100.00	0.150	99.30	0.0121	65.44
4.75	100.00	0.075	96.33	0.0089	59.09
				0.0064	54.32
				0.0045	51.15
				0.0033	47.97
				0.0024	44.80
				0.0017	41.62
				0.0010	38.45

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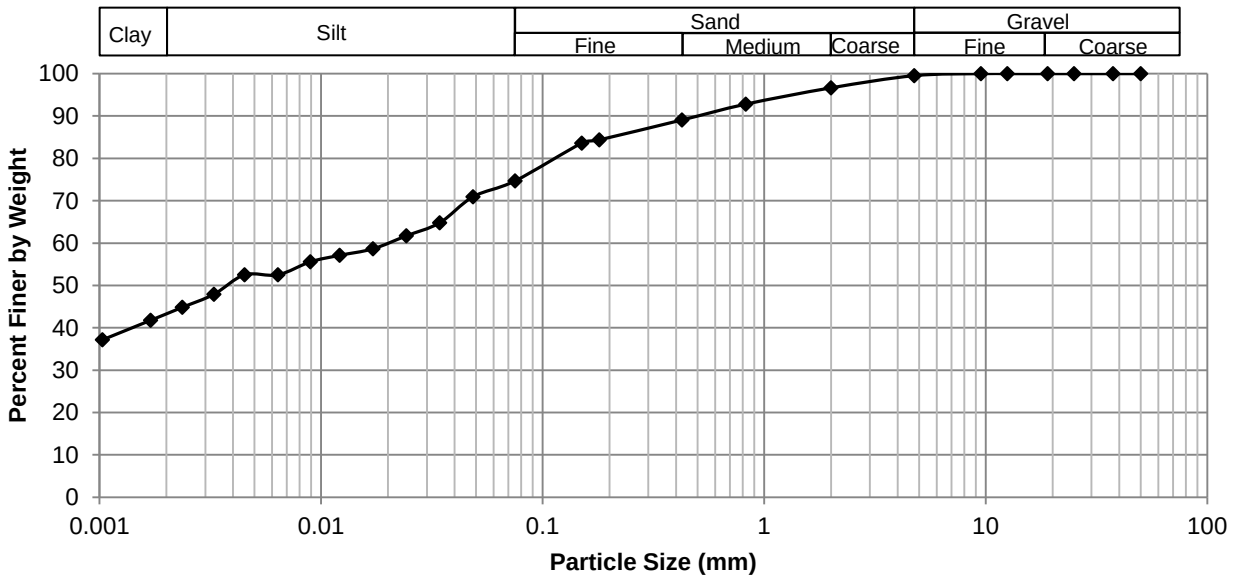
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Ash-Oak
Test Hole	AO12-06
Sample #	G238
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	14-Feb-12
Technician	Lee Boughton

Gravel	0.5%
Sand	24.8%
Silt	31.0%
Clay	43.6%

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	99.53	0.0750	74.68
37.5	100.00	2.00	96.65	0.0484	70.93
25.0	100.00	0.825	92.80	0.0343	64.79
19.0	100.00	0.425	89.07	0.0242	61.72
12.5	100.00	0.180	84.37	0.0171	58.65
9.50	100.00	0.150	83.59	0.0121	57.12
4.75	99.53	0.075	74.68	0.0089	55.58
				0.0064	52.51
				0.0045	52.51
				0.0033	47.91
				0.0024	44.84
				0.0017	41.77
				0.0010	37.16

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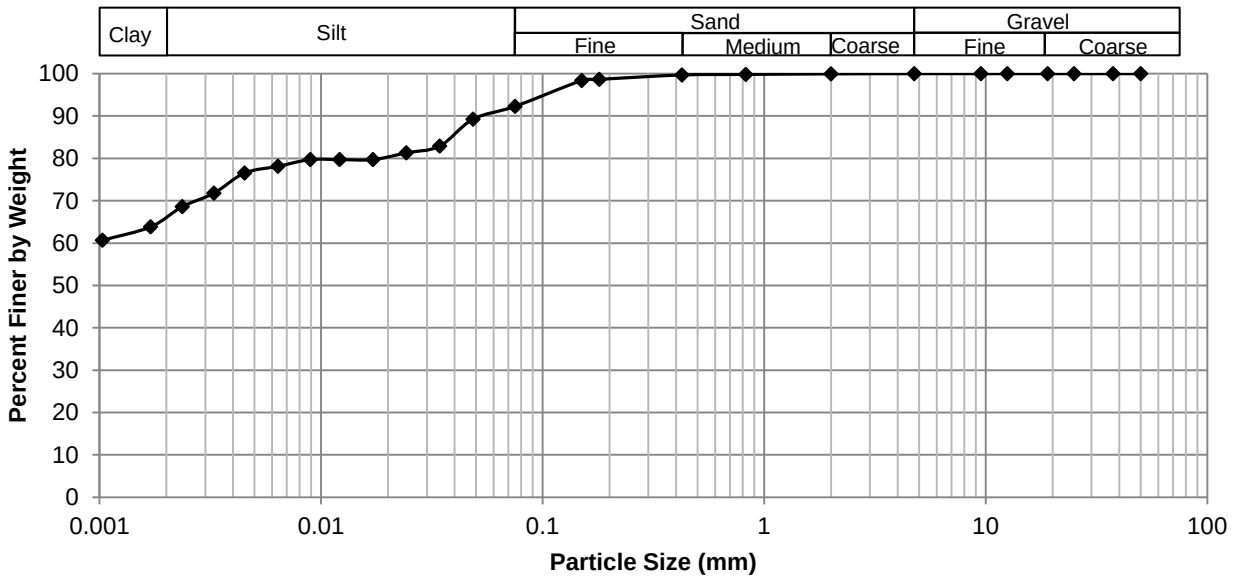
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Ash-Oak
Test Hole	AO12-07
Sample #	G248
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	14-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	7.7%
Silt	24.9%
Clay	67.4%

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	92.28
37.5	100.00	2.00	99.95	0.0484	89.25
25.0	100.00	0.825	99.82	0.0343	82.90
19.0	100.00	0.425	99.69	0.0242	81.31
12.5	100.00	0.180	98.66	0.0171	79.73
9.50	100.00	0.150	98.38	0.0121	79.73
4.75	100.00	0.075	92.28	0.0089	79.73
				0.0064	78.14
				0.0045	76.55
				0.0033	71.79
				0.0024	68.61
				0.0017	63.85
				0.0010	60.67

Photo 24: Asphalt core sample from Test Hole AO12-01

Photo 25: Concrete core sample from Test Hole AO12-01

Photo 26: Concrete core sample from Test Hole AO12-02

Photo 27: Asphalt core sample from Test Hole AO12-03

Photo 28: Concrete core sample from Test Hole AO12-03

Photo 29: Concrete core sample from Test Hole AO12-04

Photo 30: Asphalt core sample from Test Hole AO12-05

Photo 31: Concrete core sample from Test Hole AO12-05

Photo 32: Asphalt core sample from Test Hole AO12-06

Photo 33: Concrete core sample from Test Hole AO12-06

Photo 34: Concrete core sample from Test Hole AO12-07

Appendix F

Alley East of Pembina Hwy, between Killarney Ave and Summerside Ave

Sub-Surface Log

Test Hole KIL12-01
1 of 1

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley East of Pembina, between Killarney and Summerside
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 26, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) 0 50 100 150 200 250 (△ Torvane △, ✤ Pocket Pen. ✤, ☒ Qu ☒, ○ Field Vane ○)
		CONCRETE (150 mm thick)		C254		
		SAND and GRAVEL (Fill) - light brown, frozen, moist to wet and compact when thawed, well graded, medium grained sand to fine grained gravel, subangular to angular, 20 mm down crushed limestone		G255		
				G256		
		CLAY - some silt, trace sand (fine grained), trace silt inclusions (<5 mm diam.) - dark brown - frozen to 0.9 m, moist and firm when thawed - high plasticity		G257		
0.5						
		- firm to stiff below 0.8 m		G258		
1.0						
		- stiff to very stiff below 1.1 m		G259		△ ✤
				G260		△ ✤
1.5		- brown below 1.5 m				
				G261		△ ✤
2.0		- stiff below 2.0 m		G262		✤
		- silt seam (50 mm thick) at 2.1 m				
2.5						
				G263		△ ✤
3.0		END OF TEST HOLE AT 3.1 m IN CLAY				

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 38.1 m S, 2.5 m W of light stand (2-003-201).

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS KILLARNEY TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole KIL12-02

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley East of Pembina, between Killarney and Summerside
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 26, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21	Particle Size (%) 0 20 40 60 80 100	PL MC LL 0 20 40 60 80 100	Undrained Shear Strength (kPa) 0 50 100 150 200 250
		CONCRETE (125 mm thick) - asphalt in crack		C264				
		SAND and GRAVEL (Fill) - light brown, frozen, moist to wet and compact when thawed, well graded, medium grained sand to fine grained gravel, subangular to angular, 20 mm down crushed limestone		G265				
		CLAY - some silt, trace silt inclusions (<5 mm dia.) - dark brown - frozen to 0.9 m, moist and soft to firm when thawed - high plasticity		G266				
0.5				G267				
1.0		- firm to stiff below 1.1 m		G268				
		- stiff to very stiff below 1.4 m - silt seam (<50 mm thick) at 1.4 m		G269				
1.5		- brown below 1.7 m		G270				△ ✤
		- silt seam (25 mm thick) at 2.1 m						
2.0		- stiff below 1.5 m		G271				✤
		- firm 2.3 m						
2.5								
3.0				G272				✤ △

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 19.3 m S, 3.5 m W of light stand (2-003-201).

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS KILLARNEY TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

Sub-Surface Log

Test Hole KIL12-03

Client:	Morrison Hershfield	**Project Number:**	0035 004 00
Project Name:	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01	**Location:**	Alley East of Pembina, between Killarney and Summerside
Contractor:	Paddock Drilling Ltd.	**Ground Elevation:**	Not Surveyed
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	January 26, 2012

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

Particle Size Legend: Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) 0 50 100 150 200 250
		CONCRETE (140 mm thick)		C273		
		SAND and GRAVEL (Fill) - light brown, frozen, moist to wet and compact when thawed, well graded, medium grained sand to fine grained gravel, subangular to angular, 20 mm down crushed limestone		G274		
				G275		
		CLAY - trace to some silt, trace silt inclusions (<10 mm dia.) - dark brown - frozen to 1.1 m, moist and soft when thawed - high plasticity		G276		
0.5		- firm to stiff below 0.8 m		G277		
1.0		- very stiff below 1.1 m		G278		
				G279		
1.5		- stiff below 1.5 m		G280		
		- brown below 1.7 m				
2.0		- silt seam (100 mm thick) at 2.1 m		G281		
2.5		- firm to stiff below 2.3 m				
3.0				G282		

END OF TEST HOLE AT 3.1 m IN CLAY

Notes:
1. No sloughing or seepage observed.
2. Backfilled test hole with auger cuttings to ~1.0 m below top of pavement, bentonite pellets to 0.2 m below top of pavement, sand to 0.1 m below top of pavement and asphalt cold patch to top of pavement.
3. Test hole location 1.3 m S, 2.3 m W of light stand (2-003-201).

Logged By: Stephen Renner **Reviewed By:** Nelson Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG 2012 RESIDENTIAL STREET RENEWALS KILLARNEY TESTHOLE LOGS.GPJ TREK GEOTECHNICAL.GDT 2/27/12

2012 City of Winnipeg Alley Package
PW File #: 12-RL-01
Sub-Surface Investigation

Test Hole No.	Test Hole Location (Street Name)	House No.	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
			Type	Thickness (mm)	Type	Thickness (mm)				Gravel (%)	Sand (%)`	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
KIL12-01	Alley East of Pembina Hwy, between Killarney Ave and Summerside Ave	33	Concrete	145												
		Killarney					Sand and Gravel (Fill)	0.2	13							
							Clay	0.3	37							
							Clay	0.5	37							
							Clay	0.8	36							
							Clay	1.1	34							
							Clay	1.4	35							
							Clay	1.7	42							
							Clay	2.1	43							
							Clay	2.8	48							
KIL12-02	Alley East of Pembina Hwy, between Killarney Ave and Summerside Ave	33	Concrete	127												
		Killarney					Clay	0.2	43							
							Clay	0.5	42							
							Clay	0.8	37							
							Clay	1.1	38							
							Clay	1.4	40							
							Clay	1.7	42							
							Clay	2.0	44							
							Clay	2.9	51							
KIL12-03	Alley East of Pembina Hwy, between Killarney Ave and Summerside Ave	33	Concrete	140												
		Killarney					Sand and Gravel (Fill)	0.1	21							
							Clay	0.2	42							
							Clay	0.5	42							
							Clay	0.8	40							
							Clay	1.1	35							
							Clay	1.4	40							
							Clay	1.7	41							
							Clay	2.0	44							
							Clay	2.9	51							

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley East of Pembina Hwy, between Killarney Ave and Summerside Ave

Sample Date Jan 26, 2012
Test Date Feb 1, 2012
Technician Lee Boughton

Test Hole	KIL12-01	KIL12-01	KIL12-01	KIL12-01	KIL12-01	KIL12-01
Depth (m)	0.2 - 0.2	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5
Sample #	G255	G256	G257	G258	G259	G260
Tare ID	Z25	Z44	Z39	Z48	Z49	Z40
Mass of tare	8.2	8.3	8.3	8.3	8.2	8.3
Mass wet + tare	401.5	312.8	383.7	379.7	363	348.8
Mass dry + tare	355.1	231.2	281.7	281.7	274	261.5
Mass water	46.4	81.6	102.0	98.0	89.0	87.3
Mass dry soil	346.9	222.9	273.4	273.4	265.8	253.2
Moisture %	13.4%	36.6%	37.3%	35.8%	33.5%	34.5%

Test Hole	KIL12-01	KIL12-01	KIL12-01	KIL12-02	KIL12-02	KIL12-02
Depth (m)	1.7 - 1.8	2.0 - 2.1	2.7 - 2.9	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9
Sample #	G261	G262	G263	G265	G266	G267
Tare ID	Z42	Z47	Z46	Z28	Z50	Z45
Mass of tare	8.1	8.3	8.3	8.2	8.2	8.2
Mass wet + tare	438	405	493.5	348.7	371.6	415.3
Mass dry + tare	311.7	285.7	337	247.1	265	305.5
Mass water	126.3	119.3	156.5	101.6	106.6	109.8
Mass dry soil	303.6	277.4	328.7	238.9	256.8	297.3
Moisture %	41.6%	43.0%	47.6%	42.5%	41.5%	36.9%

Test Hole	KIL12-02	KIL12-02	KIL12-02	KIL12-02	KIL12-02	KIL12-03
Depth (m)	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.0 - 2.1	2.9 - 3.0	0.1 - 0.2
Sample #	G268	G269	G270	G271	G272	G274
Tare ID	Z43	Z30	Z32	Z35	Z38	Z26
Mass of tare	8.2	8.3	8.4	8.4	8.3	8.2
Mass wet + tare	375.8	421.1	500.9	423.6	420.8	376.6
Mass dry + tare	274.5	304	356.3	296.2	281.2	311.7
Mass water	101.3	117.1	144.6	127.4	139.6	64.9
Mass dry soil	266.3	295.7	347.9	287.8	272.9	303.5
Moisture %	38.0%	39.6%	41.6%	44.3%	51.2%	21.4%

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Moisture Content Report
ASTM D2216-98

Project No. 0035 004 00
Client Morrison Hershfield
Project 2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location Alley East of Pembina Hwy, between Killarney Ave and Summerside Ave

Sample Date Jan 26, 2012
Test Date Feb 1, 2012
Technician Lee Boughton

Test Hole	KIL12-03	KIL12-03	KIL12-03	KIL12-03	KIL12-03	KIL12-03
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 5.0
Sample #	G275	G276	G277	G278	G279	G280
Tare ID	Z37	Z33	Z41	Z29	Z31	Z34
Mass of tare	8.2	8.3	8.4	8.3	8.2	8.3
Mass wet + tare	305.5	285.8	360	504.4	314	419.4
Mass dry + tare	217.9	203.7	259.1	374.8	227.4	300.5
Mass water	87.6	82.1	100.9	129.6	86.6	118.9
Mass dry soil	209.7	195.4	250.7	366.5	219.2	292.2
Moisture %	41.8%	42.0%	40.2%	35.4%	39.5%	40.7%

Test Hole	KIL12-03	KIL12-03				
Depth (m)	2.0 - 2.1	2.9 - 3.0				
Sample #	G281	G282				
Tare ID	Z27	Z36				
Mass of tare	8.2	8.2				
Mass wet + tare	417.3	448.8				
Mass dry + tare	292.9	300.8				
Mass water	124.4	148.0				
Mass dry soil	284.7	292.6				
Moisture %	43.7%	50.6%				

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Atterberg Limits
ASTM D4318

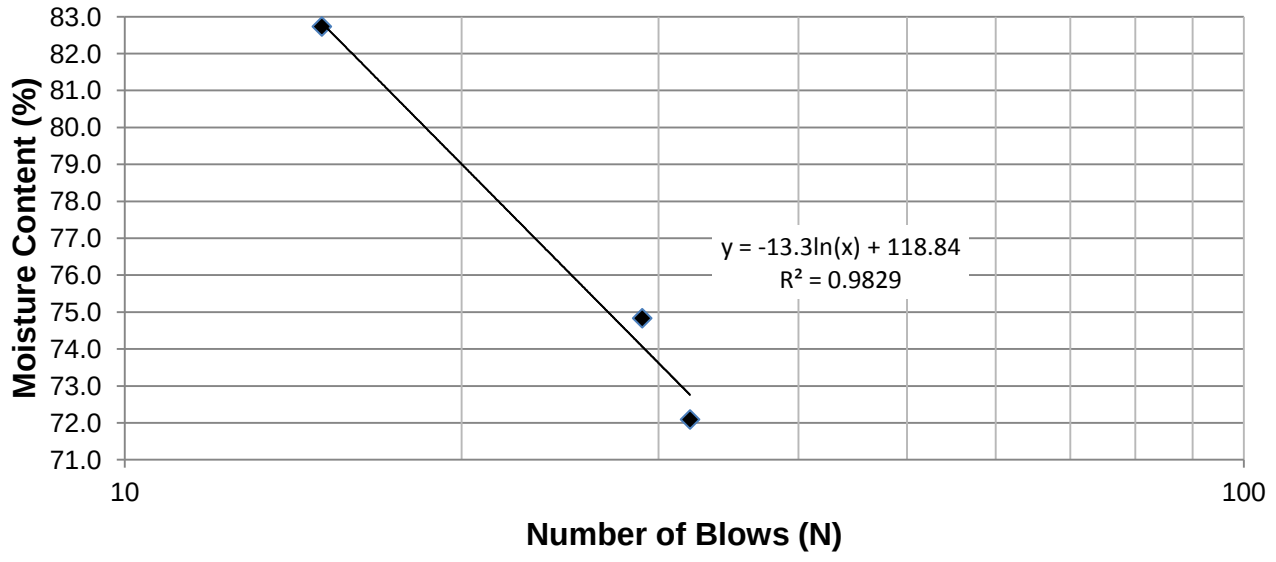
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley East of Pembina Hwy, between Killarney Ave and Summerside Ave

Test Hole	KIL12-01
Sample #	G257
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	16-Feb-12
Technician	Lee Boughton

Liquid Limit	76.0
Plastic Limit	21.9
Plasticity Index	54.1

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	32	29	15		
Mass Wet Soil + Tare (g)	25.696	25.573	27.075		
Mass Dry Soil + Tare (g)	20.796	20.649	21.215		
Mass Tare (g)	13.999	14.069	14.132		
Mass Water (g)	4.900	4.924	5.860		
Mass Dry Soil (g)	6.797	6.580	7.083		
Moisture Content (%)	72.091	74.833	82.733		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.311	20.233			
Mass Dry Soil + Tare (g)	19.210	19.131			
Mass Tare (g)	14.222	14.065			
Mass Water (g)	1.101	1.102			
Mass Dry Soil (g)	4.988	5.066			
Moisture Content (%)	22.073	21.753			

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Atterberg Limits
ASTM D4318

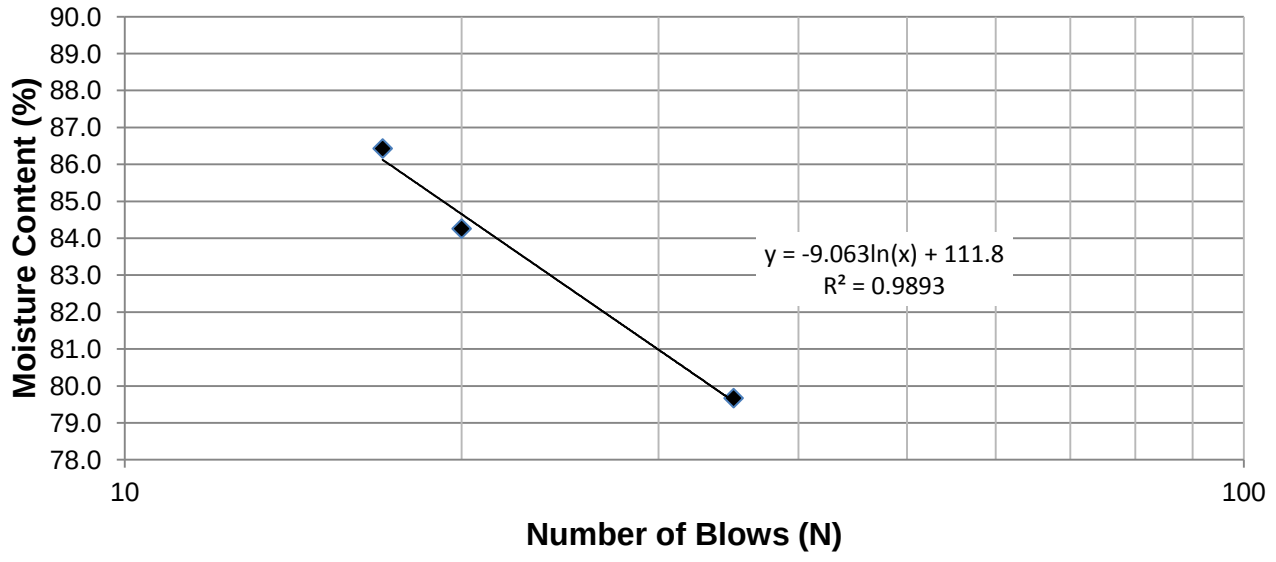
Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01
Location	Alley East of Pembina Hwy, between Killarney Ave and Summerside Ave

Test Hole	KIL12-03
Sample #	G277
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	21-Feb-12
Technician	Lee Boughton

Liquid Limit	82.6
Plastic Limit	23.6
Plasticity Index	59.0

Liquid Limit

Trial #	1	2	3	4	5
Number of Blows (N)	35	20	17		
Mass Wet Soil + Tare (g)	25.837	25.016	26.529		
Mass Dry Soil + Tare (g)	20.496	19.979	20.695		
Mass Tare (g)	13.792	14.001	13.945		
Mass Water (g)	5.341	5.037	5.834		
Mass Dry Soil (g)	6.704	5.978	6.750		
Moisture Content (%)	79.669	84.259	86.430		



Plastic Limit

Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.210	21.210			
Mass Dry Soil + Tare (g)	19.051	19.837			
Mass Tare (g)	14.099	14.060			
Mass Water (g)	1.159	1.373			
Mass Dry Soil (g)	4.952	5.777			
Moisture Content (%)	23.405	23.767			

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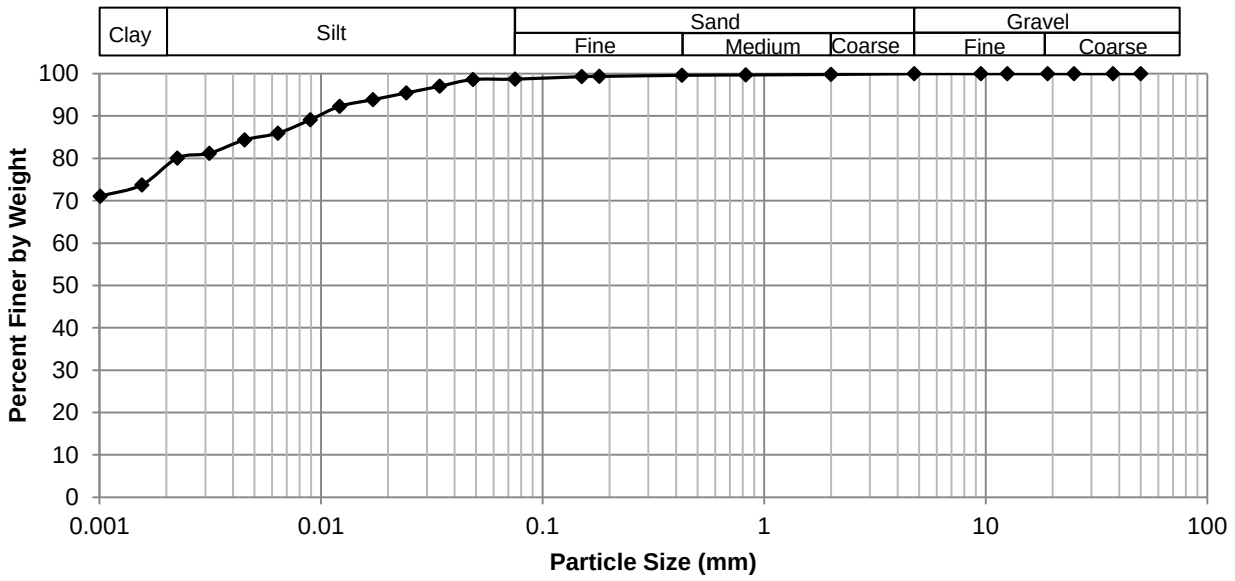
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Killarney
Test Hole	KIL12-01
Sample #	G257
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-12
Test Date	10-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	1.3%
Silt	19.0%
Clay	79.8%

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	98.72
37.5	100.00	2.00	99.83	0.0484	98.63
25.0	100.00	0.825	99.72	0.0343	97.04
19.0	100.00	0.425	99.63	0.0242	95.46
12.5	100.00	0.180	99.37	0.0171	93.87
9.50	100.00	0.150	99.32	0.0121	92.29
4.75	100.00	0.075	98.72	0.0089	89.12
				0.0064	85.95
				0.0045	84.36
				0.0031	81.19
				0.0022	80.06
				0.0016	73.72
				0.0010	71.06

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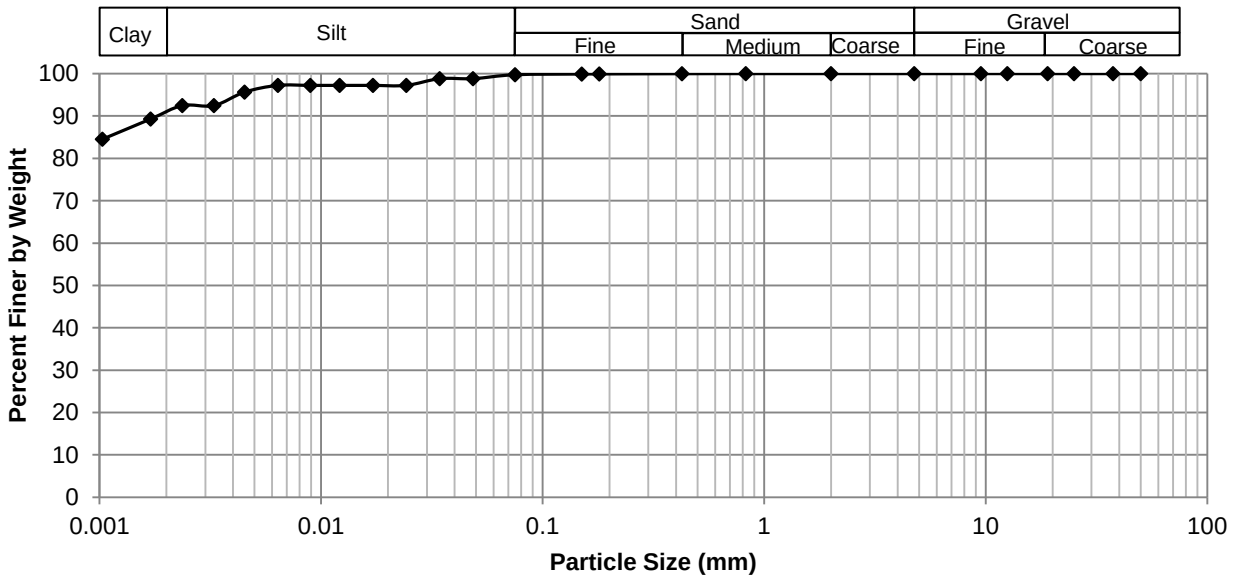
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0035 004 00
Client	Morrison Hershfield
Project	2012 City of Winnipeg Alley Package - PW File #: 12-RL-01 - Killarney
Test Hole	KIL12-03
Sample #	G277
Depth (m)	0.8 - 0.9
Sample Date	24-Jan-12
Test Date	14-Feb-12
Technician	Lee Boughton

Gravel	0.0%
Sand	0.3%
Silt	7.3%
Clay	92.5%

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	99.74
37.5	100.00	2.00	100.00	0.0484	98.81
25.0	100.00	0.825	100.00	0.0343	98.81
19.0	100.00	0.425	99.98	0.0242	97.23
12.5	100.00	0.180	99.93	0.0171	97.23
9.50	100.00	0.150	99.90	0.0121	97.23
4.75	100.00	0.075	99.74	0.0089	97.23
				0.0064	97.23
				0.0045	95.64
				0.0033	92.46
				0.0024	92.46
				0.0017	89.29
				0.0010	84.52

Photo 35: Concrete core sample from Test Hole KIL12-01

Photo 36: Concrete core sample from Test Hole KIL12-02

Photo 37: Concrete core sample from Test Hole KIL12-03

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