APPENDIX 'A'

GEOTECHNICAL REPORT

CITY OF WINNIPEG

2019 ALLEY RENEWALS – 19-RL-01
GEOTECHNICAL REPORT

NOVEMBER 20, 2019 ORIGINAL

2019 ALLEY RENEWALS – 19-RL-01

GEOTECHNICAL REPORT

CITY OF WINNIPEG

ORIGINAL

PROJECT NO.: 18M-01983-00
DATE: NOVEMBER 20, 2019

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WSP Canada Inc.

SIGNATURES

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NOV 20, 2019
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ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
WSP Canada Inc.
No. 5750 Date: 2019-11-20

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The original of the technology-based document sent herewith has been authenticated and will be retained by WSP for a minimum of ten years. Since the file transmitted is now out of WSP's control and its integrity can no longer be ensured, no guarantee may be given with regards to any modifications made to this document.

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1 INTRODUCTION

A geotechnical investigation was conducted by WSP Canada Inc. for the proposed 2019 Alley Renewals in Winnipeg, Manitoba. The purpose of this investigation was to assess the general subsurface conditions with respect to identifying the existing pavement structure and the underlying soil profile.

Five (5) alleys were cored and drilled, which includes the following alleys:

A. North/south alley between Oak St and Elm St, from Academy Rd to Kingsway
B. North/south alley between Borebank St and Campbell St, from Academy Rd to Kingsway
C. North/south alley between Ash St and River Heights Community Centre, from Grosvenor Ave to Corydon Ave
D. North/south alley between Ash St and Oak St, from Corydon Ave to Fleet Ave
E. North/south alley between Waverley St and Oxford St, from Grosvenor Ave to Corydon Ave

2 SUB-SURFACE INVESTIGATION AND TESTING

The field investigation commenced on February 21, 2019 and was completed on February 26, 2019. A total of 20 test holes and cores were completed by Maple Leaf Drilling. The test holes were drilled to a depth of 2.9 to 3.05 m below the road surface using a GeoProbe 7822DT track-mounted rig equipped with a 125 mm. The pavement was cored using a 150 mm diameter coring press. All test holes were backfilled with auger cuttings and bentonite after the completion of the drilling and patched with cold mix asphalt. Testhole locations are noted on the testhole logs and within the testhole summary tables.

The soils encountered were visually classified to the full extent of the test hole. Representative soil samples were recovered at regular intervals starting from 0.1 m below pavement structure and every 0.3 m thereafter to a maximum depth of approximately 2.4 m below grade (mbg). All of the soil samples were tested for their moisture contents and selected soil samples were submitted for grain size analysis and Atterberg limits (minimum one per alley). The pavement cores were measured for their thickness and each core was photographed. No groundwater seepage or sloughing was encountered in any of the test holes during drilling.

The photos of the pavement cores, detailed descriptions of the soil profiles for each test hole, the material test results and the testhole maps are included in Appendices, organized by alley.

3 TESTHOLE SUMMARY TABLES

Table 3-1 – Oak / Elm Alley

TEST HOLE NO.	TESTHOLE LOCATION	PAVEMENT SURFACE		PAVEMENT STRUCTURE MATERIAL		SOIL DESCRIPTION	BOREHOLE DEPTH (m)	No. of Samples Taken
		Type	Thickness (mm)	Type	Thickness (mm)			
TH1	UTM 14N: 5525812.189 m N, 630735.179 m E 3.2 m east of 276 Oak's backyard fence, 2nd post from garage	Concrete	200	Fill (Clayey)	400	Silt and Silty Clay	3.05	8
TH2	UTM 14N: 5525927.886 m N, 630740.134 m E 3 m east of fence of 230 Oak, 0.5 m from back door	Asphalt & Concrete	65 & 165	Fill (Clayey)	320	Clayey Silt and Silty Clay	3.05	8
TH3	UTM 14N: 5526021.803 m N, 630741.447 m E 2.6 m west of north corner of green shed of 203 Elm St	Asphalt & Concrete	50 & 180	Fill (Clayey)	320	Silt, Clayey Silt and Silty Clay	3.05	8
TH4	UTM 14N: 5526130.906 m N, 630745.124 m E 3.7 m west of corner fence post closest to garage of 172 Oak St	Concrete	200	Fill (Clayey)	550	Clayey Silt, Silt and Silty Clay	3.05	8

Table 3-2 – Borebank / Campbell Alley

TEST HOLE NO.	TESTHOLE LOCATION	PAVEMENT SURFACE		PAVEMENT STRUCTURE MATERIAL		SOIL DESCRIPTION	BOREHOLE DEPTH (m)	No. of Samples Taken
		Type	Thickness (mm)	Type	Thickness (mm)			
TH5	UTM 14N: 5526156.837 m N, 629983.241 m E 4.8 m west of south backyard gate post of 173 Campbell St	Concrete	200	Fill (clayey)	400	Clayey Silty and Silty Clay	3.05	7
TH6	UTM 14N: 5526048.332 m N, 629981.261 m E 4.5 m east of north garage corner of 212 Borebank St	Concrete	250	Fill (clayey)	350	Silty Clay	3.05	8
TH7	UTM 14N: 5525932.667 m N, 629977.583 m E 3.2 m west of south chainlink post of 237 Campbell St	Concrete	230	Fill (Clayey)	670	Clayey Silt and Silty Clay	3.05	8
TH8	UTM 14N: 5525857 m N, 629975.003 m E 5.7 m west of south garage wall of 269 Campbell St	Concrete	180	Fill (Clayey)	570	Clayey Silt and Silty Clay	3.05	8

Table 3-3 – Alley between Ash St & River Heights Community Centre

TEST HOLE NO.	TESTHOLE LOCATION	PAVEMENT SURFACE		PAVEMENT STRUCTURE MATERIAL		SOIL DESCRIPTION	BOREHOLE DEPTH (m)	No. of Samples Taken
		Type	Thickness (mm)	Type	Thickness (mm)			
TH9	UTM 14N: 5525376.214 m N, 630623.822 m E 5.2 m from 416 Ash St's garage door	Concrete	200	Fill (clayey)	850	Silty Clay	2.9	8
TH10	UTM 14N: 5525263.453 m N, 630620.662 m E 3.5 m from corner of 452 Ash St's backyard fence	Concrete	180	Fill (clayey)	570	Clayey Silt and Silty Clay	2.9	8
TH11	UTM 14N: 5525141.774 m N, 630616.712 m E 4.3 m east of south edge of 492 Ash St's garage	Concrete	110	Fill (clayey)	630	Silt and Silty Clay	2.9	8
TH12	UTM 14N: 5525054.058 m N, 630614.237 m E 3.2 m west of community centre chainlink fence behind 520 Ash St	Concrete	200	Fill (clayey)	850	Silty Clay	3.05	8

Table 3-4 – Ash / Oak Alley

TEST HOLE NO.	TESTHOLE LOCATION	PAVEMENT SURFACE		PAVEMENT STRUCTURE MATERIAL		SOIL DESCRIPTION	BOREHOLE DEPTH (m)	No. of Samples Taken
		Type	Thickness (mm)	Type	Thickness (mm)			
TH13	UTM 14N: 5524658.758 m N, 630602.11 m E Centre of alley beside 648 Ash St	Asphalt & Concrete	65 & 110	Fill (clayey)	425	Silt & Silty Clay	3.05	8
TH14	UTM 14N: 5524760.73 m N, 630605.317 m E Centre of alley beside garage of 608 Ash St	Concrete	200	Fill (clayey)	400	Silt & Silty Clay	3.05	8
TH15	UTM 14N: 5524881.608 m N, 630608.354 m E 3.4 m from south corner of 567 Oak St's garage	Concrete	200	Fill (clayey)	700	Silty Clay	3.05	8
TH16	UTM 14N: 5524990.599 m N, 630612.038 m E 3.5 m east of base of yellow tension cable	Asphalt & Concrete	80 & 150	Fill (clayey)	370	Silt & Silty Clay	3.05	8

Table 3-5 – Waverley / Oxford Alley

TEST HOLE NO.	TESTHOLE LOCATION	PAVEMENT SURFACE		PAVEMENT STRUCTURE MATERIAL		SOIL DESCRIPTION	BOREHOLE DEPTH (m)	No. of Samples Taken
		Type	Thickness (mm)	Type	Thickness (mm)			
TH17	UTM 14N: 5525043.913 m N, 631016.223 m E 5.4 m east of centre of 496 Waverley's garage	Concrete	150	Fill (clayey)	300	Silt & Silty Clay	3.05	8
TH18	UTM 14N: 5525132.829 m N, 631017.727 m E 4.2 m east of white garage door, 1 m north off centre of garage door	Concrete	200	Fill (clayey)	1000	Silty Clay	3.05	8
TH19	UTM 14N: 5525247.265 m N, 631021.126 m E 5.4 m east of white garage wall post of 444 Waverley	Concrete	250	Fill (clayey)	350	Silty Clay	3.05	8
TH20	UTM 14N: 5525340.391 m N, 631026.481 m E 4.7 m west of centre of 418 Waverley's garage door	Concrete	150	Fill (clayey)	450	Silt & Silty Clay	3.05	8

4 CLOSURE

The findings and recommendations provided in this report were prepared by WSP Canada Inc. (the Consultant) in accordance with generally accepted professional engineering principles and practices. The recommendations are based on the results of field and laboratory investigations and are reflective only of the actual test hole(s) and/or excavation(s) examined. If conditions encountered during construction appear to be different than those shown by the test hole(s) and/or excavation(s) at this site, the Consultant should be notified immediately in order that the recommendations can be reviewed and modified as necessary to address actual site conditions.

This report is limited in scope to only those items that are specifically referenced in this report. There may be existing conditions that were not recorded in this report. Such conditions were not apparent to the Consultant due to the limitations imposed by the scope of work. The Consultant, therefore, accepts no liability for any costs incurred by the Client for subsequent discovery, manifestation or rectification of such conditions.

This report is intended solely for the Client named as a general indication of the visible or reported physical condition of the items addressed in the report at the time of the geotechnical investigation. The material in this report reflects the Consultant's best judgment in light of the information available to it at the time of preparation.

This report and the information and data contained herein are to be treated as confidential and may be used only by the Client and its officers and employees in relation to the specific project that it was prepared for. Any use a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. The Consultant accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The report has been written to be read in its entirety, do not use any part of this report as a separate entity.

All files, notes, source data, test results and master files are retained by the Consultant and remain the property of the Consultant.

APPENDIX

A CORE PHOTOS

Figure 1 – TH1 Oak / Elm / Academy / Kingsway Alley

Figure 2 – TH2 Oak / Elm / Academy / Kingsway Alley

Figure 3 – TH3 Oak / Elm / Academy / Kingsway Alley

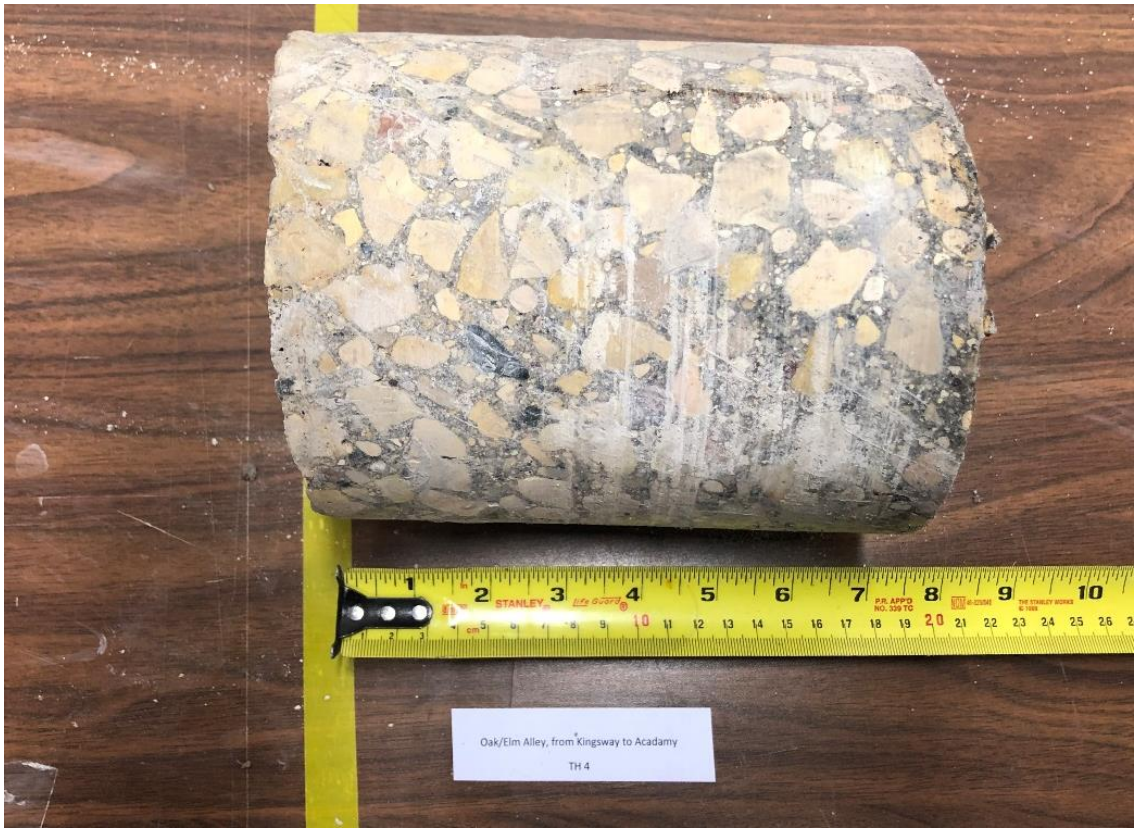

Figure 4 – TH4 Oak / Elm / Academy / Kingsway Alley

Figure 5 – TH5 Borebank / Campbell Alley

Figure 6 – TH6 Borebank / Campbell Alley

Figure 7 – TH7 Borebank / Campbell Alley

Figure 8 – TH8 Borebank / Campbell Alley

Figure 9 – TH9 Ash / River Heights CC Alley

Figure 10 – TH10 Ash / River Heights CC Alley

Figure 11 – TH11 Ash / River Heights CC Alley

Figure 12 – TH12 Ash / River Heights CC Alley

Figure 13 – TH13 Ash / Oak Alley

Figure 14 – TH14 Ash / Oak Alley

Figure 15 – TH15 Ash / Oak Alley

Figure 16 – TH16 Ash / Oak Alley

Figure 17 – TH17 Waverley / Oxford Alley

Figure 18 – TH18 Waverley / Oxford Alley

Figure 19 – TH19 Waverley / Oxford Alley

Figure 20 – TH20 Waverley / Oxford Alley

APPENDIX

B BOREHOLE LOGS

WSP
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TH01

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Oak/Elm Alley From Academy to Kingsway
DATE STARTED 2/22/19 **COMPLETED** 2/22/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5525812.189 m N, 630735.179 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.80	**PAVEMENT** - 200 mm concrete, intact				
		FILL - SILTY CLAY with trace sand, black, frozen stiff	GB 1			27
0.5	99.40					
	99.25	**SILT** - Some sand, trace clay, tan-brown, frozen	GB 2			14
		SILTY CLAY - Brown, frozen stiff - Moist, stiff, highly plastic below 1.5 m - Firm below 2 m	GB 3			36
1.0			GB 4			37
1.5			GB 5			36
			GB 6		75	43
2.0			GB 7			45
					37.5	
2.5			GB 8			49
3.0	96.95				50	

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
Su (kPa)
PP Torvane
50 100 150 200

- Depth of frost at 1.5 m.
- Testhole ended in soft clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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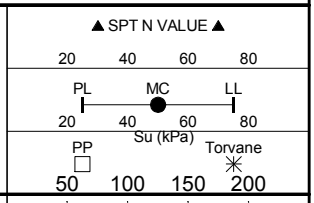
TH02

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Oak/Elm Alley From Academy to Kingsway
DATE STARTED 2/22/19 **COMPLETED** 2/22/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5525927.886 m N, 630740.134 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.94	**PAVEMENT** - 65 mm asphalt, intact				
	99.77	**PAVEMENT** - 165 mm concrete, broken in place				
	99.55	**FILL** - SILTY CLAY, trace sand, black, frozen stiff	GB 1			23
0.5		**CLAYEY SILT** - Silty, varved, tan-brown and brown, frozen stiff - Brown, mottled, moist, stiff, highly plastic below 1.5 m - Silt layer encountered from 1.65 m to 1.8 m	GB 2			42
1.0			GB 3			30
			GB 4			20
1.5			GB 5			21
	98.20					
		SILTY CLAY - Brown, moist, stiff, trace sulfates - Soft below 2.75 m	GB 6		75	42
2.0			GB 7			44
					50	
2.5			GB 8			48
3.0	96.95				12.5	

- Depth of frost at 1.5 m.
- Testhole ended in soft clay at 3.05 m.
- No caving or seepage observed.



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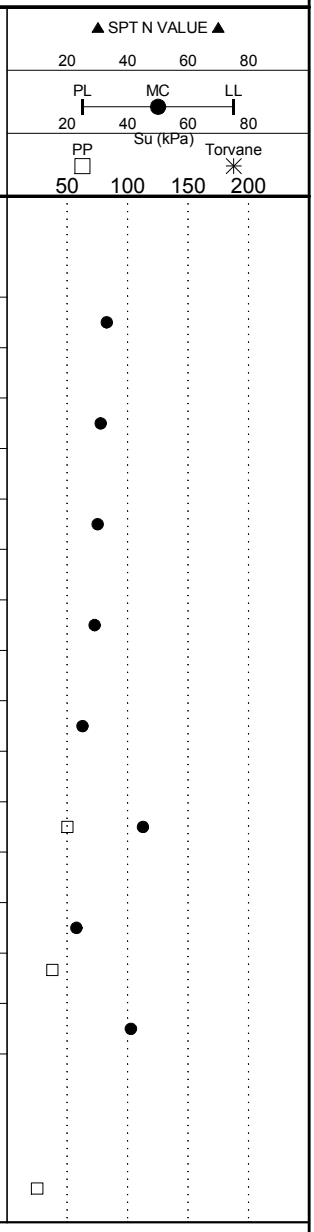
TH03

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Oak/Elm Alley From Academy to Kingsway
DATE STARTED 2/22/19 **COMPLETED** 2/22/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5526021.803 m N, 630741.447 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.95	**PAVEMENT** - 50 mm asphalt, intact				
	99.77	**PAVEMENT** - 180 mm concrete, broken in place				
	99.55	**FILL** - SILTY CLAY, trace sand, black, frozen stiff	GB 1			33
0.5		**SILT** - Some sand seams, tan-brown, frozen stiff	GB 2			31
1.0	98.95		GB 3			30
		CLAYEY SILT - Silty, brown, frozen stiff - Moist, stiff, highly plastic below 1.2 m	GB 4			29
1.5			GB 5			25
2.0	97.90		GB 6		50	45
		SILTY CLAY - Mottled grey-brown, moist, firm - Soft below 2.75 m	GB 7			23
2.5			GB 8		37.5	41
3.0	96.95				25	



- Depth to frost at 1.2 m.
- Testhole ended in soft clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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TH04

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Oak/Elm Alley From Academy to Kingsway
DATE STARTED 2/22/19 **COMPLETED** 2/22/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5526130.906 m N, 630745.124 m E
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
		99.80		**PAVEMENT** - 200 mm concrete, intact				
				FILL - SILTY CLAY, trace sand, black, frozen stiff	GB 1			33
0.5		99.25			GB 2			21
				CLAYEY SILT - Clayey, brown, frozen stiff, trace sulphates				
1.0				- 63% Silt, 33% Clay, 4% Sand at 1.2 m	GB 3			20
					GB 4			23
1.5					GB 5			24
		98.20		**SILT** - Trace sand and clay, soft, wet, medium plasticity	GB 6			23
2.0					GB 7			22
2.5					GB 8			22
		97.25		**SILTY CLAY** - SILTY, brown, mottled, highly plastic, firm - Soft below 2.75 m			25	
3.0		96.95						

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
Su (kPa)
PP □ Torvane ✳
50 100 150 200

- Depth to frost at 1.65 m.
- Testhole ended in soft clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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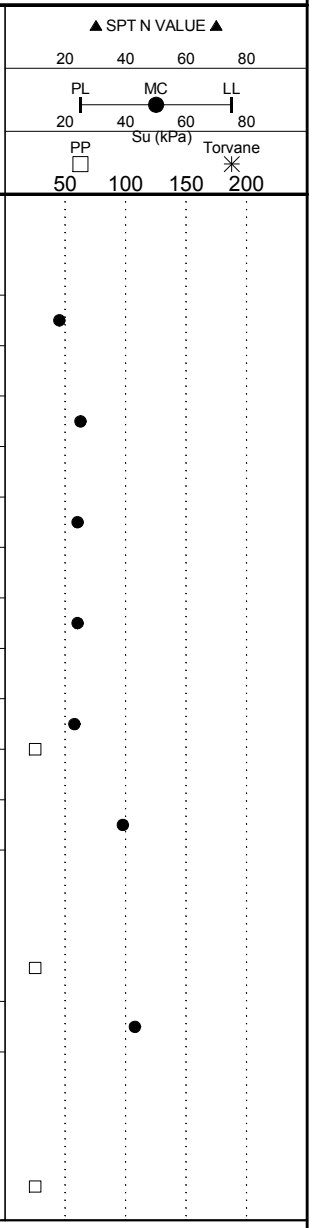
TH05

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Borebank/Campbell from Academy to Kingsway
DATE STARTED 2/26/19 **COMPLETED** 2/26/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5526156.837 m N, 629983.241 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.80	**PAVEMENT** - 120 mm concrete, intact				
0.5	99.40	**FILL** - CLAYEY SILT, trace sand, black, frozen stiff	GB 1			18
		CLAYEY SILT - Silty, varved, brown, frozen stiff	GB 2			25
1.0			GB 3			24
	98.65		GB 4			24
1.5		**SILTY CLAY** - Brown, moist, firm to soft, highly plastic below 1.5 m - Organics (wood debris) encountered from 1.65 m to 2.3 m - SILTY from 2.3 m to 2.45 m - Clayey, soft, below 2.45 m	GB 5		25	23
2.0			GB 6			39
2.5			GB 8		25	43
3.0	96.95				25	



- Depth to frost at 1.5 m.
- Testhole ended in soft clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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TH06

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Borebank/Campbell from Academy to Kingsway
DATE STARTED 2/26/19 **COMPLETED** 2/26/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5526048.332 m N, 629981.261 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.75	**PAVEMENT** - 250 mm concrete, intact				
0.5	99.40	**FILL** - CLAYEY SILT, trace sand, black, frozen stiff	GB 1			37
		SILTY CLAY - SILTY, brown, frozen stiff - Clayey below 0.9 m - Stiff, moist below 1.35 m - Trace sulphates below 1.8 m - Silty, tan-brown from 2.1 m to 2.3 m - Brown, mottled, clayey, highly plastic, firm to soft below 2.3 m	GB 2			30
1.0			GB 3			33
			GB 4			31
1.5			GB 5			34
			GB 6		50	46
2.0			GB 7			43
					50	
2.5			GB 8			46
3.0	96.95				25	

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
Su (kPa)
PP □ Torvane ✳
50 100 150 200

- Depth to frost at 1.35 m.
- Testhole ended in soft clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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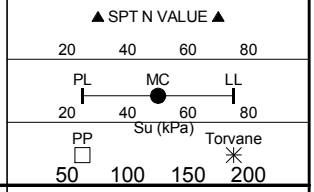
TH07

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Borebank/Campbell from Academy to Kingsway
DATE STARTED 2/26/19 **COMPLETED** 2/26/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5525932.667 m N, 629977.583 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.77	**PAVEMENT** - 230 mm concrete, intact				
0.5	99.10	**FILL** - CLAYEY SILT, trace sand, black, frozen stiff - 63% Silt, 30% Clay, 7% Sand at 0.6 m	GB 1 GB 2			28 21
1.0	98.65	**CLAYEY SILT** - SILTY, tan brown, frozen stiff	GB 3 GB 4			25 29
1.5 2.0 2.5 3.0	96.95	**SILTY CLAY** - Brown, mottled, frozen stiff - Firm, highly plastic below 1.5 m - SILTY between 2.3 m to 2.45 m - Soft below 2.75 m	GB 5 GB 6 GB 7 GB 8		50 50 62.5	45 40 47 50

- Depth to frost at 1.5 m.
- Testhole ended in soft clay at 3.05 m.
- No caving or seepage observed.



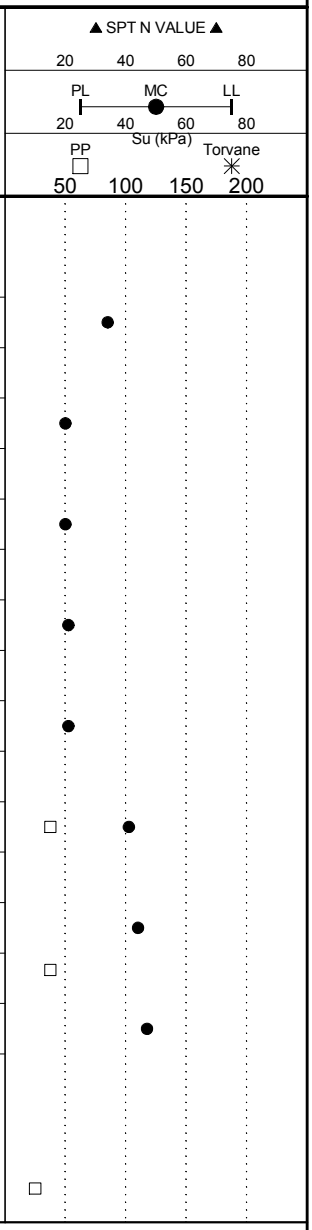
GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

WSP
1600 Buffalo Place
Winnipeg, MB R3T 6B8
Telephone: (204)-477-6650

TH08

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Borebank/Campbell from Academy to Kingsway
DATE STARTED 2/26/19 **COMPLETED** 2/26/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5525857 m N, 629975.003 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.82	**PAVEMENT** - 180 mm concrete, intact				
		FILL - CLAYEY SILT, trace sand, mixed structure	GB 1			34
0.5	99.25		GB 2			20
		CLAYEY SILT - SILTY, tan brown, frozen stiff	GB 3			20
1.0			GB 4			21
1.5	98.35		GB 5			21
		SILTY CLAY - Brown, mottled, highly plastic, moist, firm to soft	GB 6		37.5	41
2.0			GB 7		37.5	44
2.5			GB 8			47
3.0	96.95				25	



- Depth to frost at 1.65 m.
- Testhole ended in soft clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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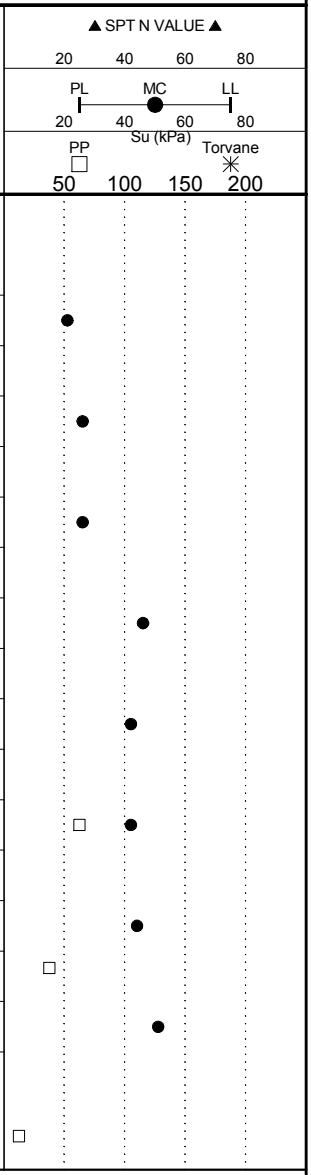
TH09

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Ash/Montrose W. Alley from Grosvenor to Corydon
DATE STARTED 2/21/19 **COMPLETED** 2/21/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5525376.214 m N, 630623.822 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.80	**PAVEMENT** - 200 mm concrete, partially broken				
		FILL - SILTY CLAY, trace sand, black, frozen stiff - Grey-brown below 0.6 m	GB 1			21
0.5			GB 2			26
1.0	98.95		GB 3			26
		SILTY CLAY - Organics (wood debris) encountered within brown silty clay from 1.05 m to 1.2 m - Clayey, brown, highly plastic, stiff to firm below 1.2 m - SILTY, tan-brown between 1.8 m to 2.1 m - Clayey, brown, mottled, firm to soft below 2.1 m	GB 4			46
1.5			GB 5			42
			GB 6		62.5	42
2.0			GB 7			44
					37.5	
2.5			GB 8			51
	97.10				12.5	



- Depth to frost at 1.2 m.
- Testhole ended in soft clay at 2.9 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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TH10

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Ash/Montrose W. Alley from Grosvenor to Corydon
DATE STARTED 2/21/19 **COMPLETED** 2/21/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5525263.453 m N, 630620.662 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.82	**PAVEMENT** - 180 mm concrete, intact				
		FILL - SILTY CLAY, trace sand, frozen stiff	GB 1			26
0.5			GB 2			18
	99.25	**CLAYEY SILT** - Silty, tan-brown, frozen stiff - Sand seam encountered at 0.75 m	GB 3			18
1.0	98.80	**SILTY CLAY** - Brown, highly plastic, moist, stiff below 1.2 m - Mottled, soft below 2.6 m	GB 4			27
1.5			GB 5			38
			GB 6		50	42
2.0			GB 7			48
					37.5	
2.5			GB 8			50
	97.10				12.5	

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
Su (kPa)
PP □ Torvane ✳
50 100 150 200

- Depth to frost at 1.2 m.
- Testhole ended in soft clay at 2.9 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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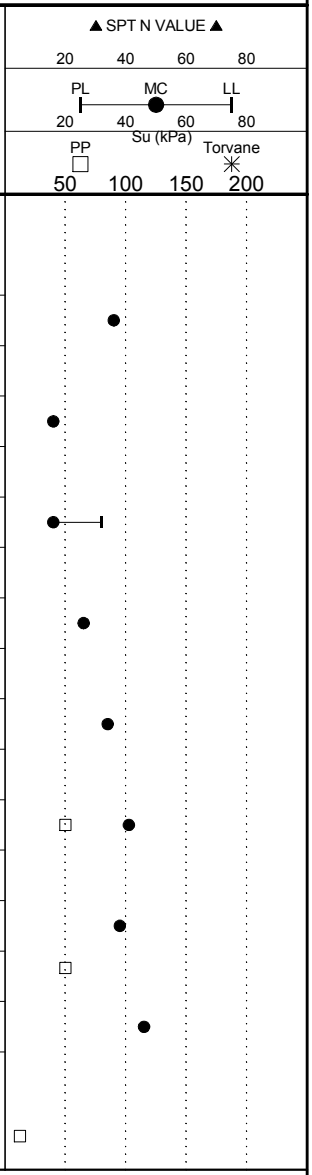
TH11

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Ash/Montrose W. Alley from Grosvenor to Corydon
DATE STARTED 2/21/19 **COMPLETED** 2/21/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5525141.774 m N, 630616.712 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.89	**PAVEMENT** - 110 mm concrete, intact				
		FILL - SILTY CLAY with trace sand, mixed structure, black, frozen stiff	GB 1			36
0.5			GB 2			16
	99.25	**SILT** - Tan-brown, some clay, trace sand, medium plastic, frozen stiff - 76% Silt, 20% Clay, 4% Sand at 0.9 m	GB 3			16
1.0	98.80	**SILTY CLAY** - Brown, highly plastic, moist, stiff - Mottled grey-brown below 1.8 m - Soft below 2.75 m	GB 4			26
			GB 5			34
1.5			GB 6		50	41
2.0			GB 7			38
					50	
2.5			GB 8			46
	97.10				12.5	



- Depth to frost at 1.05 m.
- Testhole ended in soft clay at 2.9 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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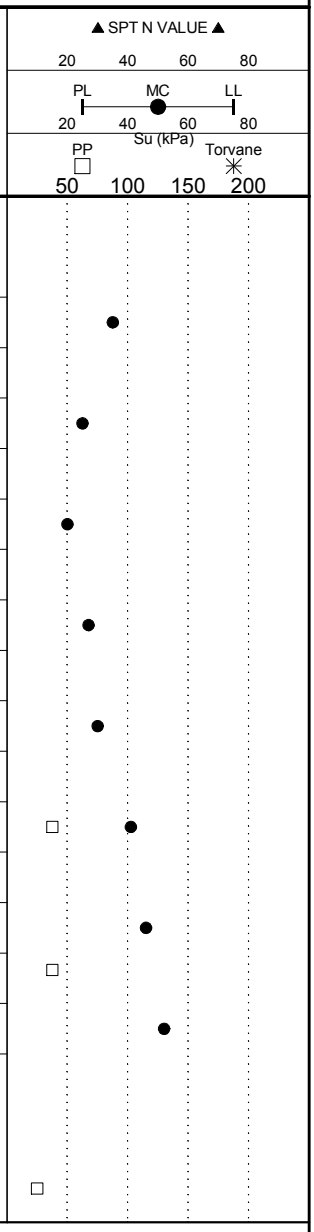
TH12

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Ash/Montrose W. Alley from Grosvenor to Corydon
DATE STARTED 2/21/19 **COMPLETED** 2/21/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5525054.058 m N, 630614.237 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.80	**PAVEMENT** - 200 mm concrete, intact				
		FILL - SILTY CLAY, trace sand, black, frozen stiff - SILTY, tan-brown, trace organics below 0.6 m	GB 1			35
0.5			GB 2			25
1.0	98.95		GB 3			20
		SILTY CLAY - SILTY, brown, stiff, highly plastic - Silt layers encountered between 2.15 m to 2.45 m - Brown, mottled below 2.45 m - Soft below 2.75 m	GB 4			27
1.5			GB 5			30
			GB 6		37.5	41
2.0			GB 7			46
					37.5	
2.5			GB 8			52
3.0	96.95				25	



- Depth to frost at 1.05 m.
- Testhole ended in soft clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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TH13

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Ash/Oak Alley from Corydon to Fleet
DATE STARTED 2/21/19 **COMPLETED** 2/21/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5524658.758 m N, 630602.11 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.93	**PAVEMENT** - 65 mm asphalt, broken				
	99.82	**PAVEMENT** - 110 mm concrete, broken				
0.5	99.40	**FILL** - SILTY CLAY, tan-brown to brown, mixed structure, frozen stiff	GB 1			36
		SILT - Tan-brown, some clay, frozen stiff	GB 2			20
1.0			GB 3			20
	98.80	**SILTY CLAY** - SILTY, brown, moist, firm to 1.8 m - Mottled, firm below 1.8 m with occasional silt pockets	GB 4			32
1.5			GB 5			22
			GB 6		50	39
2.0			GB 7		50	36
2.5			GB 8			48
3.0	96.95					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
Su (kPa)
PP Torvane
50 100 150 200

- Depth to frost at 1.35 m.
- Testhole ended in firm clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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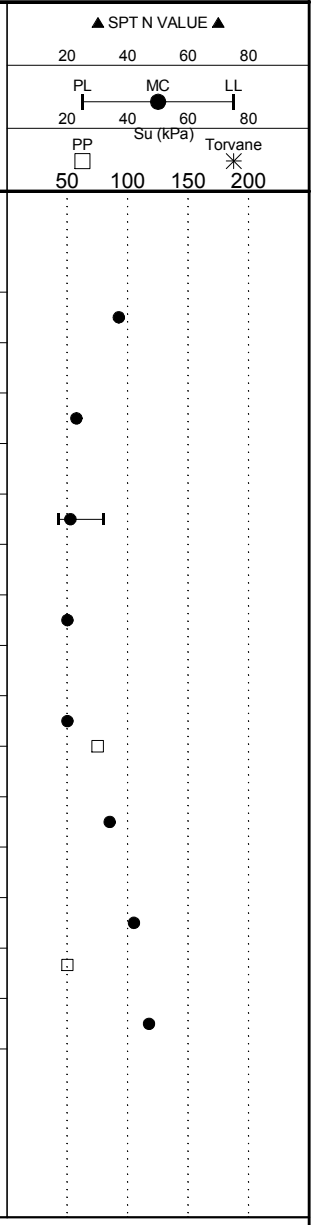
TH14

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Ash/Oak Alley from Corydon to Fleet
DATE STARTED 2/21/19 **COMPLETED** 2/21/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5524760.73 m N, 630605.317 m E
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
		99.80		**PAVEMENT** - 200 mm concrete, intact				
				FILL - SILTY CLAY, some sand, black and brown, frozen stiff	GB 1			37
0.5		99.40		**SILT** - Tan-brown, some clay, trace sand, frozen stiff, medium plastic - 74% Silt, 18% Clay, 8% Sand at 0.9 m - Moist, soft below 1.2 m	GB 2			23
1.0					GB 3			21
					GB 4			20
1.5		98.50		**SILTY CLAY** - Mottled brown-grey, moist, stiff, highly plastic, with occasional silt pockets below 1.5 m - SILT layer encountered at 2.1 m	GB 5		75	20
					GB 6			34
2.0					GB 7			42
							50	
2.5					GB 8			47
3.0		96.95						



- Depth to frost at 1.2 m.
- Testhole ended in firm clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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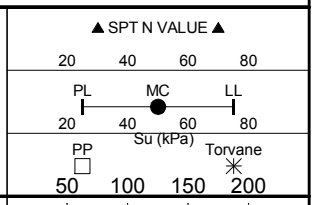
TH15

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Ash/Oak Alley from Corydon to Fleet
DATE STARTED 2/21/19 **COMPLETED** 2/21/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5524881.608 m N, 630608.354 m E
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
		99.80		**PAVEMENT** - 200 mm concrete, intact				
				FILL - SILTY CLAY, some sand, black and brown, frozen stiff	GB 1			44
0.5					GB 2			32
		99.10						
1.0				**SILTY CLAY** - SILTY, mottled brown-grey, moist, firm, highly plastic, trace sulfates - Occasional silt pockets encountered - Clayey below 1.5 m - Soft below 2.9 m	GB 3			33
					GB 4			33
1.5					GB 5			34
					GB 6		37.5	43
2.0								
					GB 7			49
							25	
2.5					GB 8			51
3.0		96.95					12.5	



- Depth to frost at 1.2 m.
- Testhole ended in soft clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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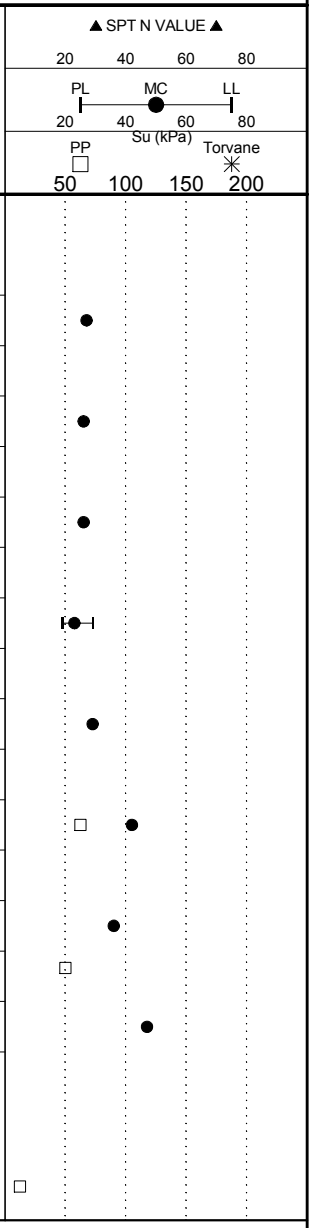
TH16

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Ash/Oak Alley from Corydon to Fleet
DATE STARTED 2/21/19 **COMPLETED** 2/21/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5524990.599 m N, 630612.038 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.92	**PAVEMENT** - 80 mm asphalt, broken				
	99.77	**PAVEMENT** - 150 mm concrete, broken				
0.5	99.40	**FILL** - SILTY CLAY, tan-brown and brown, mixed structure, frozen stiff	GB 1			27
1.0	98.65	**SILT** - Tan-brown, some clay, trace sand, frozen stiff, medium plasticity, trace oxidation - 78% Silt, 17% Clay, 5% Sand at 1.2 m	GB 2 GB 3 GB 4			26 26 23
1.5		**SILTY CLAY** - SILTY, mottled brown-grey, moist, stiff, highly plastic - SILT seam encountered at 2.15 m - Firm to soft below 2.45 m	GB 5			29
2.0			GB 6 GB 7		62.5 50	42 36
2.5			GB 8			47
3.0	96.95				12.5	



- Depth of frost at 1.35 m.
- Testhole ended in soft clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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TH17

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Waverley/Oxford Alley from Grosvenor to Corydon
DATE STARTED 2/22/19 **COMPLETED** 2/22/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5525043.913 m N, 631016.223 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.85	**PAVEMENT** - 150 mm concrete, broken				
	99.55	**FILL** - SILTY CLAY, trace sand, black, frozen stiff	GB 1			41
0.5		**SILT** - Some clay, trace sand, tan-brown, frozen stiff - Clayey below 1.2 m	GB 2			40
1.0			GB 3			23
	98.65		GB 4			38
1.5		**SILTY CLAY** - Brown, mottled, moist, stiff to firm, highly plastic	GB 5			39
			GB 6		50	35
2.0			GB 7			44
					37.5	
2.5			GB 8			42
3.0	96.95				25	

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
Su (kPa)
PP Torvane
50 100 150 200

- Depth to frost at 1.5 m.
- Testhole ended in soft clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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TH18

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Waverley/Oxford Alley from Grosvenor to Corydon
DATE STARTED 2/22/19 **COMPLETED** 2/22/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5525132.829 m N, 631017.727 m E
AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
		99.80		**PAVEMENT** - 200 mm concrete, intact				
				FILL - SILTY CLAY, trace sand, black, frozen stiff	GB 1			36
0.5					GB 2			45
1.0					GB 3			34
		98.80		**SILTY CLAY** - SILTY with varves, mottled brown, highly plastic, stiff to firm - Clayey below 2.45 m	GB 4			37
1.5					GB 5			34
					GB 6		125	34
2.0					GB 7			33
							37.5	
2.5					GB 8			25
3.0		96.95					25	

- Depth to frost at 1.65 m.
- Testhole ended in firm clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

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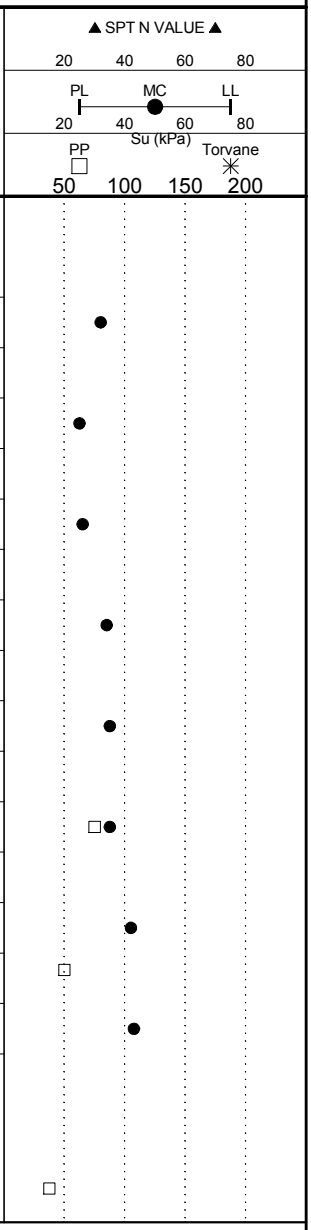
TH19

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Waverley/Oxford Alley from Grosvenor to Corydon
DATE STARTED 2/22/19 **COMPLETED** 2/22/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5525247.265 m N, 631021.126 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.75	**PAVEMENT** - 250 mm concrete, intact				
0.5	99.40	**FILL** - SILTY CLAY, trace sand, black, frozen stiff	GB 1			32
		SILTY CLAY - SILTY with varves, mottled brown, moist, stiff to firm, highly plastic, trace sulphates - Silt layers between clay from 1.5 m to 2.15 m, trace oxidation - Clayey, mottled below 2.15 m	GB 2			25
1.0			GB 3			26
			GB 4			34
1.5			GB 5			35
			GB 6		75	35
2.0			GB 7			42
					50	
2.5			GB 8			43
3.0	96.95				37.5	



- Depth to frost at 1.65 m.
- Testhole ended in firm clay at 3.05 m.
- No caving or seepage observed.

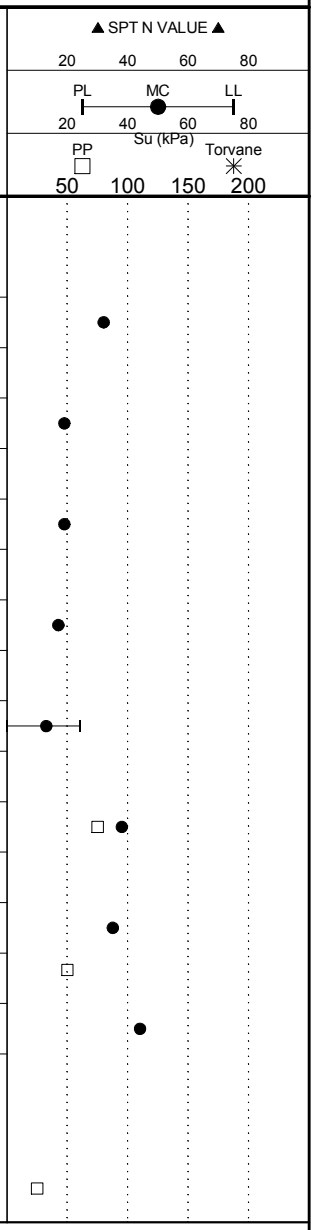
GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

WSP
1600 Buffalo Place
Winnipeg, MB R3T 6B8
Telephone: (204)-477-6650

TH20

CLIENT City of Winnipeg
PROJECT NAME 19-RL-01 - 2019 Alley Renewals
PROJECT NUMBER 18M-01983-00
PROJECT LOCATION Waverley/Oxford Alley from Grosvenor to Corydon
DATE STARTED 2/22/19 **COMPLETED** 2/22/19
GROUND ELEVATION 100 m **HOLE SIZE** 125 mm
DRILLING CONTRACTOR Maple Leaf Drilling
GROUND WATER LEVELS:
DRILLING METHOD Solid Stem Auger - Geoprobe 7822DT
AT TIME OF DRILLING ---
LOGGED BY Alfred Chan **CHECKED BY** Dana Bredin
AT END OF DRILLING ---
NOTES UTM 14N: 5525340.391 m N, 631026.481 m E
AFTER DRILLING ---

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)
	99.85	**PAVEMENT** - 65 mm concrete cored, 85 mm broken in place				
		FILL - SILTY CLAY, some sand, black, frozen stiff	GB 1			32
0.5	99.40	**SILT** - Trace sand and clay, tan-brown, frozen stiff, trace oxidation - Soft, dry, low plasticity below 1.2 m	GB 2			19
1.0		- 80% Silt, 10% Sand, 10% Clay at 1.5 m	GB 3			19
			GB 4			17
1.5	98.35		GB 5			13
		SILTY CLAY - Brown, mottled, highly plastic, moist, firm to soft, trace sulphates	GB 6		75	38
2.0			GB 7		50	35
2.5			GB 8			44
3.0	96.95				25	



- Depth to frost at 1.2 m.
- Testhole ended in soft clay at 3.05 m.
- No caving or seepage observed.

GENERAL BH PLOTS - WSP RIVER HEIGHTS ALLEYWAYS - 18M-01983-00.GPJ GINT STD CANADA.GDT 4/24/19

APPENDIX

C MATERIAL TESTING RESULTS

H. MANALO CONSULTING LTD.

1402 Notre Dame Avenue, Winnipeg, MB R3E 3G5
Phone: 204-697-3854 Cell: 204-997-1355
Email: hmanalo@mts.net

MOISTURE CONTENT OF SOIL (ASTM D2216)

CLIENT:	WSP Canada Group Limited	TEST NO:	19- 001	PROJECT NO:	103-1901
PROJECT:	18M-01983-00	DATE SAMPLED:		SAMPLED BY:	Client
PROJECT CONTACT:	Dana Bredin	DATE TESTED:	27-Feb-2019	TESTED BY:	Irvin Araquil
TEST LOCATION:	-				

Description	TH 1	TH 1	TH 1	TH 1	TH 1
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	189.90	203.60	201.60	202.50	203.40
Wt Dry Sample + Tare	150.70	179.70	149.10	148.80	151.00
Wt Water	39.20	23.90	52.50	53.70	52.40
Wt Tare	4.30	4.60	4.40	4.30	5.10
Wt Dry Sample	146.40	175.10	144.70	144.50	145.90
Moisture Content (%)	**26.8**	**13.6**	**36.3**	**37.2**	**35.9**

Description	TH 1	TH 1	TH 1		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	123.70	162.60	175.70		
Wt Dry Sample + Tare	88.10	114.10	119.60		
Wt Water	35.60	48.50	56.10		
Wt Tare	4.50	5.20	4.30		
Wt Dry Sample	83.60	108.90	115.30		
Moisture Content (%)	**42.6**	**44.5**	**48.7**		

Description	TH 2	TH 2	TH 2	TH 2	TH 2
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	215.20	168.40	206.30	200.40	204.60
Wt Dry Sample + Tare	175.60	119.80	159.40	167.20	169.30
Wt Water	39.60	48.60	46.90	33.20	35.30
Wt Tare	4.60	4.80	4.40	4.30	4.30
Wt Dry Sample	171.00	115.00	155.00	162.90	165.00
Moisture Content (%)	**23.2**	**42.3**	**30.3**	**20.4**	**21.4**

Description	TH 2	TH 2	TH 2		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	201.70	200.70	204.60		
Wt Dry Sample + Tare	143.70	140.70	139.90		
Wt Water	58.00	60.00	64.70		
Wt Tare	4.20	4.30	4.30		
Wt Dry Sample	139.50	136.40	135.60		
Moisture Content (%)	**41.6**	**44.0**	**47.7**		

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MOISTURE CONTENT OF SOIL (ASTM D2216)

CLIENT:	WSP Canada Group Limited	TEST NO:	19- 001	PROJECT NO:	103-1901
PROJECT:	18M-01983-00	DATE SAMPLED:		SAMPLED BY:	Client
PROJECT CONTACT:	Dana Bredin	DATE TESTED:	27-Feb-2019	TESTED BY:	Irvin Araquil
TEST LOCATION:	-				

Description	TH 3	TH 3	TH 3	TH 3	TH 3
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	204.00	167.90	202.10	162.80	205.60
Wt Dry Sample + Tare	154.50	128.90	156.10	127.40	165.80
Wt Water	49.50	39.00	46.00	35.40	39.80
Wt Tare	4.30	4.40	4.90	4.60	4.20
Wt Dry Sample	150.20	124.50	151.20	122.80	161.60
Moisture Content (%)	**33.0**	**31.3**	**30.4**	**28.8**	**24.6**

Description	TH 3	TH 3	TH 3		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	178.10	207.50	183.60		
Wt Dry Sample + Tare	124.00	169.50	131.50		
Wt Water	54.10	38.00	52.10		
Wt Tare	4.30	4.30	5.00		
Wt Dry Sample	119.70	165.20	126.50		
Moisture Content (%)	**45.2**	**23.0**	**41.2**		

Description	TH 4	TH 4	TH 4	TH 4	TH 4
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	157.90	164.80	206.70	205.90	173.20
Wt Dry Sample + Tare	119.70	137.00	173.20	168.40	140.50
Wt Water	38.20	27.80	33.50	37.50	32.70
Wt Tare	4.30	4.40	4.60	4.80	4.70
Wt Dry Sample	115.40	132.60	168.60	163.60	135.80
Moisture Content (%)	**33.1**	**21.0**	**19.9**	**22.9**	**24.1**

Description	TH 4	TH 4	TH 4		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	208.20	214.10	202.10		
Wt Dry Sample + Tare	170.30	176.20	166.80		
Wt Water	37.90	37.90	35.30		
Wt Tare	4.20	4.50	4.10		
Wt Dry Sample	166.10	171.70	162.70		
Moisture Content (%)	**22.8**	**22.1**	**21.7**		

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MOISTURE CONTENT OF SOIL (ASTM D2216)

CLIENT:	WSP Canada Group Limited	TEST NO:	19- 001	PROJECT NO:	103-1901
PROJECT:	18M-01983-00	DATE SAMPLED:		SAMPLED BY:	Client
PROJECT CONTACT:	Dana Bredin	DATE TESTED:	27-Feb-2019	TESTED BY:	Irvin Araquil
TEST LOCATION:	-				

Description	TH 5	TH 5	TH 5	TH 5	TH 5
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	207.50	206.50	204.20	200.10	203.30
Wt Dry Sample + Tare	176.90	166.30	165.90	162.70	166.70
Wt Water	30.60	40.20	38.30	37.40	36.60
Wt Tare	4.40	4.60	4.70	4.60	4.40
Wt Dry Sample	172.50	161.70	161.20	158.10	162.30
Moisture Content (%)	**17.7**	**24.9**	**23.8**	**23.7**	**22.6**

Description	TH 5	TH 5			
Sample	6 ft	8 ft			
Wt Wet Sample + Tare	182.90	207.20			
Wt Dry Sample + Tare	133.00	146.60			
Wt Water	49.90	60.60			
Wt Tare	4.50	4.30			
Wt Dry Sample	128.50	142.30			
Moisture Content (%)	**38.8**	**42.6**			

Description	TH 6	TH 6	TH 6	TH 6	TH 6
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	204.30	200.70	194.30	203.50	202.00
Wt Dry Sample + Tare	150.60	155.90	147.60	156.20	152.00
Wt Water	53.70	44.80	46.70	47.30	50.00
Wt Tare	4.80	4.90	4.40	4.40	4.40
Wt Dry Sample	145.80	151.00	143.20	151.80	147.60
Moisture Content (%)	**36.8**	**29.7**	**32.6**	**31.2**	**33.9**

Description	TH 6	TH 6	TH 6		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	173.70	187.90	203.00		
Wt Dry Sample + Tare	120.50	132.50	140.20		
Wt Water	53.20	55.40	62.80		
Wt Tare	4.30	4.30	4.40		
Wt Dry Sample	116.20	128.20	135.80		
Moisture Content (%)	**45.8**	**43.2**	**46.2**		

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CLIENT:	WSP Canada Group Limited	TEST NO:	19- 001	PROJECT NO:	103-1901
PROJECT:	18M-01983-00	DATE SAMPLED:		SAMPLED BY:	Client
PROJECT CONTACT:	Dana Bredin	DATE TESTED:	27-Feb-2019	TESTED BY:	Irvin Araquil
TEST LOCATION:	-				

Description	TH 7	TH 7	TH 7	TH 7	TH 7
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	205.30	767.90	175.10	206.30	138.50
Wt Dry Sample + Tare	169.50	639.50	140.50	160.70	97.20
Wt Water	35.80	128.40	34.60	45.60	41.30
Wt Tare	42.00	13.10	4.20	4.60	4.60
Wt Dry Sample	127.50	626.40	136.30	156.10	92.60
Moisture Content (%)	**28.1**	**20.5**	**25.4**	**29.2**	**44.6**

Description	TH 7	TH 7	TH 7		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	204.90	181.20	153.90		
Wt Dry Sample + Tare	147.40	124.40	103.90		
Wt Water	57.50	56.80	50.00		
Wt Tare	4.50	4.50	4.30		
Wt Dry Sample	142.90	119.90	99.60		
Moisture Content (%)	**40.2**	**47.4**	**50.2**		

Description	TH 8	TH 8	TH 8	TH 8	TH 8
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	200.70	149.50	151.60	130.40	83.00
Wt Dry Sample + Tare	151.20	124.90	127.10	108.50	69.60
Wt Water	49.50	24.60	24.50	21.90	13.40
Wt Tare	4.20	4.50	4.20	4.20	4.30
Wt Dry Sample	147.00	120.40	122.90	104.30	65.30
Moisture Content (%)	**33.7**	**20.4**	**19.9**	**21.0**	**20.5**

Description	TH 8	TH 8	TH 8		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	144.60	161.70	135.10		
Wt Dry Sample + Tare	104.00	113.50	93.20		
Wt Water	40.60	48.20	41.90		
Wt Tare	4.20	4.50	4.30		
Wt Dry Sample	99.80	109.00	88.90		
Moisture Content (%)	**40.7**	**44.2**	**47.1**		

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MOISTURE CONTENT OF SOIL (ASTM D2216)

CLIENT:	WSP Canada Group Limited	TEST NO:	19- 001	PROJECT NO:	103-1901
PROJECT:	18M-01983-00	DATE SAMPLED:		SAMPLED BY:	Client
PROJECT CONTACT:	Dana Bredin	DATE TESTED:	27-Feb-2019	TESTED BY:	Irvin Araquil
TEST LOCATION:	-				

Description	TH 9	TH 9	TH 9	TH 9	TH 9
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	205.90	200.60	205.50	102.60	153.40
Wt Dry Sample + Tare	171.30	159.80	163.70	71.80	109.20
Wt Water	34.60	40.80	41.80	30.80	44.20
Wt Tare	4.20	4.10	4.10	4.20	4.10
Wt Dry Sample	167.10	155.70	159.60	67.60	105.10
Moisture Content (%)	**20.7**	**26.2**	**26.2**	**45.6**	**42.1**

Description	TH 9	TH 9	TH 9		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	156.80	185.30	135.80		
Wt Dry Sample + Tare	111.40	130.20	91.10		
Wt Water	45.40	55.10	44.70		
Wt Tare	4.10	4.20	4.20		
Wt Dry Sample	107.30	126.00	86.90		
Moisture Content (%)	**42.3**	**43.7**	**51.4**		

Description	TH-10	TH-10	TH-10	TH-10	TH-10
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	185.90	200.70	204.30	151.10	193.90
Wt Dry Sample + Tare	148.60	170.90	173.40	119.80	141.80
Wt Water	37.30	29.80	30.90	31.30	52.10
Wt Tare	4.20	4.20	4.20	4.10	4.20
Wt Dry Sample	144.40	166.70	169.20	115.70	137.60
Moisture Content (%)	**25.8**	**17.9**	**18.3**	**27.1**	**37.9**

Description	TH-10	TH-10	TH-10		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	158.20	136.00	156.40		
Wt Dry Sample + Tare	112.80	93.10	105.70		
Wt Water	45.40	42.90	50.70		
Wt Tare	4.20	4.30	4.30		
Wt Dry Sample	108.60	88.80	101.40		
Moisture Content (%)	**41.8**	**48.3**	**50.0**		

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MOISTURE CONTENT OF SOIL (ASTM D2216)

CLIENT:	WSP Canada Group Limited	TEST NO:	19- 001	PROJECT NO:	103-1901
PROJECT:	18M-01983-00	DATE SAMPLED:		SAMPLED BY:	Client
PROJECT CONTACT:	Dana Bredin	DATE TESTED:	27-Feb-2019	TESTED BY:	Irvin Araquil
TEST LOCATION:	-				

Description	TH-11	TH-11	TH-11	TH-11	TH-11
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	141.60	172.90	736.10	203.10	163.90
Wt Dry Sample + Tare	109.50	149.50	636.30	162.30	123.60
Wt Water	32.10	23.40	99.80	40.80	40.30
Wt Tare	4.20	4.20	14.00	4.40	5.00
Wt Dry Sample	105.30	145.30	622.30	157.90	118.60
Moisture Content (%)	**30.5**	**16.1**	**16.0**	**25.8**	**34.0**

Description	TH-11	TH-11	TH-11		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	168.70	161.20	135.30		
Wt Dry Sample + Tare	121.20	118.50	93.90		
Wt Water	47.50	42.70	41.40		
Wt Tare	4.70	4.50	4.30		
Wt Dry Sample	116.50	114.00	89.60		
Moisture Content (%)	**40.8**	**37.5**	**46.2**		

Description	TH-12	TH-12	TH-12	TH-12	TH-12
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	203.10	202.40	203.00	201.90	154.10
Wt Dry Sample + Tare	151.80	162.40	169.50	159.40	119.50
Wt Water	51.30	40.00	33.50	42.50	34.60
Wt Tare	4.10	4.20	4.20	4.20	4.10
Wt Dry Sample	147.70	158.20	165.30	155.20	115.40
Moisture Content (%)	**34.7**	**25.3**	**20.3**	**27.4**	**30.0**

Description	TH-12	TH-12	TH-12		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	123.80	128.50	107.90		
Wt Dry Sample + Tare	89.30	89.40	72.40		
Wt Water	34.50	39.10	35.50		
Wt Tare	4.30	4.10	4.20		
Wt Dry Sample	85.00	85.30	68.20		
Moisture Content (%)	**40.6**	**45.8**	**52.1**		

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CLIENT:	WSP Canada Group Limited	TEST NO:	19- 001	PROJECT NO:	103-1901
PROJECT:	18M-01983-00	DATE SAMPLED:		SAMPLED BY:	Client
PROJECT CONTACT:	Dana Bredin	DATE TESTED:	27-Feb-2019	TESTED BY:	Irvin Araquil
TEST LOCATION:	-				

Description	TH-13	TH-13	TH-13	TH-13	TH-13
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	209.40	201.10	200.60	180.20	203.70
Wt Dry Sample + Tare	154.70	168.60	168.10	137.70	167.60
Wt Water	54.70	32.50	32.50	42.50	36.10
Wt Tare	4.30	4.20	4.20	4.20	4.20
Wt Dry Sample	150.40	164.40	163.90	133.50	163.40
Moisture Content (%)	**36.4**	**19.8**	**19.8**	**31.8**	**22.1**

Description	TH-13	TH-13	TH-13		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	201.60	201.10	206.70		
Wt Dry Sample + Tare	146.70	148.60	141.40		
Wt Water	54.90	52.50	65.30		
Wt Tare	4.20	4.20	4.20		
Wt Dry Sample	142.50	144.40	137.20		
Moisture Content (%)	**38.5**	**36.4**	**47.6**		

Description	TH-14	TH-14	TH-14	TH-14	TH-14
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	151.70	173.10	514.80	207.30	139.90
Wt Dry Sample + Tare	112.20	141.40	427.30	173.90	117.80
Wt Water	39.50	31.70	87.50	33.40	22.10
Wt Tare	4.20	4.20	14.60	4.20	4.20
Wt Dry Sample	108.00	137.20	412.70	169.70	113.60
Moisture Content (%)	**36.6**	**23.1**	**21.2**	**19.7**	**19.5**

Description	TH-14	TH-14	TH-14		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	204.20	200.30	133.80		
Wt Dry Sample + Tare	153.10	142.70	93.80		
Wt Water	51.10	57.60	40.00		
Wt Tare	4.20	4.20	4.20		
Wt Dry Sample	148.90	138.50	89.60		
Moisture Content (%)	**34.3**	**41.6**	**44.6**		

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MOISTURE CONTENT OF SOIL (ASTM D2216)

CLIENT:	WSP Canada Group Limited	TEST NO:	19- 001	PROJECT NO:	103-1901
PROJECT:	18M-01983-00	DATE SAMPLED:		SAMPLED BY:	Client
PROJECT CONTACT:	Dana Bredin	DATE TESTED:	27-Feb-2019	TESTED BY:	Irvin Araquil
TEST LOCATION:	-				

Description	TH-15	TH-15	TH-15	TH-15	TH-15
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	160.90	206.50	159.30	202.20	190.80
Wt Dry Sample + Tare	112.90	157.80	120.50	153.60	143.50
Wt Water	48.00	48.70	38.80	48.60	47.30
Wt Tare	4.20	4.20	4.20	4.20	4.20
Wt Dry Sample	108.70	153.60	116.30	149.40	139.30
Moisture Content (%)	**44.2**	**31.7**	**33.4**	**32.5**	**34.0**

Description	TH-15	TH-15	TH-15		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	204.00	202.90	186.60		
Wt Dry Sample + Tare	144.00	137.50	125.10		
Wt Water	60.00	65.40	61.50		
Wt Tare	4.20	4.20	4.20		
Wt Dry Sample	139.80	133.30	120.90		
Moisture Content (%)	**42.9**	**49.1**	**50.9**		

Description	TH-16	TH-16	TH-16	TH-16	TH-16
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	204.00	176.20	174.20	855.30	206.00
Wt Dry Sample + Tare	161.30	140.50	139.40	695.50	161.00
Wt Water	42.70	35.70	34.80	159.80	45.00
Wt Tare	4.20	4.20	4.20	13.80	4.20
Wt Dry Sample	157.10	136.30	135.20	681.70	156.80
Moisture Content (%)	**27.2**	**26.2**	**25.7**	**23.4**	**28.7**

Description	TH-16	TH-16	TH-16		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	132.50	198.40	112.50		
Wt Dry Sample + Tare	94.80	146.50	78.00		
Wt Water	37.70	51.90	34.50		
Wt Tare	4.20	4.10	4.20		
Wt Dry Sample	90.60	142.40	73.80		
Moisture Content (%)	**41.6**	**36.4**	**46.7**		

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MOISTURE CONTENT OF SOIL (ASTM D2216)

CLIENT:	WSP Canada Group Limited	TEST NO:	19- 001	PROJECT NO:	103-1901
PROJECT:	18M-01983-00	DATE SAMPLED:		SAMPLED BY:	Client
PROJECT CONTACT:	Dana Bredin	DATE TESTED:	27-Feb-2019	TESTED BY:	Irvin Araquil
TEST LOCATION:	-				

Description	TH-17	TH-17	TH-17	TH-17	TH-17
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	188.90	168.20	205.20	155.90	200.10
Wt Dry Sample + Tare	135.40	121.60	167.90	114.40	145.20
Wt Water	53.50	46.60	37.30	41.50	54.90
Wt Tare	4.20	4.20	4.20	4.20	4.20
Wt Dry Sample	131.20	117.40	163.70	110.20	141.00
Moisture Content (%)	**40.8**	**39.7**	**22.8**	**37.7**	**38.9**

Description	TH-17	TH-17	TH-17		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	153.40	163.20	166.10		
Wt Dry Sample + Tare	114.60	115.00	118.40		
Wt Water	38.80	48.20	47.70		
Wt Tare	4.20	4.20	4.20		
Wt Dry Sample	110.40	110.80	114.20		
Moisture Content (%)	**35.1**	**43.5**	**41.8**		

Description	TH-18	TH-18	TH-18	TH-18	TH-18
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	161.00	204.70	148.50	139.60	190.40
Wt Dry Sample + Tare	119.20	142.60	111.70	102.90	143.60
Wt Water	41.80	62.10	36.80	36.70	46.80
Wt Tare	4.10	4.20	4.20	4.30	4.20
Wt Dry Sample	115.10	138.40	107.50	98.60	139.40
Moisture Content (%)	**36.3**	**44.9**	**34.2**	**37.2**	**33.6**

Description	TH-18	TH-18	TH-18		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	179.20	149.90	186.30		
Wt Dry Sample + Tare	135.10	113.90	149.50		
Wt Water	44.10	36.00	36.80		
Wt Tare	4.20	4.20	4.20		
Wt Dry Sample	130.90	109.70	145.30		
Moisture Content (%)	**33.7**	**32.8**	**25.3**		

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MOISTURE CONTENT OF SOIL (ASTM D2216)

CLIENT:	WSP Canada Group Limited	TEST NO:	19- 001	PROJECT NO:	103-1901
PROJECT:	18M-01983-00	DATE SAMPLED:		SAMPLED BY:	Client
PROJECT CONTACT:	Dana Bredin	DATE TESTED:	27-Feb-2019	TESTED BY:	Irvin Araquil
TEST LOCATION:	-				

Description	TH-19	TH-19	TH-19	TH-19	TH-19
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	204.90	191.60	166.50	151.20	156.10
Wt Dry Sample + Tare	156.80	153.70	132.90	113.60	116.80
Wt Water	48.10	37.90	33.60	37.60	39.30
Wt Tare	4.20	4.20	4.10	4.20	4.20
Wt Dry Sample	152.60	149.50	128.80	109.40	112.60
Moisture Content (%)	**31.5**	**25.4**	**26.1**	**34.4**	**34.9**

Description	TH-19	TH-19	TH-19		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	163.10	164.20	146.50		
Wt Dry Sample + Tare	122.30	116.60	103.70		
Wt Water	40.80	47.60	42.80		
Wt Tare	4.20	4.20	4.20		
Wt Dry Sample	118.10	112.40	99.50		
Moisture Content (%)	**34.5**	**42.3**	**43.0**		

Description	TH-20	TH-20	TH-20	TH-20	TH-20
Sample	1 ft	2 ft	3 ft	4 ft	5 ft
Wt Wet Sample + Tare	202.00	201.30	202.70	204.60	742.40
Wt Dry Sample + Tare	153.90	169.50	170.80	176.00	661.10
Wt Water	48.10	31.80	31.90	28.60	81.30
Wt Tare	4.10	4.10	4.10	4.30	13.60
Wt Dry Sample	149.80	165.40	166.70	171.70	647.50
Moisture Content (%)	**32.1**	**19.2**	**19.1**	**16.7**	**12.6**

Description	TH-20	TH-20	TH-20		
Sample	6 ft	7 ft	8 ft		
Wt Wet Sample + Tare	175.70	202.40	209.20		
Wt Dry Sample + Tare	128.30	150.80	146.70		
Wt Water	47.40	51.60	62.50		
Wt Tare	4.20	4.20	4.20		
Wt Dry Sample	124.10	146.60	142.50		
Moisture Content (%)	**38.2**	**35.2**	**43.9**		

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PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

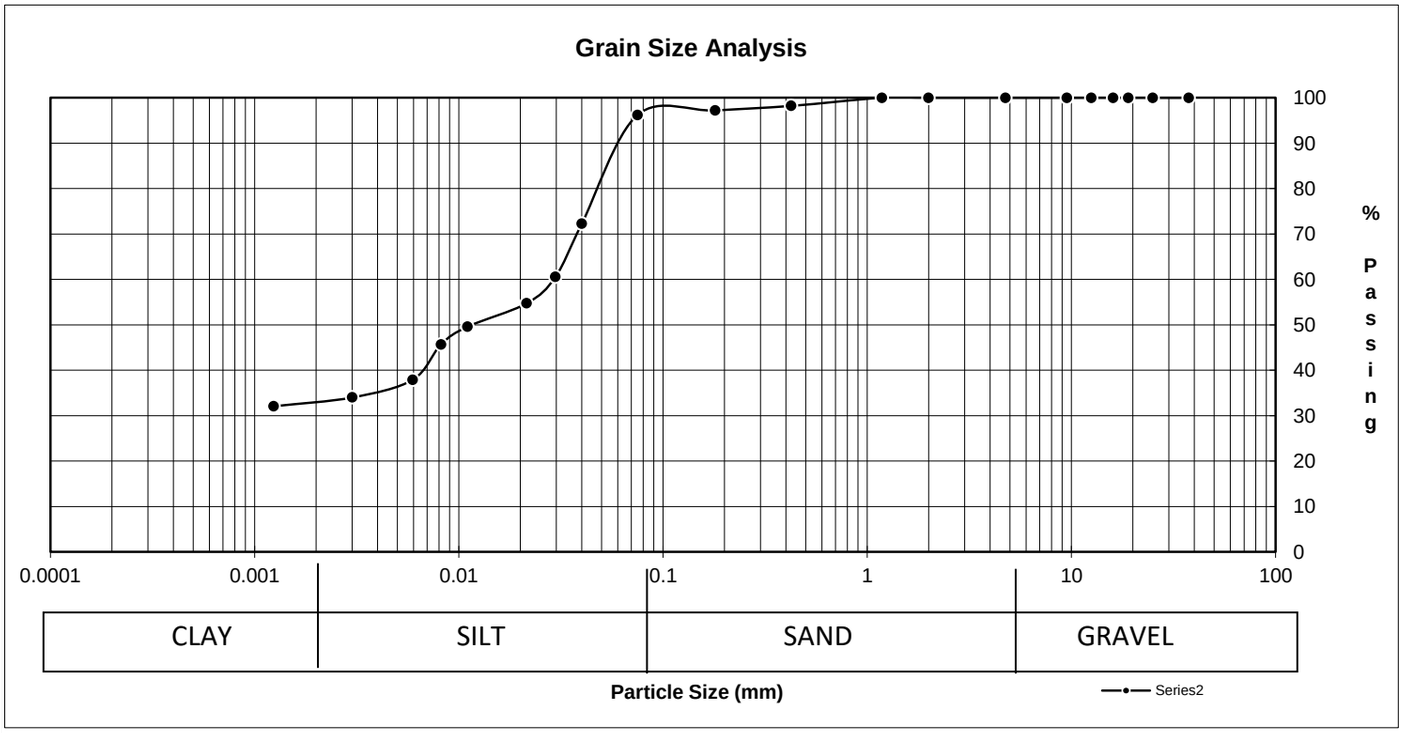
CLIENT: WSP Canada Group Limited
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTENTION: Dana Bredin
PROJECT: 18M-01983-00

PROJECT NO. 103-1901

Date Sampled:
Sampled By: Client
Date Received:
Date Tested: 12-Mar-19

Material Identification
B.H./T.H. No. **TH 4 - 4**
Sample No. **HM 18 - 1**
Sample Source
Specific Gravity of Material: 2.650

Sieve Analysis		Hydrometer Analysis	
Sieve (mm)	% Passing	Diameter	% Finer
50.00	100.0		
37.50	100.0		
25.00	100.0		
19.00	100.0		
16.00	100.0		
12.50	100.0	0.0400	72.3
9.50	100.0	0.0297	60.6
4.75	100.0	0.0215	54.7
2.00	100.0	0.0111	49.6
1.18	100.0	0.0082	45.7
0.425	98.2	0.0059	37.9
0.180	97.2	0.0030	34.0
0.075	96.2	0.0012	32.1



SOIL DESCRIPTION	% Composition		D10
		Gravel	D30
SILTY CLAY LOAM	3.8	Sand	D60
	63.2	Silt	Cu
	33.0	Clay	Cc

Remarks: Test Method: ASTM D422, D2216, D4318

Technician: ECS

Reviewed by: Hermie Manalo

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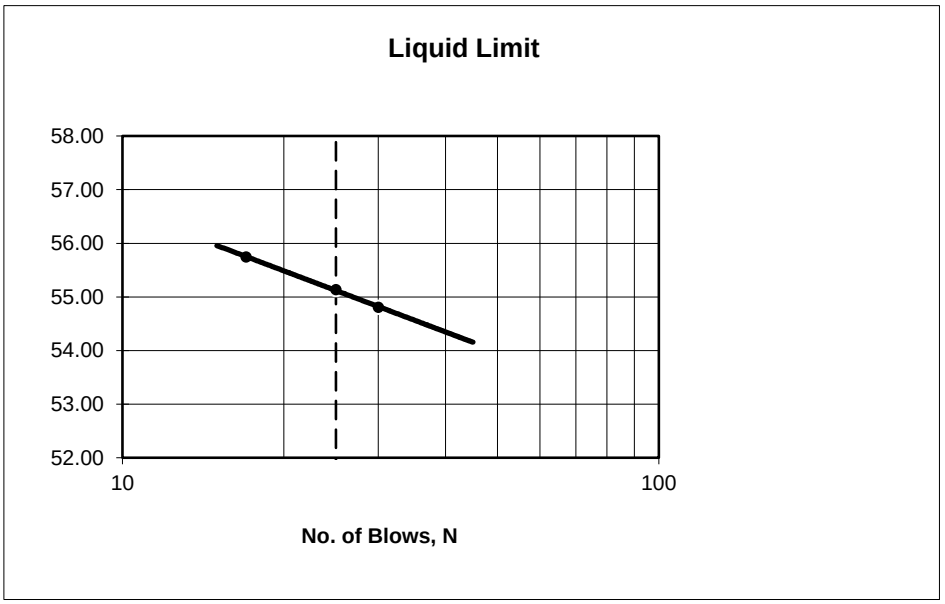
ATTERBERG LIMITS

CLIENT: WSP Canada Group Limited
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTENTION: Dana Bredin
PROJECT: 18M-01983-00

PROJECT NO.: 103-1901

Liquid Limit Determination

Dish No.:	1	2	3		Liquid Limit
Wet Soil + Dish:	50.22	48.63	51.24		25 Blows
Dry Soil + Dish:	46.97	45.84	47.65		
Moisture:	3.25	2.79	3.59		
Dish:	41.04	40.78	41.21		
Dry Soil:	5.93	5.06	6.44		
% Moisture:	54.81	55.14	55.75		
No. of Blows:	30	25	17		
Liquid Limits:	56.03	55.14	53.20		**54.8**



Material Identification:

TH 4 - 4

Depth: **4'**

Liquid Limit, %: **55**
Plastic Limit, %: **21**
Plasticity Index: **33**
(LL-PL)

Plastic Limit Determination

Dish No.:	1	2	3		
Wet Soil + Dish:	48.47	38.22	50.81		
Dry Soil + Dish:	47.16	36.68	49.01		
Moisture:	1.31	1.54	1.8		
Dish:	41.19	29.42	40.43		
Dry Soil:	5.97	7.26	8.58		
% Moisture:	21.94	21.21	20.98		
Average:					**21.4**

Test Method : ASTM: D4318, D2216
HMCL Tech: ECS
Date Tested: 14-Mar-19

Reviewed by: Hermie Manalo

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PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

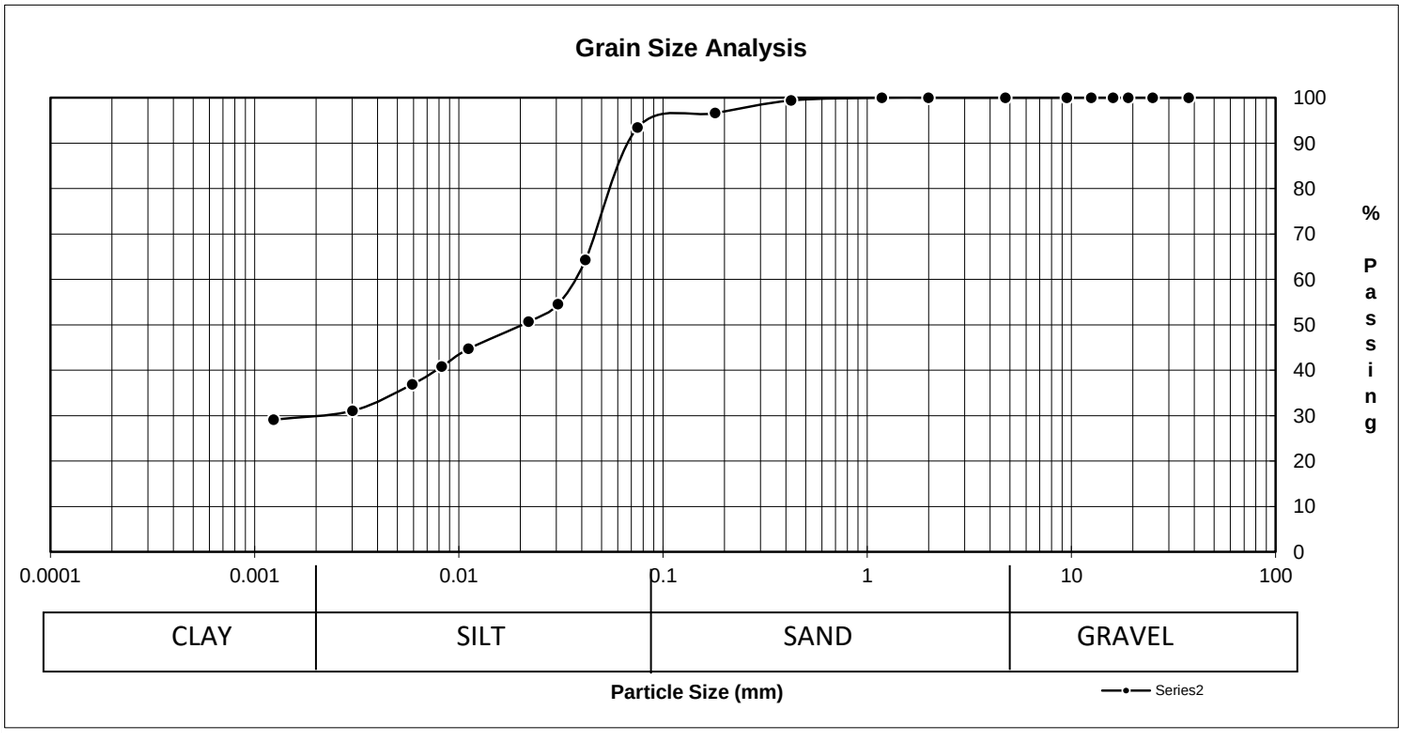
CLIENT: WSP Canada Group Limited
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTENTION: Dana Bredin
PROJECT: 18M-01983-00

PROJECT NO. 103-1901

Date Sampled:
Sampled By: Client
Date Received:
Date Tested: 12-Mar-19

Material Identification
B.H./T.H. No. **TH 7 - 2**
Sample No. **HM 18 - 2**
Sample Source
Specific Gravity of Material: 2.650

Sieve Analysis		Hydrometer Analysis	
Sieve (mm)	% Passing	Diameter	% Finer
50.00	100.0		
37.50	100.0		
25.00	100.0		
19.00	100.0		
16.00	100.0		
12.50	100.0	0.0417	64.3
9.50	100.0	0.0307	54.6
4.75	100.0	0.0220	50.7
2.00	100.0	0.0112	44.7
1.18	100.0	0.0083	40.8
0.425	99.4	0.0059	36.9
0.180	96.6	0.0030	31.1
0.075	93.4	0.0012	29.1



SOIL DESCRIPTION	% Composition		D10
		Gravel	D30
SILTY CLAY LOAM	6.6	Sand	D60
	63.4	Silt	Cu
	30.0	Clay	Cc

Remarks: Test Method: ASTM D422, D2216, D4318

Technician: ECS

Reviewed by: Hermie Manalo

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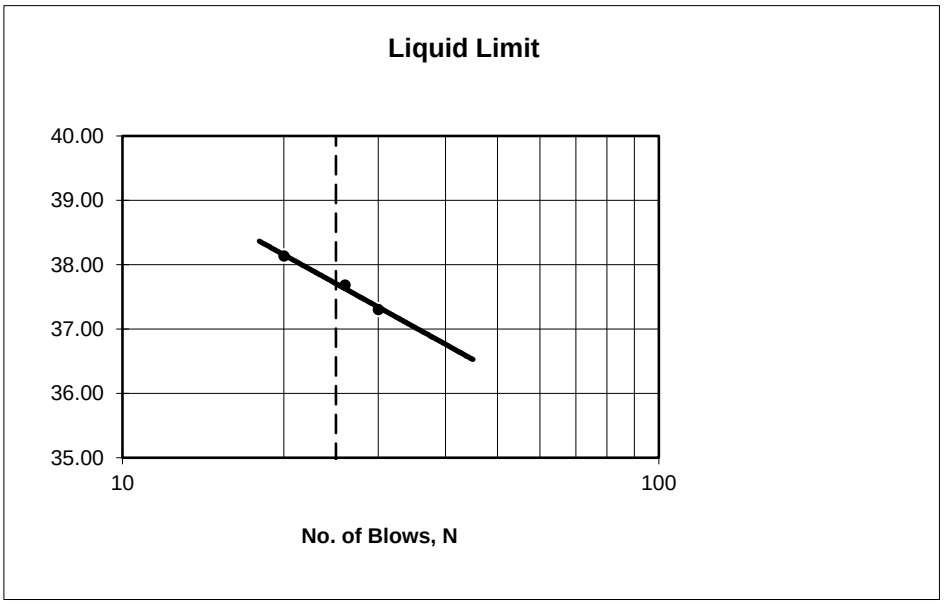
ATTERBERG LIMITS

CLIENT: WSP Canada Group Limited
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTENTION: Dana Bredin
PROJECT: 18M-01983-00

PROJECT NO.: 103-1901

Liquid Limit Determination

Dish No.:	1	2	3		Liquid Limit
Wet Soil + Dish:	52.38	57.03	52.4		25 Blows
Dry Soil + Dish:	49.28	52.67	49.17		
Moisture:	3.1	4.36	3.23		
Dish:	40.97	41.1	40.7		
Dry Soil:	8.31	11.57	8.47		
% Moisture:	37.30	37.68	38.13		
No. of Blows:	30	26	20		
Liquid Limits:	38.14	37.86	37.12		**37.7**



Material Identification:

TH 7 - 2

Depth: **2'**

Liquid Limit, %: **38**
Plastic Limit, %: **16**
Plasticity Index: **21**
(LL-PL)

Plastic Limit Determination

Dish No.:	1	2	3		
Wet Soil + Dish:	51.61	43.67	52.23		
Dry Soil + Dish:	50.12	41.62	50.65		
Moisture:	1.49	2.05	1.58		
Dish:	40.61	29.1	41.34		
Dry Soil:	9.51	12.52	9.31		
% Moisture:	15.67	16.37	16.97		
Average:					**16.3**

Test Method : ASTM: D4318, D2216
HMCL Tech: ECS
Date Tested: 15-Mar-19

Reviewed by: Hermie Manalo

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PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

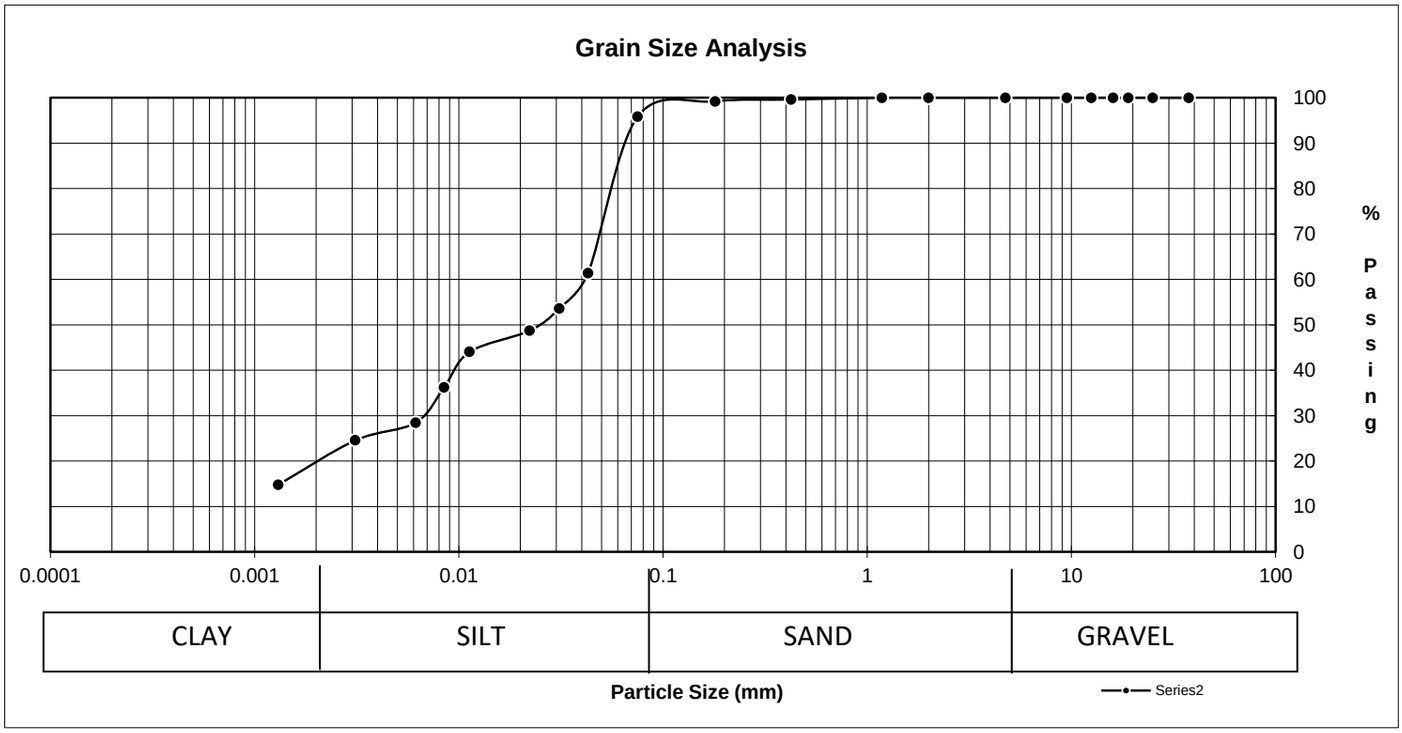
CLIENT: WSP Canada Group Limited
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTENTION: Dana Bredin
PROJECT: 18M-01983-00

PROJECT NO. 103-1901

Date Sampled:
Sampled By: Client
Date Received:
Date Tested: 12-Mar-19

Material Identification
B.H./T.H. No. **TH 11- 3**
Sample No. **HM 18 - 3**
Sample Source
Specific Gravity of Material: 2.650

Sieve Analysis		Hydrometer Analysis	
Sieve (mm)	% Passing	Diameter	% Finer
50.00	100.0		
37.50	100.0		
25.00	100.0		
19.00	100.0		
16.00	100.0		
12.50	100.0	0.0429	61.4
9.50	100.0	0.0310	53.6
4.75	100.0	0.0223	48.7
2.00	100.0	0.0113	44.0
1.18	100.0	0.0085	36.2
0.425	99.6	0.0061	28.4
0.180	99.2	0.0031	24.5
0.075	95.8	0.0013	14.8



SOIL DESCRIPTION	% Composition		D10
		Gravel	D30
SILTY LOAM	4.2	Sand	D60
	75.8	Silt	Cu
	20.0	Clay	Cc

Remarks: Test Method: ASTM D422, D2216, D4318

Technician: IA

Reviewed by: Hermie Manalo

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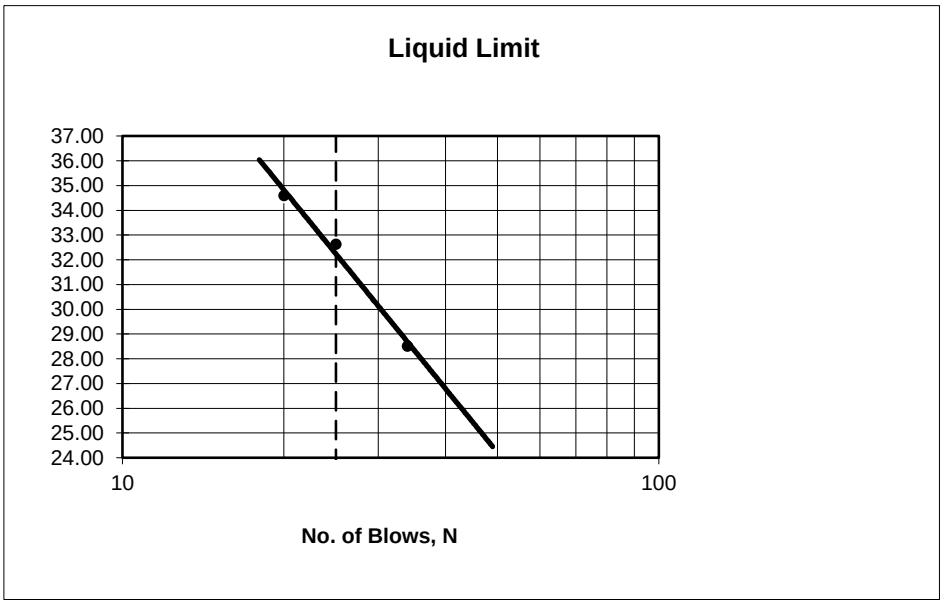
ATTERBERG LIMITS

CLIENT: WSP Canada Group Limited
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTENTION: Dana Bredin
PROJECT: 18M-01983-00

PROJECT NO.: 103-1901

Liquid Limit Determination

Dish No.:	1	2	3		Liquid Limit 25 Blows
Wet Soil + Dish:	54.52	56.17	54.56		
Dry Soil + Dish:	51.52	52.32	51		
Moisture:	3	3.85	3.56		
Dish:	41	40.52	40.71		
Dry Soil:	10.52	11.8	10.29		
% Moisture:	28.52	32.63	34.60		
No. of Blows:	34	25	20		
Liquid Limits:	29.60	32.63	33.68		**32.0**



Material Identification:

TH 11 - 3

Depth: **3'**

Liquid Limit, %: **32**
Plastic Limit, %: **16**
Plasticity Index: **16**
(LL-PL)

Plastic Limit Determination

Dish No.:	1	2	3		
Wet Soil + Dish:	50.6	52.65	52.13		
Dry Soil + Dish:	49.19	51.08	50.56		
Moisture:	1.41	1.57	1.57		
Dish:	40.94	40.83	40.54		
Dry Soil:	8.25	10.25	10.02		
% Moisture:	17.09	15.32	15.67		
Average:					**16.0**

Test Method : ASTM: D4318, D2216
HMCL Tech: ECS
Date Tested: 12-Mar-19

Reviewed by: Hermie Manalo

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PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

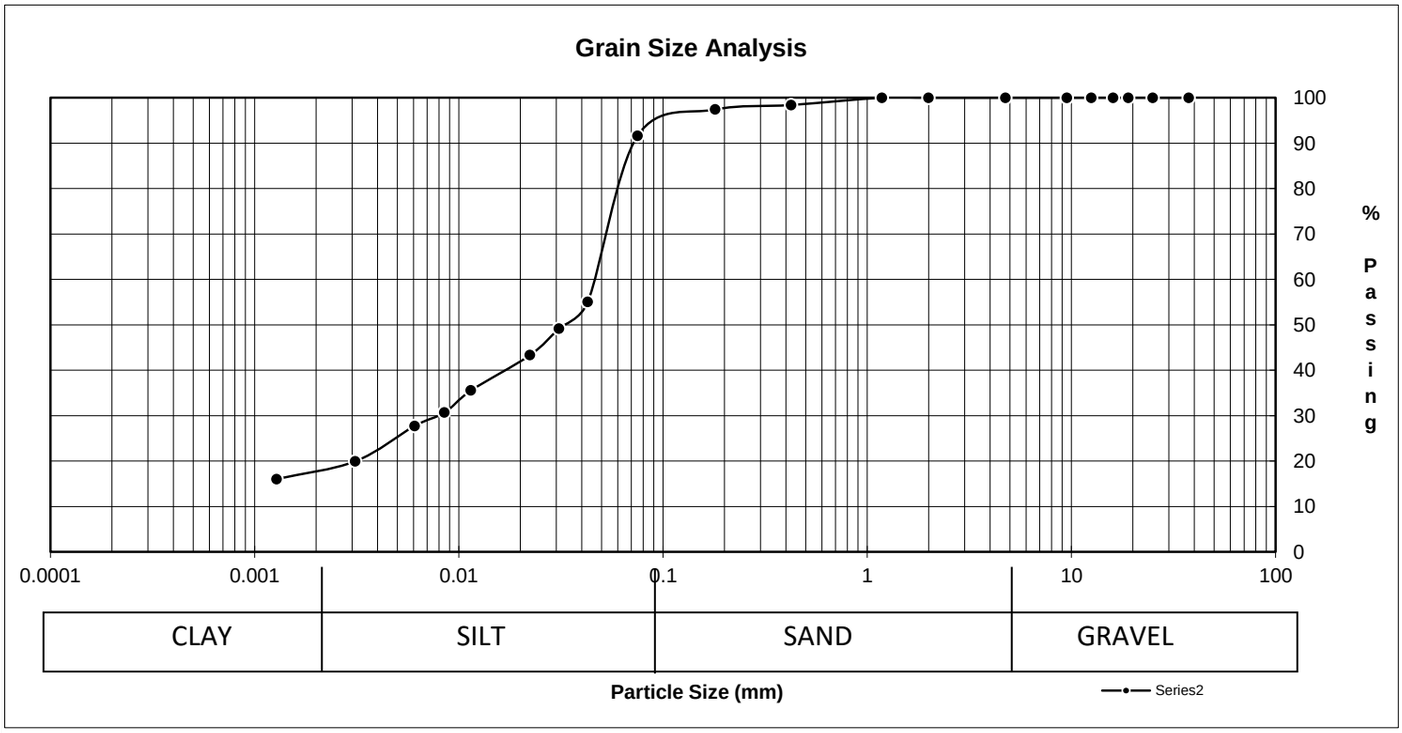
CLIENT: WSP Canada Group Limited
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTENTION: Dana Bredin
PROJECT: 18M-01983-00

PROJECT NO. 103-1901

Date Sampled:
Sampled By: Client
Date Received:
Date Tested: 12-Mar-19

Material Identification
B.H./T.H. No. **TH 14 - 3**
Sample No. **HM 18-4**
Sample Source
Specific Gravity of Material: 2.650

Sieve Analysis		Hydrometer Analysis	
Sieve (mm)	% Passing	Diameter	% Finer
50.00	100.0		
37.50	100.0		
25.00	100.0		
19.00	100.0		
16.00	100.0		
12.50	100.0	0.0428	55.0
9.50	100.0	0.0309	49.2
4.75	100.0	0.0223	43.3
2.00	100.0	0.0115	35.5
1.18	100.0	0.0085	30.7
0.425	98.4	0.0061	27.7
0.180	97.4	0.0031	19.9
0.075	91.6	0.0013	16.0



SOIL DESCRIPTION	% Composition		D10
		Gravel	D30
SILT LOAM	8.4	Sand	D60
	73.6	Silt	Cu
	18.0	Clay	Cc

Remarks: Test Method: ASTM D422, D2216, D4318

Technician: ECS

Reviewed by: Hermie Manalo

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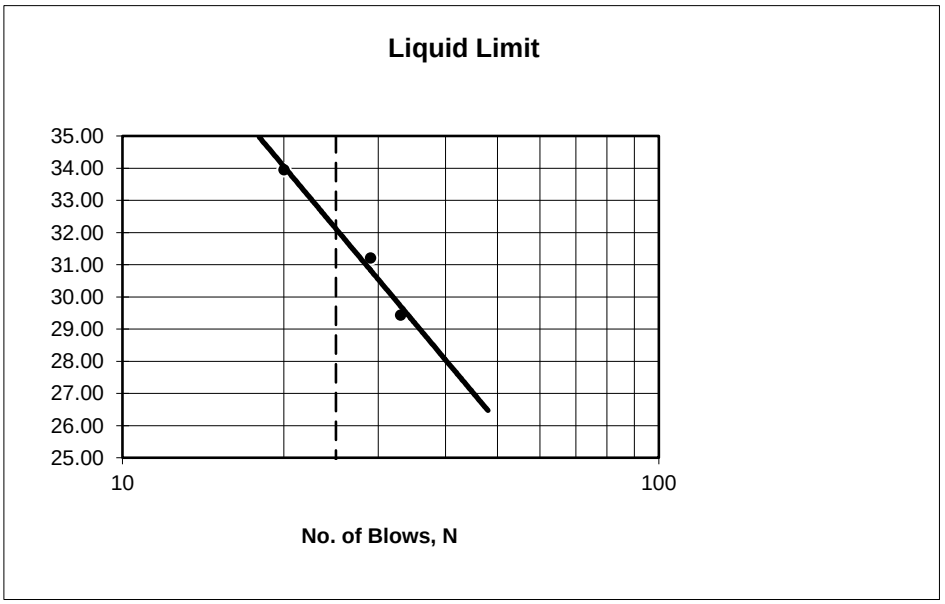
ATTERBERG LIMITS

CLIENT: WSP Canada Group Limited
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTENTION: Dana Bredin
PROJECT: 18M-01983-00

PROJECT NO.: 103-1901

Liquid Limit Determination

Dish No.:	1	2	3		Liquid Limit
Wet Soil + Dish:	52.81	52.96	55.14		25 Blows
Dry Soil + Dish:	50.17	50.16	51.66		
Moisture:	2.64	2.8	3.48		
Dish:	41.2	41.19	41.41		
Dry Soil:	8.97	8.97	10.25		
% Moisture:	29.43	31.22	33.95		
No. of Blows:	33	29	20		
Liquid Limits:	30.44	31.78	33.05		**31.8**



Material Identification:

TH 14 - 3

Depth: **3'**

Liquid Limit, %: **32**
Plastic Limit, %: **17**
Plasticity Index: **15**
(LL-PL)

Plastic Limit Determination

Dish No.:	1	2	3		
Wet Soil + Dish:	54.91	51.34	51.91		
Dry Soil + Dish:	52.79	49.91	50.28		
Moisture:	2.12	1.43	1.63		
Dish:	41.4	40.64	40.97		
Dry Soil:	11.39	9.27	9.31		
% Moisture:	18.61	15.43	17.51		
Average:					**17.2**

Test Method : ASTM: D4318, D2216
HMCL Tech: ECS
Date Tested: 15-Mar-19

Reviewed by: Hermie Manalo

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Phone: 204 697 3854 Cell: 204 997-1355
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PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

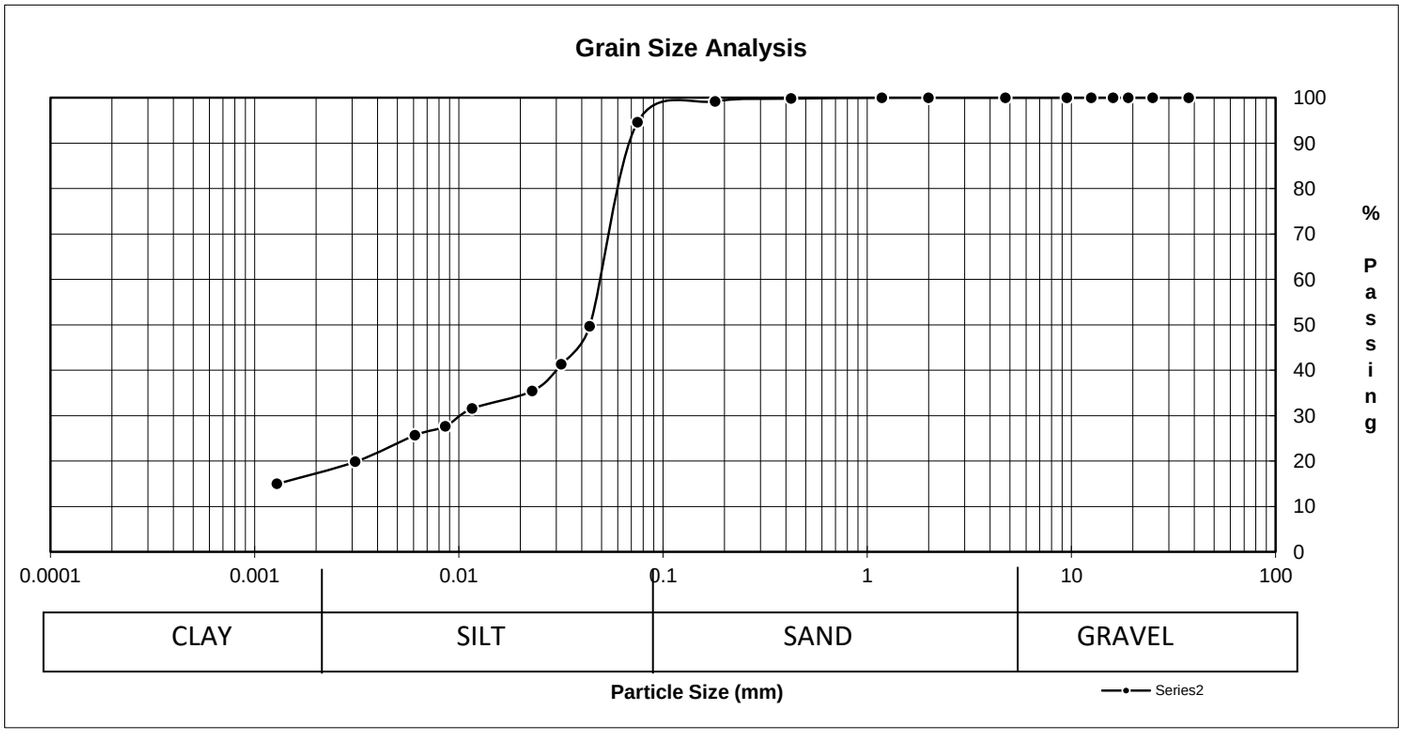
CLIENT: WSP Canada Group Limited
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTENTION: Dana Bredin
PROJECT: 18M-01983-00

PROJECT NO. 103-1901

Date Sampled:
Sampled By: Client
Date Received:
Date Tested: 12-Mar-19

Material Identification
B.H./T.H. No. **TH 16 - 4**
Sample No. **HM 18 - 5**
Sample Source
Specific Gravity of Material: 2.650

Sieve Analysis		Hydrometer Analysis	
Sieve (mm)	% Passing	Diameter	% Finer
50.00	100.0		
37.50	100.0		
25.00	100.0		
19.00	100.0		
16.00	100.0		
12.50	100.0	0.0437	49.7
9.50	100.0	0.0318	41.3
4.75	100.0	0.0229	35.4
2.00	100.0	0.0116	31.5
1.18	100.0	0.0086	27.6
0.425	99.8	0.0061	25.7
0.180	99.2	0.0031	19.8
0.075	94.6	0.0013	15.0



SOIL DESCRIPTION	% Composition		D10
		Gravel	D30
SILT LOAM	5.4	Sand	D60
	77.6	Silt	Cu
	17.0	Clay	Cc

Remarks: Test Method: ASTM D422, D2216, D4318

Technician: ECS

Reviewed by: Hermie Manalo

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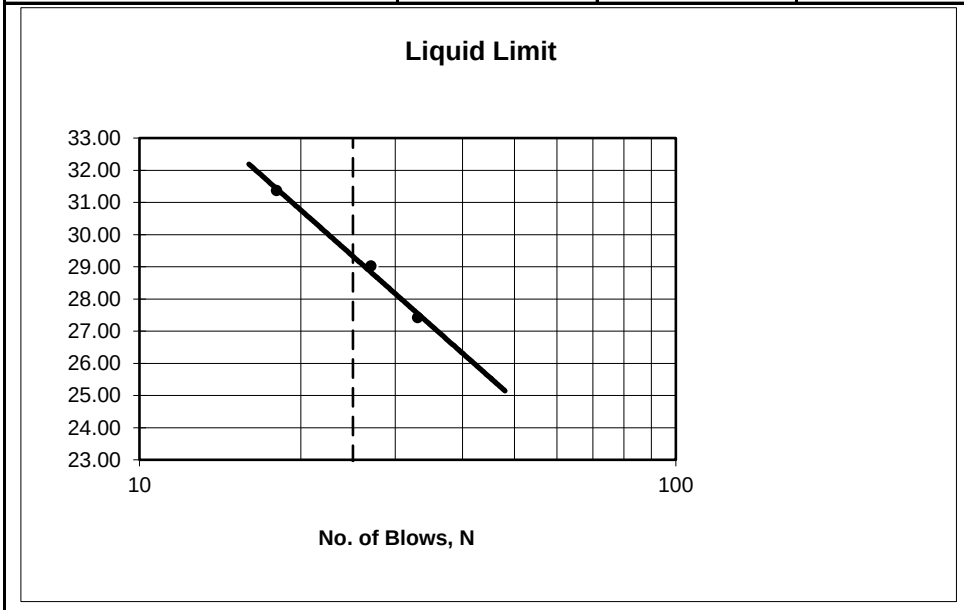
ATTERBERG LIMITS

CLIENT: WSP Canada Group Limited
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTENTION: Dana Bredin
PROJECT: 18M-01983-00

PROJECT NO.: 103-1901

Liquid Limit Determination

Dish No.:	1	2	3		Liquid Limit
Wet Soil + Dish:	57.06	53.52	59.37		25 Blows
Dry Soil + Dish:	53.55	50.69	55		
Moisture:	3.51	2.83	4.37		
Dish:	40.75	40.94	41.07		
Dry Soil:	12.8	9.75	13.93		
% Moisture:	27.42	29.03	31.37		
No. of Blows:	33	27	18		
Liquid Limits:	28.36	29.30	30.15		**29.3**



Material Identification:

TH 16 - 4

Depth: **4'**

Liquid Limit, %: **29**
Plastic Limit, %: **19**
Plasticity Index: **10**
(LL-PL)

Plastic Limit Determination

Dish No.:	1	2	3		
Wet Soil + Dish:	53.11	57.96	52.89		
Dry Soil + Dish:	51.14	55.23	51.04		
Moisture:	1.97	2.73	1.85		
Dish:	40.91	40.66	41.07		
Dry Soil:	10.23	14.57	9.97		
% Moisture:	19.26	18.74	18.56		
Average:					**18.8**

Test Method : ASTM: D4318, D2216
HMCL Tech: ECS
Date Tested: 15-Mar-19

Reviewed by: Hermie Manalo

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PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

CLIENT: WSP Canada Group Limited
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTENTION: Dana Bredin
PROJECT: 18M-01983-00

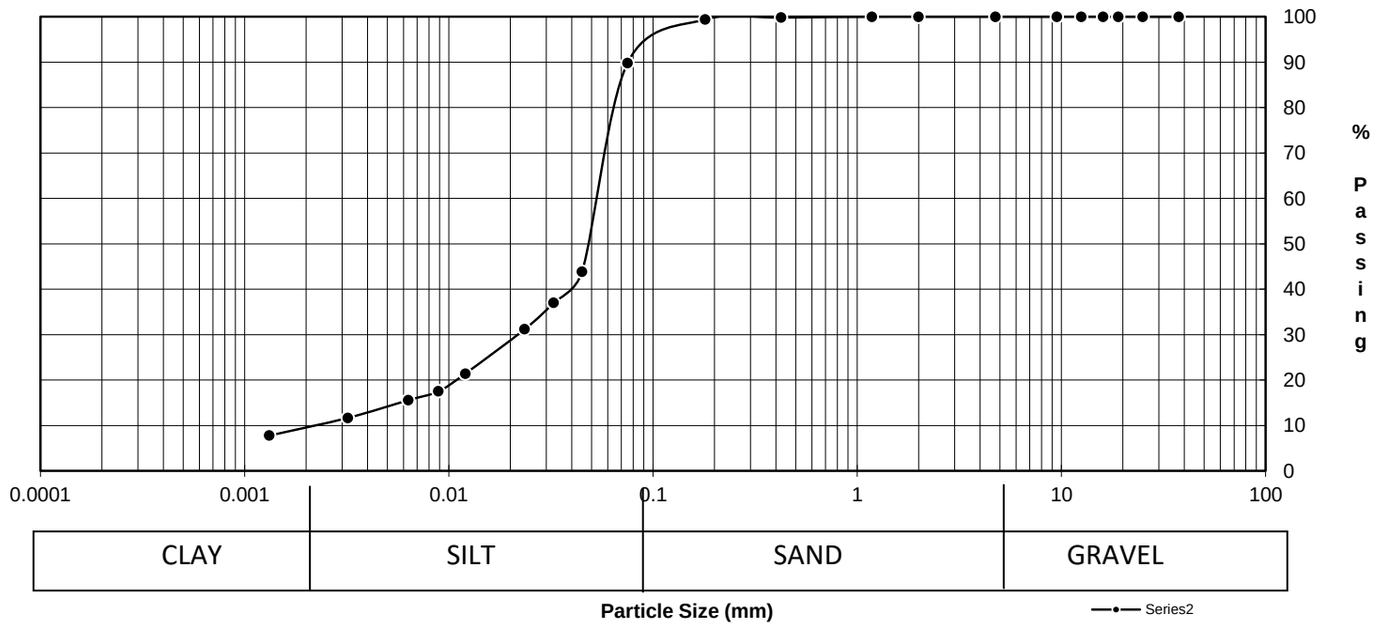
PROJECT NO. 103-1901

Date Sampled:
Sampled By: Client
Date Received:
Date Tested: 12-Mar-19

Material Identification
B.H./T.H. No. **TH 20 - 5**
Sample No. **HM 18 - 6**
Sample Source
Specific Gravity of Material: 2.650

Sieve Analysis		Hydrometer Analysis	
Sieve (mm)	% Passing	Diameter	% Finer
50.00	100.0		
37.50	100.0		
25.00	100.0		
19.00	100.0		
16.00	100.0		
12.50	100.0	0.0449	43.8
9.50	100.0	0.0326	37.0
4.75	100.0	0.0235	31.2
2.00	100.0	0.0120	21.4
1.18	100.0	0.0089	17.5
0.425	99.8	0.0063	15.6
0.180	99.4	0.0032	11.7
0.075	89.8	0.0013	7.8

Grain Size Analysis



SOIL DESCRIPTION	% Composition			
		Gravel	D10	0.00320
		Gravel	D30	0.03340
	10.2	Sand	D60	0.04640
SILTY CLAY	80.1	Silt	Cu	14.50
	9.7	Clay	Cc	7.51

Remarks: Test Method: ASTM D422, D2216, D4318

Technician: ECS

Reviewed by: Hermie Manalo

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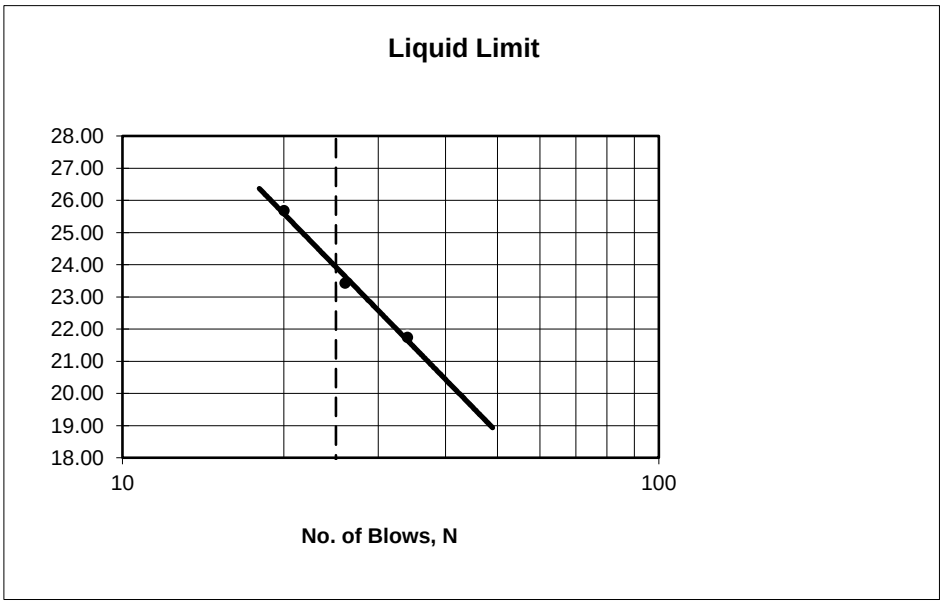
ATTERBERG LIMITS

CLIENT: WSP Canada Group Limited
1600 Buffalo Place
Winnipeg, MB R3T 6B8
ATTENTION: Dana Bredin
PROJECT: 18M-01983-00

PROJECT NO.: 103-1901

Liquid Limit Determination

Dish No.:	1	2	3		Liquid Limit
Wet Soil + Dish:	55.41	52.27	51.99		25 Blows
Dry Soil + Dish:	52.82	50.1	49.75		
Moisture:	2.59	2.17	2.24		
Dish:	40.91	40.84	41.03		
Dry Soil:	11.91	9.26	8.72		
% Moisture:	21.75	23.43	25.69		
No. of Blows:	34	26	20		
Liquid Limits:	22.57	23.55	25.00		**23.7**



Material Identification:

TH 20 - 5

Depth: **5'**

Liquid Limit, %: **24**
Plastic Limit, %: **NP**
Plasticity Index: **N/A**
(LL-PL)

Plastic Limit Determination

Dish No.:	1	2	3		
Wet Soil + Dish:					
Dry Soil + Dish:					
Moisture:	SAMPLE TESTED				
Dish:	SAMPLE PROVEN NON PLASTIC				
Dry Soil:					
% Moisture:					
Average:					**0.00**

Test Method : ASTM: D4318, D2216
HMCL Tech: ECS
Date Tested: 14-Mar-19

Reviewed by: Hermie Manalo