



Quality Engineering | Valued Relationships

WSP Canada Group Winnipeg
20-LI-01 Local Alley Renewals

Prepared for:

WSP Canada Group Ltd.
111-93 Lombard Ave.
Winnipeg, MB R3B
Attention: Lissa VanDorp, P.Eng.

Project Number:

1000 043 10 400

Date:

March 2, 2020
Final Report



Quality Engineering | Valued Relationships

March 2, 2020

Our File No. 1000 043 10 400

Lissa VanDorp, P.Eng.
WSP Canada Group Ltd.
111-93 Lombard Ave.
Winnipeg, MB R3B

**RE: Road Investigation Report for
20-LI-01 Local Alley Renewals**

TREK Geotechnical Inc. is pleased to submit our report for the road investigations for the 20-LI-01 Local Alley Renewals project.

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

Sincerely,

TREK Geotechnical Inc.

Per:

A handwritten signature in blue ink, appearing to read "N. Ferreira", is written over a light blue circular stamp.

Nelson John Ferreira, Ph.D., P. Eng.
Geotechnical Engineer, Principal
Tel: 204.975.9433 ext. 103


cc: Angela Fidler-Kliewer C.Tech. (TREK Geotechnical)

Revision History

Revision No.	Author	Issue Date	Description
1	AFK	March 2, 2020	Final Report

Authorization Signatures

Prepared By:


Angela Fidler-Kliewer, C. Tech
Manager of Laboratory and Field Services



Reviewed By:

Nelson John Ferreira, Ph.D., P.Eng.
Geotechnical Engineer



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1.0 Introduction

This report summarizes the results of the road investigation completed for the 20-LI-01 Local Alley Renewal project. The test holes were completed within the alleys of Coniston St. and Gauvin St., Coniston St. and Highfield St., Highfield St. and Kirkdale St., Walmer St. and Kirkdale St. and Prosper St. and Evans St. The information collected describes the soil stratigraphy beneath the surface at the test hole locations.

2.0 Road Investigation and Laboratory Program

The investigation included the drilling of test holes. The investigation locations are shown on Figure 01 through Figure 05 (attached) and Table 1 below summarizes the investigation program per alley.

Table 1 – Road Investigation Program

Street	# of Locations	Investigation
Alley – Walmer St. to Kirkdale St.	3	Test Holes
Alley – Prosper St. to Evans St.	4	Test Holes
Alley – Highland St. to Kirkdale St.	4	Test Holes
Alley – Coniston St. to Highfield	3	Test Holes
Alley – Coniston St. to Gauvin St. to Chandos Ave	7	Test Holes

The sub-surface investigation was conducted between January 15, 2020 and January 28, 2020. The test holes were drilled to a depth of 3.0 m below road surface by Maple Leaf Drilling Ltd. using a truck mounted drill rig equipped with 125 mm diameter solid stem augers. The sub-surface conditions were observed during drilling and visually classified by Nuno Mendonca of TREK. Other pertinent information such as groundwater and drilling conditions were also recorded during the drilling investigation. Disturbed (auger cuttings) samples and bulk samples retrieved during the sub-surface investigation were transported to TREK's material testing laboratory for further testing.

The laboratory testing program consisted of moisture content determination on all samples, as well as Atterberg limits, and grain size analysis (mechanical sieve and hydrometer methods) on select samples between 0.5 and 1.0 m below surface. Information gathered for each alley is included in separate appendices (Appendices A through E). The information provided in the Appendices includes test hole logs, laboratory testing summary tables and results.

Test hole locations noted on the summary tables and test hole logs are based on UTM coordinates obtained using a hand-held GPS and their location relative to the nearest address, and measured distance from the edge of pavement or other permanent features.

3.0 Closure

The information provided in this report is in accordance with current engineering principles and practices (Standard of Practice). The findings of this report were based on information provided (field investigation, laboratory testing, geometries). Soil conditions are natural deposits that can be highly variable across a site. If sub-surface conditions are different than the conditions previously encountered on-site or those presented here, we should be notified to adjust our findings if necessary.

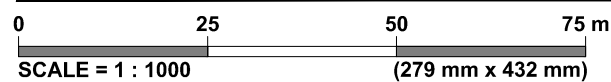
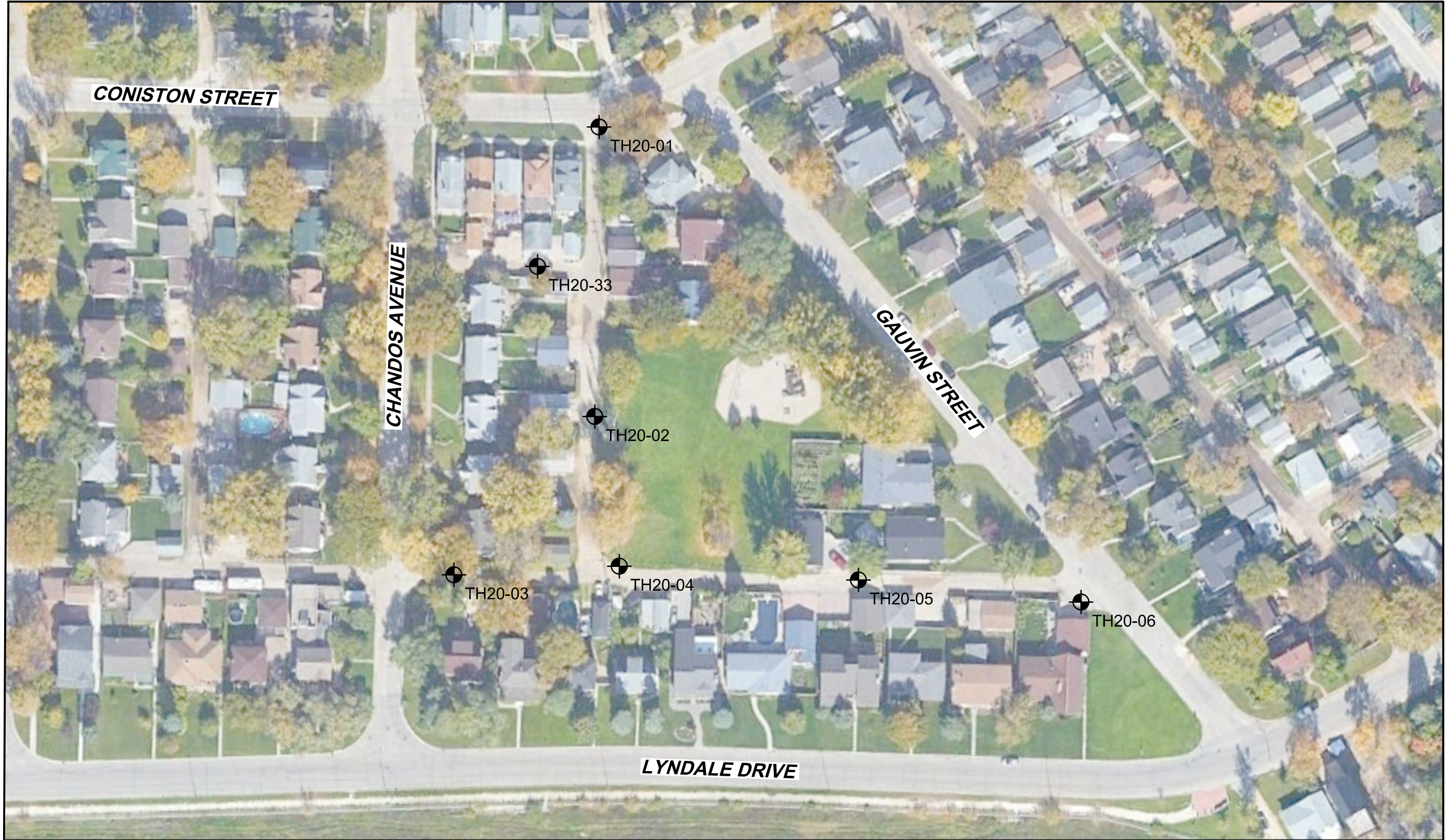
All information provided in this report is subject to our standard terms and conditions for engineering services, a copy of which is provided to each of our clients with the original scope of work, or a mutually executed standard engineering services agreement. If these conditions are not attached, and you are not already in possession of such terms and conditions, contact our office and you will be promptly provided with a copy.

This report has been prepared by TREK Geotechnical Inc. (the Consultant) for the exclusive use of WSP Canada Group (the Client) and their agents for the work product presented in the report. Any findings or recommendations provided in this report are not to be used or relied upon by any third parties, except as agreed to in writing by the Client and Consultant prior to use.

Figures

ANSI full bleed B (11.00 x 17.00 inches)

Z:\Projects\1000 Soils Lab\Lab Projects\1000-043 WSP\1000-043-10 Local Streets and Alleys\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\20.02.13 TH LOCATIONS - CONISTON_GAUVIN.dwg, 2/26/2020 1:58:49 PM



LEGEND: TEST HOLE (TREK, 2020)

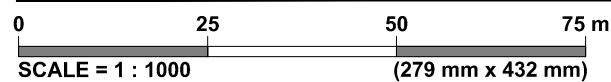
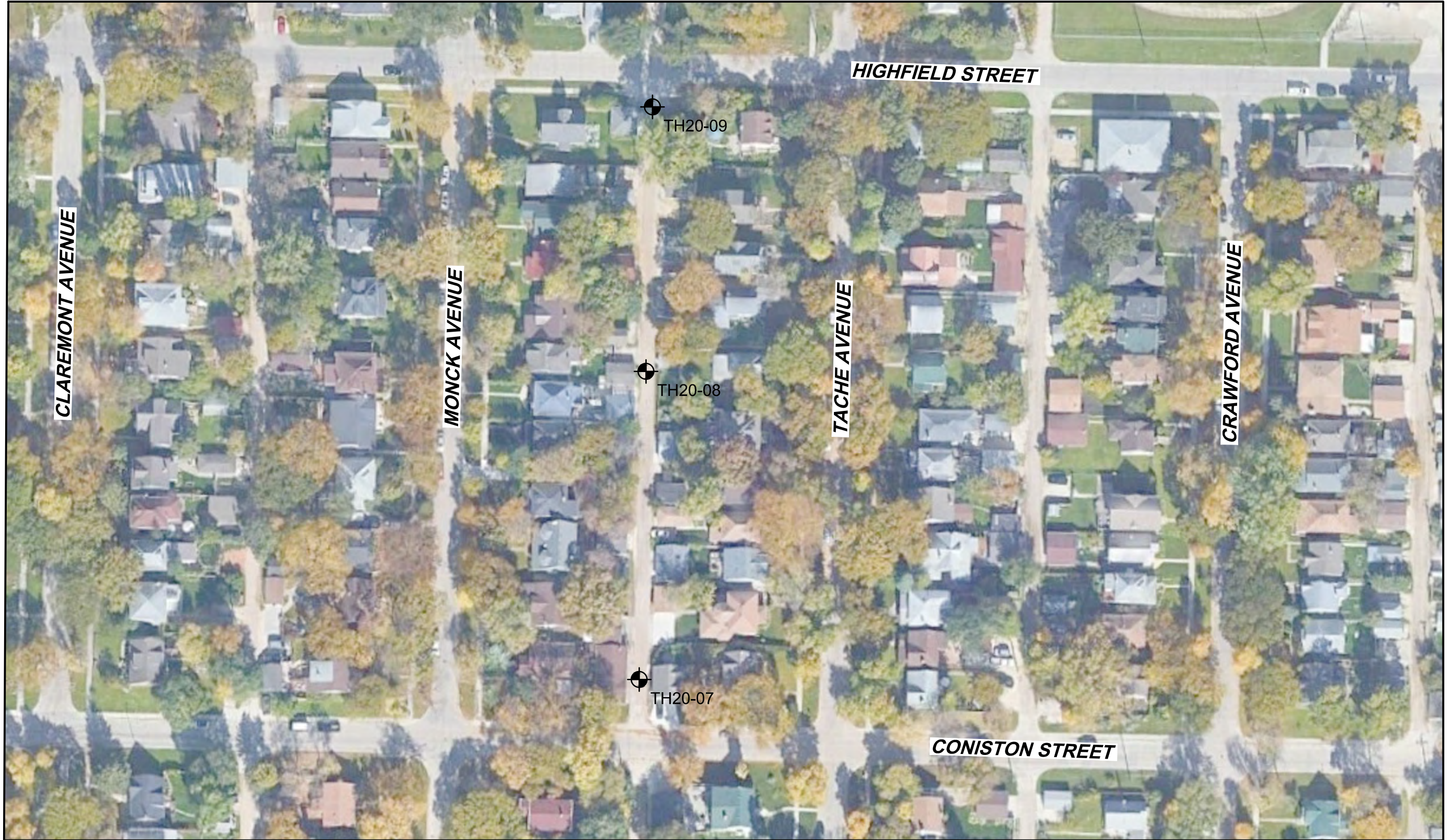
NOTES:

1. AERIAL IMAGE FROM GOOGLE EARTH (2019)
2. TEST HOLE LOCATIONS OBTAINED USING HAND HELD GPS UNIT AND BY MEASURING DISTANCES OFF EXISTING STRUCTURES.

Figure 01
TEST HOLE LOCATION PLAN

ANSI full bleed B (11.00 x 17.00 inches)

Z:\Projects\1000 Soils Lab\Lab Projects\1000-043 WSP\1000-043-10 Local Streets and Alleys\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\20.02.13 TH LOCATIONS - CONISTON.dwg, 2/24/2020 3:07:01 PM



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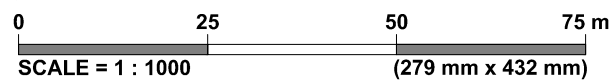
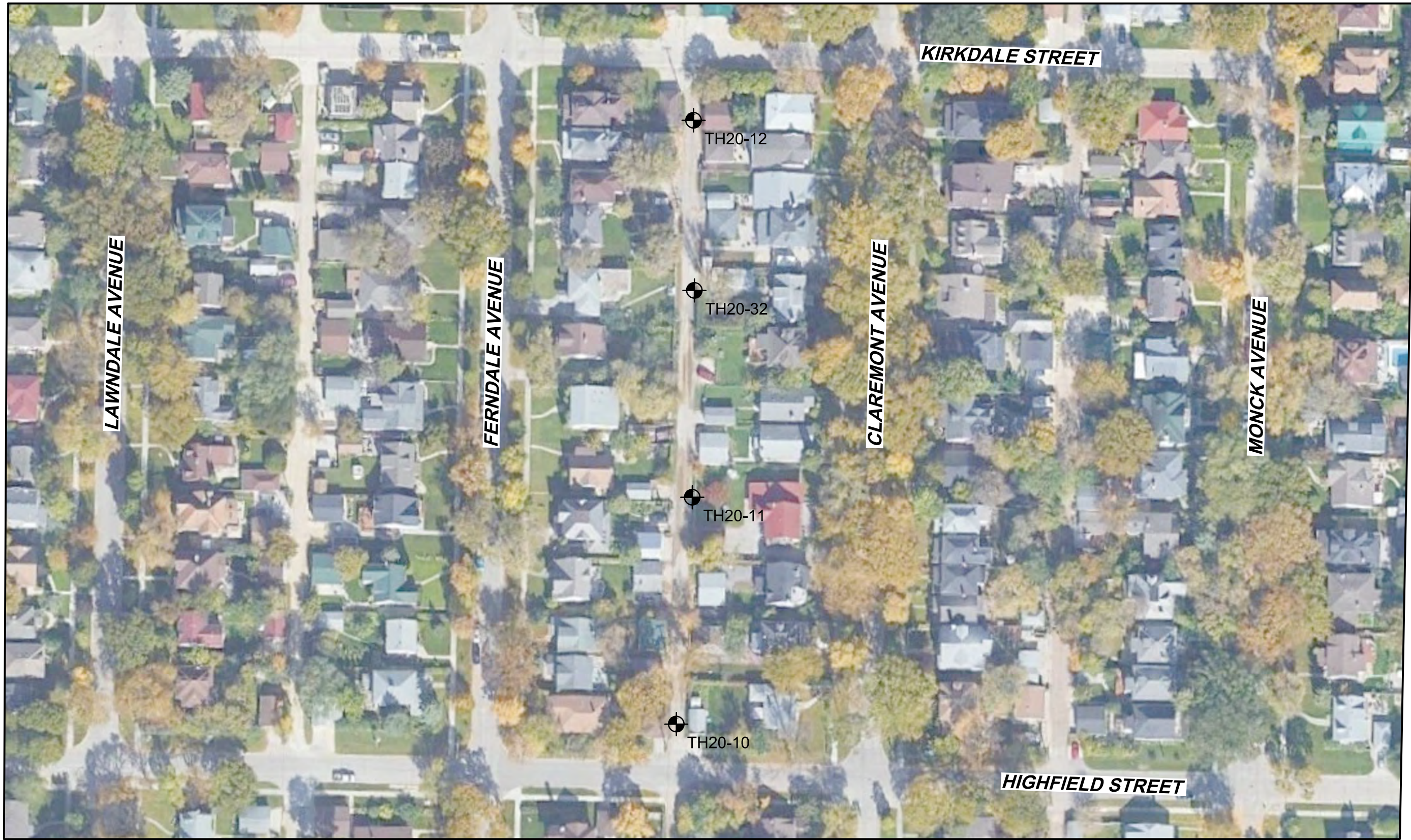
NOTES:

1. AERIAL IMAGE FROM GOOGLE EARTH (2019)
2. TEST HOLE LOCATIONS OBTAINED USING HAND HELD GPS UNIT AND BY MEASURING DISTANCES OFF EXISTING STRUCTURES.

Figure 02
TEST HOLE LOCATION PLAN

ANSI full bleed B (11.00 x 17.00 inches)

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LEGEND:  TEST HOLE (TREK, 2020)

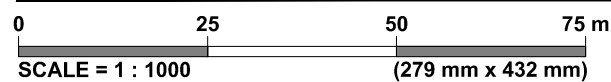
NOTES:

1. AERIAL IMAGE FROM GOOGLE EARTH (2019)
2. TEST HOLE LOCATIONS OBTAINED USING HAND HELD GPS UNIT AND BY MEASURING DISTANCES OFF EXISTING STRUCTURES.

Figure 03
TEST HOLE LOCATION PLAN

ANSI full bleed B (11.00 x 17.00 inches)

Z:\Projects\1000 Soils Lab\Projects\1000-043 WSP\1000-043-10 Local Streets and Alleys\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\20.02.13 TH LOCATIONS - KIRKDALE_WALMER.dwg, 2/24/2020 3:09:01 PM

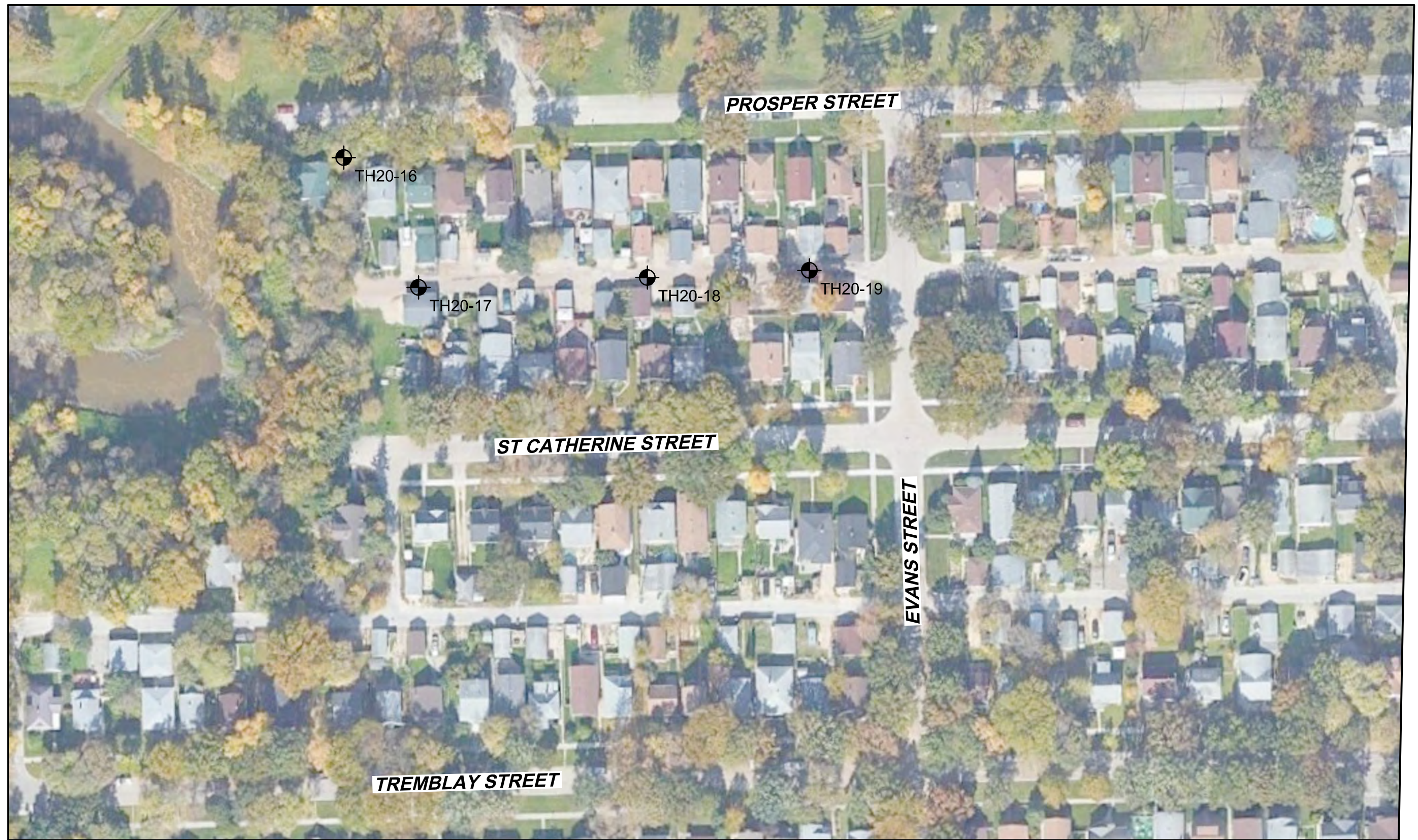


LEGEND:  TEST HOLE (TREK, 2020)

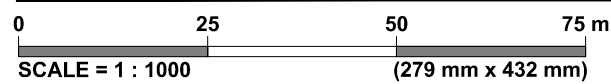
NOTES: 1. AERIAL IMAGE FROM GOOGLE EARTH (2019)
2. TEST HOLE LOCATIONS OBTAINED USING HAND HELD GPS UNIT AND BY MEASURING DISTANCES OFF EXISTING STRUCTURES.

Figure 04
TEST HOLE LOCATION PLAN

ANSI full bleed B (11.00 x 17.00 inches)



Z:\Projects\1000 Soils Lab\Lab Projects\1000-043 WSP\1000-043-10 Local Streets and Alleys\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\20.02.13 TH LOCATIONS - PROSPER_EVANS.dwg, 2/26/2020 11:18:57 AM



LEGEND: TEST HOLE (TREK, 2020)

NOTES:

1. AERIAL IMAGE FROM GOOGLE EARTH (2019)
2. TEST HOLE LOCATIONS OBTAINED USING HAND HELD GPS UNIT AND BY MEASURING DISTANCES OFF EXISTING STRUCTURES.

Figure 05
TEST HOLE LOCATION PLAN

Appendix A

Coniston Ave / Gauvin St.

Test Hole Logs, Summary Table, Lab Testing Results

GENERAL NOTES

- Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
- Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
- When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions	USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria		Particle Size			
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP More than 12 percent..... GM, GC, SM, SC 6 to 12 percent..... Borderline cases requiring dual symbols*	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	ASTM Sieve sizes #10 to #4 #40 to #10 #200 to #40 < #200			
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW				
		GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols			
		GC	Clayey gravels, gravel-sand-silt mixtures		Atterberg limits above "A" line or P.I. greater than 7				
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	mm 2.00 to 4.75 0.425 to 2.00 0.075 to 0.425 < 0.075		
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW			
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols		
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7			
			Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)		Sils and Clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity		Material Sand Coarse Medium Fine Silt or Clay
						CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
OL	Organic silts and organic silty clays of low plasticity								
Sils and Clays (Liquid limit greater than 50)	MH	Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts							
	CH	Inorganic clays of high plasticity, fat clays							
	OH	Organic clays of medium to high plasticity, organic silts							
	Pt	Peat and other highly organic soils		Von Post Classification Limit	Strong colour or odour, and often fibrous texture				

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)	▽ Water Level at Time of Drilling
PL - Plastic Limit (%)	▼ Water Level at End of Drilling
PI - Plasticity Index (%)	▽ Water Level After Drilling as Indicated on Test Hole Logs
MC - Moisture Content (%)	
SPT - Standard Penetration Test	
RQD- Rock Quality Designation	
Qu - Unconfined Compression	
Su - Undrained Shear Strength	
VW - Vibrating Wire Piezometer	
SI - Slope Incliner	

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>Undrained Shear Strength (kPa)</u>
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200



Sub-Surface Log

Test Hole TH20-01

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-LI-01 Local Streets and Alleys (Coniston St / Gauvin St) Location: UTM N-5526271, E-635095
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 14, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0		SAND (FILL) - silty, some gravel, trace clay, light brown, frozen, moist and compact when thawed, poorly graded fine grained sand to gravel (<25 mm diam.), angular crushed limestone	G01													
0.0		SILT AND CLAY - trace organics, trace sand, trace gravel (<30 mm diam.) - mottled dark brown and black - frozen to 1.5 m depth, moist and soft to firm when thawed - intermediate plasticity	G02													
0.5			G03													
1.0			G04													
1.5			G05													
2.0			G06													
2.5		CLAY - silty - mottled brown to grey - moist, firm to stiff - high plasticity	G07													
3.0			G08													

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open and dry to 2.1 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 2.8 m North and 2.7 m West of hydro pole located on the Northeast corner of the alley at Coniston St.

Logged By: Nuno Mendonca Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_0_A_NM CONISTON GAVIN.GPJ_TREK GEOTECHNICAL.GDT_2/28/20



Sub-Surface Log

Test Hole TH20-02

1 of 1

Client: WSP Canada **Project Number:** 1000-043-10
Project Name: 20-LI-01 Local Streets and Alleys (Coniston St / Gauvin St) **Location:** UTM N-5526200, E-635094
Contractor: Maple Leaf Drilling Ltd. **Ground Elevation:** Existing Ground
Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount **Date Drilled:** January 14, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					0	20	40	60	80	100	0	50	100	150	200	250
					PL MC LL						<input checked="" type="checkbox"/> Torvane <input type="checkbox"/> <input checked="" type="checkbox"/> Pocket Pen. <input checked="" type="checkbox"/> <input type="checkbox"/> Qu <input type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>					
0.0 - 0.2		SAND (FILL) - silty, some gravel, trace clay, light brown, frozen, moist and compact when thawed, poorly graded fine grained sand to gravel (<25 mm diam.), angular crushed limestone	G09													
0.2 - 0.4		SILT AND CLAY - trace sand - dark brown - frozen, moist and soft to firm when thawed - high plasticity	G10													
0.4 - 1.2		SILT - clayey, trace sand, trace organics - light brown - frozen to 1.2 m depth, moist and soft to firm when thawed - intermediate plasticity	G11													
1.2 - 1.8		- very stiff below 1.2 m	G12													
1.8 - 2.0			G13													
2.0 - 2.7		CLAY - silty - mottled brown to grey - moist, stiff to very stiff - high plasticity	G14													
2.7 - 3.0		- firm to stiff below 2.7 m	G15													

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open and dry to 1.8 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 1.7 m North and 5.7 m East from the Southeast corner of the garage at house #54 of Chandos Av.

Logged By: Nuno Mendonca **Reviewed By:** Angela Fidler-Kliewer **Project Engineer:** Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_A_NM CONISTON GAVIN.GPJ_TREK GEOTECHNICAL.GDT_2/28/20



Sub-Surface Log

Test Hole TH20-04

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-LI-01 Local Streets and Alleys (Coniston St / Gauvin St) Location: UTM N-5526161, E-635100
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 14, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.2		SAND (FILL) - silty, some gravel, trace clay, light brown, frozen, moist and compact when thawed, poorly graded fine grained sand to gravel (<25 mm diam.), angular crushed limestone	G16													
0.2 - 0.5		SILT AND CLAY - trace organics - mottled dark brown and black - frozen, moist and firm to stiff when thawed - intermediate to high plasticity	G17													
0.5 - 1.0		SILT - trace to some clay, trace organics - light brown to black - frozen to 1.1 m depth, moist to wet and soft when thawed - low plasticity	G18													
1.0 - 1.5		- no organics, light brown below 1.2 m	G19													
1.5 - 2.0		CLAY - silty - brown - moist, very stiff - high plasticity	G20													
2.0 - 2.5		- mottled brown and grey, firm below 2.3 m	G21													
2.5 - 3.0			G22													

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage observed. Sloughing observed at 1.5 m in silt.
 2) Test hole open and dry to 1.5 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 1.2 m South and 2.6 m East from Northeast corner of alley crossing at house #601 of Lyndale Drive.

Logged By: Nuno Mendonca Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_0_A_NM CONISTON GAVIN.GPJ_TREK GEOTECHNICAL.GDT_2/28/20



Sub-Surface Log

Test Hole TH20-05

1 of 1

Client: WSP Canada **Project Number:** 1000-043-10
Project Name: 20-LI-01 Local Streets and Alleys (Coniston St / Gauvin St) **Location:** UTM N-5526155, E-635156
Contractor: Maple Leaf Drilling Ltd. **Ground Elevation:** Existing Ground
Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount **Date Drilled:** January 14, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21						
					Particle Size (%)											
					0	20	40	60	80	100						
					PL	MC	LL				0	50	100	150	200	250
0.0 - 0.5		SAND (FILL) - silty, some gravel, trace clay, light brown, frozen, moist and compact when thawed, poorly graded fine grained sand to gravel (<25 mm diam.), angular crushed limestone	Grab	G30												
0.5 - 0.8			Grab	G31												
0.8 - 1.8		SILT AND CLAY - trace organics, trace sand, trace gravel (<25 mm diam.) - mottled brown and black - frozen to 1.8 m depth, moist and soft and firm when thawed - high plasticity	Grab	G32												
1.8 - 2.0		- stiff below 1.2 m	Grab	G33												
2.0 - 2.4		- trace silt inclusions (<10 mm diam.), no trace gravel, no organics, no trace sand below 1.8 m	Grab	G34												
2.4 - 3.0			Grab	G35												
3.0			Grab	G36												

END OF TEST HOLE AT 3.0 m IN SILT AND CLAY
 1) No seepage or sloughing observed.
 2) Test hole open and dry to 2.4 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 3.2 m North and 6.2 m West of the Northeast corner of the garage at house #615 of Lyndale Drive.

Logged By: Nuno Mendonca **Reviewed By:** Angela Fidler-Kliewer **Project Engineer:** Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS 1000-043-10 0.0 A NM CONISTON GAVIN GP J TREK GEOTECHNICAL GDT 2/28/20



Sub-Surface Log

Test Hole TH20-06

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-LI-01 Local Streets and Alleys (Coniston St / Gauvin St) Location: UTM N-5526150, E-635220
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 14, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)				
					16	17	18	19	20	21	Test Type				
					Particle Size (%)										
					0	20	40	60	80	100					
					PL MC LL 0 20 40 60 80 100										
					0 20 40 60 80 100						0 50 100 150 200 250				
0.0 - 0.2		SAND (FILL) - silty, some gravel, trace clay, light brown, frozen, moist and compact when thawed, poorly graded fine grained sand to gravel (<25 mm diam.), angular crushed limestone	▲	G37	●										
0.2 - 0.6		SILT AND CLAY - trace organics, trace to some sand, trace gravel (<20 mm diam.) - dark grey - frozen, moist and firm when thawed - intermediate plasticity - no gravel below 0.6 m	▲	G38	●										
0.6 - 1.0			▲	G39			●								
1.0 - 1.4			▲	G40			●								
1.4 - 1.8		SILT - trace clay - light brown - frozen to 1.5 m depth, moist and soft to firm when thawed - low plasticity	▲	G41			●								
1.8 - 2.2			▲	G42			●								
2.2 - 3.0		CLAY - silty, trace silt inclusions (<10 mm diam.) - brown - moist, very stiff - high plasticity	▲	G43			●								△

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage observed. Sloughing observed at 1.2 m in Silt.
 2) Test hole open and dry to 1.2 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 2.5 m North and 3.0 m West of Southeast corner of the fence at house #631 of Lyndale Drive.

Logged By: Nuno Mendonca Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_A_NM CONISTON GAVIN GP.J_TREK GEOTECHNICAL GDT_2/28/20



Sub-Surface Log

Test Hole TH20-33

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-LI-01 Local Streets and Alleys (Coniston St / Gauvin St) Location: UTM N-5526235, E-635080
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 28, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21						
					Particle Size (%)											
					0	20	40	60	80	100						
					PL	MC	LL				Test Type					
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.2		SAND (FILL) - silty, some gravel, trace clay, light brown, frozen, moist and compact when thawed, poorly graded fine grained sand to gravel (<25 mm diam.), angular crushed limestone	G	G300												
0.2 - 1.4		SILT AND CLAY - trace organics - greyish brown - frozen to 1.4 m depth, moist and soft to firm when thawed - high plasticity	G	G301												
0.4 - 0.8			G	G302												
0.8 - 1.4			G	G303												
1.4 - 1.6			G	G304												
1.6 - 1.8			G	G305												
1.8 - 2.2																
2.2 - 2.8		CLAY - silty - brown - moist, firm - high plasticity	G	G306												
2.8 - 3.0			G	G307												

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage or sloughing observed.
- 2) Test hole open and dry to 3.0 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings and bentonite chips to surface.
- 4) Test hole located at the center line of the backlane and center of the garage doors of house #172 of Coniston St.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_A_NM CONISTON GAVIN GP.J_TREK GEOTECHNICAL GDT_2/28/20



20-LI-01 Alley Renewal - Coniston St. / Gauvin St.
Sub-Surface Investigation

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index
TH20-01	UTM : 5526271 N, 635095 E Located 2.8 m North and 2.7 m West of hydro pole located on Northeast corner of the alley at Coniston St.	Asphalt	N/A	Concrete	N/A	Sand and Gravel	0.0	0.1	14							
						Silt and Clay	0.3	0.5	20							
						Silt and Clay	0.6	0.8	35							
						Silt and Clay	0.9	1.1	38							
						Silt and Clay	1.2	1.4	38							
						Silt and Clay	1.7	1.8	41							
						Clay	2.1	2.3	46							
						Clay	2.9	3.0	49							
TH20-02	UTM : 5526200 N, 635094 E Located 1.7 m North and 5.7 m East from Southeast corner of garage of 54 Chandos Ave.	Asphalt	N/A	Concrete	N/A	Sand and Gravel	0.0	0.1	10							
						Silt and Clay	0.3	0.5	30							
						Silt	0.6	0.8	30							
						Silt	0.9	1.1	32	23	73	4	0	17	33	16
						Silt	1.2	1.4	25							
						Clay	1.5	1.8	39							
						Clay	2.9	3.0	48							
TH20-03	UTM : 5526155 N, 635055 E Located 3.3 m North and 0.6 m East from Northwest corner of shed at 593 Lyndale Drive.	Asphalt	N/A	Concrete	N/A	Sand and Gravel	0.0	0.1	9							
						Silt and Clay	0.3	0.5	34							
						Silt and Clay	0.6	0.8	30	54	43	3	0	23	73	51
						Silt and Clay	0.9	1.1	35							
						Silt	1.2	1.4	31							
						Clay	1.5	1.7	34							
						Clay	2.9	3.0	42							
TH20-04	UTM : 5526161 N, 635100 E Located 1.2 m South and 2.6 m East from Northeast corner of akkey crossing near 601 Lyndale Drive.	Asphalt	N/A	Concrete	N/A	Sand and Gravel	0.0	0.2	10							
						Silt and Clay	0.3	0.5	30							
						Silt and Clay	0.6	0.8	32							
						Silt	0.9	1.1	41							
						Silt	1.2	1.4	18							
						Clay	1.5	1.7	38							
						Clay	2.9	3.0	49							



Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley Package - Coniston St. / Gauvin St.

Sample Date 14-Jan-20
Test Date 28-Jan-20
Technician BMH

Test Hole	TH20-01	TH20-01	TH20-01	TH20-01	TH20-01	TH20-01
Depth (m)	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.7 - 1.8
Sample #	G01	G02	G03	G04	G05	G06
Tare ID	AC08	A26	W99	N18	F47	E3
Mass of tare	6.7	8.4	8.6	8.6	8.7	8.6
Mass wet + tare	142.5	251.5	162.9	291.6	217.5	180.9
Mass dry + tare	125.6	211.2	122.9	213.7	159.6	131.2
Mass water	16.9	40.3	40.0	77.9	57.9	49.7
Mass dry soil	118.9	202.8	114.3	205.1	150.9	122.6
Moisture %	14.2%	19.9%	35.0%	38.0%	38.4%	40.5%

Test Hole	TH20-01	TH20-01	TH20-02	TH20-02	TH20-02	TH20-02
Depth (m)	2.1 - 2.3	2.9 - 3.0	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1
Sample #	G07	G08	G09	G10	G11	G12
Tare ID	H12	F52	D29	Z58	W100	Z59
Mass of tare	8.6	8.5	8.3	8.7	8.5	8.5
Mass wet + tare	225.3	147.1	275.3	171.1	400.4	183.5
Mass dry + tare	157.1	101.5	250.9	133.2	311.2	141.6
Mass water	68.2	45.6	24.4	37.9	89.2	41.9
Mass dry soil	148.5	93.0	242.6	124.5	302.7	133.1
Moisture %	45.9%	49.0%	10.1%	30.4%	29.5%	31.5%

Test Hole	TH20-02	TH20-02	TH20-02	TH20-03	TH20-03	TH20-03
Depth (m)	1.2 - 1.4	1.5 - 1.8	2.9 - 3.0	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8
Sample #	G13	G14	G15	G23	G24	G25
Tare ID	H2	K33	N24	W28	N07	E59
Mass of tare	8.5	8.6	8.6	8.8	8.8	8.5
Mass wet + tare	203.3	290.0	195.6	251.0	182.6	365.2
Mass dry + tare	163.9	210.5	135.2	230.8	138.1	283.2
Mass water	39.4	79.5	60.4	20.2	44.5	82.0
Mass dry soil	155.4	201.9	126.6	222.0	129.3	274.7
Moisture %	25.4%	39.4%	47.7%	9.1%	34.4%	29.9%



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Moisture Content Report ASTM D2216-10

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley Package - Coniston St. / Gauvin St.

Sample Date 14-Jan-20
Test Date 28-Jan-20
Technician BMH

Test Hole	TH20-03	TH20-03	TH20-03	TH20-03	TH20-04	TH20-04
Depth (m)	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.9 - 3.0	0.0 - 0.2	0.3 - 0.5
Sample #	G26	G27	G28	G29	G16	G17
Tare ID	P06	Z38	N45	D3	H59	Z37
Mass of tare	8.8	8.6	8.6	8.5	9.5	8.6
Mass wet + tare	167.6	248.5	218.8	143.2	367.3	198.8
Mass dry + tare	126.6	191.9	165.6	103.5	335.4	154.7
Mass water	41.0	56.6	53.2	39.7	31.9	44.1
Mass dry soil	117.8	183.3	157.0	95.0	325.9	146.1
Moisture %	34.8%	30.9%	33.9%	41.8%	9.8%	30.2%

Test Hole	TH20-04	TH20-04	TH20-04	TH20-04	TH20-04	TH20-05
Depth (m)	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.9 - 3.0	0.0 - 0.2
Sample #	G18	G19	G20	G21	G22	G30
Tare ID	W45	E18	F17	D5	K7	H14
Mass of tare	8.6	8.5	8.8	8.4	8.6	8.4
Mass wet + tare	155.7	88.9	154.5	154.5	204.3	387.2
Mass dry + tare	119.9	65.6	132.0	114.5	140.3	367.7
Mass water	35.8	23.3	22.5	40.0	64.0	19.5
Mass dry soil	111.3	57.1	123.2	106.1	131.7	359.3
Moisture %	32.2%	40.8%	18.3%	37.7%	48.6%	5.4%

Test Hole	TH20-05	TH20-05	TH20-05	TH20-05	TH20-05	TH20-05
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.8 - 2.0	2.9 - 3.0
Sample #	G31	G32	G33	G34	G35	G36
Tare ID	F10	AB71	Z102	B12	C17	AB01
Mass of tare	8.8	6.8	8.6	8.8	8.7	6.8
Mass wet + tare	160.0	278.6	263.5	233.2	176.5	135.4
Mass dry + tare	150.6	219.6	194.8	170.2	126.8	92.6
Mass water	9.4	59.0	68.7	63.0	49.7	42.8
Mass dry soil	141.8	212.8	186.2	161.4	118.1	85.8
Moisture %	6.6%	27.7%	36.9%	39.0%	42.1%	49.9%



Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley Package - Coniston St. / Gauvin St.

Sample Date 14-Jan-20
Test Date 28-Jan-20
Technician BMH

Test Hole	TH20-06	TH20-06	TH20-06	TH20-06	TH20-06	TH20-06
Depth (m)	0.0 - 0.3	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.7 - 1.8
Sample #	G37	G38	G39	G40	G41	G42
Tare ID	N51	N84	AB05	E107	D39	F41
Mass of tare	8.6	8.5	6.9	8.6	8.3	8.5
Mass wet + tare	162.1	186.1	200.2	132.2	229.4	236.7
Mass dry + tare	146.6	152.9	147.3	98.3	182.2	191.4
Mass water	15.5	33.2	52.9	33.9	47.2	45.3
Mass dry soil	138.0	144.4	140.4	89.7	173.9	182.9
Moisture %	11.2%	23.0%	37.7%	37.8%	27.1%	24.8%

Test Hole	TH20-06	TH20-33	TH20-33	TH20-33	TH20-33	TH20-33
Depth (m)	2.3 - 2.4	0.0 - 0.2	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4
Sample #	G43	G300	G301	G302	G303	G304
Tare ID	Z23	D42	Z13	Q01	H24	W15
Mass of tare	8.6	8.6	8.6	8.8	8.8	8.7
Mass wet + tare	172.9	156.8	147.0	145.5	124.6	130.7
Mass dry + tare	132.8	126.2	112.8	109.3	93.8	100.1
Mass water	40.1	30.6	34.2	36.2	30.8	30.6
Mass dry soil	124.2	117.6	104.2	100.5	85.0	91.4
Moisture %	32.3%	26.0%	32.8%	36.0%	36.2%	33.5%

Test Hole	TH20-33	TH20-33	TH20-33			
Depth (m)	1.4 - 1.5	2.3 - 2.4	2.9 - 3.0			
Sample #	G305	G306	G307			
Tare ID	F23	Z140	P33			
Mass of tare	8.6	8.8	8.5			
Mass wet + tare	280.5	192.6	181.7			
Mass dry + tare	215.0	137.1	129.2			
Mass water	65.5	55.5	52.5			
Mass dry soil	206.4	128.3	120.7			
Moisture %	31.7%	43.3%	43.5%			



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Atterberg Limits
ASTM D4318-10e1

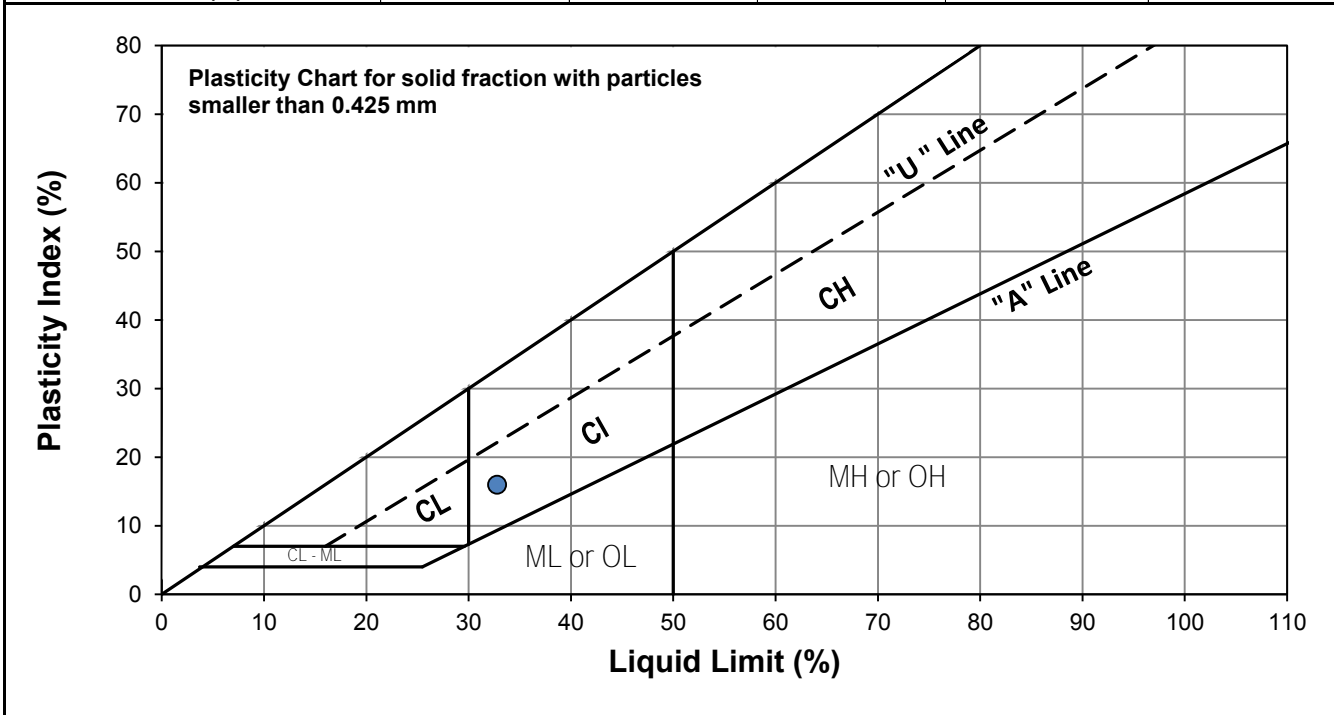
Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley Package - Coniston St. / Gauvin St.
Test Hole TH20-02
Sample # G11
Depth (m) 0.9 - 1.1
Sample Date 17-Jan-20
Test Date 12-Feb-20
Technician HS



Liquid Limit	33
Plastic Limit	17
Plasticity Index	16

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	18	24	35
Mass Wet Soil + Tare (g)	23.847	26.520	25.449
Mass Dry Soil + Tare (g)	21.409	23.428	22.691
Mass Tare (g)	14.191	14.071	13.970
Mass Water (g)	2.438	3.092	2.758
Mass Dry Soil (g)	7.218	9.357	8.721
Moisture Content (%)	33.777	33.045	31.625



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.156	14.028			
Mass Wet Soil + Tare (g)	22.512	24.342			
Mass Dry Soil + Tare (g)	21.310	22.854			
Mass Water (g)	1.202	1.488			
Mass Dry Soil (g)	7.154	8.826			
Moisture Content (%)	16.802	16.859			



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Client WSP
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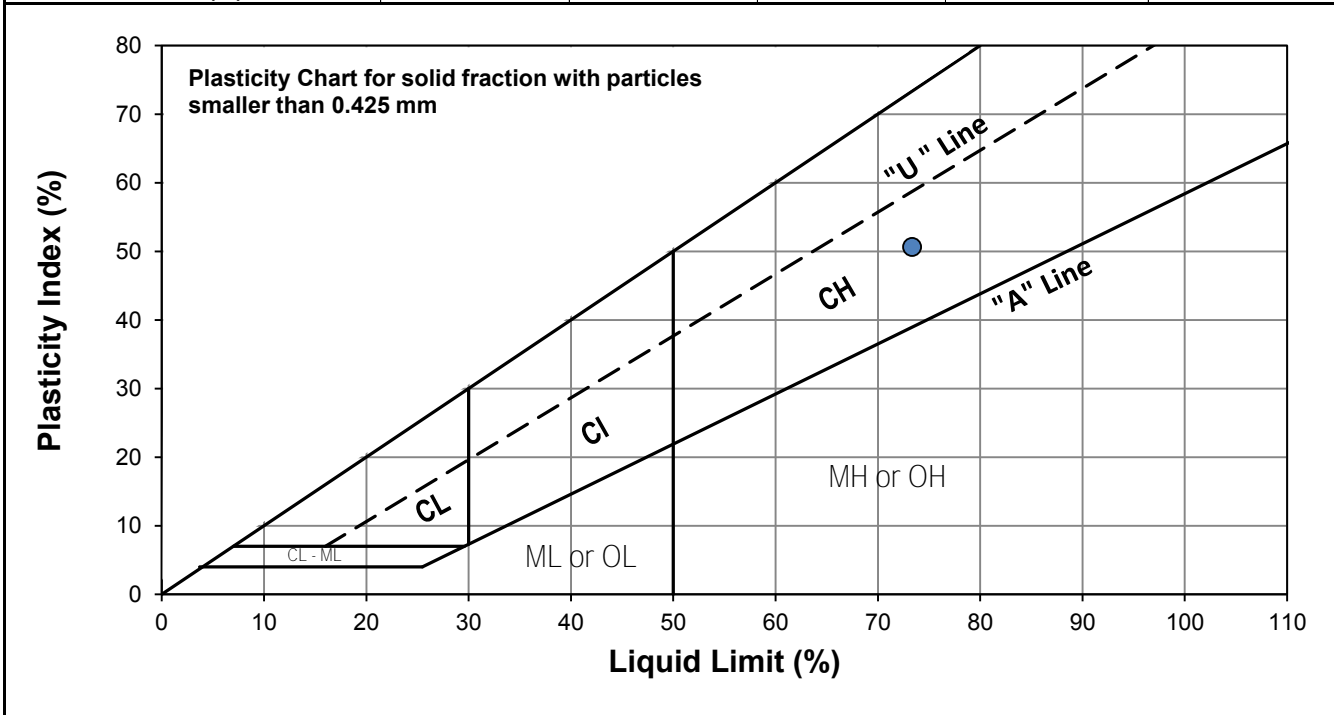


Test Hole TH20-03
Sample # G25
Depth (m) 0.6 - 0.8
Sample Date 17-Jan-20
Test Date 12-Feb-20
Technician HS

Liquid Limit	73
Plastic Limit	23
Plasticity Index	51

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	23	25	33
Mass Wet Soil + Tare (g)	23.209	26.084	27.022
Mass Dry Soil + Tare (g)	19.299	21.004	21.728
Mass Tare (g)	14.012	14.087	14.277
Mass Water (g)	3.910	5.080	5.294
Mass Dry Soil (g)	5.287	6.917	7.451
Moisture Content (%)	73.955	73.442	71.051



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.141	14.164			
Mass Wet Soil + Tare (g)	20.752	22.763			
Mass Dry Soil + Tare (g)	19.530	21.168			
Mass Water (g)	1.222	1.595			
Mass Dry Soil (g)	5.389	7.004			
Moisture Content (%)	22.676	22.773			



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Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley Package - Coniston St. / Gauvin St.

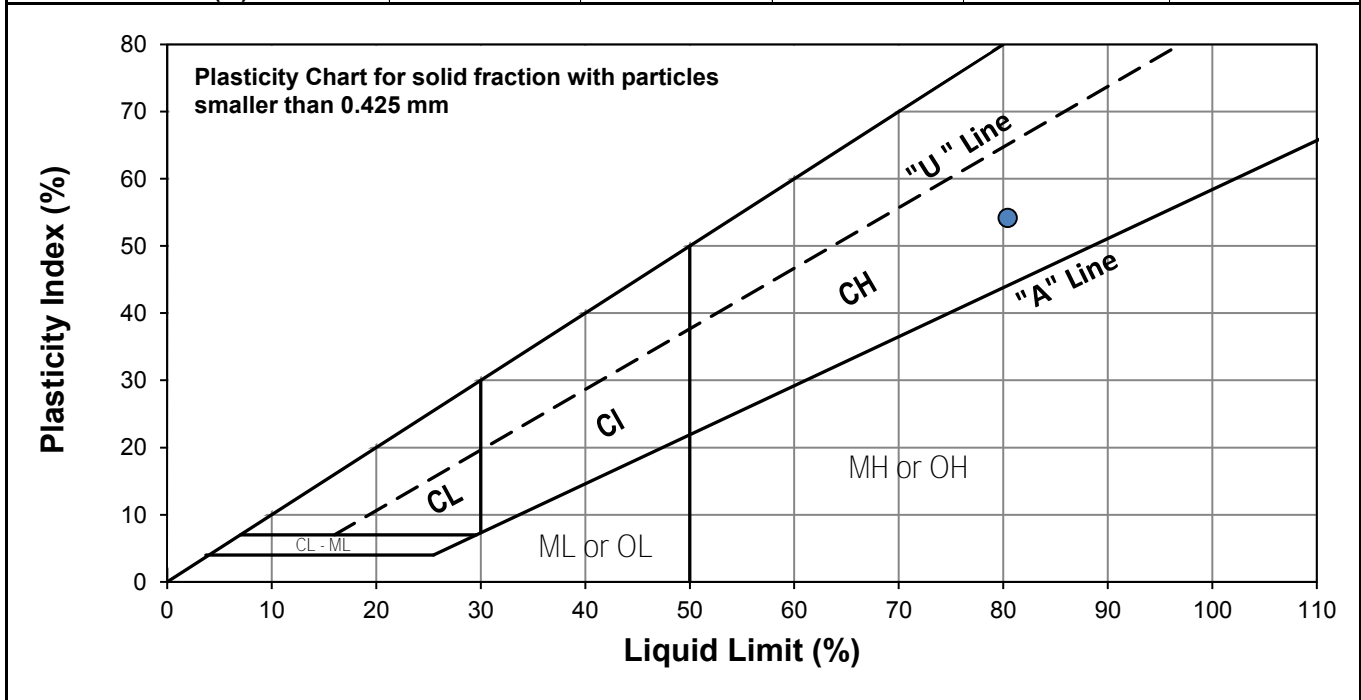


Test Hole TH20-05
Sample # G33
Depth (m) 0.9 - 1.1
Sample Date 28-Jan-20
Test Date 12-Feb-20
Technician HS

Liquid Limit	80
Plastic Limit	26
Plasticity Index	54

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	18	24	34
Mass Wet Soil + Tare (g)	42.254	42.806	44.040
Mass Dry Soil + Tare (g)	39.300	39.486	40.370
Mass Tare (g)	35.791	35.419	35.553
Mass Water (g)	2.954	3.320	3.670
Mass Dry Soil (g)	3.509	4.067	4.817
Moisture Content (%)	84.184	81.633	76.188



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	35.471	35.964			
Mass Wet Soil + Tare (g)	42.063	42.705			
Mass Dry Soil + Tare (g)	40.702	41.294			
Mass Water (g)	1.361	1.411			
Mass Dry Soil (g)	5.231	5.330			
Moisture Content (%)	26.018	26.473			



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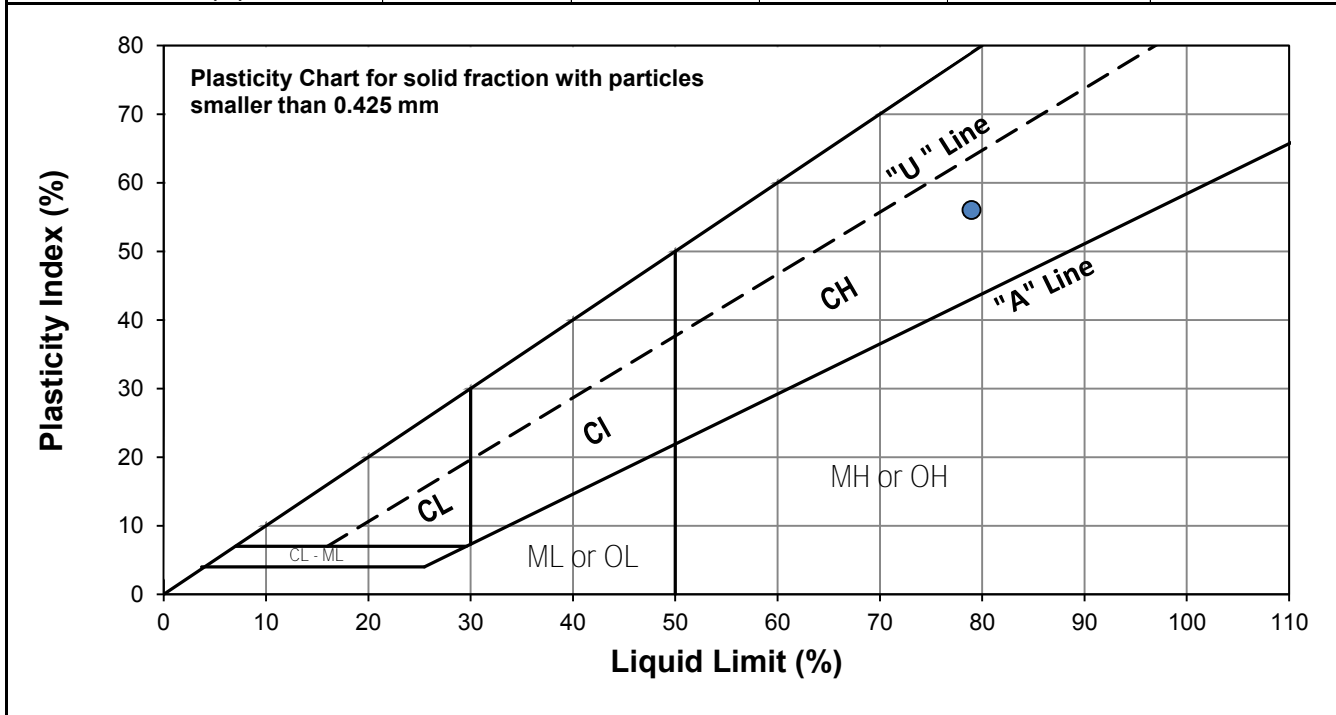
Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley Package - Coniston St. / Gauvin St.
Test Hole TH20-33
Sample # G302
Depth (m) 0.6 - 0.8
Sample Date 28-Jan-20
Test Date 20-Feb-20
Technician HS



Liquid Limit	79
Plastic Limit	23
Plasticity Index	56

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	17	23	30
Mass Wet Soil + Tare (g)	25.538	22.545	25.984
Mass Dry Soil + Tare (g)	20.406	18.762	20.791
Mass Tare (g)	14.211	13.996	14.086
Mass Water (g)	5.132	3.783	5.193
Mass Dry Soil (g)	6.195	4.766	6.705
Moisture Content (%)	82.841	79.375	77.450



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.175	14.188			
Mass Wet Soil + Tare (g)	20.905	20.888			
Mass Dry Soil + Tare (g)	19.642	19.642			
Mass Water (g)	1.263	1.246			
Mass Dry Soil (g)	5.467	5.454			
Moisture Content (%)	23.102	22.846			



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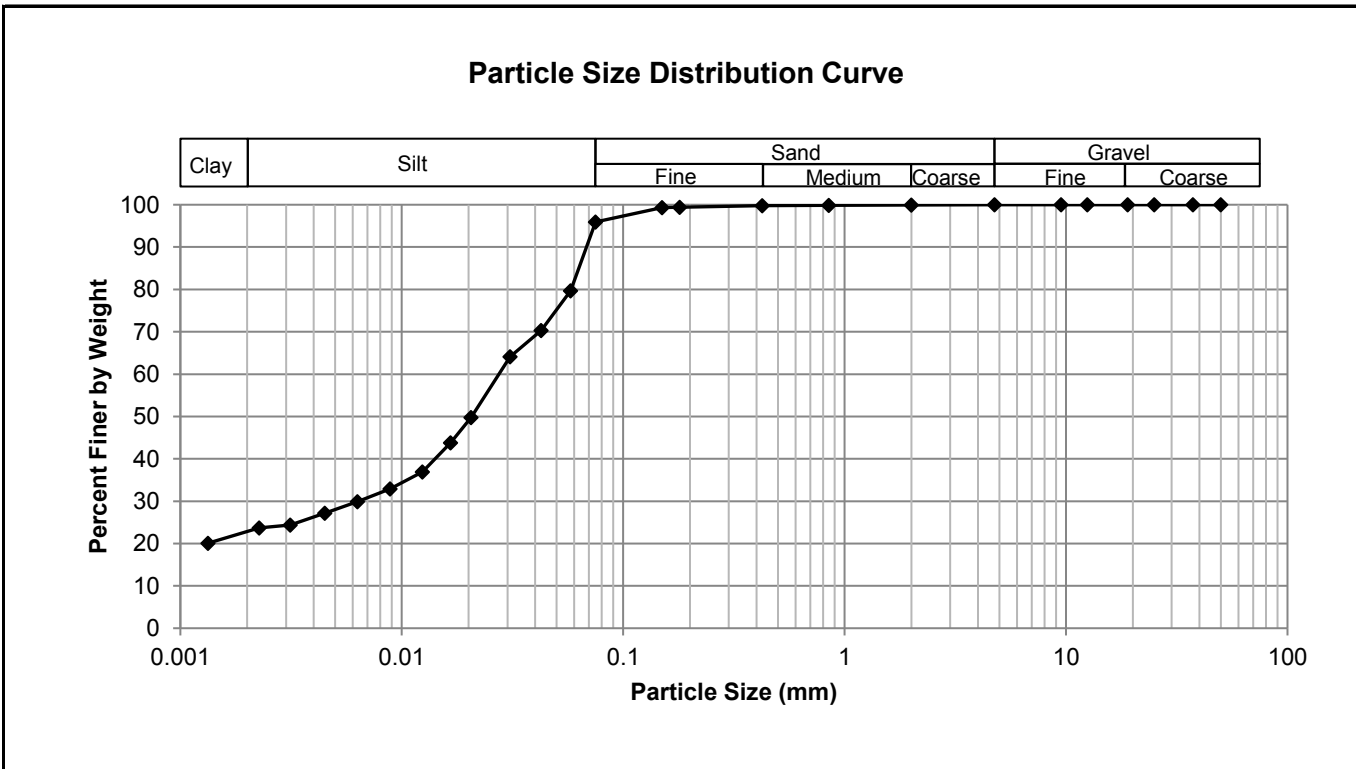
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley Package - Coniston St. / Gauvin St.



Test Hole TH20-02
Sample # G11
Depth (m) 0.6 - 0.8
Sample Date 14-Jan-20
Test Date 1-Feb-20
Technician HS

Gravel	0.0%
Sand	4.0%
Silt	73.3%
Clay	22.7%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	95.96
37.5	100.00	2.00	99.96	0.0579	79.71
25.0	100.00	0.850	99.88	0.0426	70.33
19.0	100.00	0.425	99.77	0.0309	64.08
12.5	100.00	0.180	99.44	0.0206	49.76
9.50	100.00	0.150	99.32	0.0166	43.82
4.75	100.00	0.075	95.96	0.0124	36.95
				0.0089	32.94
				0.0063	29.87
				0.0045	27.17
				0.0031	24.35
				0.0023	23.73
				0.0013	20.07



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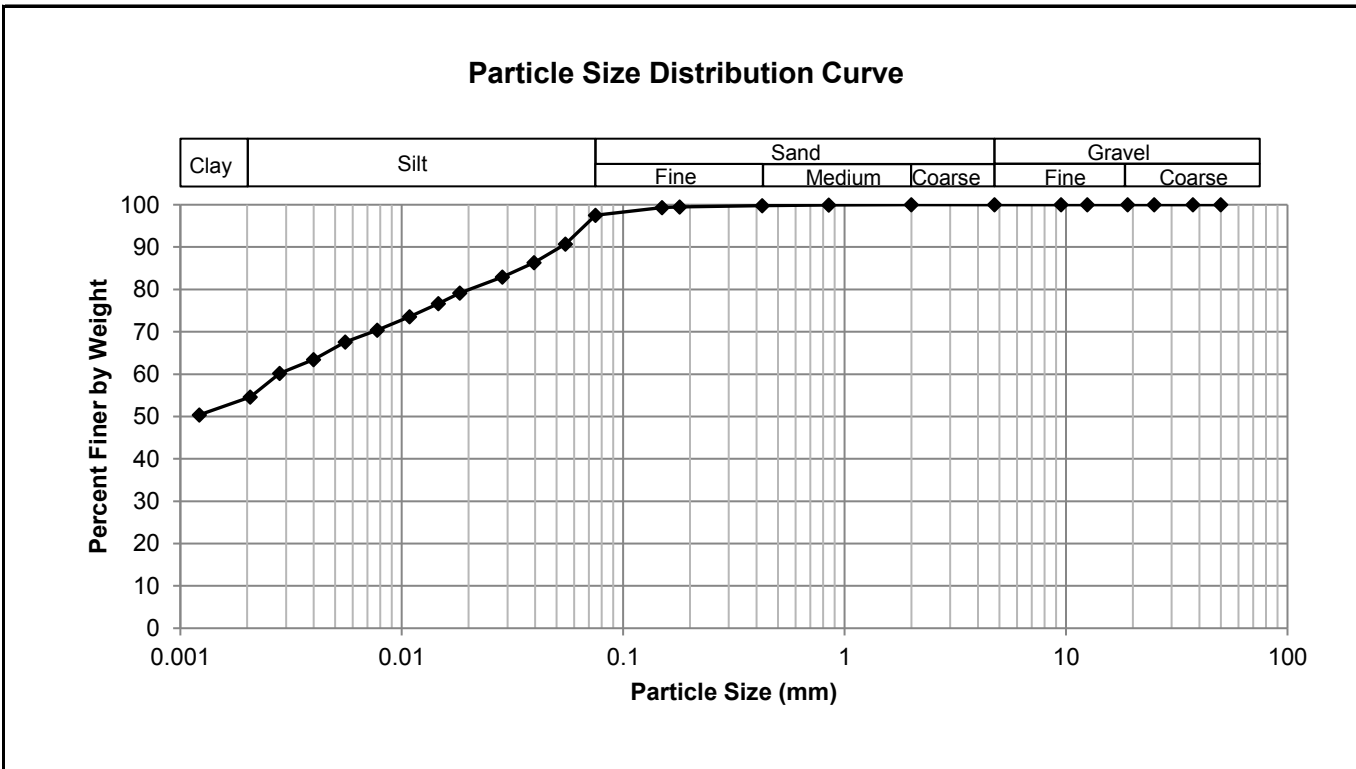
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley Package - Coniston St. / Gauvin St.



Test Hole TH20-03
Sample # G25
Depth (m) 0.6 - 0.8
Sample Date 14-Jan-20
Test Date 6-Feb-20
Technician HS

Gravel	0.0%
Sand	2.5%
Silt	43.3%
Clay	54.3%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	97.54
37.5	100.00	2.00	99.98	0.0549	90.72
25.0	100.00	0.850	99.90	0.0397	86.34
19.0	100.00	0.425	99.76	0.0285	82.90
12.5	100.00	0.180	99.50	0.0183	79.15
9.50	100.00	0.150	99.34	0.0146	76.65
4.75	100.00	0.075	97.54	0.0108	73.53
				0.0078	70.40
				0.0056	67.59
				0.0040	63.47
				0.0028	60.18
				0.0021	54.61
				0.0012	50.38



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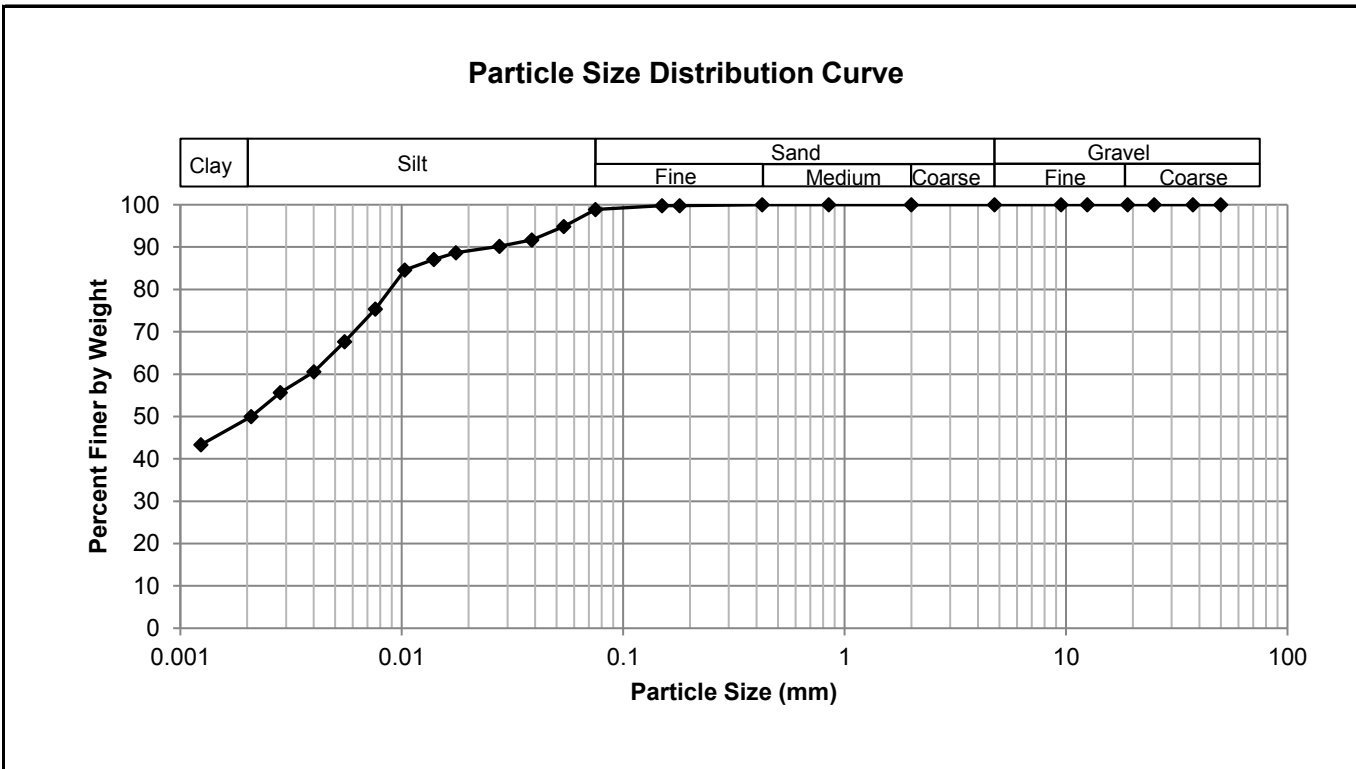
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alleys- Coniston/ Gauvin



Test Hole TH20-05
Sample # G33
Depth (m) 0.9 - 1.1
Sample Date 28-Jan-20
Test Date 19-Feb-20
Technician HS/JSB

Gravel	0.0%
Sand	1.1%
Silt	49.6%
Clay	49.3%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	98.87
37.5	100.00	2.00	100.00	0.0539	94.85
25.0	100.00	0.850	100.00	0.0387	91.72
19.0	100.00	0.425	100.00	0.0276	90.16
12.5	100.00	0.180	99.76	0.0176	88.67
9.50	100.00	0.150	99.76	0.0140	87.11
4.75	100.00	0.075	98.87	0.0103	84.61
				0.0076	75.37
				0.0055	67.71
				0.0040	60.59
				0.0028	55.66
				0.0021	49.96
				0.0012	43.33



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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

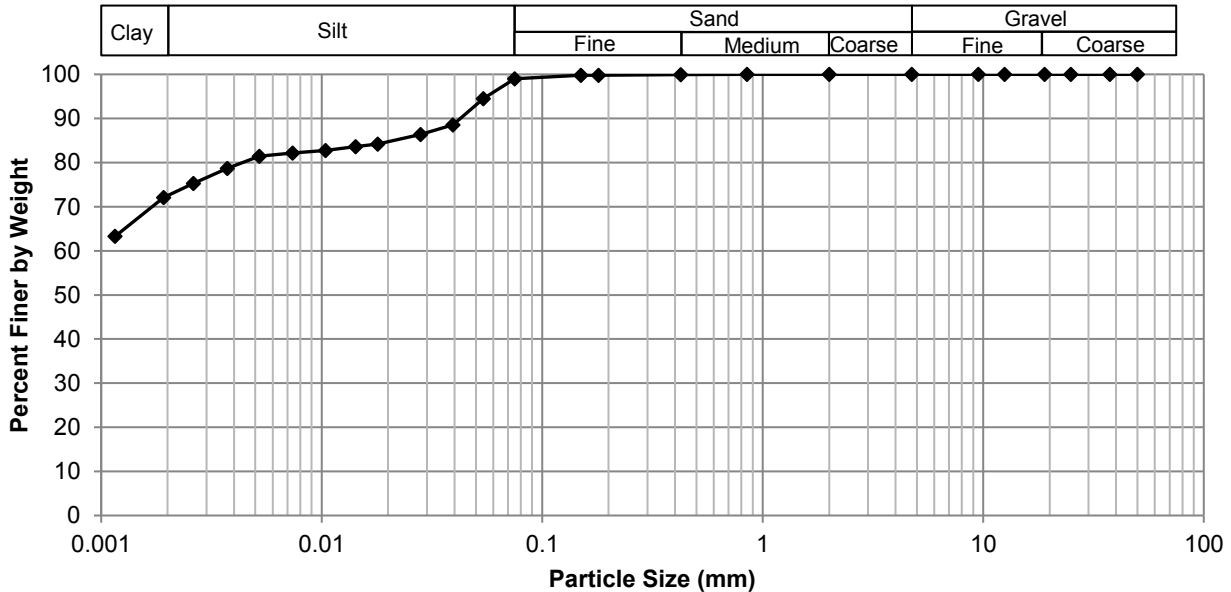
Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alleys- Coniston/ Gauvin

Test Hole TH20-33
Sample # G302
Depth (m) 0.6 - 0.8
Sample Date 28-Jan-20
Test Date 19-Feb-20
Technician HS/JSB



Gravel	0.0%
Sand	1.0%
Silt	26.5%
Clay	72.5%

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	99.03
37.5	100.00	2.00	100.00	0.0541	94.48
25.0	100.00	0.850	100.00	0.0394	88.54
19.0	100.00	0.425	99.97	0.0281	86.41
12.5	100.00	0.180	99.83	0.0180	84.23
9.50	100.00	0.150	99.83	0.0142	83.60
4.75	100.00	0.075	99.03	0.0104	82.73
				0.0074	82.17
				0.0052	81.42
				0.0037	78.67
				0.0026	75.30
				0.0019	72.11
				0.0012	63.28



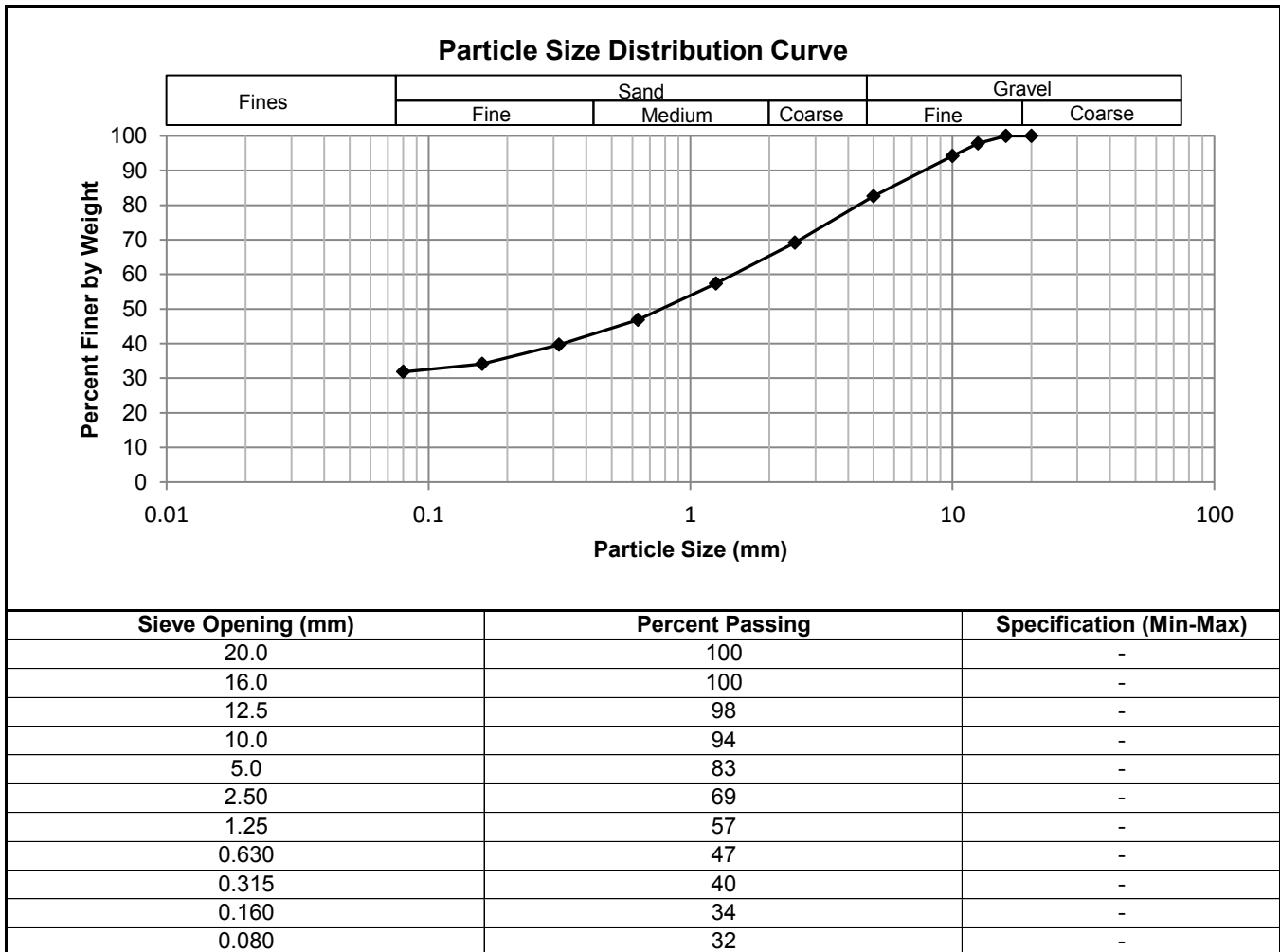
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Grain Size Analysis (Sieve Method)
ASTM C136-06

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley Package - Coniston St. / Gauvin St.

Test Hole TH20-05
Sample # G31
Depth (m) 0.3 - 0.5
Date Sampled 14-Jan-20
Date Tested 18-Feb-20
Technician HS

Total Weight (g)	775.0
Gravel %	17.4
Sand %	50.7
Fines %	31.8



Appendix B

Coniston St. / Highfield St.

Test Hole Logs, Summary Table, Lab Testing Results

GENERAL NOTES

- Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
- Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
- When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions	USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria		Particle Size			
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP More than 12 percent..... GM, GC, SM, SC 6 to 12 percent..... Borderline cases requiring dual symbols*	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	ASTM Sieve sizes #10 to #4 #40 to #10 #200 to #40 < #200			
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW				
		GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols			
		GC	Clayey gravels, gravel-sand-silt mixtures		Atterberg limits above "A" line or P.I. greater than 7				
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	mm 2.00 to 4.75 0.425 to 2.00 0.075 to 0.425 < 0.075		
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW			
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols		
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7			
			Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)		Sils and Clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity		Material Sand Coarse Medium Fine Silt or Clay
						CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
OL	Organic silts and organic silty clays of low plasticity								
Sils and Clays (Liquid limit greater than 50)	MH	Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts							
	CH	Inorganic clays of high plasticity, fat clays							
	OH	Organic clays of medium to high plasticity, organic silts							
	Pt	Peat and other highly organic soils		Von Post Classification Limit	Strong colour or odour, and often fibrous texture				

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)	▽ Water Level at Time of Drilling
PL - Plastic Limit (%)	▼ Water Level at End of Drilling
PI - Plasticity Index (%)	▽ Water Level After Drilling as Indicated on Test Hole Logs
MC - Moisture Content (%)	
SPT - Standard Penetration Test	
RQD- Rock Quality Designation	
Qu - Unconfined Compression	
Su - Undrained Shear Strength	
VW - Vibrating Wire Piezometer	
SI - Slope Incliner	

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>Undrained Shear Strength (kPa)</u>
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200



Sub-Surface Log

Test Hole TH20-07

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-LI-01 Local Streets and Alleys (Coniston St / Highfield St) Location: UTM N-5526297, E-634798
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 14, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.1		SAND (FILL) - no sample was retrieved														
0.1 - 0.9		SILT AND CLAY - trace sand, some organics - dark grey - frozen to 1.0 m depth, moist and firm when thawed - high plasticity		G44												
0.9 - 1.2		SILT - sandy, trace clay, trace gravel - light brown - moist and soft - low plasticity - some clay below 1.2 m		G45												
1.2 - 1.8		SILT - sandy, trace clay, trace gravel - light brown - moist and soft - low plasticity - some clay below 1.2 m		G46												
1.8 - 2.0		SILT - sandy, trace clay, trace gravel - light brown - moist and soft - low plasticity - some clay below 1.2 m		G47												
2.0 - 3.0		CLAY - silty - mottled brown and grey - moist, stiff to very stiff - high plasticity		G48												
3.0		CLAY - silty - mottled brown and grey - moist, stiff to very stiff - high plasticity		G49												

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage observed. Sloughing observed at 1.8 m in Silt.
- 2) Test hole open and dry to 1.8 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings and granular fill to surface.
- 4) Test hole located 5.7 m North and 3.7 m East of Southeast corner of the garage at house #80 of Monck Ave.

Logged By: Nuno Mendonca Reviewed By: _____ Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS 1000-043-10 0.0 A NM CONISTON HIGHFIELD.GPJ TREK GEOTECHNICAL GDT 2/28/20



Sub-Surface Log

Test Hole TH20-08

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-LI-01 Local Streets and Alleys (Coniston St / Highfield St) Location: UTM N-5526376, E-634800
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 14, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.2		SAND (FILL) - some silt, some gravel, trace clay, dark grey, frozen, moist and compact when thawed, well graded fine grained sand to gravel (<25 mm diam.), sub-rounded to angular crushed "pit run"	▲	G50	●											
0.2 - 0.5		ORGANIC CLAY (TOPSOIL) - silty, trace to some sand - black - frozen, moist and stiff when thawed - high plasticity	▲	G51		●										+
0.5 - 1.0		SILT AND CLAY - some organics - blackish grey - frozen, moist and firm to very stiff when thawed - high plasticity	▲	G52		●										+
1.0 - 1.5		SILT - trace clay - light brown and black - frozen to 1.5 m depth, moist to wet and stiff when thawed - low plasticity	▲	G53		●										+
1.5 - 2.0		SILT - trace clay - light brown and black - frozen to 1.5 m depth, moist to wet and stiff when thawed - low plasticity	▲	G54		●										+
2.0 - 3.0		CLAY - silty - mottled brown and grey - moist, stiff - high plasticity	▲	G55		●										+
3.0		CLAY - silty - mottled brown and grey - moist, stiff - high plasticity	▲	G56		●										+

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage observed. Sloughing observed at 1.8 m in Silt.
- 2) Test hole open and dry to 1.8 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings and granular fill to surface.
- 4) Test hole located 2.3 m West of the fence at #99 and centered with garage door of house #102 of Monck Ave.

Logged By: Nuno Mendonca Reviewed By: _____ Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS 1000-043-10 0. A. NM CONISTON HIGHFIELD.GPJ TREK GEOTECHNICAL GDT 2/28/20



Sub-Surface Log

Test Hole TH20-09

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-LI-01 Local Streets and Alleys (Coniston St / Highfield St) Location: UTM N-5526441, E-634800
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 14, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
		SAND (FILL) - no sample was retrieved														
		SILT AND CLAY - trace sand, trace organics - brown - frozen to 1.8 m depth, moist and stiff when thawed - high plasticity	G57													
			G58													
			G59													
		- trace rootlets at 1.0 m	G60													
		- very stiff, intermediate plasticity below 1.2 m	G61													
		- soft below 1.8 m														
		CLAY - silty - mottled brown and grey - moist, firm to stiff - high plasticity	G62													
			G63													

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage observed. Sloughing observed at 1.5 m.
- 2) Test hole open and dry to 1.5 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings and granular fill to surface.
- 4) Test hole located 3.0 m North and 3.5 West of Northwest corner of the garage at house #115 of Tache Ave.

Logged By: Nuno Mendonca Reviewed By: _____ Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_A_NM CONISTON HIGHFIELD.GPJ TREK GEOTECHNICAL GDT_2/28/20



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Moisture Content Report ASTM D2216-10

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley - Coniston St. / Highfield St.

Sample Date 14-Jan-20
Test Date 27-Jan-20
Technician BMH

Test Hole	TH20-07	TH20-07	TH20-07	TH20-07	TH20-07	TH20-07
Depth (m)	0.1 - 0.3	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.8 - 2.0	2.9 - 3.0
Sample #	G44	G45	G46	G47	G48	G49
Tare ID	A30	A27	E119	W20	AB07	Z87
Mass of tare	8.2	8.5	8.6	8.6	6.8	9.2
Mass wet + tare	245.2	189.4	487.0	210.5	224.8	168.2
Mass dry + tare	180.7	139.2	399.6	157.1	171.4	118.0
Mass water	64.5	50.2	87.4	53.4	53.4	50.2
Mass dry soil	172.5	130.7	391.0	148.5	164.6	108.8
Moisture %	37.4%	38.4%	22.4%	36.0%	32.4%	46.1%

Test Hole	TH20-08	TH20-08	TH20-08	TH20-08	TH20-08	TH20-08
Depth (m)	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	2.0 - 2.1
Sample #	G50	G51	G52	G53	G54	G55
Tare ID	N23	K19	E29	Z104	P09	Z107
Mass of tare	8.6	8.7	8.8	8.5	8.8	8.6
Mass wet + tare	309.5	283.9	179.3	231.9	171.3	216.5
Mass dry + tare	287.8	215.1	136.6	173.8	127.6	157.7
Mass water	21.7	68.8	42.7	58.1	43.7	58.8
Mass dry soil	279.2	206.4	127.8	165.3	118.8	149.1
Moisture %	7.8%	33.3%	33.4%	35.1%	36.8%	39.4%

Test Hole	TH20-08	TH20-09	TH20-09	TH20-09	TH20-09	TH20-09
Depth (m)	2.9 - 3.0	0.0 - 0.2	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4
Sample #	G56	G57	G58	G59	G60	G61
Tare ID	P34	E10	H22	F114	E88	F8
Mass of tare	8.7	8.8	8.6	9.6	9.2	8.7
Mass wet + tare	149.9	152.8	362.9	306.8	139.0	191.7
Mass dry + tare	105.1	124.4	292.9	242.0	106.6	149.6
Mass water	44.8	28.4	70.0	64.8	32.4	42.1
Mass dry soil	96.4	115.6	284.3	232.4	97.4	140.9
Moisture %	46.5%	24.6%	24.6%	27.9%	33.3%	29.9%



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Moisture Content Report ASTM D2216-10

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley - Coniston St. / Highfield St.

Sample Date 14-Jan-20
Test Date 27-Jan-20
Technician BMH

Test Hole	TH20-09	TH20-09				
Depth (m)	2.3 - 2.4	2.9 - 3.0				
Sample #	G62	G63				
Tare ID	F9	D19				
Mass of tare	8.8	8.6				
Mass wet + tare	265.9	211.2				
Mass dry + tare	210.5	152.1				
Mass water	55.4	59.1				
Mass dry soil	201.7	143.5				
Moisture %	27.5%	41.2%				



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Atterberg Limits
ASTM D4318-10e1

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley - Coniston St. / Highfield St.

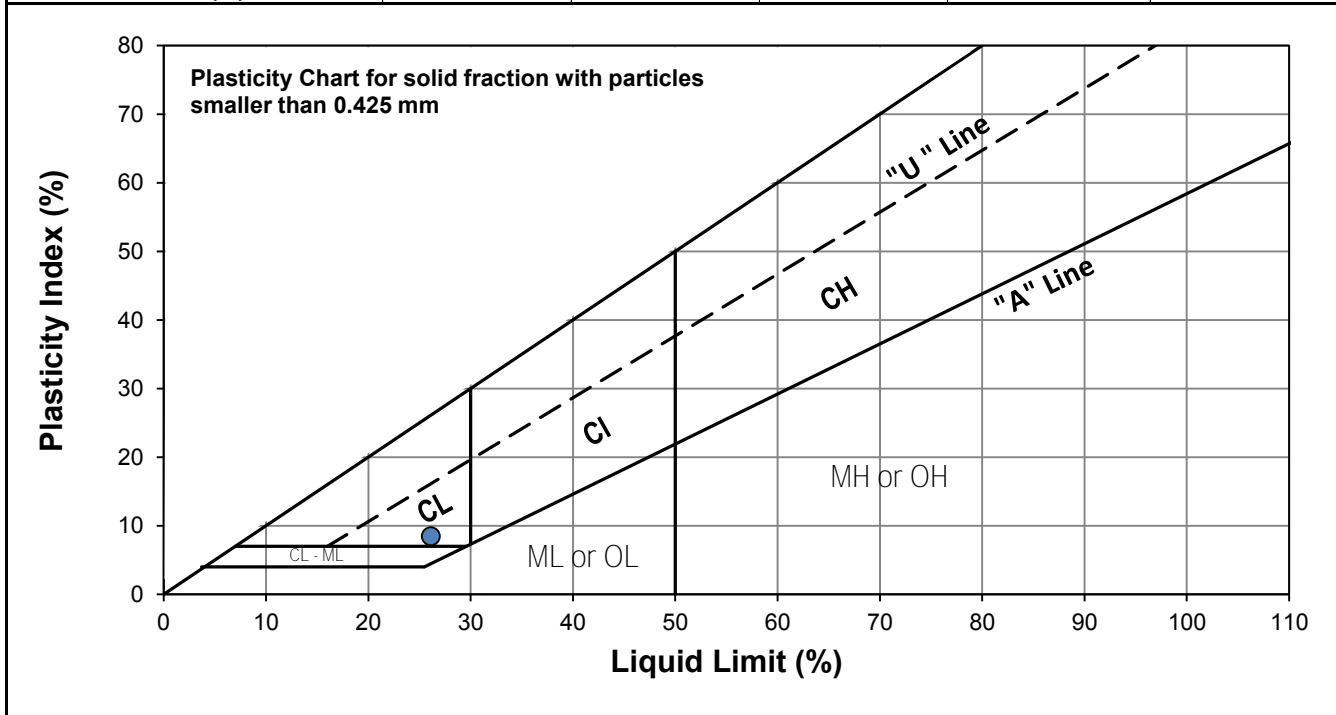


Test Hole TH20-07
Sample # G46
Depth (m) 0.9 - 1.1
Sample Date 14-Jan-20
Test Date 12-Feb-20
Technician HS

Liquid Limit	26
Plastic Limit	18
Plasticity Index	8

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	16	22	27
Mass Wet Soil + Tare (g)	26.017	32.320	26.441
Mass Dry Soil + Tare (g)	23.399	28.528	23.902
Mass Tare (g)	14.107	14.365	14.030
Mass Water (g)	2.618	3.792	2.539
Mass Dry Soil (g)	9.292	14.163	9.872
Moisture Content (%)	28.175	26.774	25.719



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.009	14.089			
Mass Wet Soil + Tare (g)	23.610	20.309			
Mass Dry Soil + Tare (g)	22.172	19.374			
Mass Water (g)	1.438	0.935			
Mass Dry Soil (g)	8.163	5.285			
Moisture Content (%)	17.616	17.692			



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Atterberg Limits
ASTM D4318-10e1

Project No. 1000-043-10
Client WSP
Project 2020 Local Streets and Alleys - Coniston St. / Highfield St.

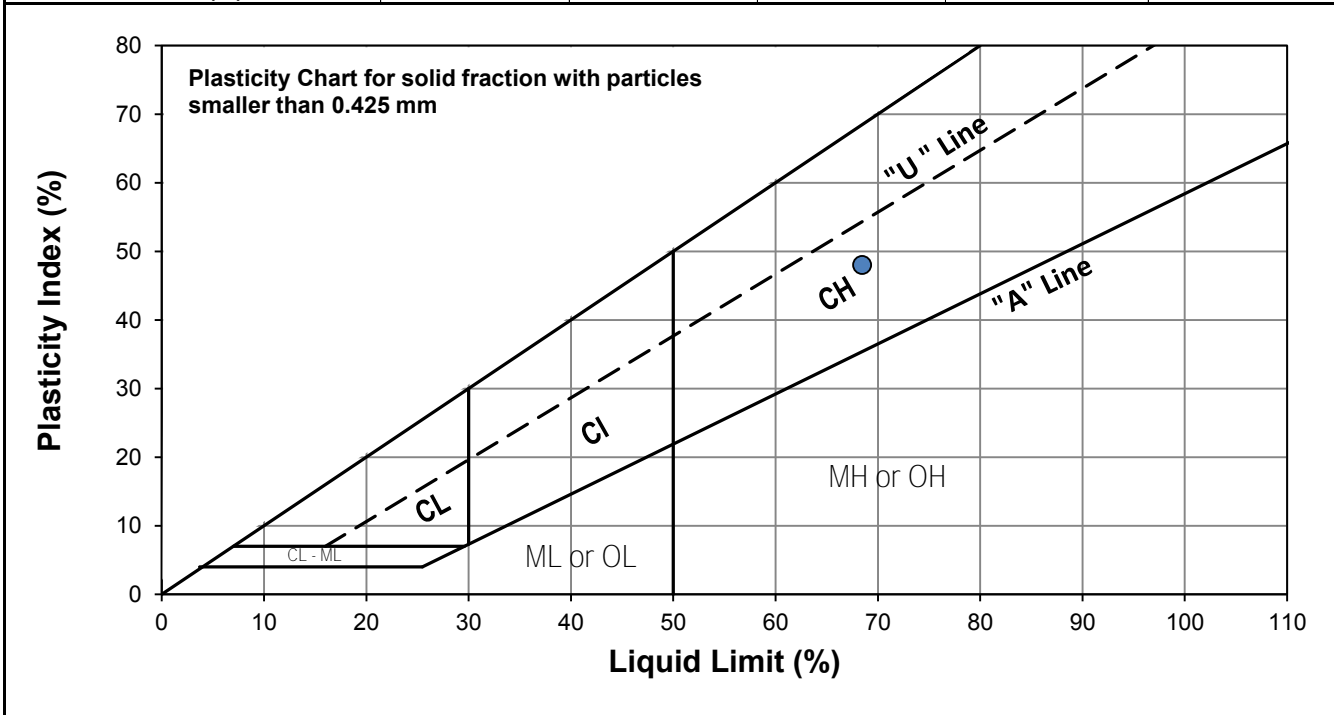


Test Hole TH20-09
Sample # G59
Depth (m) 0.6 - 0.8
Sample Date 14-Jan-20
Test Date 18-Feb-20
Technician HS

Liquid Limit	68
Plastic Limit	20
Plasticity Index	48

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	18	27	33
Mass Wet Soil + Tare (g)	26.855	27.981	25.859
Mass Dry Soil + Tare (g)	21.550	22.473	21.176
Mass Tare (g)	13.993	14.380	14.182
Mass Water (g)	5.305	5.508	4.683
Mass Dry Soil (g)	7.557	8.093	6.994
Moisture Content (%)	70.200	68.059	66.957



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.183	14.211			
Mass Wet Soil + Tare (g)	20.436	20.912			
Mass Dry Soil + Tare (g)	19.375	19.771			
Mass Water (g)	1.061	1.141			
Mass Dry Soil (g)	5.192	5.560			
Moisture Content (%)	20.435	20.522			



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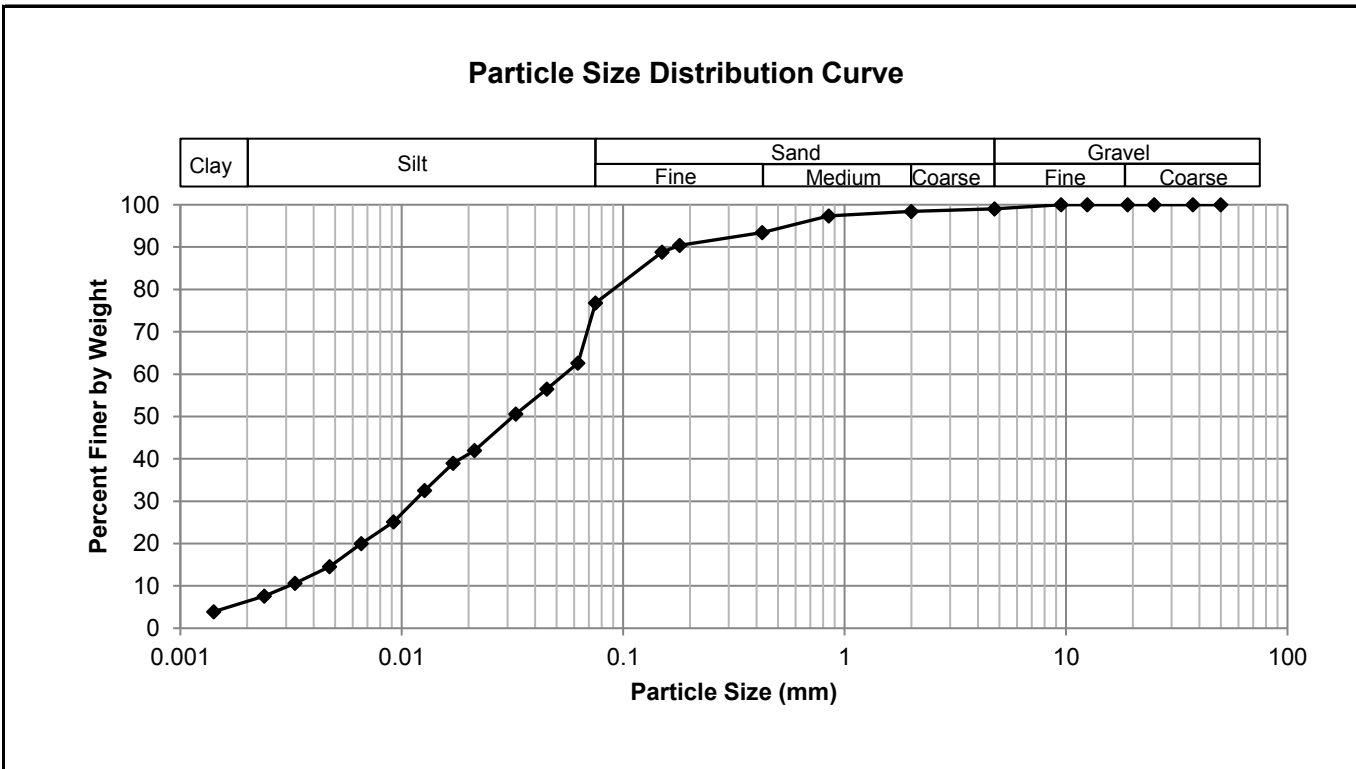
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-10
Client WSP
Project 2020 Local Streets and Alleys - Coniston St. / Highfield St.



Test Hole TH20-07
Sample # G46
Depth (m) 0.9 - 1.1
Sample Date 14-Jan-20
Test Date 7-Feb-20
Technician HS/JSB

Gravel	1.0%
Sand	22.2%
Silt	70.7%
Clay	6.1%



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	98.99	0.0750	76.80
37.5	100.00	2.00	98.46	0.0626	62.63
25.0	100.00	0.850	97.37	0.0453	56.48
19.0	100.00	0.425	93.46	0.0327	50.63
12.5	100.00	0.180	90.39	0.0213	42.01
9.50	100.00	0.150	88.84	0.0170	38.93
4.75	98.99	0.075	76.80	0.0127	32.52
				0.0092	25.13
				0.0066	20.00
				0.0047	14.52
				0.0033	10.62
				0.0024	7.60
				0.0014	3.92



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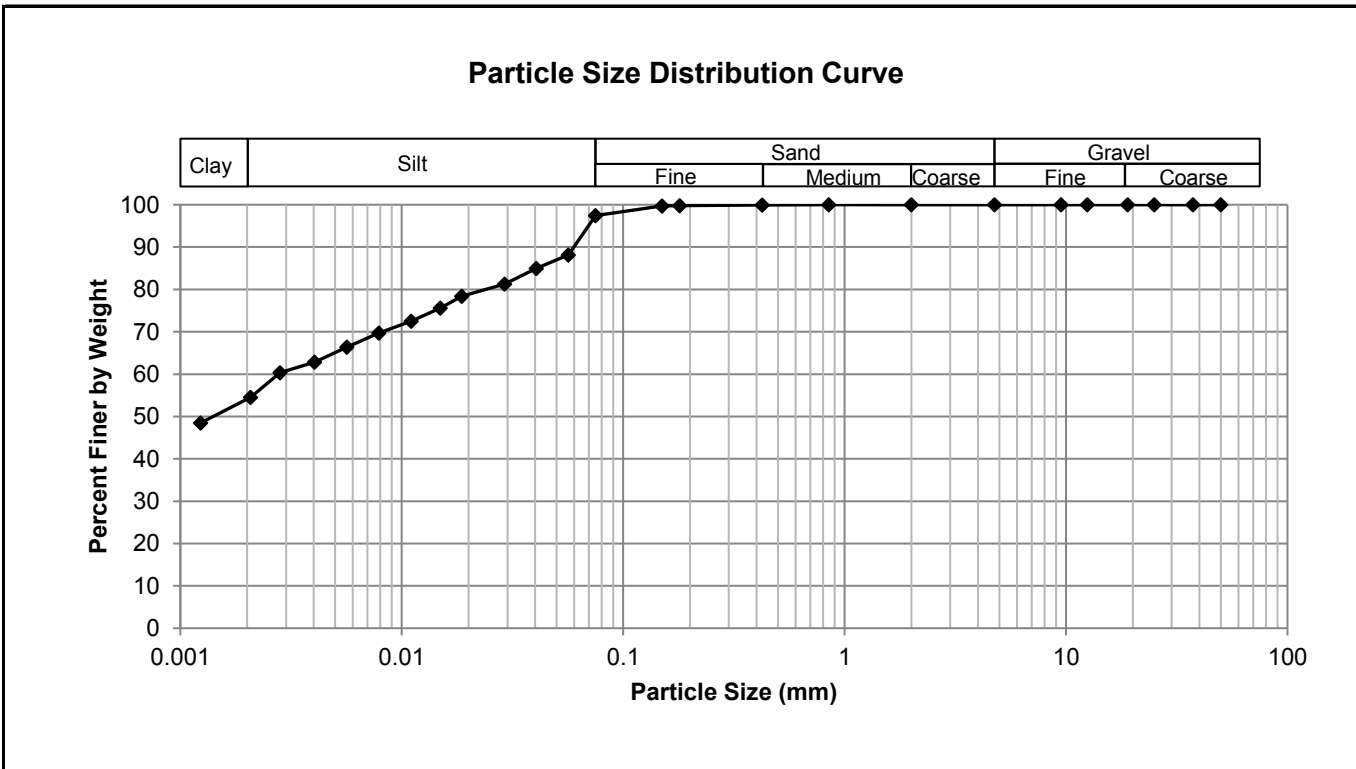
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-10
Client WSP
Project 2020 Local Streets and Alleys - Coniston St. / Highfield St.



Test Hole TH20-09
Sample # G59
Depth (m) 0.6 - 0.8
Sample Date 14-Jan-20
Test Date 7-Feb-20
Technician HS

Gravel	0.0%
Sand	2.6%
Silt	43.5%
Clay	53.9%



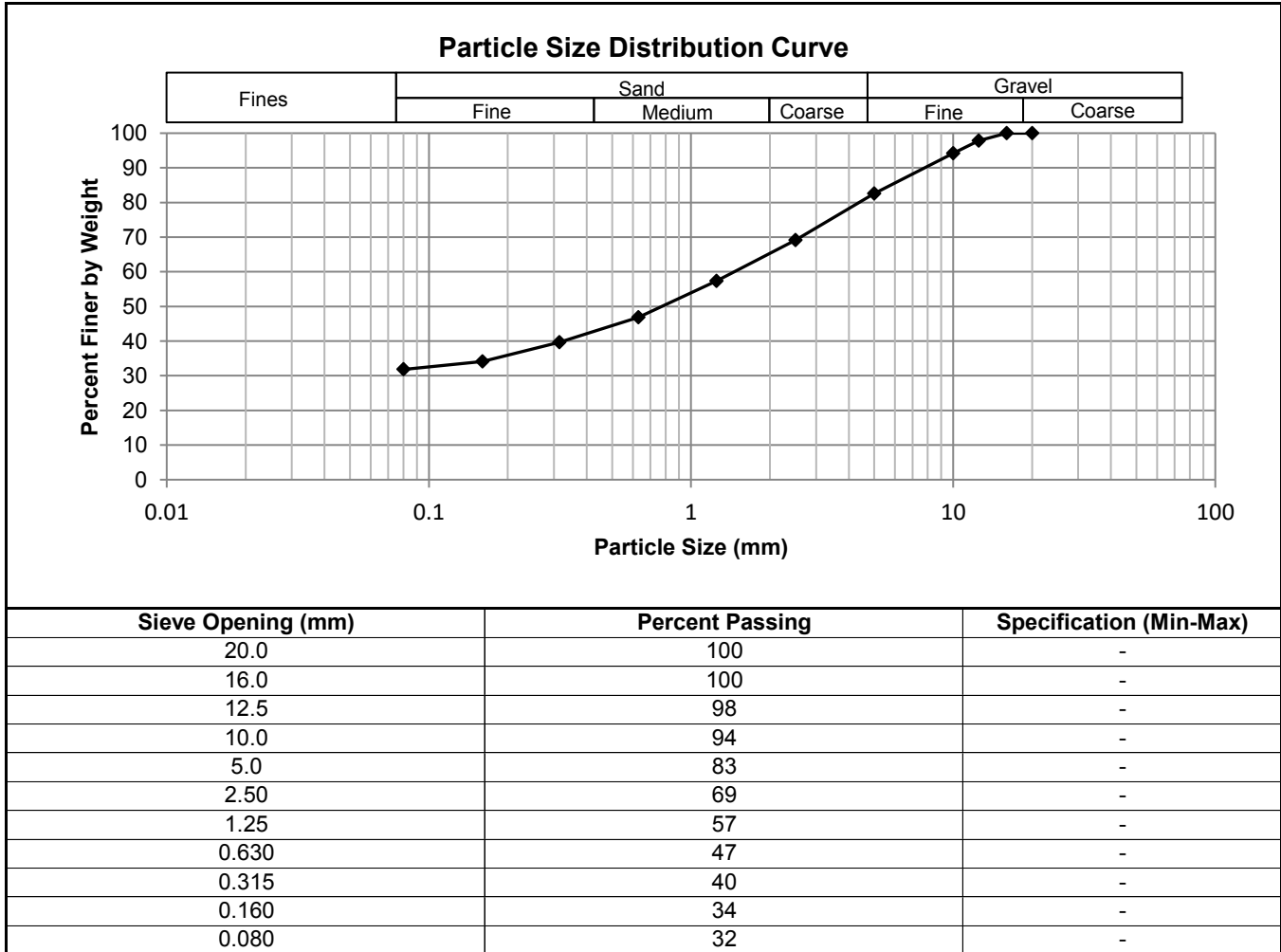
Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	97.42
37.5	100.00	2.00	100.00	0.0565	88.12
25.0	100.00	0.850	99.99	0.0405	84.99
19.0	100.00	0.425	99.94	0.0291	81.24
12.5	100.00	0.180	99.79	0.0187	78.43
9.50	100.00	0.150	99.74	0.0149	75.61
4.75	100.00	0.075	97.42	0.0111	72.49
				0.0079	69.74
				0.0057	66.36
				0.0040	62.81
				0.0028	60.31
				0.0021	54.50
				0.0012	48.48



Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley Package - Coniston St. / Gauvin St.

Test Hole TH20-05
Sample # G31
Depth (m) 0.3 - 0.5
Date Sampled 14-Jan-20
Date Tested 18-Feb-20
Technician HS

Total Weight (g)	775.0
Gravel %	17.4
Sand %	50.7
Fines %	31.8



Appendix C

Kirkdale St. and Highfield St.

Test Hole Logs, Summary Table, Lab Testing Results

GENERAL NOTES

- Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
- Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
- When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions	USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria		Particle Size			
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP More than 12 percent..... GM, GC, SM, SC 6 to 12 percent..... Borderline cases requiring dual symbols*	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	ASTM Sieve sizes #10 to #4 #40 to #10 #200 to #40 < #200			
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW				
		GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols			
		GC	Clayey gravels, gravel-sand-silt mixtures		Atterberg limits above "A" line or P.I. greater than 7				
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	mm 2.00 to 4.75 0.425 to 2.00 0.075 to 0.425 < 0.075		
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW			
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols		
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7			
			Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)		Sils and Clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity		Material Sand Coarse Medium Fine Silt or Clay
						CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
OL	Organic silts and organic silty clays of low plasticity								
Sils and Clays (Liquid limit greater than 50)	MH	Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts							
	CH	Inorganic clays of high plasticity, fat clays							
	OH	Organic clays of medium to high plasticity, organic silts							
	Pt	Peat and other highly organic soils		Von Post Classification Limit	Strong colour or odour, and often fibrous texture				

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)	▽ Water Level at Time of Drilling
PL - Plastic Limit (%)	▼ Water Level at End of Drilling
PI - Plasticity Index (%)	▽ Water Level After Drilling as Indicated on Test Hole Logs
MC - Moisture Content (%)	
SPT - Standard Penetration Test	
RQD- Rock Quality Designation	
Qu - Unconfined Compression	
Su - Undrained Shear Strength	
VW - Vibrating Wire Piezometer	
SI - Slope Incliner	

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>Undrained Shear Strength (kPa)</u>
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200



Sub-Surface Log

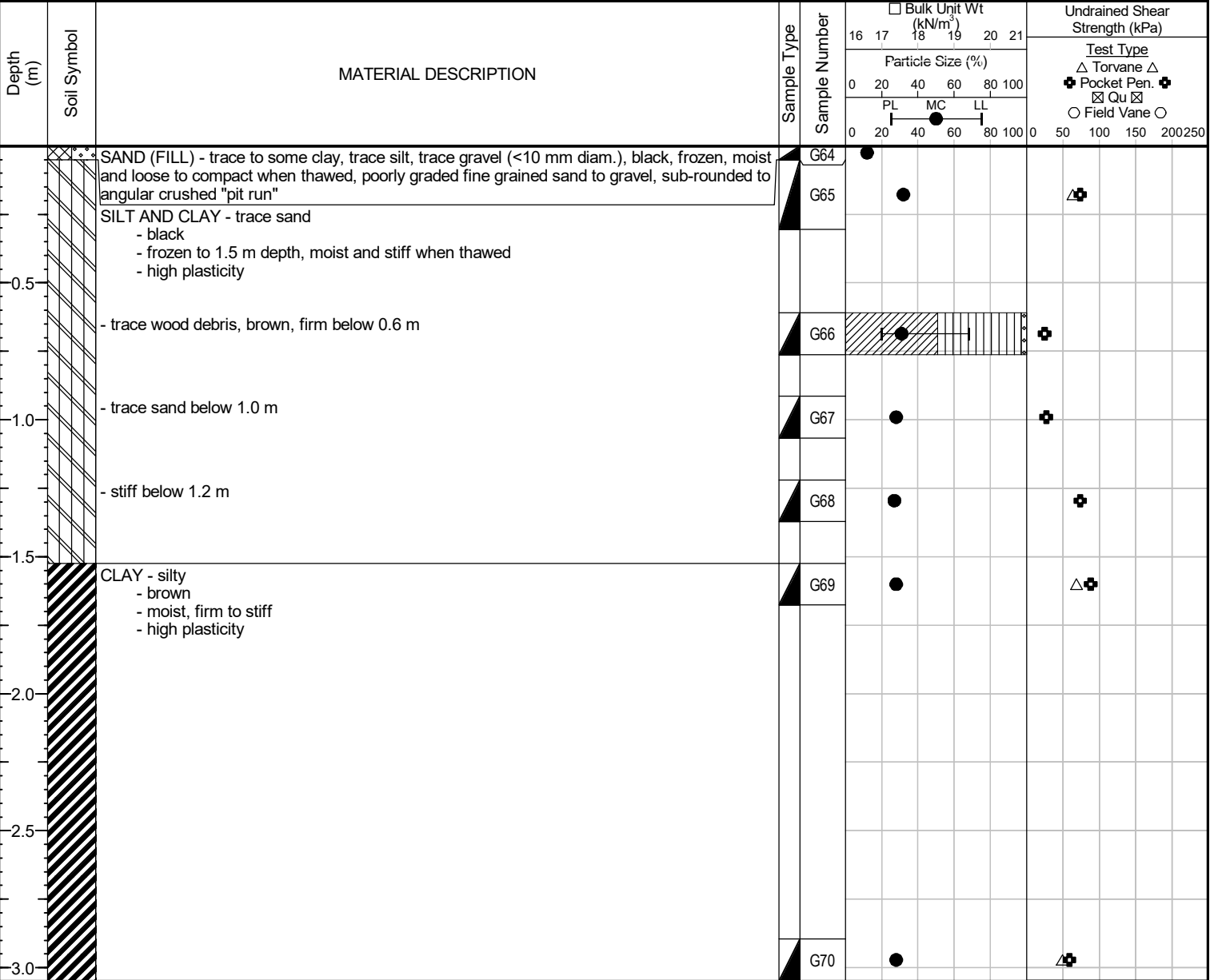
Test Hole TH20-10

1 of 1

Client: WSP Canada **Project Number:** 1000-043-10
Project Name: 20-L1-01 Local Streets and Alleys (Highfield St / Kirkdale St) **Location:** UTM N-5526471, E-634603
Contractor: Maple Leaf Drilling Ltd. **Ground Elevation:** Existing Ground
Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount **Date Drilled:** January 15, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders



END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open and dry to 2.9 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 1.6 m North and 3.3 m West of the Southwest corner of the garage at house #125 of Claremont Ave.

Logged By: Nuno Mendonca **Reviewed By:** Angela Fidler-Kliewer **Project Engineer:** Brent Hay

SUB-SURFACE LOG - LOGS 2020-01-17 LOCAL STREETS AND ALLEYS - 1000-043-10 - 0. A - NM HIGHFIELD KIRKDALE GPJ - TREK GEOTECHNICAL GDT - 2/28/20



Sub-Surface Log

Test Hole TH20-11

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-L1-01 Local Streets and Alleys (Highfield St / Kirkdale St) Location: UTM N-5526534, E-634605
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 15, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)										
					16	17	18	19	20	21	0	50	100	150	200	250			
0.0		SAND (FILL) - trace to some clay, trace silt, trace gravel (<10 mm diam.), black, frozen, moist and loose to compact when thawed, poorly graded fine grained sand to gravel, sub-rounded to angular crushed "pit run"	G71																
0.5		SILT AND CLAY - trace to some organics, trace sand - black - frozen to 1.5 m depth, moist and firm to stiff when thawed - high plasticity	G72																
0.7			G73																
1.0			G74																
1.2		- trace silt inclusions (<15 mm diam.), trace wood debris at 1.2 m	G75																
1.5		- trace silt inclusions (<10 mm diam.), brown below 1.5 m	G76																
3.0		- trace oxidation below 2.9 m	G77																

END OF TEST HOLE AT 3.0 m IN SILT AND CLAY
 1) No seepage or sloughing observed.
 2) Test hole open and dry to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 9.0 m South and 2.5 m East of Southeast corner of the garage at house #143 of Claremont Ave.

Logged By: Nuno Mendonca Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_A_NM HIGHFIELD KIRKDALE GPJ_TREK GEOTECHNICAL_GDT_2/28/20



Sub-Surface Log

Test Hole TH20-12

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-L1-01 Local Streets and Alleys (Highfield St / Kirkdale St) Location: UTM N-5526630, E-634607
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 15, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0		SAND (FILL) - trace to some clay, trace silt, trace gravel (<10 mm diam.), black, frozen, moist and loose to compact when thawed, poorly graded fine grained sand to gravel, sub-rounded to angular crushed "pit run"	G85													
0.0		SILT AND CLAY - trace to some sand - grey - frozen to 1.5 m depth, moist and stiff when thawed - high plasticity	G86													
0.5		- brown, stiff to very stiff below 0.6 m	G87													
1.0		- trace silt inclusions (<10 mm diam.) below 1.0 m	G88													
1.5		- firm to stiff below 1.5 m	G89													
1.5			G90													
3.0			G91													

END OF TEST HOLE AT 3.0 m IN SILT AND CLAY
 1) No seepage or sloughing observed.
 2) Test hole open and dry to 2.9 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 1.2 m North and 4.3 m East of Southeast corner of garage at house #166 of Ferndale Ave.

Logged By: Nuno Mendonca Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS 1000-043-10 0.0 A NM HIGHFIELD KIRKDALE GPJ TREK GEOTECHNICAL GDT 2/28/20



Sub-Surface Log

Test Hole TH20-32

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-L1-01 Local Streets and Alleys (Highfield St / Kirkdale St) Location: UTM N-5526584, E-634607
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 15, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)	
					16	17	18	19	20	21
0.0		SAND (FILL) - trace to some clay, trace silt, trace gravel (<10 mm diam.), black, frozen, moist and loose to compact when thawed, poorly graded fine grained sand to gravel, sub-rounded to angular crushed "pit run"	G78							
0.0 - 0.5		SILT AND CLAY - trace organics, trace sand - black - frozen to 1.5 m depth, moist and stiff when thawed - high plasticity	G79							
0.5 - 0.6		- grey below 0.6 m	G80							
0.6 - 1.0			G81							
1.0 - 1.2		- trace silt inclusions (<10 mm diam.), very stiff below 1.2 m	G82							
1.2 - 1.5			G83							
1.5 - 2.0		- brown, firm to stiff below 1.5 m								
2.0 - 2.5										
2.5 - 3.0										
3.0			G84							

END OF TEST HOLE AT 3.0 m IN SILT AND CLAY
 1) No seepage or sloughing observed.
 2) Test hole open and dry to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 4.6 m North and 6.5 m East of hydropole located on the alley at house #154 of Ferndale Ave.

Logged By: Nuno Mendonca Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_A_NM HIGHFIELD KIRKDALE GPJ_TREK GEOTECHNICAL_GDT_2/28/20



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Moisture Content Report ASTM D2216-10

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alleys- Highfield St. / Kirkdale St.

Sample Date 15-Jan-20
Test Date 27-Jan-20
Technician HS

Test Hole	TH20-10	TH20-10	TH20-10	TH20-10	TH20-10	TH20-10
Depth (m)	0.0 - 0.1	0.1 - 0.3	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7
Sample #	G64	G65	G66	G67	G68	G69
Tare ID	Z45	AB92	W102	AB45	AA02	F21
Mass of tare	8.8	6.8	8.6	6.7	6.9	8.5
Mass wet + tare	480.7	343.0	404.4	177.9	281.8	258.4
Mass dry + tare	431.6	260.8	311.4	140.9	223.1	203.4
Mass water	49.1	82.2	93.0	37.0	58.7	55.0
Mass dry soil	422.8	254.0	302.8	134.2	216.2	194.9
Moisture %	11.6%	32.4%	30.7%	27.6%	27.2%	28.2%

Test Hole	TH20-10	TH20-11	TH20-11	TH20-11	TH20-11	TH20-11
Depth (m)	2.9 - 3.0	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4
Sample #	G70	G71	G72	G73	G74	G75
Tare ID	F135	N02	A3	P21	H50	H43
Mass of tare	8.7	8.6	8.5	8.6	8.5	8.6
Mass wet + tare	325.2	151.5	462.6	187.4	414.6	267.0
Mass dry + tare	255.9	134.6	345.3	139.0	303.9	198.6
Mass water	69.3	16.9	117.3	48.4	110.7	68.4
Mass dry soil	247.2	126.0	336.8	130.4	295.4	190.0
Moisture %	28.0%	13.4%	34.8%	37.1%	37.5%	36.0%

Test Hole	TH20-11	TH20-11	TH20-12	TH20-12	TH20-12	TH20-12
Depth (m)	1.5 - 1.7	2.9 - 3.0	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1
Sample #	G76	G77	G85	G86	G87	G88
Tare ID	AA24	W74	F44	AB69	C22	E119
Mass of tare	6.8	8.4	8.5	6.8	8.6	8.6
Mass wet + tare	187.2	242.1	251.2	228.9	159.7	163.5
Mass dry + tare	143.7	184.1	214.4	170.1	124.8	129.1
Mass water	43.5	58.0	36.8	58.8	34.9	34.4
Mass dry soil	136.9	175.7	205.9	163.3	116.2	120.5
Moisture %	31.8%	33.0%	17.9%	36.0%	30.0%	28.5%



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**Moisture Content Report
 ASTM D2216-10**

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alleys- Highfield St. / Kirkdale St.

Sample Date 15-Jan-20
Test Date 27-Jan-20
Technician HS

Test Hole	TH20-12	TH20-12	TH20-12	TH20-32	TH20-32	TH20-32
Depth (m)	1.2 - 1.4	1.5 - 1.7	2.9 - 3.0	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8
Sample #	G89	G90	G91	G78	G79	G80
Tare ID	W81	N75	Z01	AC40	D17	Z57
Mass of tare	8.9	9.0	8.6	6.7	8.7	8.6
Mass wet + tare	218.1	226.0	225.2	128.6	127.8	192.4
Mass dry + tare	166.2	173.9	171.4	114.1	93.9	146.1
Mass water	51.9	52.1	53.8	14.5	33.9	46.3
Mass dry soil	157.3	164.9	162.8	107.4	85.2	137.5
Moisture %	33.0%	31.6%	33.0%	13.5%	39.8%	33.7%

Test Hole	TH20-32	TH20-32	TH20-32	TH20-32		
Depth (m)	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.9 - 3.0		
Sample #	G81	G82	G83	G84		
Tare ID	Z94	Z99	H72	K35		
Mass of tare	8.5	8.7	8.7	8.6		
Mass wet + tare	140.2	181.8	203.5	170.7		
Mass dry + tare	108.8	141.7	156.9	131.7		
Mass water	31.4	40.1	46.6	39.0		
Mass dry soil	100.3	133.0	148.2	123.1		
Moisture %	31.3%	30.2%	31.4%	31.7%		



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Atterberg Limits
ASTM D4318-10e1

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley - Highfield St. / Kirkdale St.

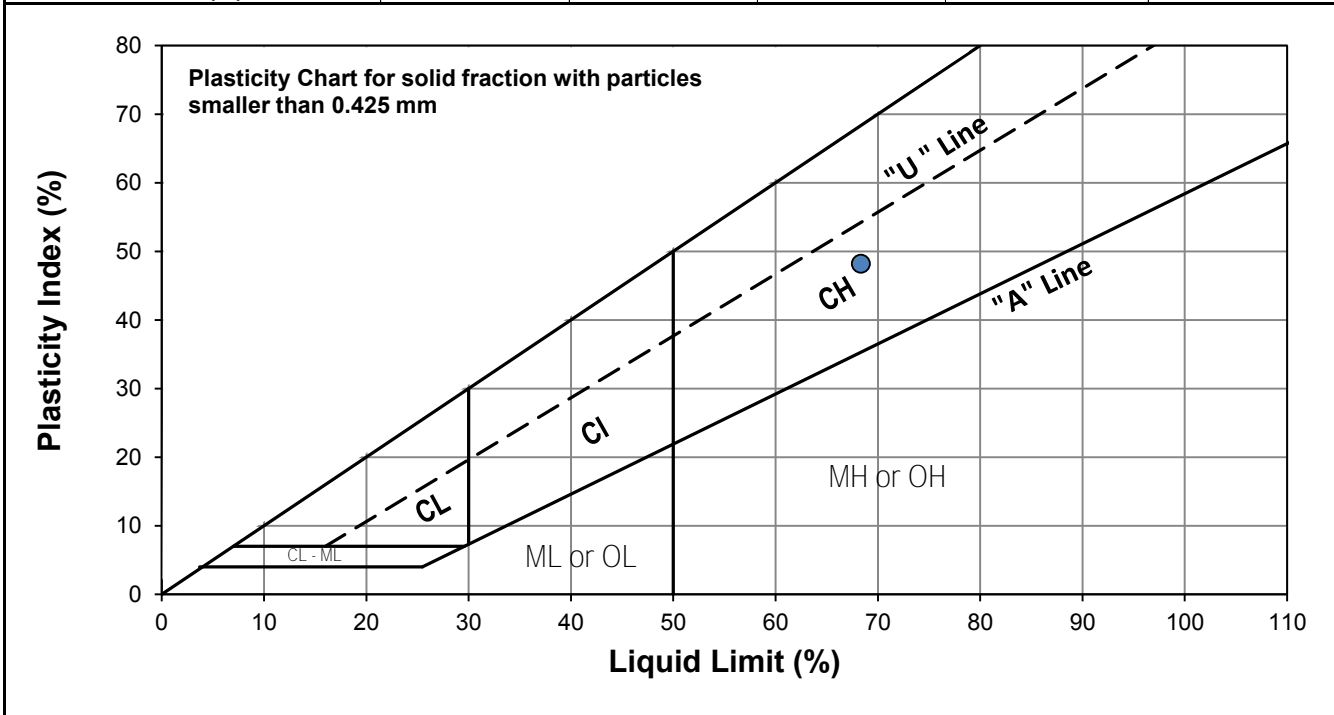


Test Hole TH20-10
Sample # G66
Depth (m) 0.6 - 0.8
Sample Date 15-Jan-20
Test Date 6-Feb-20
Technician HS

Liquid Limit	68
Plastic Limit	20
Plasticity Index	48

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	17	22	29
Mass Wet Soil + Tare (g)	27.369	24.311	31.230
Mass Dry Soil + Tare (g)	21.805	20.077	24.411
Mass Tare (g)	14.074	14.008	14.204
Mass Water (g)	5.564	4.234	6.819
Mass Dry Soil (g)	7.731	6.069	10.207
Moisture Content (%)	71.970	69.764	66.807



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.033	13.866			
Mass Wet Soil + Tare (g)	20.494	20.723			
Mass Dry Soil + Tare (g)	19.415	19.565			
Mass Water (g)	1.079	1.158			
Mass Dry Soil (g)	5.382	5.699			
Moisture Content (%)	20.048	20.319			



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Atterberg Limits
ASTM D4318-10e1

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley - Highfield St. / Kirkdale St.

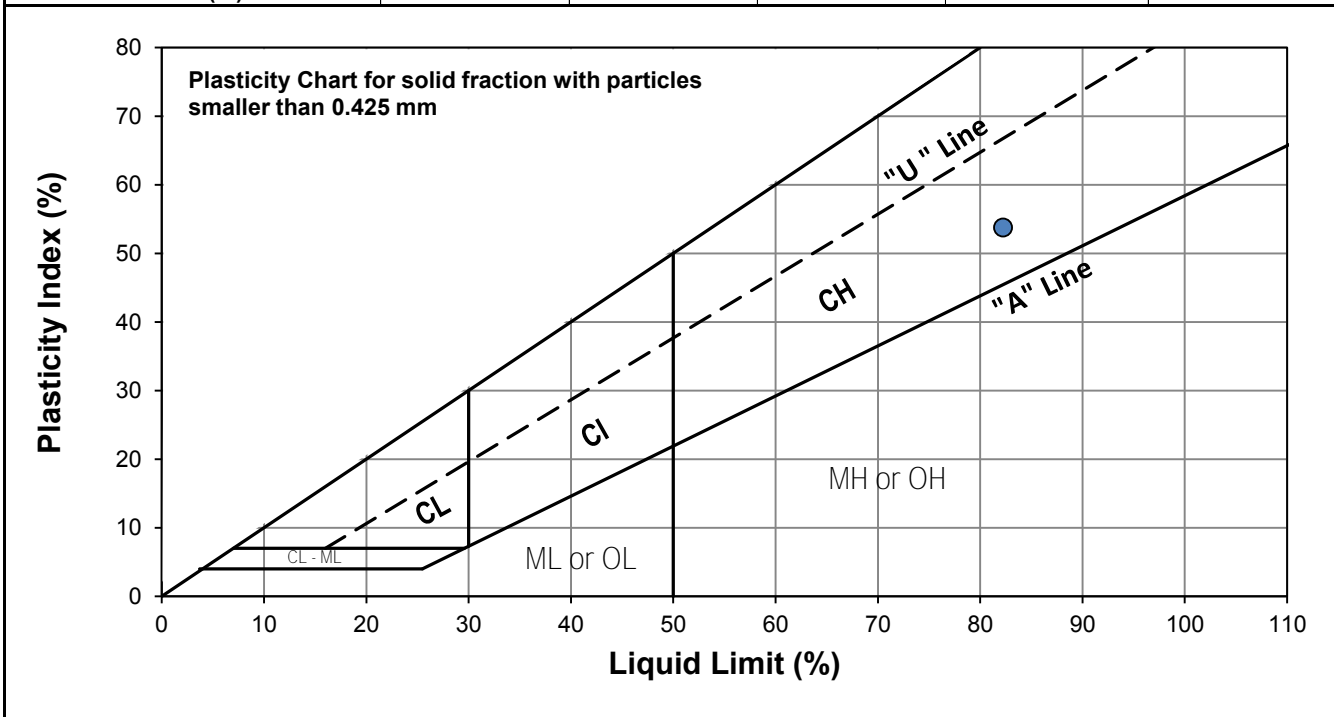


Test Hole TH20-11
Sample # G74
Depth (m) 0.9 - 1.1
Sample Date 15-Jan-20
Test Date 20-Feb-20
Technician HS

Liquid Limit	82
Plastic Limit	29
Plasticity Index	54

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	17	22	34
Mass Wet Soil + Tare (g)	25.850	26.169	26.723
Mass Dry Soil + Tare (g)	20.363	20.545	21.114
Mass Tare (g)	13.897	13.761	14.130
Mass Water (g)	5.487	5.624	5.609
Mass Dry Soil (g)	6.466	6.784	6.984
Moisture Content (%)	84.859	82.901	80.312



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.982	14.160			
Mass Wet Soil + Tare (g)	21.531	20.586			
Mass Dry Soil + Tare (g)	19.851	19.165			
Mass Water (g)	1.680	1.421			
Mass Dry Soil (g)	5.869	5.005			
Moisture Content (%)	28.625	28.392			



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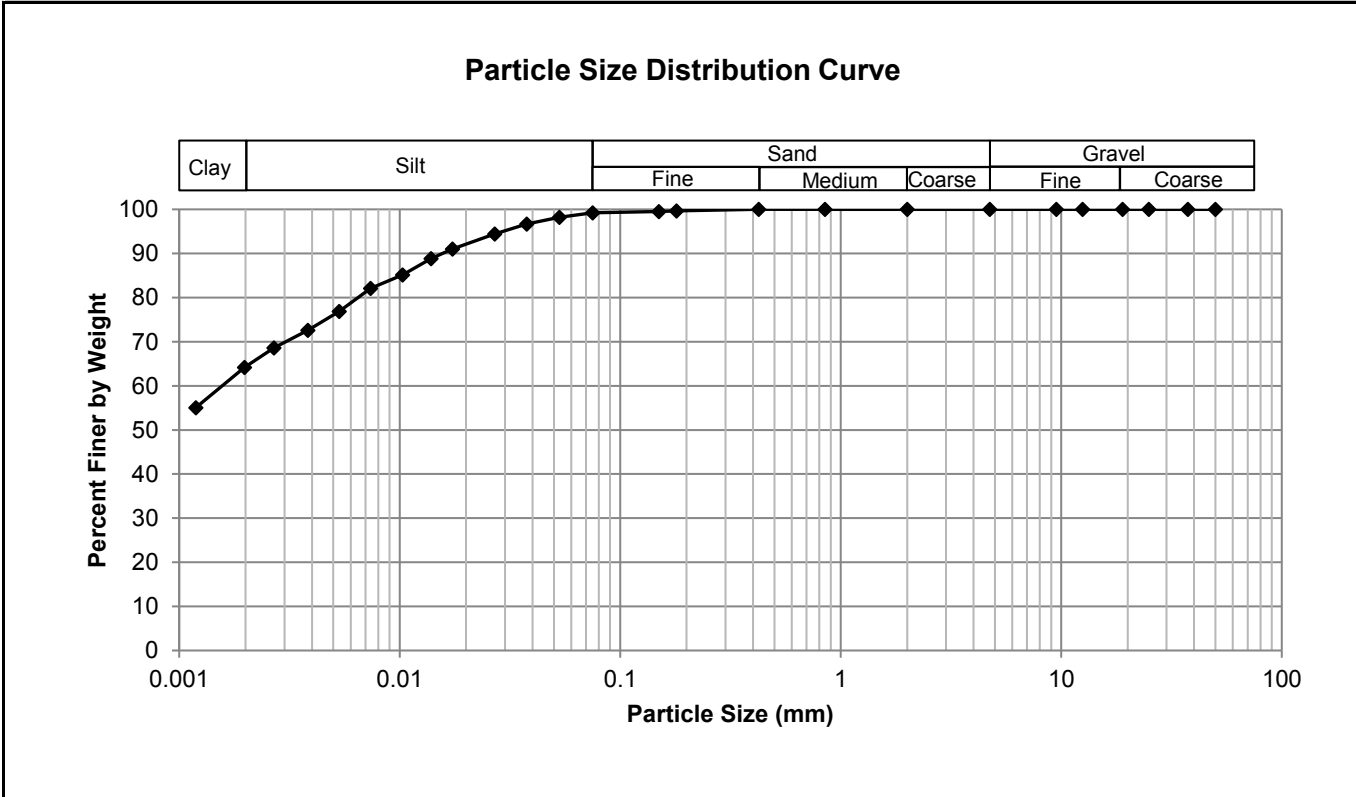
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley- Highfield St. / Kirkdale St.

Test Hole TH20-11
Sample # G74
Depth (m) 0.9 - 1.1
Sample Date 15-Jan-20
Test Date 20-Feb-20
Technician HS/JSB



Gravel	0.0%
Sand	0.8%
Silt	35.0%
Clay	64.3%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	99.23
37.5	100.00	2.00	100.00	0.0529	98.22
25.0	100.00	0.850	100.00	0.0377	96.66
19.0	100.00	0.425	99.98	0.0270	94.47
12.5	100.00	0.180	99.62	0.0174	91.03
9.50	100.00	0.150	99.52	0.0139	88.84
4.75	100.00	0.075	99.23	0.0103	85.15
				0.0074	82.09
				0.0053	76.91
				0.0038	72.59
				0.0027	68.59
				0.0020	64.15
				0.0012	55.07

Appendix D

Kirkdale St. and Walmer St.

Test Hole Logs, Summary Table, Lab Testing Results

GENERAL NOTES

- Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
- Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
- When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions	USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria		Particle Size			
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP More than 12 percent..... GM, GC, SM, SC 6 to 12 percent..... Borderline cases requiring dual symbols*	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	ASTM Sieve sizes #10 to #4 #40 to #10 #200 to #40 < #200			
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW				
		GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols			
		GC	Clayey gravels, gravel-sand-silt mixtures		Atterberg limits above "A" line or P.I. greater than 7				
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	mm 2.00 to 4.75 0.425 to 2.00 0.075 to 0.425 < 0.075		
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW			
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols		
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7			
			Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)		Sils and Clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity		Particle Size ASTM Sieve Sizes mm > 300 75 to 300 19 to 75 4.75 to 19
						CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
OL	Organic silts and organic silty clays of low plasticity								
Sils and Clays (Liquid limit greater than 50)	MH	Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts							
	CH	Inorganic clays of high plasticity, fat clays							
	OH	Organic clays of medium to high plasticity, organic silts							
	Highly Organic Soils	Pt		Peat and other highly organic soils	Von Post Classification Limit	Strong colour or odour, and often fibrous texture			
		Material		Sand Coarse Medium Fine Silt or Clay					

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)	▽ Water Level at Time of Drilling
PL - Plastic Limit (%)	▼ Water Level at End of Drilling
PI - Plasticity Index (%)	▽ Water Level After Drilling as Indicated on Test Hole Logs
MC - Moisture Content (%)	
SPT - Standard Penetration Test	
RQD- Rock Quality Designation	
Qu - Unconfined Compression	
Su - Undrained Shear Strength	
VW - Vibrating Wire Piezometer	
SI - Slope Incliner	

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>Undrained Shear Strength (kPa)</u>
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200



Sub-Surface Log

Test Hole TH20-13

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-LI-01 Local Streets and Alleys (Kirkdale St / Walmer St) Location: UTM N-5526660, E-634508
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 15, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)	
					16	17	18	19	20	21
0.0		SAND (FILL) - silty, trace clay, trace gravel, brown, frozen, moist and compact when thawed poorly graded fine grained sand to gravel (<10 mm diam.), sub-rounded to angular crushed "pit run"	G92							
0.0 - 0.5		SILT AND CLAY - trace to some organics - dark grey - frozen to 1.5 m depth, moist and firm to stiff when thawed - high plasticity	G93							
0.5 - 1.0		- no organics, trace silt inclusions (<10 mm diam.), brown, very stiff below 1.0 m	G94							
1.0 - 1.5			G95							
1.5 - 2.0			G96							
2.0 - 2.5			G97							
2.5 - 3.0		- trace oxidation at 2.9 m	G98							

END OF TEST HOLE AT 3.0 m IN SILT AND CLAY
 1) No seepage or sloughing observed.
 2) Test hole open and dry to 2.9 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 1.0 m South and 3.0 m East of Southeast corner of the garage at house #172 of Lawndale Ave.

Logged By: Nuno Mendonca Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_A_NM KIRKDALE WALMER GP.J_TREK GEOTECHNICAL.GDT_2/28/20



Sub-Surface Log

Test Hole TH20-14

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-LI-01 Local Streets and Alleys (Kirkdale St / Walmer St) Location: UTM N-5526771, E-634510
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 15, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)	
					16	17	18	19	20	21
0.0		SAND (FILL) - silty, trace gravel, brown, frozen, moist and compact when thawed poorly graded fine grained sand to gravel (<10 mm diam.), sub-rounded to angular crushed "pit run"	G99							
0.0		SILT AND CLAY - trace organics, trace sand - dark grey - frozen to 1.5 m depth, moist and stiff when thawed - high plasticity	G100							
0.5			G101							△ ⊕
1.0			G102							△ ⊕
1.5		- trace silt inclusions (<10 mm diam.) below 1.2 m	G103							△ ⊕
2.0			G104							△ ⊕
2.5		- brown below 1.5 m								
3.0			G105							△ ⊕

END OF TEST HOLE AT 3.0 m IN SILT AND CLAY
 1) No seepage or sloughing observed.
 2) Test hole open and dry to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 5.7 m North and 4.1 m East of the Southeast corner of the garage at house #200 of Lawndale Ave.

Logged By: Nuno Mendonca Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS 1000-043-10 0.0 A NM KIRKDALE WALMER GP J TREK GEOTECHNICAL GDT 2/28/20



Sub-Surface Log

Test Hole TH20-15

1 of 1

Client: WSP Canada **Project Number:** 1000-043-10
Project Name: 20-LI-01 Local Streets and Alleys (Kirkdale St / Walmer St) **Location:** UTM N-5526824, E-634512
Contractor: Maple Leaf Drilling Ltd. **Ground Elevation:** Existing Ground
Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount **Date Drilled:** January 15, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)	
					16	17	18	19	20	21		
0.0		SAND (FILL) - silty, trace gravel, brown, frozen, moist and compact when thawed poorly graded fine grained sand to gravel (<10 mm diam.), sub-rounded to angular crushed "pit run"	G106									
0.0		SILT AND CLAY - trace to some organics - dark grey - frozen to 1.5 m depth, moist and stiff when thawed - high plasticity	G107									
0.6		- grey, stiff below 0.6 m	G108									
1.0		- trace sand, trace silt inclusions (<10 mm diam.), brown, stiff to very stiff below 1.0 m	G109									
1.5			G110									
2.0			G111									
3.0			G112									

END OF TEST HOLE AT 3.0 m IN SILT AND CLAY
 1) No seepage or sloughing observed.
 2) Test hole open and dry to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 3.2 m South and 3.6 m East of Northeast corner of garage at house #32 of Walmer St.

Logged By: Nuno Mendonca **Reviewed By:** Angela Fidler-Kliewer **Project Engineer:** Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_A_NM KIRKDALE WALMER GP.J_TREK GEOTECHNICAL.GDT_2/28/20



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Moisture Content Report ASTM D2216-10

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alleys- Kirkdale St. / Walmer St.

Sample Date 15-Jan-20
Test Date 27-Jan-20
Technician HS

Test Hole	TH20-13	TH20-13	TH20-13	TH20-13	TH20-13	TH20-13
Depth (m)	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.7 - 1.8
Sample #	G92	G93	G94	G95	G96	G97
Tare ID	lockey	P36	E49	W97	F58	F148
Mass of tare	356.7	8.5	8.6	8.4	8.7	8.3
Mass wet + tare	1354.2	439.9	216.9	255.8	257.2	200.7
Mass dry + tare	1305.2	327.9	167.6	198.1	201.6	155.0
Mass water	49.0	112.0	49.3	57.7	55.6	45.7
Mass dry soil	948.5	319.4	159.0	189.7	192.9	146.7
Moisture %	5.2%	35.1%	31.0%	30.4%	28.8%	31.2%

Test Hole	TH20-13	TH20-14	TH20-14	TH20-14	TH20-14	TH20-14
Depth (m)	2.9 - 3.0	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4
Sample #	G98	G99	G100	G101	G102	G103
Tare ID	AB16	R7	Z70	Z26	Z83	F94
Mass of tare	6.6	252.2	8.7	8.5	8.4	8.5
Mass wet + tare	226.8	809.1	133.7	239.5	173.8	162.1
Mass dry + tare	170.3	704.4	101.5	181.0	131.8	122.1
Mass water	56.5	104.7	32.2	58.5	42.0	40.0
Mass dry soil	163.7	452.2	92.8	172.5	123.4	113.6
Moisture %	34.5%	23.2%	34.7%	33.9%	34.0%	35.2%

Test Hole	TH20-14	TH20-14	TH20-15	TH20-15	TH20-15	TH20-15
Depth (m)	1.5 - 1.7	2.9 - 3.0	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1
Sample #	G104	G105	G106	G107	G108	G109
Tare ID	E109	Z10	F45	AB07	Z74	H60
Mass of tare	8.6	8.5	8.4	6.8	8.4	8.6
Mass wet + tare	183.5	195.7	290.0	175.1	184.2	499.2
Mass dry + tare	142.5	150.5	251.8	134.2	144.0	395.3
Mass water	41.0	45.2	38.2	40.9	40.2	103.9
Mass dry soil	133.9	142.0	243.4	127.4	135.6	386.7
Moisture %	30.6%	31.8%	15.7%	32.1%	29.6%	26.9%



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Moisture Content Report ASTM D2216-10

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alleys- Kirkdale St. / Walmer St.

Sample Date 15-Jan-20
Test Date 27-Jan-20
Technician HS

Test Hole	TH20-15	TH20-15	TH20-15			
Depth (m)	1.2 - 1.4	1.5 - 1.7	2.9 - 3.0			
Sample #	G110	G111	G112			
Tare ID	Z22	E22	D11			
Mass of tare	8.4	8.4	8.7			
Mass wet + tare	167.6	155.7	195.0			
Mass dry + tare	133.1	121.6	153.8			
Mass water	34.5	34.1	41.2			
Mass dry soil	124.7	113.2	145.1			
Moisture %	27.7%	30.1%	28.4%			



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Project No. 1000-043-10
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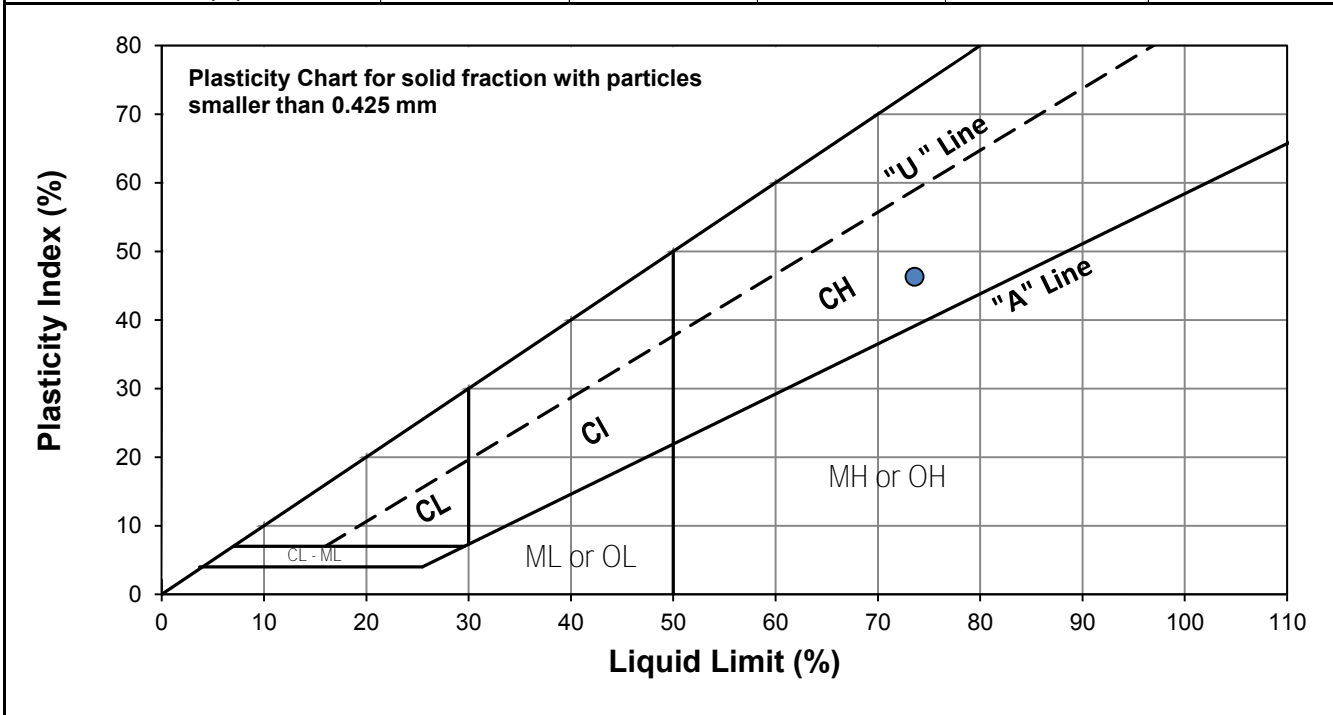


Test Hole TH20-13
Sample # G94
Depth (m) 0.6 - 0.8
Sample Date 15-Jan-20
Test Date 10-Feb-20
Technician HS

Liquid Limit	74
Plastic Limit	27
Plasticity Index	46

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	18	26	33
Mass Wet Soil + Tare (g)	26.913	24.179	24.260
Mass Dry Soil + Tare (g)	21.402	19.973	20.107
Mass Tare (g)	14.181	14.189	14.327
Mass Water (g)	5.511	4.206	4.153
Mass Dry Soil (g)	7.221	5.784	5.780
Moisture Content (%)	76.319	72.718	71.851



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.204	14.066			
Mass Wet Soil + Tare (g)	22.120	21.924			
Mass Dry Soil + Tare (g)	20.427	20.230			
Mass Water (g)	1.693	1.694			
Mass Dry Soil (g)	6.223	6.164			
Moisture Content (%)	27.206	27.482			



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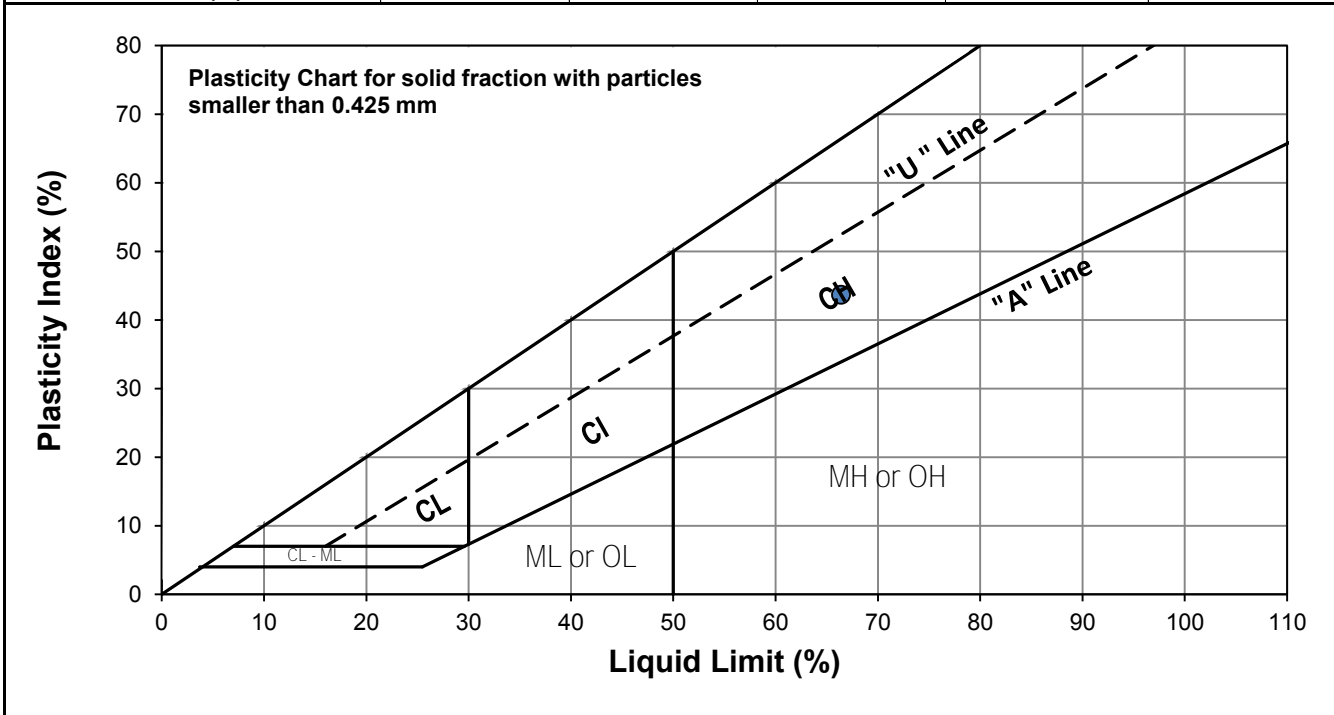


Test Hole TH20-15
Sample # G109
Depth (m) 0.9 - 1.1
Sample Date 15-Jan-20
Test Date 6-Feb-20
Technician HS

Liquid Limit	66
Plastic Limit	23
Plasticity Index	44

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	16	27	32
Mass Wet Soil + Tare (g)	25.472	28.030	29.990
Mass Dry Soil + Tare (g)	20.727	22.452	23.646
Mass Tare (g)	13.729	14.021	13.978
Mass Water (g)	4.745	5.578	6.344
Mass Dry Soil (g)	6.998	8.431	9.668
Moisture Content (%)	67.805	66.161	65.619



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.094	14.213			
Mass Wet Soil + Tare (g)	20.907	20.563			
Mass Dry Soil + Tare (g)	19.649	19.381			
Mass Water (g)	1.258	1.182			
Mass Dry Soil (g)	5.555	5.168			
Moisture Content (%)	22.646	22.872			



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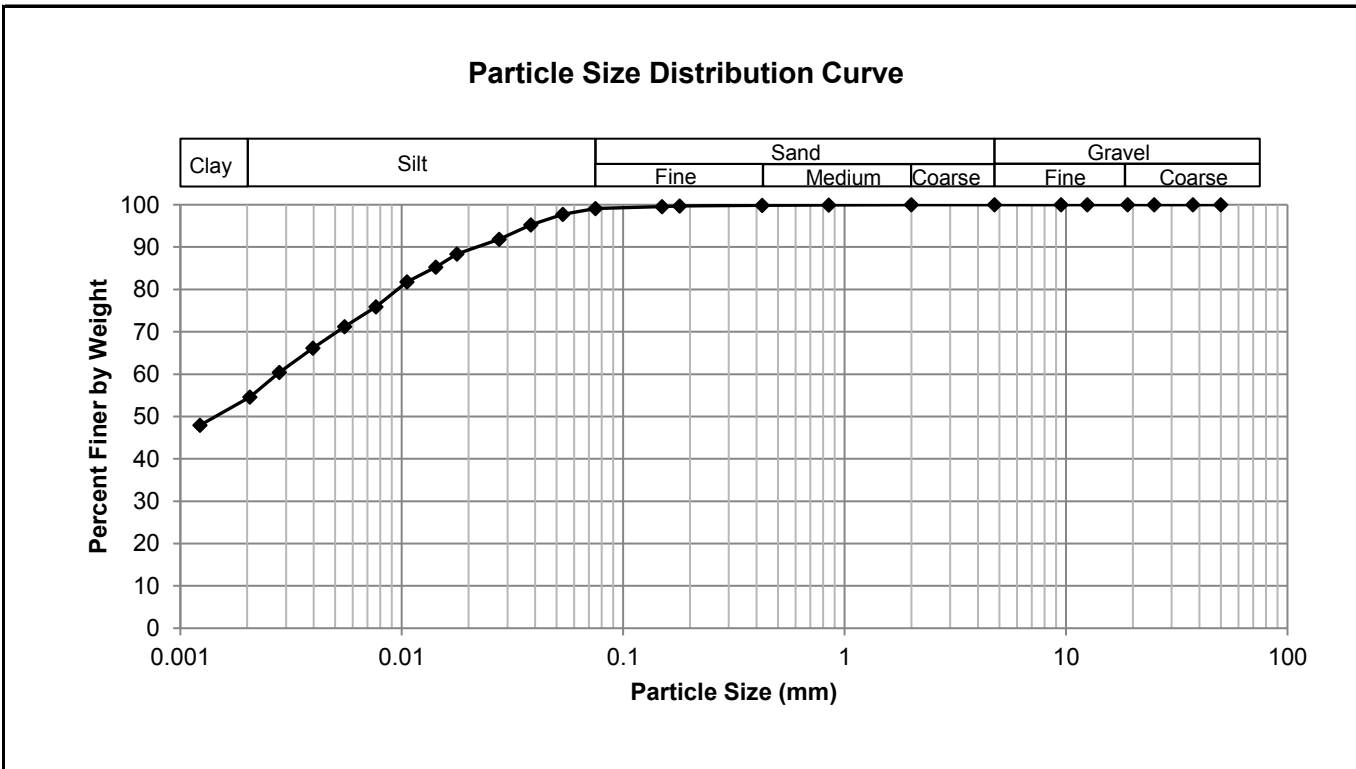
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley - Walmer St. / Kirkdale St.



Test Hole TH20-13
Sample # G94
Depth (m) 0.6 - 0.8
Sample Date 15-Jan-20
Test Date 10-Feb-20
Technician HS

Gravel	0.0%
Sand	0.9%
Silt	45.0%
Clay	54.1%



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	99.11
37.5	100.00	2.00	100.00	0.0535	97.76
25.0	100.00	0.850	99.96	0.0383	95.26
19.0	100.00	0.425	99.89	0.0276	91.82
12.5	100.00	0.180	99.68	0.0177	88.38
9.50	100.00	0.150	99.57	0.0142	85.26
4.75	100.00	0.075	99.11	0.0106	81.82
				0.0077	75.88
				0.0055	71.25
				0.0040	66.13
				0.0028	60.39
				0.0021	54.58
				0.0012	47.93



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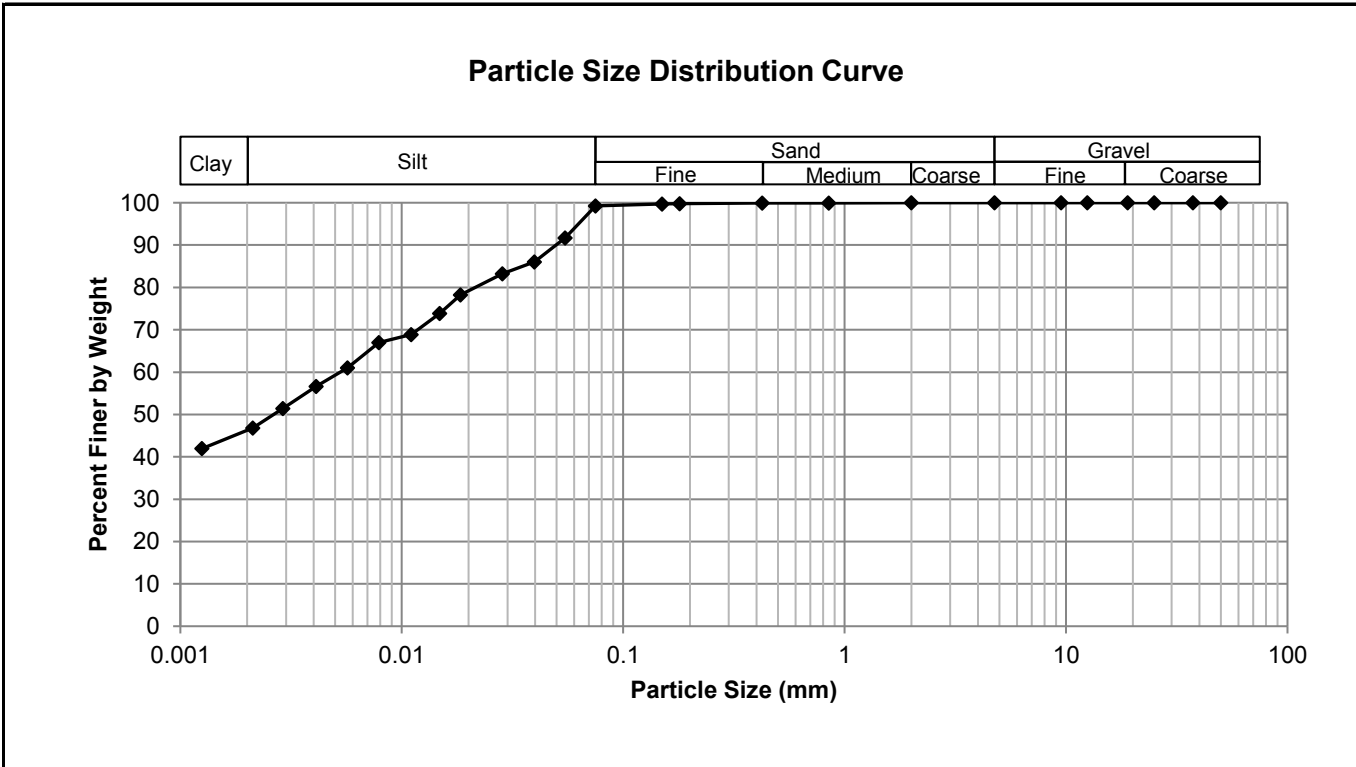
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley - Walmer St. / Kirkdale St.



Test Hole TH20-15
Sample # G109
Depth (m) 0.9 - 1.1
Sample Date 15-Jan-20
Test Date 3-Feb-20
Technician HS

Gravel	0.0%
Sand	0.7%
Silt	53.2%
Clay	46.1%



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	99.26
37.5	100.00	2.00	100.00	0.0547	91.68
25.0	100.00	0.850	99.96	0.0397	86.05
19.0	100.00	0.425	99.91	0.0285	83.24
12.5	100.00	0.180	99.81	0.0184	78.23
9.50	100.00	0.150	99.74	0.0148	73.86
4.75	100.00	0.075	99.26	0.0111	68.85
				0.0079	66.98
				0.0057	61.04
				0.0041	56.60
				0.0029	51.44
				0.0021	46.80
				0.0013	41.95



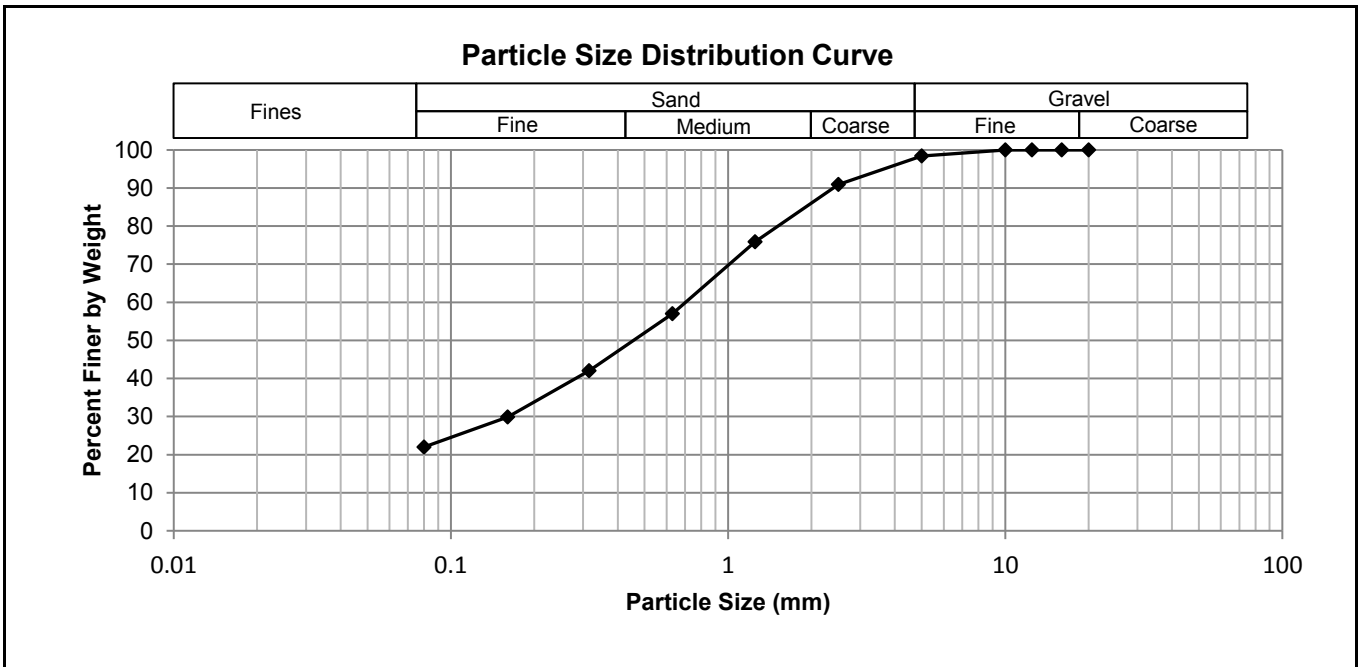
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Grain Size Analysis (Sieve Method)
ASTM C136-06

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley Package - Kirkdale St. / Walmer St.

Test Hole TH20-13
Sample # G92
Depth (m) 0.0 - 0.1
Date Sampled 15-Jan-20
Date Tested 14-Feb-20
Technician HS

Total Weight (g)	945.7
Gravel %	1.6
Sand %	76.4
Fines %	22.0



Sieve Opening (mm)	Percent Passing	Specification (Min-Max)
10.0	100	-
5.0	98	-
2.50	91	-
1.25	76	-
0.630	57	-
0.315	42	-
0.160	30	-
0.080	22	-



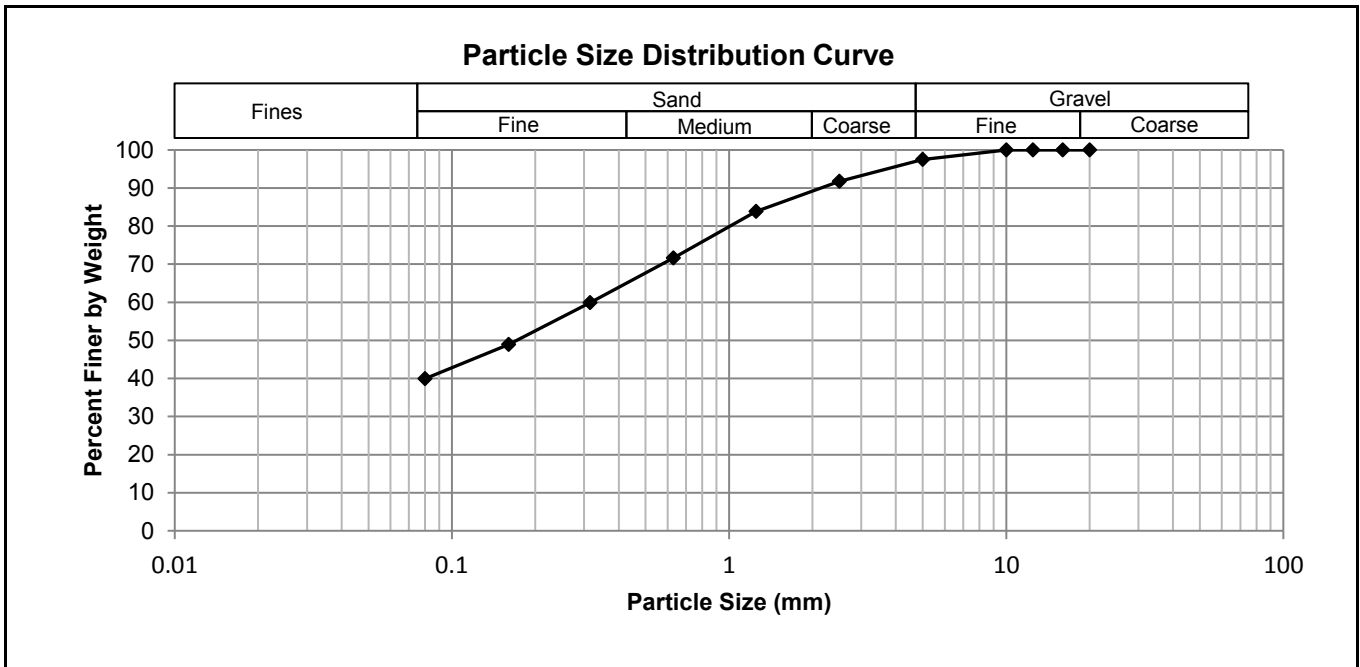
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Grain Size Analysis (Sieve Method)
ASTM C136-06

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley Package - Kirkdale St. / Walmer St.

Test Hole TH20-14
Sample # G99
Depth (m) 0.0 - 0.1
Date Sampled 15-Jan-20
Date Tested 14-Feb-20
Technician HS

Total Weight (g)	452.2
Gravel %	2.5
Sand %	57.5
Fines %	39.9



Sieve Opening (mm)	Percent Passing	Specification (Min-Max)
10.0	100	-
5.0	97	-
2.50	92	-
1.25	84	-
0.630	72	-
0.315	60	-
0.160	49	-
0.080	40	-

Appendix E

Prosper St. and Evans St.

Test Hole Logs, Summary Table, Lab Testing Results

GENERAL NOTES

- Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
- Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
- When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions	USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria		Particle Size			
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP More than 12 percent..... GM, GC, SM, SC 6 to 12 percent..... Borderline cases requiring dual symbols*	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	ASTM Sieve sizes #10 to #4 #40 to #10 #200 to #40 < #200			
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW				
		GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols			
		GC	Clayey gravels, gravel-sand-silt mixtures		Atterberg limits above "A" line or P.I. greater than 7				
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	mm 2.00 to 4.75 0.425 to 2.00 0.075 to 0.425 < 0.075		
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW			
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols		
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7			
			Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)		Sils and Clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity		Material Sand Coarse Medium Fine Silt or Clay
						CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
OL	Organic silts and organic silty clays of low plasticity								
Sils and Clays (Liquid limit greater than 50)	MH	Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts							
	CH	Inorganic clays of high plasticity, fat clays							
	OH	Organic clays of medium to high plasticity, organic silts							
	Pt	Peat and other highly organic soils		Von Post Classification Limit	Strong colour or odour, and often fibrous texture				

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)	▽ Water Level at Time of Drilling
PL - Plastic Limit (%)	▼ Water Level at End of Drilling
PI - Plasticity Index (%)	▽ Water Level After Drilling as Indicated on Test Hole Logs
MC - Moisture Content (%)	
SPT - Standard Penetration Test	
RQD- Rock Quality Designation	
Qu - Unconfined Compression	
Su - Undrained Shear Strength	
VW - Vibrating Wire Piezometer	
SI - Slope Incliner	

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>Undrained Shear Strength (kPa)</u>
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200



Sub-Surface Log

Test Hole TH20-16

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-LI-01 Local Streets and Alleys (Prosper St / Evans St) Location: UTM N-5527127, E-636322
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 15, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)	
					16	17	18	19	20	21		
					Particle Size (%)							
					0	20	40	60	80	100		
					PL MC LL 0 20 40 60 80 100 0 50 100 150 200 250							
					Test Type △ Torvane △ ⊕ Pocket Pen. ⊕ ⊠ Qu ⊠ ○ Field Vane ○							
0.0		SAND (FILL) - silty, some gravel, trace clay, brown, frozen, moist and compact when thawed, poorly graded fine grained sand to gravel (<25 mm diam.), sub-rounded to angular crushed "pit run"	▲	G113	●							
0.5		SILT AND CLAY - silty, trace sand - dark grey - frozen to 1.5 m depth, moist and very stiff to hard when thawed - high plasticity	▲	G114	●							⊕
0.8			▲	G115	●							⊕
1.0			▲	G116	●							⊕
1.5			▲	G117	●							⊕
2.0			▲	G118	●							⊕
2.1		- trace to some silt inclusions (<10 mm diam.) below 2.1 m										
2.7		- stiff below 2.7 m										
3.0			▲	G119	●							⊕

END OF TEST HOLE AT 3.0 m IN SILT AND CLAY
 1) No seepage or sloughing observed.
 2) Test hole open and dry to 2.7 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 1.0 m North and 4.3 m East of the Northeast corner of house #16 of Prosper St.

Logged By: Nuno Mendonca Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_A_NM PROSPER EVANS.GPJ_TREK GEOTECHNICAL.GDT_2/28/20



Sub-Surface Log

Test Hole TH20-17

1 of 1

Client: WSP Canada Project Number: 1000-043-10
 Project Name: 20-LI-01 Local Streets and Alleys (Prosper St / Evans St) Location: UTM N-5527094, E-636339
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: January 15, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)											
					16	17	18	19	20	21	0	50	100	150	200	250				
0.0		SAND (FILL) - silty, some gravel, trace clay, brown, frozen, moist and compact when thawed, poorly graded fine grained sand to gravel (<25 mm diam.), sub-rounded to angular crushed "pit run"	G	G120																
0.0 - 0.5		SILT AND CLAY - trace sand - dark grey - frozen to 1.5 m depth, moist and stiff to very stiff when thawed - high plasticity	G	G121																
0.5 - 1.0		SILT - clayey - light brown - moist, soft - intermediate plasticity	G	G122																
1.0 - 1.5		SILT - clayey - light brown - moist, soft - intermediate plasticity	G	G123																
1.5 - 2.0		SILT - clayey - light brown - moist, soft - intermediate plasticity	G	G124																
2.0 - 2.5		SILT AND CLAY - brown - moist, firm to stiff - high plasticity	G	G125																
2.5 - 3.0		SILT AND CLAY - brown - moist, firm to stiff - high plasticity	G	G126																

END OF TEST HOLE AT 3.0 m IN SILT AND CLAY
 1) No seepage or sloughing observed.
 2) Test hole open and dry to 2.9 m immediately after drilling.
 3) Test hole backfilled with auger cuttings and granular fill to surface.
 4) Test hole located 1.7 m North and 3.5 m East of the Northwest corner of the garage at house #519 of St Catherine St.

Logged By: Nuno Mendonca Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_A_NM PROSPER EVANS.GPJ_TREK GEOTECHNICAL.GDT_2/28/20



Sub-Surface Log

Test Hole TH20-18

1 of 1

Client: WSP Canada **Project Number:** 1000-043-10
Project Name: 20-LI-01 Local Streets and Alleys (Prosper St / Evans St) **Location:** UTM N-5527096, E-636398
Contractor: Maple Leaf Drilling Ltd. **Ground Elevation:** Existing Ground
Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount **Date Drilled:** January 15, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)	Test Type
					16	17	18	19		
0.0		SAND (FILL) - silty, some gravel, trace clay, brown, frozen, moist and compact when thawed, poorly graded fine grained sand to gravel (<25 mm diam.), sub-rounded to angular crushed "pit run"	G127							
0.2		CLAY - silty, trace organics - mottled black and brown - frozen, moist and soft to firm when thawed - high plasticity	G128							
0.5		SILT - some clay - light brown - frozen to 1.4 m depth, wet and soft when thawed - low plasticity	G129							
1.0		CLAY - silty - mottled brown and grey - moist, firm to stiff - high plasticity	G130							
1.5		CLAY - silty - mottled brown and grey - moist, firm to stiff - high plasticity	G131							
2.0		CLAY - silty - mottled brown and grey - moist, firm to stiff - high plasticity	G132							
2.5										
3.0			G133							

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage or sloughing observed.
- 2) Test hole open and dry to 3.0 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings and granular fill to surface.
- 4) Test hole located 1.7 m North and 0.9 m West of the Northeast corner of the garage at house #535 of St Catherine St.

Logged By: Nuno Mendonca **Reviewed By:** Angela Fidler-Kliewer **Project Engineer:** Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_0_A_NM PROSPER EVANS.GPJ_TREK GEOTECHNICAL.GDT_2/28/20



Sub-Surface Log

Test Hole TH20-19

1 of 1

Client: WSP Canada **Project Number:** 1000-043-10
Project Name: 20-LI-01 Local Streets and Alleys (Prosper St / Evans St) **Location:** UTM N-5527097, E-636442
Contractor: Maple Leaf Drilling Ltd. **Ground Elevation:** Existing Ground
Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount **Date Drilled:** January 15, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.3		SAND (FILL) - silty, some gravel, trace clay, brown, frozen, moist and compact when thawed, poorly graded fine grained sand to gravel (<25 mm diam.), sub-rounded to angular crushed "pit run"	G	G134	●											
0.3 - 1.0		SILT - clayey - light brown - frozen, moist and soft when thawed - intermediate plasticity	T	G135	●											
1.0 - 1.2			T	G136	●											
1.2 - 1.5		CLAY - silty - grey - frozen to 1.5 m depth, moist and stiff to very stiff when thawed - high plasticity	T	G137	●									⊕		
1.5 - 1.8			T	G138	●									⊕	△	
1.8 - 2.1			T	G139	●									⊕		
2.1 - 3.0		- firm to stiff below 2.7 m	T	G140	●									⊕		

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage or sloughing observed.
- 2) Test hole open and dry to 3.0 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings and granular fill to surface.
- 4) Test hole located 4.0 m North and 2.0 m West of the Northeast corner of the garage of house #545 of St Catherine St.

Logged By: Nuno Mendonca **Reviewed By:** Angela Fidler-Kliewer **Project Engineer:** Brent Hay

SUB-SURFACE LOG LOGS 2020-01-17 LOCAL STREETS AND ALLEYS_1000-043-10_0_A_NM PROSPER EVANS.GPJ_TREK GEOTECHNICAL.GDT_2/28/20



**20-LI-01 Alley Renewal - Prosper St. / Evans St.
Sub-Surface Investigation**

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index
TH20-16	UTM : 5527127 N, 636322 E Located 1.0 m North and 4.3 m East of the Northeast corner of 16 Prosper St.	N/A	N/A	N/A	N/A	Sand and Gravel	0.0	0.1	6.5							
						Silt and Clay	0.3	0.5	24							
						Silt and Clay	0.6	0.8	26	64	34	1.2	0	23	75	52
						Silt and Clay	0.9	1.1	25							
						Silt and Clay	1.2	1.4	27							
						Silt and Clay	1.5	1.7	36							
						Silt and Clay	2.9	3.0	40							
TH20-17	UTM : 5527094 N, 636339 E Located 1.7 m North and 3.5 m East of the Northwest corner of garage at 519 St Catherine St.	N/A	N/A	N/A	N/A	Sand and Gravel	0.0	0.1	10							
						Silt and Clay	0.3	0.5	33							
						Silt and Clay	0.6	0.8	33	67	31	2	0	25	77	53
						Silt and Clay	0.9	1.1	33							
						Silt and Clay	1.2	1.4	32							
						Silt	1.5	1.7	24							
						Silt and Clay	2.9	3.0	43							
TH20-18	UTM : 5527096 N, 636398 E Located 1.7 m North and 0.9 m West of the Northeast corner of garage at 535 St Catherine St.									Clay (%)	Silt/Fine (%)	Sand (%)	Gravel (%)			
		N/A	N/A	N/A	N/A	Sand and Gravel	0.0	0.1	9.1		20	60	19			
						Clay	0.3	0.5	48							
						Silt	0.6	0.8	41							
						Silt	0.9	1.1	24	14	82	3.5	0	19	27	8
						Silt	1.2	1.4	23							
						Clay	1.5	1.7	38							
TH20-19	UTM : 5527097 N, 636442 E Located 4.0 m North and 2.0 m West of Northeast corner of the garage at 545 St Catherine St.	N/A	N/A	N/A	N/A	Sand and Gravel	0.0	0.1	6.9							
						Silt	0.3	0.5	29							
						Silt	0.6	0.8	27							
						Clay	0.9	1.1	30							
						Clay	1.2	1.4	29							
						Clay	1.5	1.7	42							
						Clay	2.9	3.0	50							



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Moisture Content Report ASTM D2216-10

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley - Evans St. / Prosper St.

Sample Date 16-Jan-20
Test Date 27-Jan-20
Technician BMH

Test Hole	TH20-16	TH20-16	TH20-16	TH20-16	TH20-16	TH20-16
Depth (m)	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7
Sample #	G113	G114	G115	G116	G117	G118
Tare ID	N01	Z75	P02	Z62	W16	W126
Mass of tare	8.6	8.5	8.8	8.9	8.5	8.4
Mass wet + tare	203.4	198.4	396.0	208.4	230.7	191.9
Mass dry + tare	191.5	161.5	317.0	168.1	183.4	143.0
Mass water	11.9	36.9	79.0	40.3	47.3	48.9
Mass dry soil	182.9	153.0	308.2	159.2	174.9	134.6
Moisture %	6.5%	24.1%	25.6%	25.3%	27.0%	36.3%

Test Hole	TH20-16	TH20-17	TH20-17	TH20-17	TH20-17	TH20-17
Depth (m)	2.9 - 3.0	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4
Sample #	G119	G120	G121	G122	G123	G124
Tare ID	Z127	AB43	AB100	Z118	W41	Z93
Mass of tare	8.6	6.6	6.9	8.8	8.6	8.7
Mass wet + tare	209.7	336.9	138.2	361.8	215.7	225.8
Mass dry + tare	151.9	308.1	105.5	274.5	163.8	172.8
Mass water	57.8	28.8	32.7	87.3	51.9	53.0
Mass dry soil	143.3	301.5	98.6	265.7	155.2	164.1
Moisture %	40.3%	9.6%	33.2%	32.9%	33.4%	32.3%

Test Hole	TH20-17	TH20-17	TH20-18	TH20-18	TH20-18	TH20-18
Depth (m)	1.5 - 1.7	2.9 - 3.0	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1
Sample #	G125	G126	G127	G128	G129	G130
Tare ID	AB11	AC19	D11	AC24	Z02	F83
Mass of tare	6.9	6.8	354.2	6.7	9.3	8.8
Mass wet + tare	271.8	181.9	1531.2	280.3	313.6	428.3
Mass dry + tare	219.8	128.9	1432.8	191.6	224.9	348.3
Mass water	52.0	53.0	98.4	88.7	88.7	80.0
Mass dry soil	212.9	122.1	1078.6	184.9	215.6	339.5
Moisture %	24.4%	43.4%	9.1%	48.0%	41.1%	23.6%



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**Moisture Content Report
 ASTM D2216-10**

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley - Evans St. / Prosper St.

Sample Date 16-Jan-20
Test Date 27-Jan-20
Technician BMH

Test Hole	TH20-18	TH20-18	TH20-18	TH20-19	TH20-19	TH20-19
Depth (m)	1.2 - 1.4	1.5 - 1.7	2.9 - 3.0	0.0 - 0.2	0.3 - 0.5	0.6 - 0.8
Sample #	G131	G132	G133	G134	G135	G136
Tare ID	F85	F97	Z65	K32	AB73	F19
Mass of tare	8.7	8.5	8.5	8.5	6.7	8.6
Mass wet + tare	242.2	245.6	229.7	250.5	265.9	198.1
Mass dry + tare	197.9	180.1	156.7	234.9	207.9	158.0
Mass water	44.3	65.5	73.0	15.6	58.0	40.1
Mass dry soil	189.2	171.6	148.2	226.4	201.2	149.4
Moisture %	23.4%	38.2%	49.3%	6.9%	28.8%	26.8%

Test Hole	TH20-19	TH20-19	TH20-19	TH20-19		
Depth (m)	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.9 - 3.0		
Sample #	G137	G138	G139	G140		
Tare ID	A8	F75	H80	AB40		
Mass of tare	8.0	8.5	8.8	6.7		
Mass wet + tare	185.0	238.4	182.7	196.5		
Mass dry + tare	144.7	186.1	131.4	133.2		
Mass water	40.3	52.3	51.3	63.3		
Mass dry soil	136.7	177.6	122.6	126.5		
Moisture %	29.5%	29.4%	41.8%	50.0%		



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Atterberg Limits
ASTM D4318-10e1

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley - Prosper St. / Evans St.

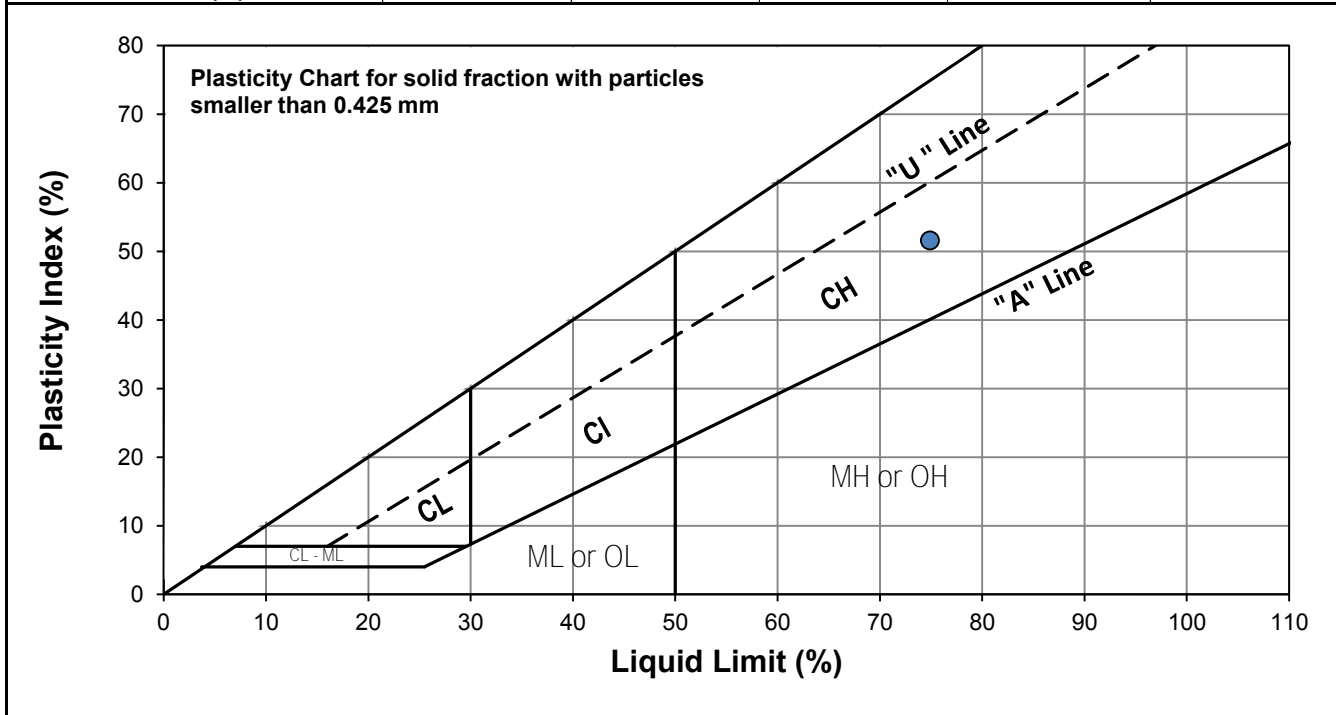


Test Hole TH20-16
Sample # G115
Depth (m) 0.6 - 0.8
Sample Date 17-Jan-20
Test Date 6-Feb-20
Technician HS

Liquid Limit	75
Plastic Limit	23
Plasticity Index	52

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	17	24	33
Mass Wet Soil + Tare (g)	28.812	24.319	26.434
Mass Dry Soil + Tare (g)	22.300	19.857	21.200
Mass Tare (g)	14.044	13.869	14.000
Mass Water (g)	6.512	4.462	5.234
Mass Dry Soil (g)	8.256	5.988	7.200
Moisture Content (%)	78.876	74.516	72.694



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.088	14.057			
Mass Wet Soil + Tare (g)	20.644	21.359			
Mass Dry Soil + Tare (g)	19.415	19.967			
Mass Water (g)	1.229	1.392			
Mass Dry Soil (g)	5.327	5.910			
Moisture Content (%)	23.071	23.553			



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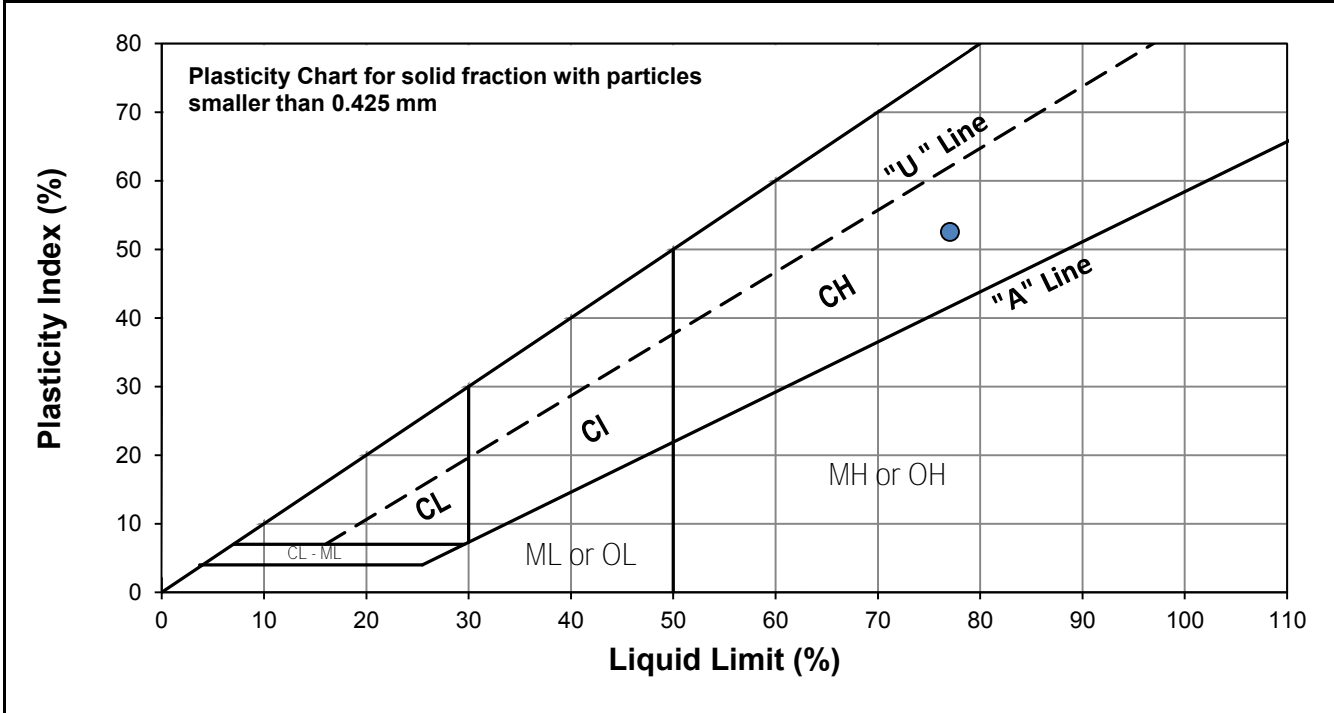


Test Hole TH20-17
Sample # G122
Depth (m) 0.6 - 0.8
Sample Date 17-Jan-20
Test Date 12-Feb-20
Technician HS

Liquid Limit	77
Plastic Limit	25
Plasticity Index	53

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	17	24	33
Mass Wet Soil + Tare (g)	77.237	76.144	75.126
Mass Dry Soil + Tare (g)	72.133	71.607	71.062
Mass Tare (g)	65.809	65.770	65.584
Mass Water (g)	5.104	4.537	4.064
Mass Dry Soil (g)	6.324	5.837	5.478
Moisture Content (%)	80.708	77.728	74.188



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.173	14.186			
Mass Wet Soil + Tare (g)	20.550	20.704			
Mass Dry Soil + Tare (g)	19.288	19.427			
Mass Water (g)	1.262	1.277			
Mass Dry Soil (g)	5.115	5.241			
Moisture Content (%)	24.673	24.366			



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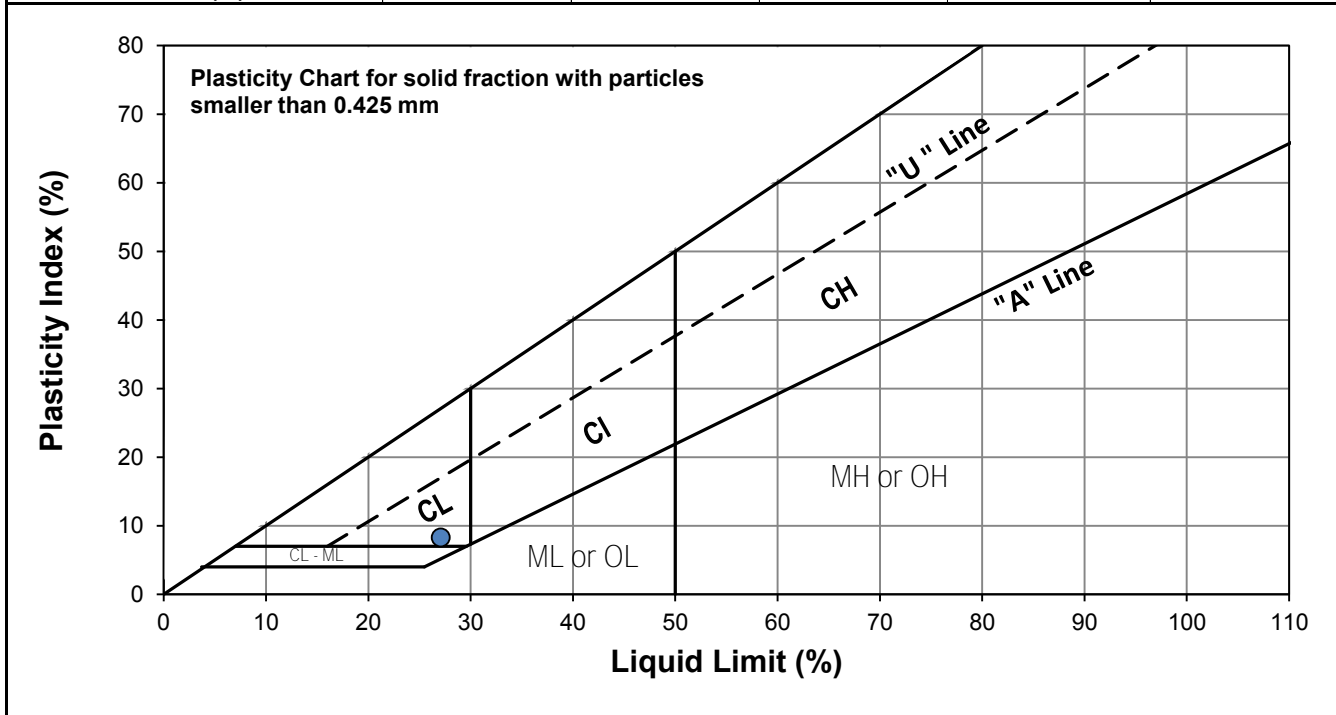


Test Hole TH20-18
Sample # G130
Depth (m) 0.9 - 1.1
Sample Date 17-Jan-20
Test Date 11-Feb-20
Technician HS

Liquid Limit	27
Plastic Limit	19
Plasticity Index	8

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	16	28	33
Mass Wet Soil + Tare (g)	25.169	29.386	29.308
Mass Dry Soil + Tare (g)	22.762	26.153	26.104
Mass Tare (g)	14.147	14.182	13.991
Mass Water (g)	2.407	3.233	3.204
Mass Dry Soil (g)	8.615	11.971	12.113
Moisture Content (%)	27.940	27.007	26.451



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.370	14.253			
Mass Wet Soil + Tare (g)	24.016	27.452			
Mass Dry Soil + Tare (g)	22.479	25.372			
Mass Water (g)	1.537	2.080			
Mass Dry Soil (g)	8.109	11.119			
Moisture Content (%)	18.954	18.707			



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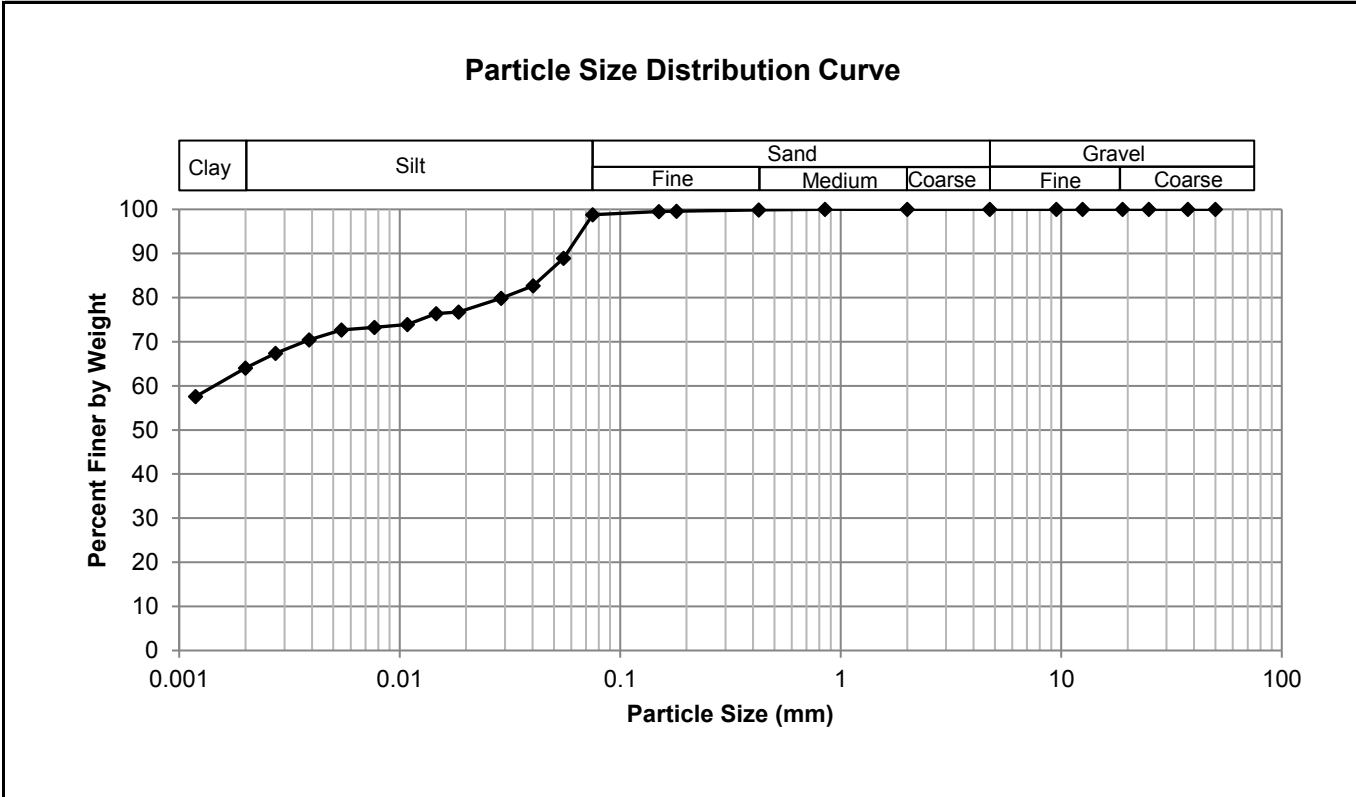
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley - Prosper St. / Evans St.



Test Hole TH20-16
Sample # G115
Depth (m) 0.6 - 0.8
Sample Date 15-Jan-20
Test Date 5-Feb-20
Technician HS

Gravel	0.0%
Sand	1.2%
Silt	34.8%
Clay	64.0%



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	98.81
37.5	100.00	2.00	100.00	0.0554	88.90
25.0	100.00	0.850	99.99	0.0403	82.65
19.0	100.00	0.425	99.87	0.0289	79.84
12.5	100.00	0.180	99.60	0.0185	76.71
9.50	100.00	0.150	99.51	0.0147	76.40
4.75	100.00	0.075	98.81	0.0108	73.90
				0.0077	73.27
				0.0054	72.65
				0.0039	70.39
				0.0027	67.38
				0.0020	64.01
				0.0012	57.56



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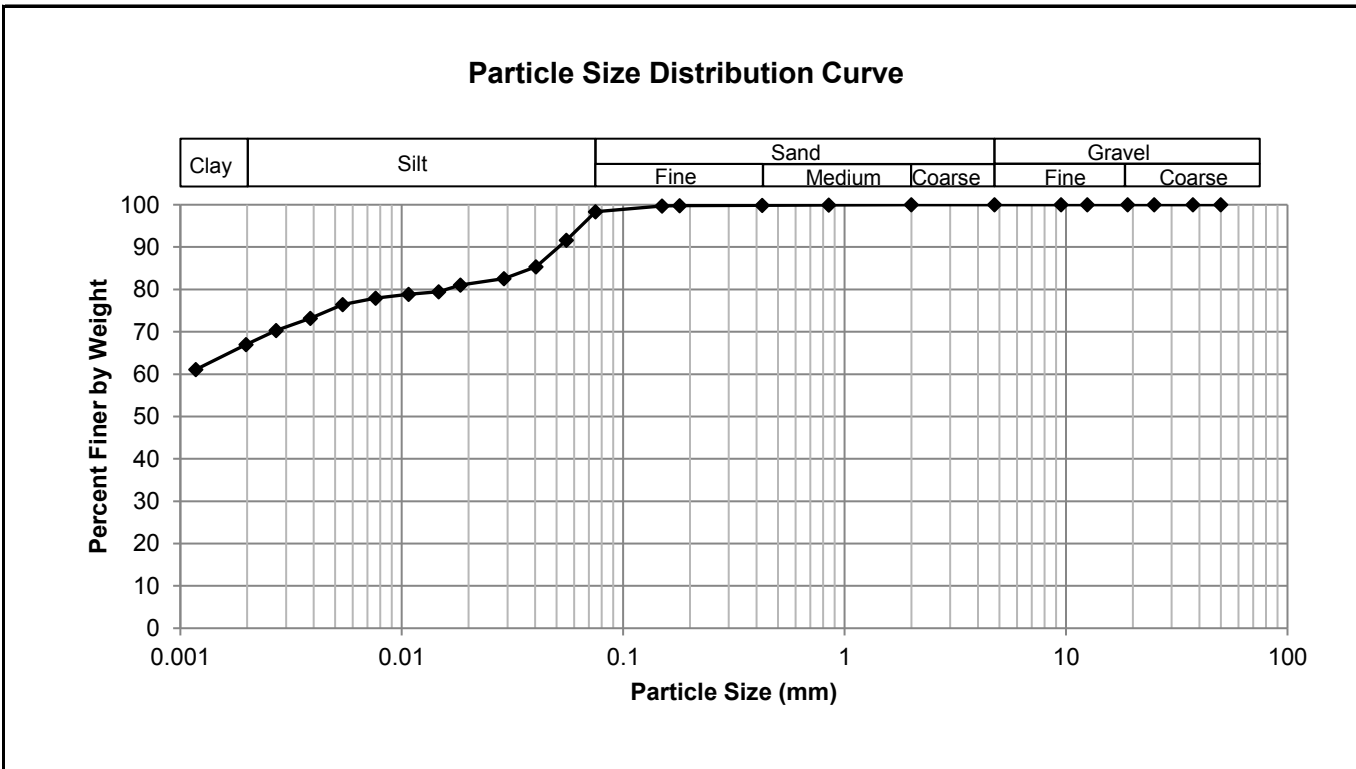
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley - Prosper St. / Evans St.



Test Hole TH20-17
Sample # G122
Depth (m) 0.6 - 0.8
Sample Date 15-Jan-20
Test Date 7-Feb-20
Technician HS

Gravel	0.0%
Sand	1.7%
Silt	31.2%
Clay	67.1%



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	98.35
37.5	100.00	2.00	100.00	0.0555	91.64
25.0	100.00	0.850	99.96	0.0404	85.39
19.0	100.00	0.425	99.86	0.0290	82.57
12.5	100.00	0.180	99.75	0.0184	81.01
9.50	100.00	0.150	99.72	0.0147	79.45
4.75	100.00	0.075	98.35	0.0108	78.82
				0.0076	77.94
				0.0054	76.43
				0.0039	73.16
				0.0027	70.34
				0.0020	67.01
				0.0012	61.11



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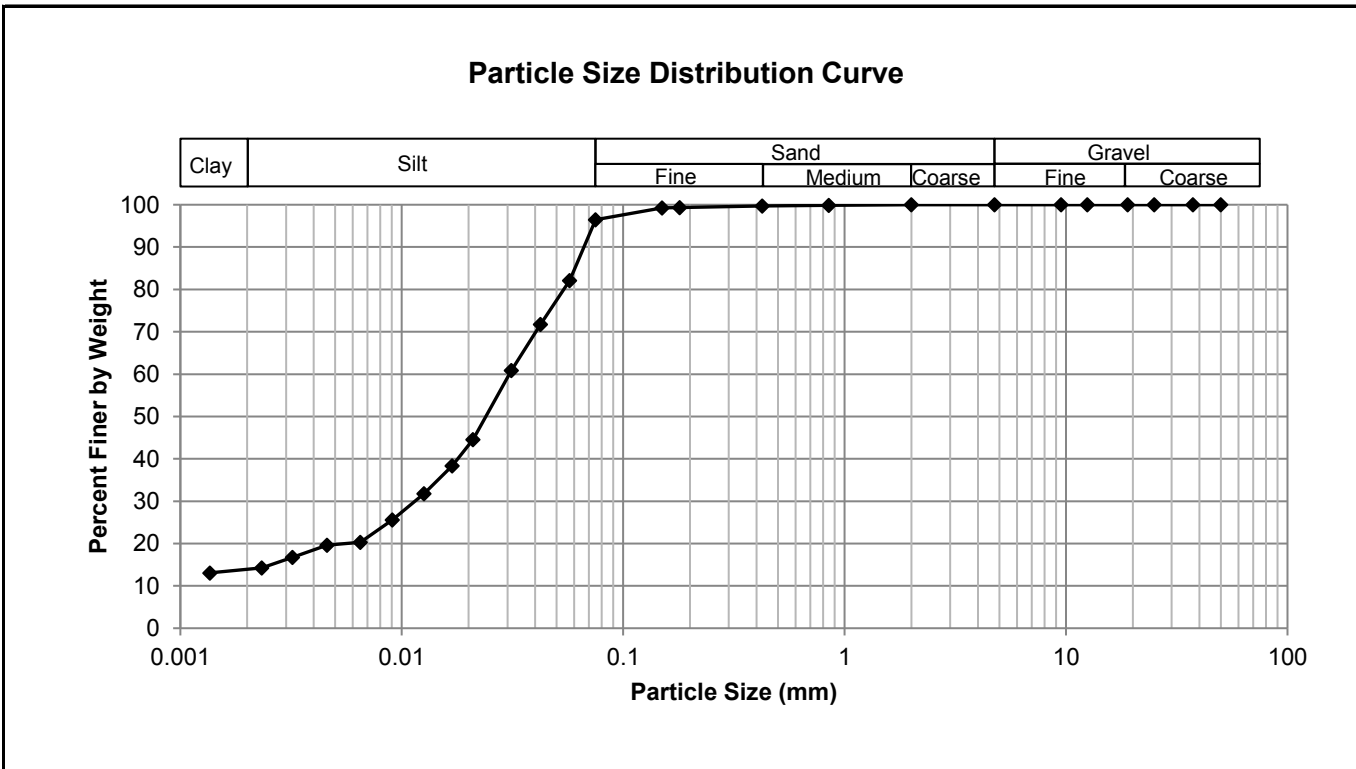
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

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Client WSP
Project 2020 Local Street and Alley - Prosper St. / Evans St.



Test Hole TH20-18
Sample # G130
Depth (m) 0.9 - 1.1
Sample Date 15-Jan-20
Test Date 5-Feb-20
Technician HS

Gravel	0.0%
Sand	3.5%
Silt	82.6%
Clay	13.9%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	96.46
37.5	100.00	2.00	100.00	0.0573	82.10
25.0	100.00	0.850	99.84	0.0423	71.78
19.0	100.00	0.425	99.68	0.0313	60.84
12.5	100.00	0.180	99.37	0.0210	44.58
9.50	100.00	0.150	99.24	0.0169	38.33
4.75	100.00	0.075	96.46	0.0126	31.76
				0.0091	25.58
				0.0065	20.32
				0.0046	19.58
				0.0032	16.77
				0.0023	14.27
				0.0014	13.07



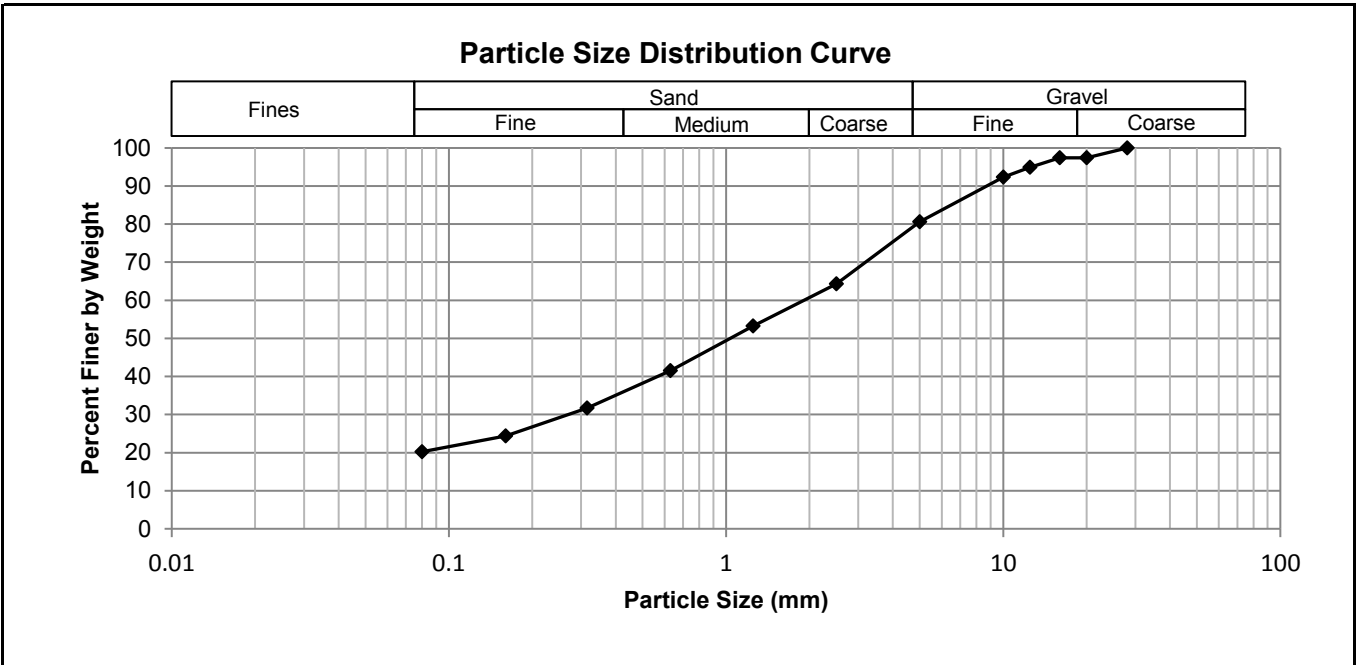
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Grain Size Analysis (Sieve Method)
ASTM C136-06

Project No. 1000-043-10
Client WSP
Project 2020 Local Street and Alley - Prosper St. / Evans St.

Test Hole TH20-18
Sample # G127
Depth (m) 0.0-0.1
Date Sampled 17-Jan-20
Date Tested 18-Feb-20
Technician HS

Total Weight (g)	1079.4
Gravel %	19.4
Sand %	60.4
Fines %	20.2



Sieve Opening (mm)	Percent Passing	Specification (Min-Max)
28.0	100	-
20.0	97	-
16.0	97	-
12.5	95	-
10.0	92	-
5.0	81	-
2.50	64	-
1.25	53	-
0.630	42	-
0.315	32	-
0.160	24	-
0.080	20	-



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WSP Canada Group Winnipeg
20-LI-01 Local Alley Renewals
Final Report

Prepared for:

WSP Canada Group Ltd.
111-93 Lombard Ave.
Winnipeg, MB R3B
Attention: Lissa VanDorp, P.Eng.

Project Number:

1000 043 10 400

Date:

April 3, 2020

April 3, 2020

Our File No. 1000 043 10 400

Lissa VanDorp, P.Eng.
WSP Canada Group Ltd.
111-93 Lombard Ave.
Winnipeg, MB R3B

**RE: Road Investigation Report for
20-LI-01 Local Alley Renewals**

TREK Geotechnical Inc. is pleased to submit our report for the road investigations for the 20-LI-01 Local Alley Renewals project.

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

Sincerely,

TREK Geotechnical Inc.

Per:



Brent Hay, P. Eng.
Geotechnical Engineer
Tel: 204.975.9433 ext. 103

cc: Angela Fidler-Kliewer C.Tech. (TREK Geotechnical)




Revision History

Revision No.	Author	Issue Date	Description
1	AFK	April 3, 2020	Final Report

Authorization Signatures

Prepared By:


Angela Fidler-Kliewer, C. Tech
Manager of Laboratory and Field Services



Reviewed By:

Brent Hay, P.Eng.
Geotechnical Engineer



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Figure 01 Alley Test Hole Location Plan – Ferry Road

List of Appendices

Appendix A Test Hole Logs, Summary Table & Lab Testing Results - Alley – Ferry Road

1.0 Introduction

This report summarizes the results of the road investigation completed for the 20-LI-01 Local Alley Renewal project. The test holes were completed within the alley of Ferry Road, between St. Mathews Ave and Silver Ave. The information collected describes the soil stratigraphy beneath the surface at the test hole locations.

2.0 Road Investigation and Laboratory Program

The investigation included the drilling of test holes and the locations are shown on Figure 01. The sub-surface investigation was conducted on March 19, 2020. The test holes were drilled to a depth of 3.0 m below road surface by Maple Leaf Drilling Ltd. using a truck mounted drill rig equipped with 125 mm diameter solid stem augers under the supervision of TREK personnel. The sub-surface conditions were observed during drilling and visually classified by Harsimran Singh of TREK. Other pertinent information such as groundwater and drilling conditions were also recorded during the drilling investigation. Disturbed (auger cuttings) samples and bulk samples retrieved during the sub-surface investigation were transported to TREK's material testing laboratory for further testing.

The laboratory testing program consisted of moisture content determination on all samples, as well as Atterberg limits, and grain size analysis (mechanical sieve and hydrometer methods) on select samples between 0.0 and 1.5 m below surface. Information gathered for each alley is included in Appendix A. The information provided in the Appendix A includes test hole logs, laboratory testing summary tables and results.

Test hole locations noted on the summary tables and test hole logs are based on UTM coordinates obtained using a hand-held GPS and their location relative to the nearest address, and measured distance from the edge of pavement or other permanent features.

3.0 Closure

The information provided in this report is in accordance with current engineering principles and practices (Standard of Practice). The findings of this report were based on information provided (field investigation, laboratory testing, geometries). Soil conditions are natural deposits that can be highly variable across a site. If sub-surface conditions are different than the conditions previously encountered on-site or those presented here, we should be notified to adjust our findings if necessary.

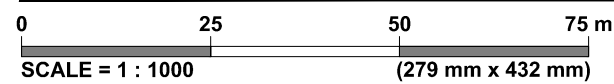
All information provided in this report is subject to our standard terms and conditions for engineering services, a copy of which is provided to each of our clients with the original scope of work, or a mutually executed standard engineering services agreement. If these conditions are not attached, and you are not already in possession of such terms and conditions, contact our office and you will be promptly provided with a copy.

This report has been prepared by TREK Geotechnical Inc. (the Consultant) for the exclusive use of WSP Canada Group (the Client) and their agents for the work product presented in the report. Any findings or recommendations provided in this report are not to be used or relied upon by any third parties, except as agreed to in writing by the Client and Consultant prior to use.

Figures

ANSI full bleed B (11.00 x 17.00 inches)

Z:\Projects\1000 Soils Lab\Lab Projects\1000-043 WSP\1000-043-10 Local Streets and Alleys\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\20.03.25 TH LOCATIONS - FERRY.dwg, 3/31/2020 3:15:06 PM



LEGEND: TEST HOLE (TREK, 2020)

NOTES: 1. AERIAL IMAGE FROM GOOGLE EARTH (2019)
2. TEST HOLE LOCATIONS OBTAINED USING HAND HELD GPS UNIT AND BY MEASURING DISTANCES OFF EXISTING STRUCTURES.

Figure 01
TEST HOLE LOCATION PLAN

Appendix A

Ferry Road

Test Hole Logs, Summary Table and Lab Testing Results

GENERAL NOTES

- Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
- Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
- When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions	USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria		Particle Size	Material		
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP More than 12 percent..... GM, GC, SM, SC 6 to 12 percent..... Borderline cases requiring dual symbols*	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	ASTM Sieve sizes	#10 to #4 #40 to #10 #200 to #40 < #200		
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW				
		Sands (More than half of coarse fraction is smaller than 4.75 mm)	GM		Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols	mm	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425 < 0.075
			GC		Clayey gravels, gravel-sand-silt mixtures	Atterberg limits above "A" line or P.I. greater than 7			
	Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Sands with fines (Appreciable amount of fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	Atterberg limits below "A" line or P.I. less than 4	Sand Coarse Medium Fine	
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW			
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols	Silt or Clay	
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7			
		Silts and Clays (Liquid limit less than 50)	Silts and Clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity		Particle Size ASTM Sieve Sizes mm > 300 75 to 300 19 to 75 4.75 to 19 > 12 in. 3 in. to 12 in. 3/4 in. to 3 in. #4 to 3/4 in.	
					CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
OL	Organic silts and organic silty clays of low plasticity								
Silts and Clays (Liquid limit greater than 50)	MH		Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts	Material Boulders Cobbles Gravel Coarse Fine					
	CH		Inorganic clays of high plasticity, fat clays						
	OH		Organic clays of medium to high plasticity, organic silts						
	Pt		Peat and other highly organic soils						
Highly Organic Soils			Von Post Classification Limit	Strong colour or odour, and often fibrous texture					

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)	▽ Water Level at Time of Drilling
PL - Plastic Limit (%)	▼ Water Level at End of Drilling
PI - Plasticity Index (%)	▽ Water Level After Drilling as Indicated on Test Hole Logs
MC - Moisture Content (%)	
SPT - Standard Penetration Test	
RQD- Rock Quality Designation	
Qu - Unconfined Compression	
Su - Undrained Shear Strength	
VW - Vibrating Wire Piezometer	
SI - Slope Incliner	

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>Undrained Shear Strength (kPa)</u>
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200



Sub-Surface Log

Test Hole TH20-01

1 of 1

Client: WSP Canada Project Number: 1000-043-10-400
 Project Name: 20-L1-01 Local Alley Renewals -Ferry Road and St Matthews Ave Location: UTM N-5528042, E-627978
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: B40 Truck Mount Date Drilled: March 19, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.3		SAND (FILL) - silty, some gravel, trace clay, light brown, frozen, moist and compact when thawed, poorly graded fine sand to gravel (<19 mm diam.), angular crushed limestone	Grab (G)	G01	●											
0.3 - 0.6		CLAY - silty, trace sand - dark grey - frozen to 1.5 m, moist and very stiff when thawed - high plasticity - stiff below 0.6 m	Grab (G)	G02	●											⊕
0.6 - 0.9		- stiff below 0.6 m	Grab (G)	G03	●											⊕
0.9 - 1.2		- trace gravel (<19 mm diam.) to 1.2 m, trace silt inclusions (<5 mm diam.), grey below 0.9 m	Grab (G)	G04	●											△ ⊕
1.2 - 1.5		- trace silt inclusions (<10 mm diam.) below 1.2 m	Grab (G)	G05	●											△ ⊕
1.5 - 2.0		- trace to some sand, trace gravel (<25 mm diam.) below 1.5 m	Grab (G)	G06	●											△ ⊕
2.0 - 2.5		SILT (Till) - clayey, trace to some sand, trace gravel (<25 mm diam.), trace silt inclusions (<10 mm diam.) - brown - moist, firm - intermediate plasticity	Grab (G)	G07	●											△ ⊕

END OF TEST HOLE AT 3.1 m IN SILT (Till)
 1) No seepage, sloughing from sand layer observed between 0.1 m to 0.3 m depth.
 2) Test hole open to 1.5 m after 15 minutes of drilling
 3) Test hole backfilled with auger cuttings and sand.
 4) Test hole located 28 m West and 4 m North of intersection of St Matthews Ave and Ferry Road.

Logged By: Harsimran Singh Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-03-30 FERRY STREET ALLEY 1000-043-10-400 A_HS - COPY - COPY.GPJ TREK GEOTECHNICAL.GDT 4/2/20



Sub-Surface Log

Test Hole TH20-02

1 of 1

Client: WSP Canada Project Number: 1000-043-10-400
 Project Name: 20-L1-01 Local Alley Renewals -Ferry Road and St Matthews Ave Location: UTM N-5527995, E-627966
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: B40 Truck Mount Date Drilled: March 19, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.4		SAND (FILL) - silty, some gravel, trace clay, light brown, frozen, moist and compact when thawed, poorly graded fine sand to gravel (<19 mm diam.), angular crushed limestone	G08		●											
0.4 - 0.6		CLAY - silty, trace sand - black - frozen, moist, stiff - high plasticity	G09			●										△
0.6 - 1.0		SILT AND CLAY - trace to some sand, trace gravel (<25 mm diam.) - brown - frozen to 1.5 m, moist and very stiff when thawed - high plasticity	G10			●										△
1.0 - 1.2			G11			●										△
1.2 - 1.5			G12			●										△
1.5 - 2.0			G13			●										△
2.0 - 2.5		SILT (Till) - clayey, trace to some sand, trace gravel (<25 mm diam.), trace oxidation - brown - moist, soft - intermediate plasticity														
2.5 - 3.0			G14			●										△

END OF TEST HOLE AT 3.1 m IN SILT (Till)
 1) No seepage or sloughing.
 2) Test hole backfilled with auger cuttings and sand.
 3) Test hole located 4 m West of North side of garage of 524 Ferry Road.

Logged By: Harsimran Singh Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-03-30 FERRY STREET ALLEY 1000-043-10-400 A_HS - COPY - COPY.GPJ TREK GEOTECHNICAL.GDT 4/2/20



Sub-Surface Log

Test Hole TH20-03

1 of 1

Client: WSP Canada Project Number: 1000-043-10-400
 Project Name: 20-L1-01 Local Alley Renewals -Ferry Road and St Matthews Ave Location: UTM N-5527931, E-627963
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: B40 Truck Mount Date Drilled: March 19, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)							
					16	17	18	19	20	21	Test Type							
					Particle Size (%)													
					0	20	40	60	80	100								
					PL MC LL 0 20 40 60 80 100													
					0 50 100 150 200 250													
					<input type="checkbox"/> Torvane <input type="checkbox"/> <input checked="" type="checkbox"/> Pocket Pen. <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Qu <input checked="" type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>													
0.0 - 0.3		SAND (FILL) - silty, some gravel, trace clay, light brown, frozen, moist and compact when thawed, poorly graded fine sand to gravel (<19 mm diam.), angular crushed limestone	G15															
0.3 - 0.9		CLAY - silty, trace sand - grey - frozen to 1.5 m, moist and firm when thawed - high plasticity - stiff below 0.9 m	G16															
0.9 - 1.5		- trace to some sand, trace gravel (<10 mm diam.), very stiff below 1.5 m	G17															
1.5 - 2.4			G18															
2.4 - 2.8			G19															
2.8 - 3.1			G20															
3.1 - 3.0		SILT (Till) - clayey, trace to some sand, trace gravel (<20 mm diam.) - brown - moist, soft - intermediate plasticity	G21															

END OF TEST HOLE AT 3.1 m IN SILT (Till)
 1) No seepage, sloughing from sand layer observed between 0.1 m to 0.3 m depth.
 2) Test hole open to 2.4 m after 15 minutes of drilling.
 3) Test hole backfilled with auger cuttings and sand.
 4) Test hole located 5 m West of South side of garage of 502 Ferry Road.

Logged By: Harsimran Singh Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-03-30 FERRY STREET ALLEY 1000-043-10-400 A_HS - COPY - COPY.GPJ TREK GEOTECHNICAL.GDT 4/2/20



Sub-Surface Log

Test Hole TH20-04

1 of 1

Client: WSP Canada Project Number: 1000-043-10-400
 Project Name: 20-L1-01 Local Alley Renewals -Ferry Road and St Matthews Ave Location: UTM N-5527870, E-627963
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: B40 Truck Mount Date Drilled: March 19, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)
					16	17	18	19	20	21	
0.0 - 0.1		SAND (FILL) - silty, some gravel, trace clay, light brown, frozen, moist and compact when thawed, poorly graded fine sand to gravel (<19 mm diam.), angular crushed limestone	G22								
0.1 - 0.6		CLAY - silty, trace sand, trace gravel (<10 mm diam.) - dark grey - frozen, moist and very stiff when thawed - high plasticity	G23								
0.6 - 1.0		SILT AND CLAY - trace to some sand, trace gravel (<20 mm diam.) - grey - frozen to 1.5 m, moist and very stiff when thawed - high plasticity	G24								
1.0 - 1.5		SILT AND CLAY - trace to some sand, trace gravel (<20 mm diam.) - grey - frozen to 1.5 m, moist and very stiff when thawed - high plasticity	G25								
1.5 - 2.4		SILT (Till) - clayey, trace to some sand, trace gravel (<20 mm diam.) - brown - moist, soft - intermediate plasticity	G26								
2.4 - 3.0		SILT (Till) - clayey, trace to some sand, trace gravel (<20 mm diam.) - brown - moist, soft - intermediate plasticity	G27								
3.0		SILT (Till) - clayey, trace to some sand, trace gravel (<20 mm diam.) - brown - moist, soft - intermediate plasticity	G28								

END OF TEST HOLE AT 3.1 m IN SILT (Till)
 1) No seepage, sloughing from sand layer observed between 0.0 m to 0.1 m depth.
 2) Test hole open to 2.4 m after 15 minutes of drilling.
 3) Test hole backfilled with auger cuttings and sand.
 4) Test hole Located 3.5 m West of the North side of property line of 482 Ferry Road.

Logged By: Harsimran Singh Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-03-30 FERRY STREET ALLEY 1000-043-10-400 A_HS - COPY - TREK GEOTECHNICAL.GDT 4/2/20



Sub-Surface Log

Test Hole TH20-05

1 of 1

Client: WSP Canada Project Number: 1000-043-10-400
 Project Name: 20-L1-01 Local Alley Renewals -Ferry Road and St Matthews Ave Location: UTM N-5527810, E-627961
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: B40 Truck Mount Date Drilled: March 19, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					0	20	40	60	80	100	0	50	100	150	200	250
					PL	MC	LL									
											□	△	⊕	⊗	○	
											□	△	⊕	⊗	○	
0.0 - 0.3		SAND (FILL) - silty, some gravel, trace clay, light brown, frozen, moist and compact when thawed, poorly graded fine sand to gravel (<19 mm diam.), angular crushed limestone	G29													
0.3 - 2.2		CLAY - silty, trace sand - grey - frozen to 1.5 m, moist and firm to stiff when thawed - high plasticity - black, trace organics below 0.6 m - light grey below 1.2 m	G30 G31 G32 G33 G34													
2.2 - 3.1		SILT (Till) - clayey, trace to some sand, trace gravel (<10 mm diam.) - brown - moist, soft - intermediate plasticity	G35 G36													

END OF TEST HOLE AT 3.1 m IN SILT (Till)
 1) No seepage, sloughing from sand layer observed between 0.0 m to 0.3 m depth.
 2) Test hole open to 2.4 m after 15 minutes of drilling.
 3) Test hole backfilled with auger cuttings and sand.
 4) Test hole located 5 m West of the North corner of garage of 470A Ferry Road.

Logged By: Harsimran Singh Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-03-30 FERRY STREET ALLEY 1000-043-10-400 A_HS - COPY - COPY.GPJ TREK GEOTECHNICAL.GDT 4/2/20



Sub-Surface Log

Test Hole TH20-06

1 of 1

Client: WSP Canada Project Number: 1000-043-10-400
 Project Name: 20-L1-01 Local Alley Renewals -Ferry Road and St Matthews Ave Location: UTM N-5527733, E-627954
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Existing Ground
 Method: B40 Truck Mount Date Drilled: March 19, 2020

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

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0 50 100 150 200 250											
0.0 - 0.3		SAND (FILL) - silty, some gravel, trace clay, light brown, frozen, moist and compact when thawed, poorly graded fine sand to gravel (<19 mm diam.), angular crushed limestone	G37		●											
0.3 - 0.9		CLAY - silty, trace sand, trace organics - grey - frozen to 1.5 m, moist and stiff when thawed - high plasticity	G38			●										△
0.9 - 1.5		- light grey below 0.9 m	G39													△
1.5 - 2.4		- very stiff below 1.5 m	G40			●										△
			G41			●										△
			G42			●										△
2.4 - 3.1		SILT (Till) - clayey, trace to some sand, trace gravel (<10 mm diam.), trace oxidation - brown - moist, soft - intermediate plasticity	G43			●										△

END OF TEST HOLE AT 3.1 m IN SILT (Till)
 1) No seepage, sloughing from sand layer observed between 0.0 m to 0.3 m depth.
 2) Test hole open to 2.4 m after 15 minutes of drilling.
 3) Test hole backfilled with auger cuttings and sand.
 4) Test hole located 7.5 m West of South side of garage of 454 Ferry Road.

Logged By: Harsimran Singh Reviewed By: Angela Fidler-Kliewer Project Engineer: Brent Hay

SUB-SURFACE LOG LOGS 2020-03-30 FERRY STREET ALLEY 1000-043-10-400 A_HS - COPY - TREK GEOTECHNICAL GDT 4/2/20



**20-LI-01 Alley Renewal - Ferry Road
Sub-Surface Investigation**

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Clay (%)	Silt/Fine (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index
TH20-05	UTM : 5527810 N, 627961 E Located 5 m West of the North corener of garage of 470A Ferry Road.	Asphalt	N/A	Concrete	N/A	Sand (Fill)	0.0	0.2	10		37	61	2			
						Clay	0.3	0.5	41							
						Clay	0.6	0.8	44							
						Clay	0.9	1.1	41							
						Clay	1.2	1.4	39							
						Clay	1.5	1.7	36							
						Silt (Till)	2.6	2.7	37							
						Silt	2.9	3.0	29							
TH20-06	UTM : 5527733 N, 627954 E Located 7.5 m West of South side of garage of 454 Ferry Road	Asphalt	N/A	Concrete	N/A	Sand (Fill)	0.0	0.2	15							
						Clay	0.3	0.5	33							
						Clay	0.6	0.8	35	76	22	1.5	0	26	78	52
						Clay	0.3	1.1	35							
						Clay	1.2	1.4	35							
						Clay	1.5	1.7	33							
						Silt (Till)	2.7	2.9	27							



Project No. 1000-043-10-400
Client WSP
Project 20-LI-01 Local Alley Renewals

Sample Date 19-Mar-20
Test Date 27-Mar-20
Technician HS

Test Hole	TH20-01	TH20-01	TH20-01	TH20-01	TH20-01	TH20-01
Depth (m)	0.0 - 0.2	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7
Sample #	G01	G02	G03	G04	G05	G06
Tare ID	H80	AB40	N72	AC05	F75	H15
Mass of tare	8.7	6.7	8.7	6.8	8.6	8.8
Mass wet + tare	317.0	325.0	339.9	274.1	370.7	454.2
Mass dry + tare	293.0	253.0	261.0	221.9	287.6	374.2
Mass water	24.0	72.0	78.9	52.2	83.1	80.0
Mass dry soil	284.3	246.3	252.3	215.1	279.0	365.4
Moisture %	8.4%	29.2%	31.3%	24.3%	29.8%	21.9%

Test Hole	TH20-01	TH20-02	TH20-02	TH20-02	TH20-02	TH20-02
Depth (m)	2.4 - 2.6	0.0 - 0.2	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4
Sample #	G07	G08	G09	G10	G11	G12
Tare ID	F97	AB69	F44	N02	H9	P21
Mass of tare	8.5	6.8	8.7	9.3	8.7	8.8
Mass wet + tare	325.9	388.8	314.8	465.4	441.7	305.1
Mass dry + tare	280.0	330.8	240.8	391.8	372.3	257.1
Mass water	45.9	58.0	74.0	73.6	69.4	48.0
Mass dry soil	271.5	324.0	232.1	382.5	363.6	248.3
Moisture %	16.9%	17.9%	31.9%	19.2%	19.1%	19.3%

Test Hole	TH20-02	TH20-02	TH20-03	TH20-03	TH20-03	TH20-03
Depth (m)	1.5 - 1.7	2.7 - 2.9	0.0 - 0.2	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1
Sample #	G13	G14	G15	G16	G17	G18
Tare ID	E119	H43	GUNIT	N53	W89	W81
Mass of tare	8.5	8.5	385.6	8.5	8.5	8.8
Mass wet + tare	222.0	341.3	4026.7	202.5	412.8	396.5
Mass dry + tare	187.3	284.9	3794.5	153.7	306.3	297.2
Mass water	34.7	56.4	232.2	48.8	106.5	99.3
Mass dry soil	178.8	276.4	3408.9	145.2	297.8	288.4
Moisture %	19.4%	20.4%	6.8%	33.6%	35.8%	34.4%



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**Moisture Content Report
 ASTM D2216-10**

Project No. 1000-043-10-400
Client WSP
Project 20-LI-01 Local Alley Renewals

Sample Date 19-Mar-20
Test Date 27-Mar-20
Technician HS

Test Hole	TH20-03	TH20-03	TH20-03	TH20-04	TH20-04	TH20-04
Depth (m)	1.2 - 1.4	1.5 - 1.7	2.6 - 2.7	0.0 - 0.1	0.3 - 0.5	0.6 - 0.8
Sample #	G19	G20	G21	G22	G23	G24
Tare ID	AA24	H78	A105	C3	E62	A25
Mass of tare	6.8	8.4	8.6	8.6	8.5	8.7
Mass wet + tare	255.6	220.1	338.1	139.0	174.0	332.8
Mass dry + tare	191.3	174.5	288.5	111.2	140.5	268.0
Mass water	64.3	45.6	49.6	27.8	33.5	64.8
Mass dry soil	184.5	166.1	279.9	102.6	132.0	259.3
Moisture %	34.9%	27.5%	17.7%	27.1%	25.4%	25.0%

Test Hole	TH20-04	TH20-04	TH20-04	TH20-04	TH20-05	TH20-05
Depth (m)	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.7 - 2.9	0.0 - 0.2	0.3 - 0.5
Sample #	G25	G26	G27	G28	G29	G30
Tare ID	E77	D48	AB12	E80	ZA	A100
Mass of tare	8.5	8.6	6.8	8.6	300.3	8.8
Mass wet + tare	434.9	189.2	305.7	228.1	1545.1	136.4
Mass dry + tare	359.8	159.0	254.4	198.1	1432.2	99.2
Mass water	75.1	30.2	51.3	30.0	112.9	37.2
Mass dry soil	351.3	150.4	247.6	189.5	1131.9	90.4
Moisture %	21.4%	20.1%	20.7%	15.8%	10.0%	41.2%

Test Hole	TH20-05	TH20-05	TH20-05	TH20-05	TH20-05	TH20-05
Depth (m)	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.6 - 2.7	2.9 - 3.0
Sample #	G31	G32	G33	G34	G35	G36
Tare ID	H74	Z72	H35	AB80	A101	A103
Mass of tare	8.7	8.8	8.5	6.7	8.6	8.8
Mass wet + tare	167.7	188.3	209.2	168.9	200.2	255.0
Mass dry + tare	119.4	136.3	153.4	125.6	148.5	199.9
Mass water	48.3	52.0	55.8	43.3	51.7	55.1
Mass dry soil	110.7	127.5	144.9	118.9	139.9	191.1
Moisture %	43.6%	40.8%	38.5%	36.4%	37.0%	28.8%



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**Moisture Content Report
 ASTM D2216-10**

Project No. 1000-043-10-400
Client WSP
Project 20-LI-01 Local Alley Renewals

Sample Date 19-Mar-20
Test Date 27-Mar-20
Technician HS

Test Hole	TH20-06	TH20-06	TH20-06	TH20-06	TH20-06	TH20-06
Depth (m)	0.0 - 0.2	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7
Sample #	G37	G38	G39	G40	G41	G42
Tare ID	E85	F132	Z91	W22	W76	Z07
Mass of tare	8.6	8.7	8.8	8.5	8.5	8.6
Mass wet + tare	186.1	153.7	360.6	258.0	363.8	239.0
Mass dry + tare	163.4	117.6	269.7	193.5	272.0	182.5
Mass water	22.7	36.1	90.9	64.5	91.8	56.5
Mass dry soil	154.8	108.9	260.9	185.0	263.5	173.9
Moisture %	14.7%	33.1%	34.8%	34.9%	34.8%	32.5%

Test Hole	TH20-06					
Depth (m)	2.7 - 2.9					
Sample #	G43					
Tare ID	AA15					
Mass of tare	6.7					
Mass wet + tare	268.9					
Mass dry + tare	213.7					
Mass water	55.2					
Mass dry soil	207.0					
Moisture %	26.7%					



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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

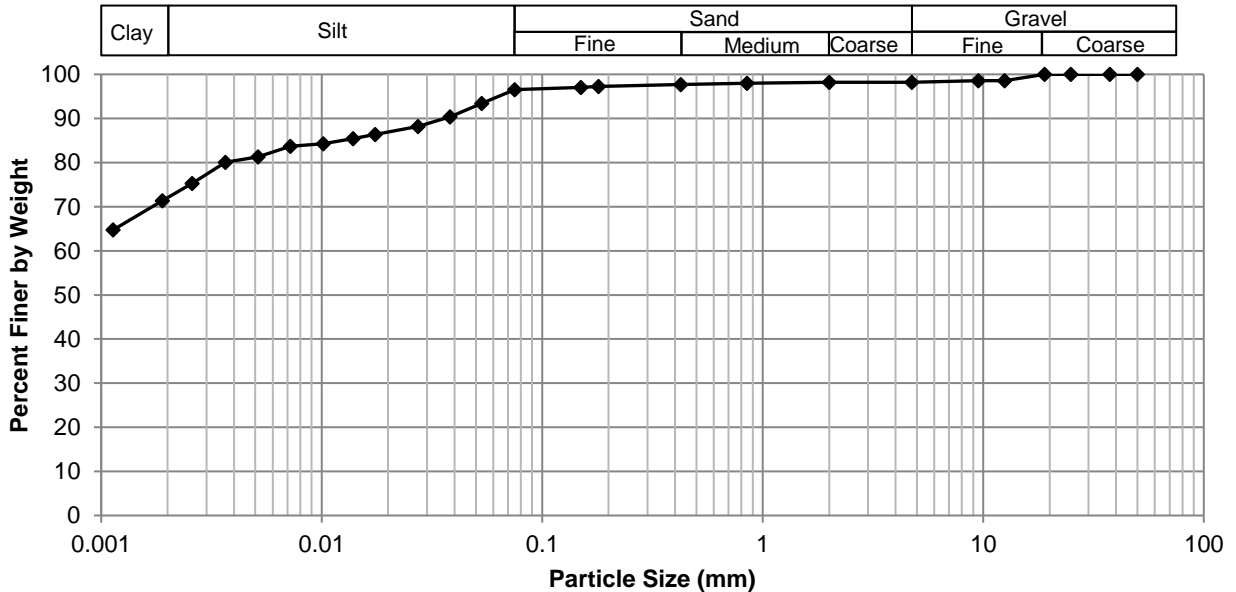
Project No. 1000-043-10-400
Client WSP
Project 20-LI-01 Local Alley Renewals



Test Hole TH20-01
Sample # G03
Depth (m) 0.6 - 0.8
Sample Date 19-Mar-20
Test Date 26-Mar-20
Technician HS

Gravel	1.8%
Sand	1.7%
Silt	24.6%
Clay	71.9%

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	98.24	0.0750	96.51
37.5	100.00	2.00	98.24	0.0533	93.44
25.0	100.00	0.850	98.00	0.0383	90.37
19.0	100.00	0.425	97.71	0.0273	88.22
12.5	98.60	0.180	97.23	0.0175	86.38
9.50	98.60	0.150	97.07	0.0139	85.45
4.75	98.24	0.075	96.51	0.0102	84.29
				0.0072	83.68
				0.0051	81.28
				0.0037	80.05
				0.0026	75.27
				0.0019	71.34
				0.0011	64.75



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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

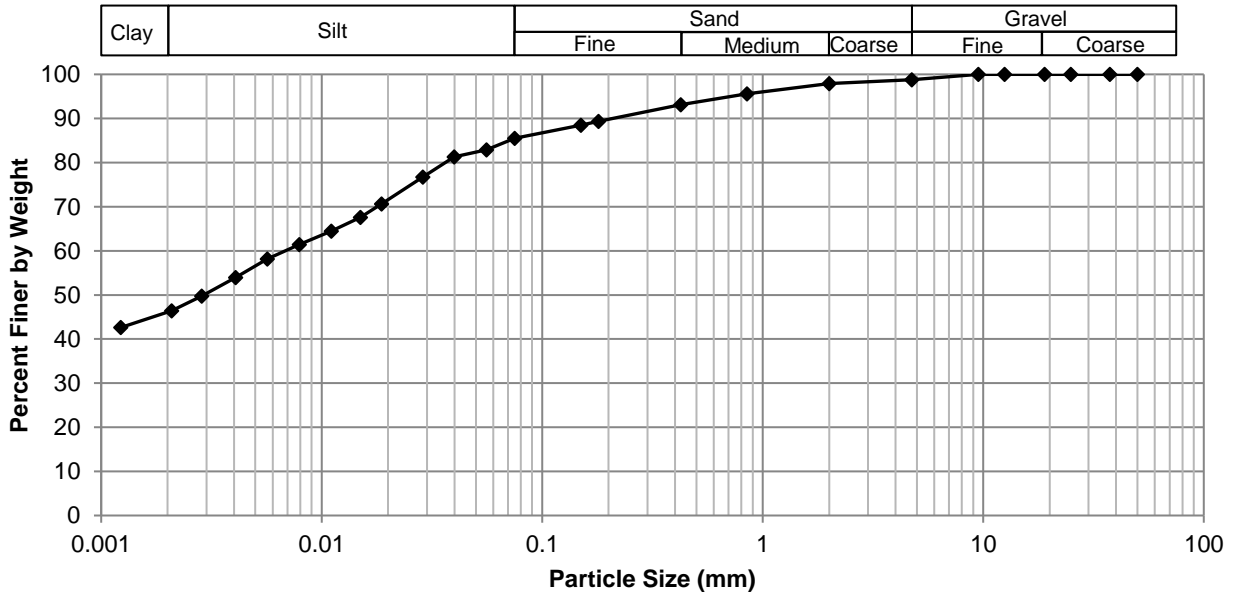
Project No. 1000-043-10-400
Client WSP
Project 20-LI-01 Local Alley Renewals



Test Hole TH20-02
Sample # G11
Depth (m) 0.9 - 1.1
Sample Date 19-Mar-20
Test Date 26-Mar-20
Technician HS

Gravel	1.2%
Sand	13.3%
Silt	39.5%
Clay	46.0%

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	98.80	0.0750	85.54
37.5	100.00	2.00	97.91	0.0560	82.87
25.0	100.00	0.850	95.63	0.0399	81.34
19.0	100.00	0.425	93.10	0.0288	76.74
12.5	100.00	0.180	89.37	0.0187	70.62
9.50	100.00	0.150	88.46	0.0150	67.56
4.75	98.80	0.075	85.54	0.0111	64.50
				0.0079	61.44
				0.0057	58.15
				0.0041	53.93
				0.0029	49.72
				0.0021	46.43
				0.0012	42.62



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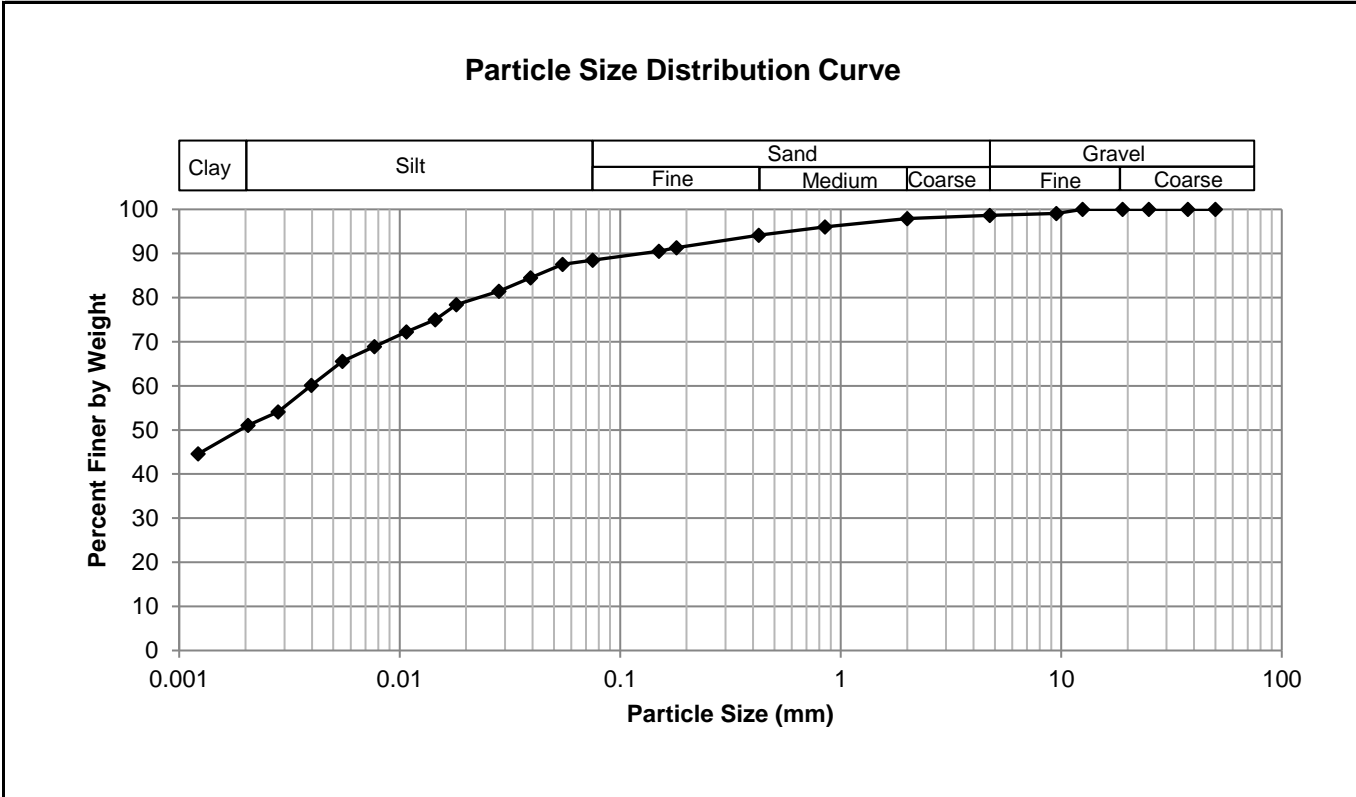
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-10-400
Client WSP
Project 20-LI-01 Local Alley Renewals



Test Hole TH20-04
Sample # G25
Depth (m) 0.9 - 1.1
Sample Date 19-Mar-20
Test Date 26-Mar-20
Technician HS

Gravel	1.3%
Sand	10.2%
Silt	37.8%
Clay	50.7%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	98.65	0.0750	88.47
37.5	100.00	2.00	97.93	0.0547	87.56
25.0	100.00	0.850	96.00	0.0393	84.50
19.0	100.00	0.425	94.16	0.0282	81.44
12.5	100.00	0.180	91.31	0.0181	78.38
9.50	99.10	0.150	90.54	0.0145	75.01
4.75	98.65	0.075	88.47	0.0107	72.26
				0.0077	68.89
				0.0055	65.58
				0.0040	60.14
				0.0028	54.08
				0.0021	51.08
				0.0012	44.57



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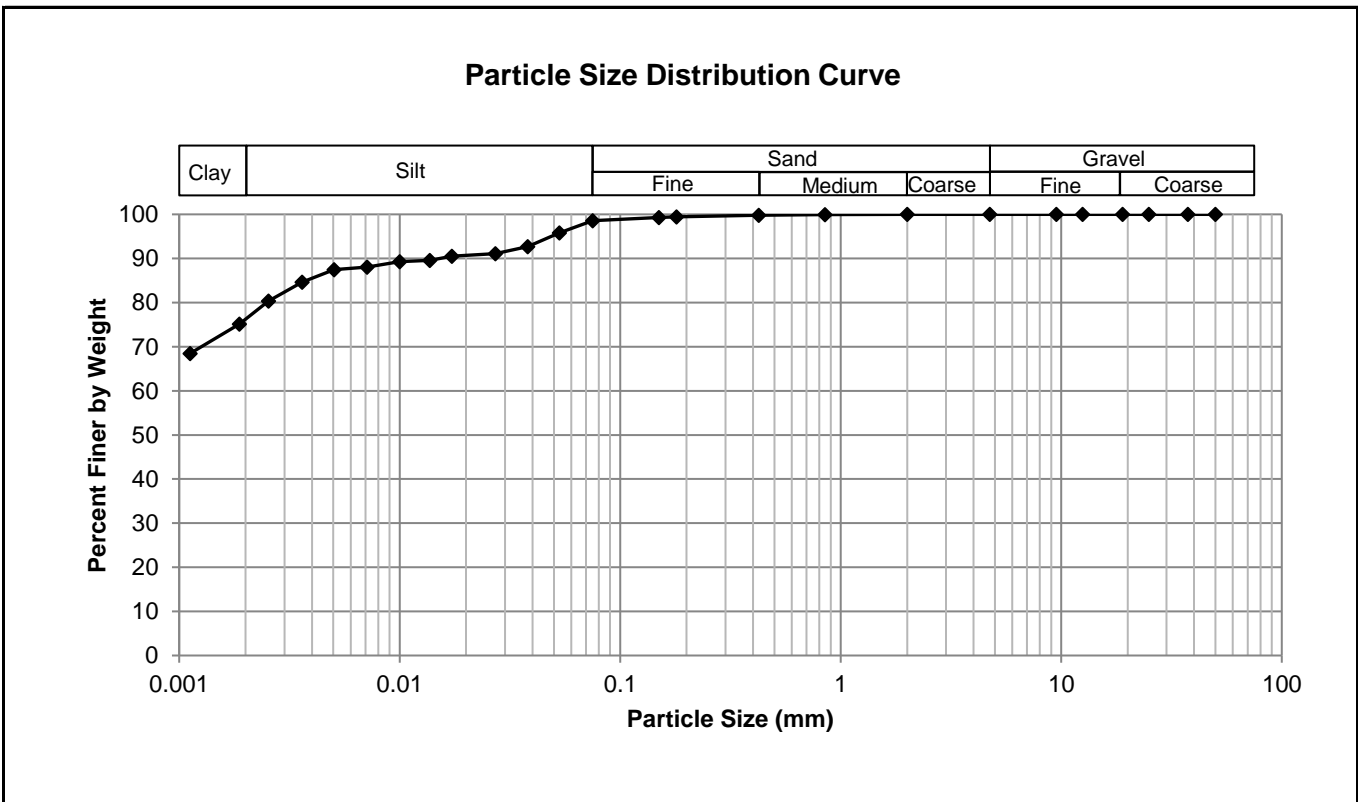
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-043-10-400
Client WSP
Project 20-LI-01 Local Alley Renewal



Test Hole TH20-06
Sample # G39
Depth (m) 0.6 - 0.8
Sample Date 19-Mar-20
Test Date 26-Mar-20
Technician HS

Gravel	0.0%
Sand	1.5%
Silt	22.4%
Clay	76.1%



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	98.53
37.5	100.00	2.00	100.00	0.0531	95.80
25.0	100.00	0.850	99.93	0.0381	92.68
19.0	100.00	0.425	99.79	0.0272	91.11
12.5	100.00	0.180	99.42	0.0172	90.49
9.50	100.00	0.150	99.32	0.0137	89.55
4.75	100.00	0.075	98.53	0.0100	89.29
				0.0071	88.04
				0.0050	87.47
				0.0036	84.66
				0.0025	80.39
				0.0019	75.13
				0.0011	68.49



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Atterberg Limits
ASTM D4318-10e1

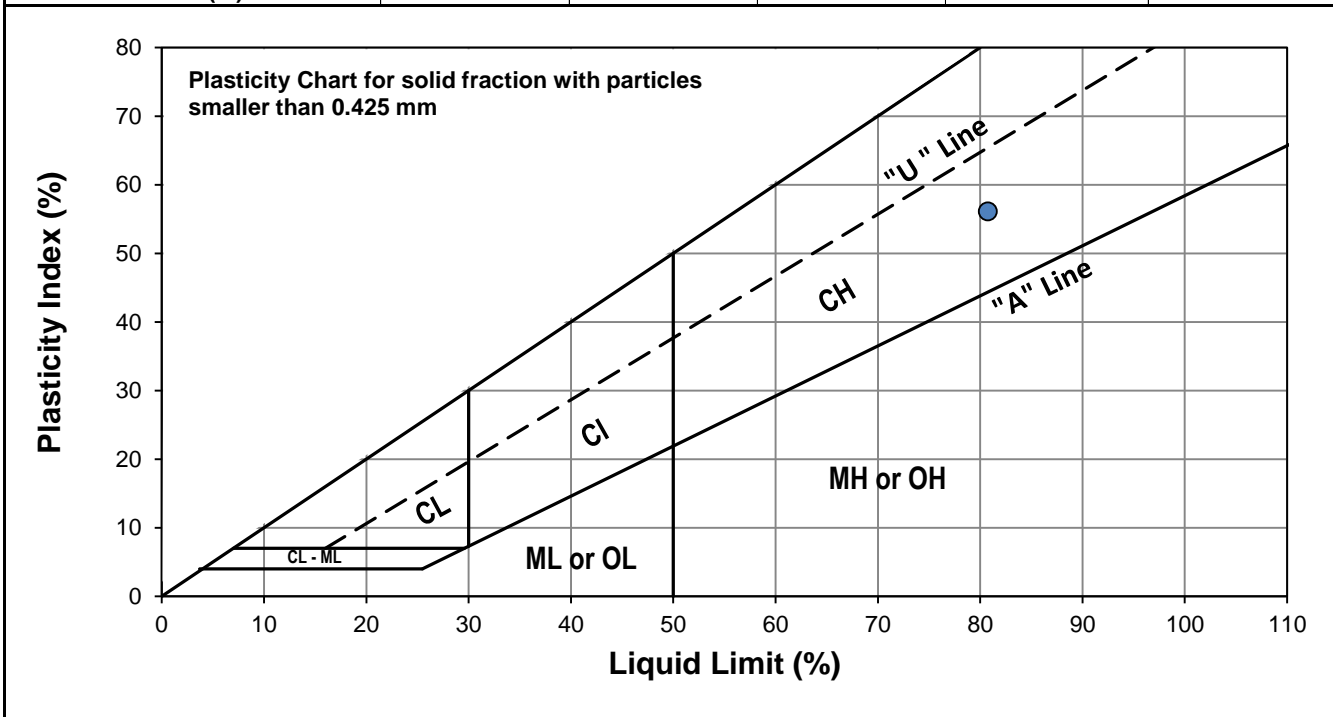
Project No.	1000-043-10-400
Client	WSP
Project	20-LI-01 Local Alley Renewals
Test Hole	TH20-01
Sample #	G03
Depth (m)	0.6 - 0.8
Sample Date	19-Mar-20
Test Date	26-Mar-20
Technician	HS



Liquid Limit	81
Plastic Limit	25
Plasticity Index	56

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	18	23	32
Mass Wet Soil + Tare (g)	28.618	23.230	25.469
Mass Dry Soil + Tare (g)	22.106	19.155	20.461
Mass Tare (g)	14.296	14.127	14.124
Mass Water (g)	6.512	4.075	5.008
Mass Dry Soil (g)	7.810	5.028	6.337
Moisture Content (%)	83.380	81.046	79.028



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.046	14.071			
Mass Wet Soil + Tare (g)	20.712	21.508			
Mass Dry Soil + Tare (g)	19.406	20.024			
Mass Water (g)	1.306	1.484			
Mass Dry Soil (g)	5.360	5.953			
Moisture Content (%)	24.366	24.929			



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Atterberg Limits
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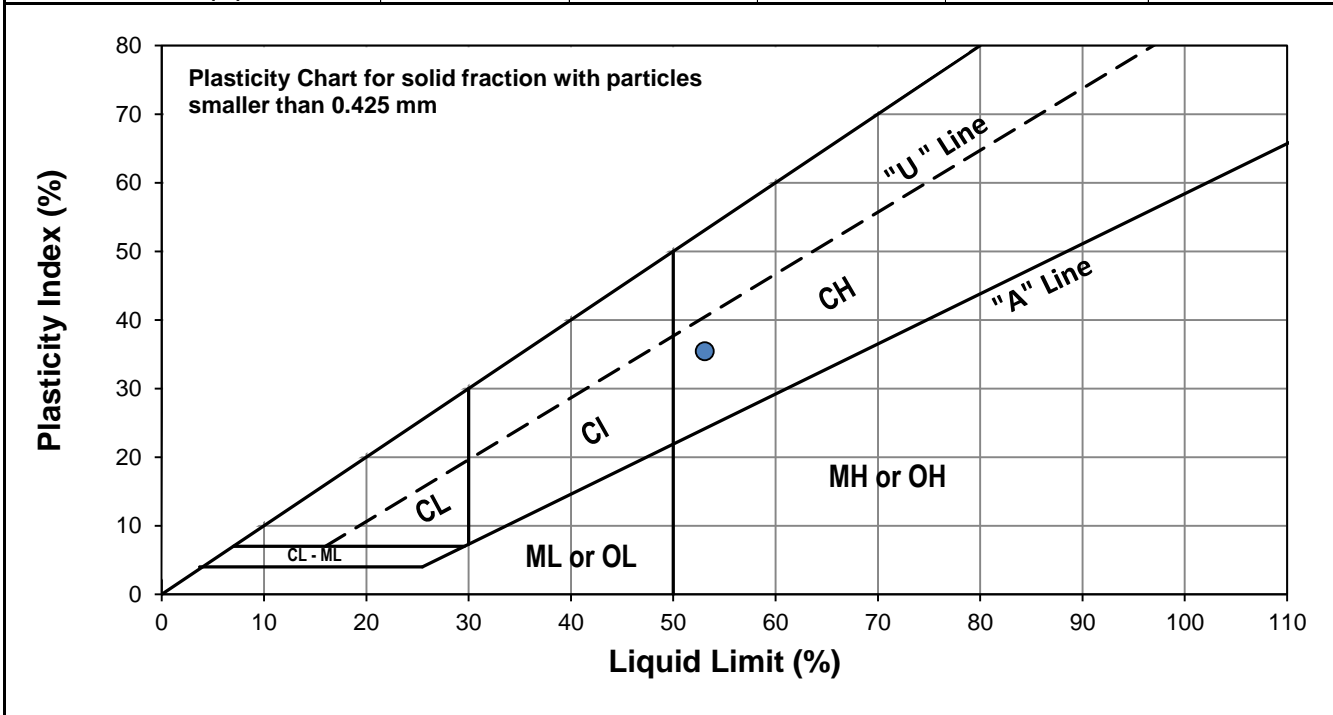
Project No.	1000-043-10-400
Client	WSP
Project	20-LI-01 Local Alley Renewals
Test Hole	TH20-02
Sample #	G11
Depth (m)	0.9 - 1.1
Sample Date	19-Mar-20
Test Date	26-Mar-20
Technician	HS



Liquid Limit	53
Plastic Limit	18
Plasticity Index	35

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	16	22	32
Mass Wet Soil + Tare (g)	22.250	23.571	24.040
Mass Dry Soil + Tare (g)	19.337	20.246	20.712
Mass Tare (g)	14.109	14.125	14.228
Mass Water (g)	2.913	3.325	3.328
Mass Dry Soil (g)	5.228	6.121	6.484
Moisture Content (%)	55.719	54.321	51.326



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.133	14.285			
Mass Wet Soil + Tare (g)	21.544	21.062			
Mass Dry Soil + Tare (g)	20.438	20.038			
Mass Water (g)	1.106	1.024			
Mass Dry Soil (g)	6.305	5.753			
Moisture Content (%)	17.542	17.799			



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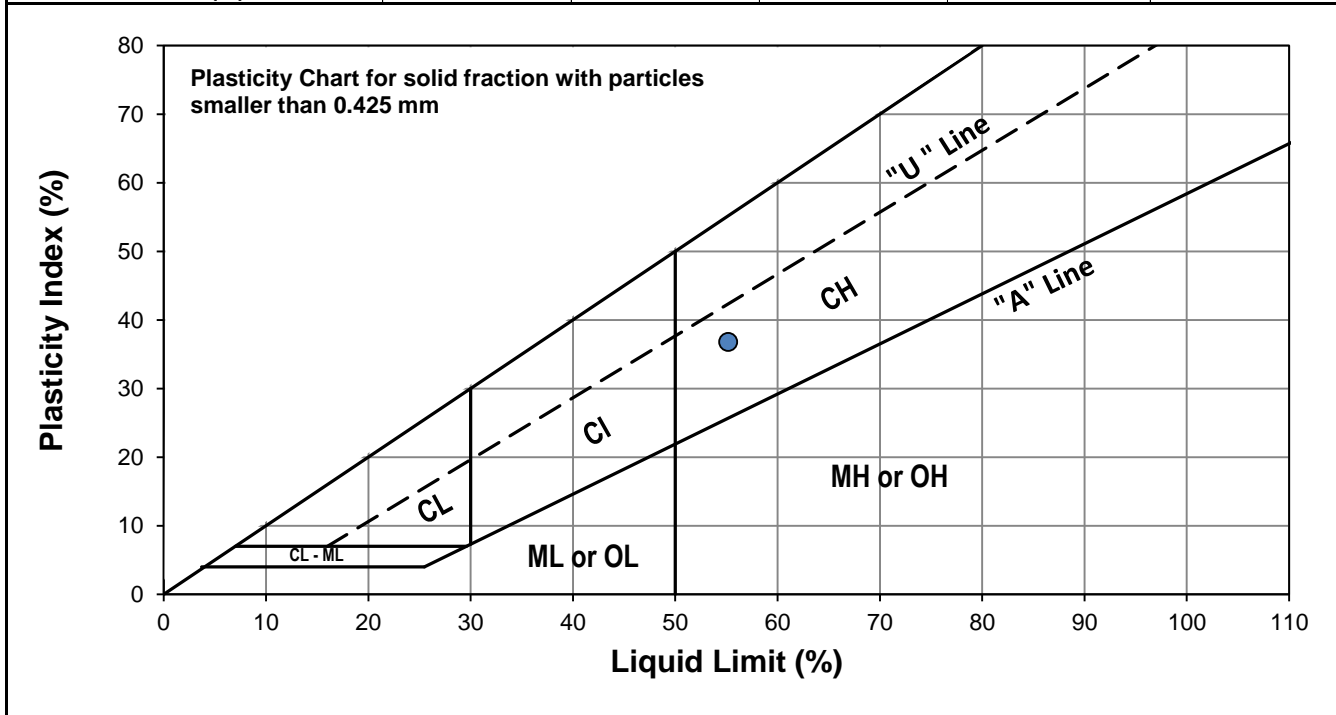
Project No.	1000-043-10-400
Client	WSP
Project	20-LI-01 Local Alley Renewals
Test Hole	TH20-04
Sample #	G25
Depth (m)	0.9 - 1.1
Sample Date	19-Mar-20
Test Date	26-Mar-20
Technician	HS



Liquid Limit	55
Plastic Limit	18
Plasticity Index	37

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	17	25	31
Mass Wet Soil + Tare (g)	26.482	27.570	28.557
Mass Dry Soil + Tare (g)	21.907	22.752	23.554
Mass Tare (g)	14.160	14.022	14.118
Mass Water (g)	4.575	4.818	5.003
Mass Dry Soil (g)	7.747	8.730	9.436
Moisture Content (%)	59.055	55.189	53.020



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.229	13.984			
Mass Wet Soil + Tare (g)	20.855	21.296			
Mass Dry Soil + Tare (g)	19.816	20.169			
Mass Water (g)	1.039	1.127			
Mass Dry Soil (g)	5.587	6.185			
Moisture Content (%)	18.597	18.222			



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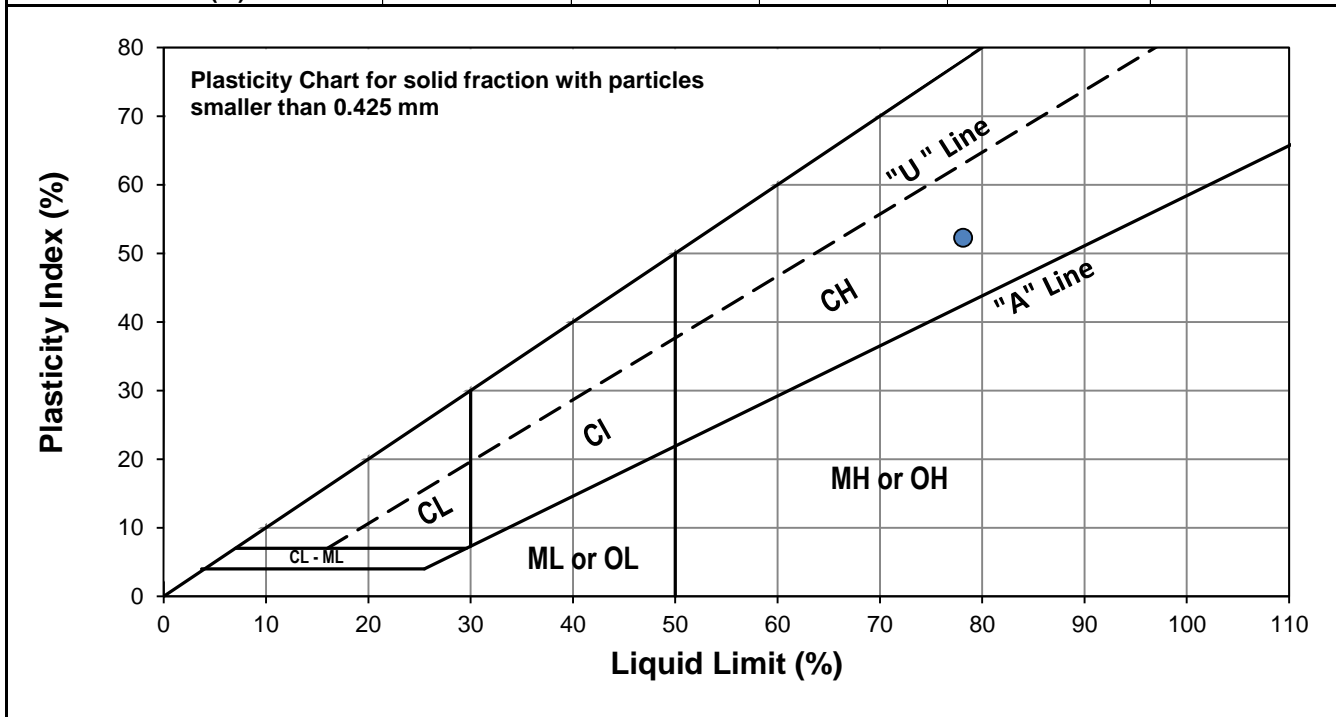
Project No.	1000-043-10-400
Client	WSP
Project	20-LI-01 Local Alley Renewals
Test Hole	TH20-06
Sample #	G39
Depth (m)	0.6 - 0.8
Sample Date	19-Mar-20
Test Date	26-Mar-20
Technician	HS



Liquid Limit	78
Plastic Limit	26
Plasticity Index	52

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	15	25	29
Mass Wet Soil + Tare (g)	21.968	27.987	25.720
Mass Dry Soil + Tare (g)	18.258	21.941	20.590
Mass Tare (g)	13.735	14.204	13.931
Mass Water (g)	3.710	6.046	5.130
Mass Dry Soil (g)	4.523	7.737	6.659
Moisture Content (%)	82.025	78.144	77.039



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.142	14.235			
Mass Wet Soil + Tare (g)	21.382	22.284			
Mass Dry Soil + Tare (g)	19.901	20.619			
Mass Water (g)	1.481	1.665			
Mass Dry Soil (g)	5.759	6.384			
Moisture Content (%)	25.716	26.081			



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Grain Size Analysis (Sieve Method)

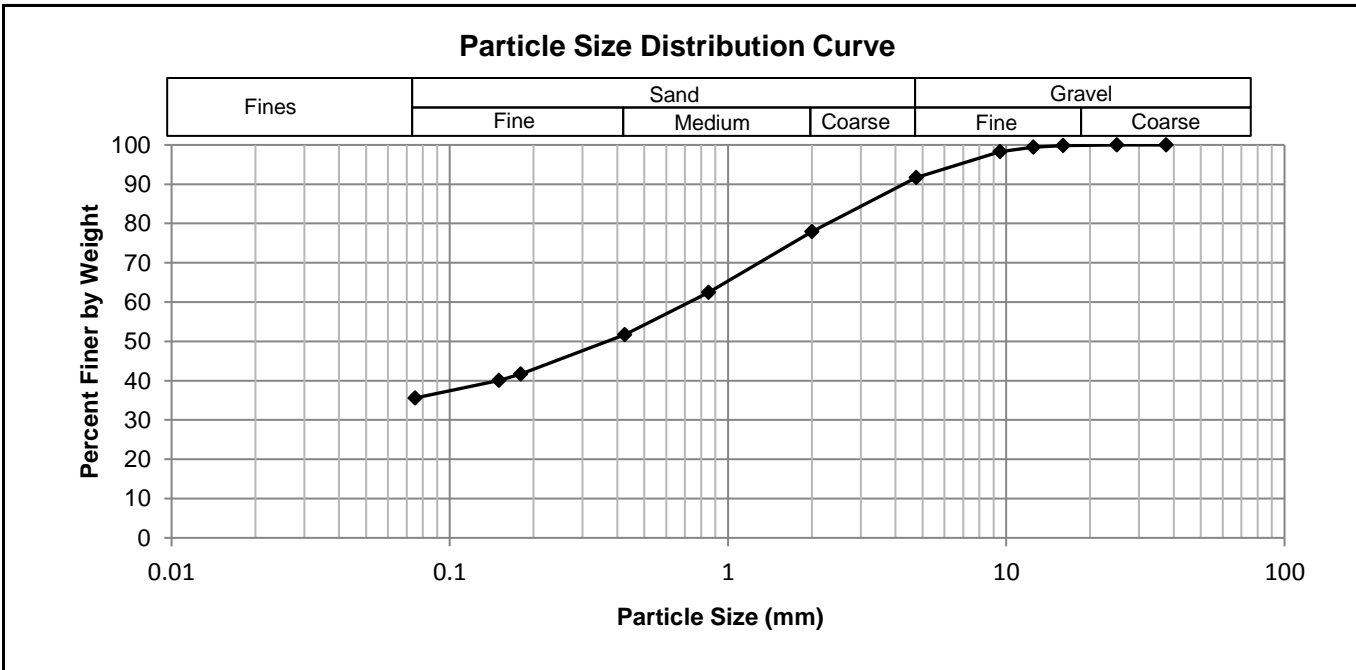
ASTM C136-14

ASTM C117-13

Project No. 1000-043-10
Client WSP
Project 20-LI-01 Local Alley Renewals

Test Hole TH20-03
Sample # G15
Depth (m) 0.0 - 0.2
Date Sampled 19-Mar-20
Date Tested 27-Mar-20
Technician BMH

Gravel %	8.3
Sand %	56.1
Fines %	35.6



Sieve Opening (mm)	Percent Passing	Specification (Min - Max)
19.0	100.0	-
16.0	99.8	-
12.5	99	-
9.5	98	-
4.75	92	-
2.00	78	-
0.850	62	-
0.425	52	-
0.180	42	-
0.150	40	-
0.075	36	-



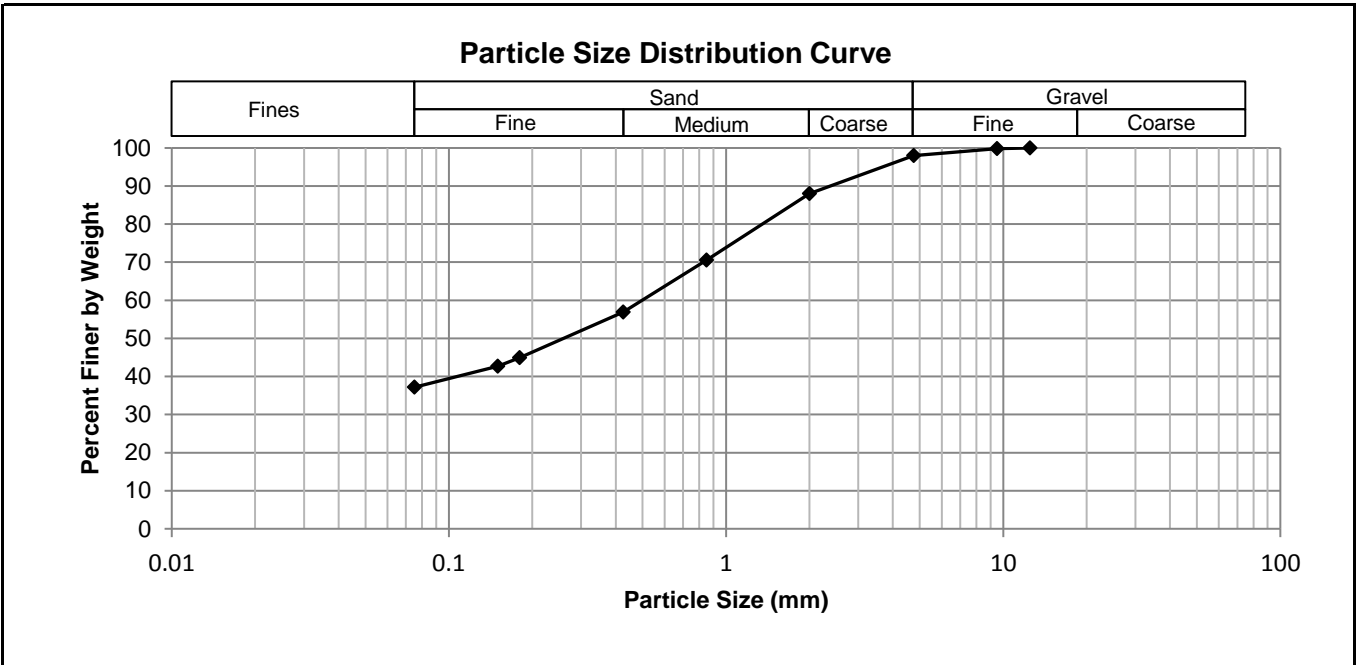
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Grain Size Analysis (Sieve Method)
ASTM C136-06

Project No. 1000-043-10-400
Client WSP
Project 20-LI-01 Local Alley Renewals

Test Hole TH20-05
Sample # G29
Depth 0.0-0.2
Date Sampled 19-Mar-20
Date Tested 30-Mar-20
Technician HS

Total Weight (g)	1109.6
Gravel %	2.0
Sand %	60.9
Fines %	37.2



Sieve Opening (mm)	Percent Passing	Specification (Min-Max)
12.5	100	-
9.5	99.9	-
4.75	98.0	-
2.00	88.0	-
0.85	70.5	-
0.425	56.9	-
0.180	44.9	-
0.150	42.7	-
0.075	37.2	-