APPENDIX 'A' GEOTECHNICAL REPORT



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File No. 19-0535-001

KGS Group 865 Waverley Street Winnipeg, Manitoba R3T 5P4

ATTENTION: Mr. Craig Rowbotham, P.Eng. Senior Project Engineer

RE: 2019 City of Winnipeg Local Streets Package Raleigh Street (North), Raleigh Street (South), Jamison Avenue, Talbot Avenue, Edison Avenue, Sanford Fleming Road, Day Street Geotechnical Investigation – Final

Dear Mr. Rowbotham:

This letter summarizes KGS Group's geotechnical investigation for Raleigh Street (North), Raleigh Street (South), Jamison Avenue, Talbot Avenue, Edison Avenue, Sanford Fleming Road, Day Street that was required as part of the City of Winnipeg Streets Package in Winnipeg, Manitoba.

1.0 INTRODUCTION

KGS Group has completed a geotechnical investigation consisting of 50 test holes for the design of the street pavement structures. The 2019 City of Winnipeg Local Streets Package includes the following streets:

- 305 m section of Raliegh Street extending north from Chalmers Avenue to Monroe Avenue;
- 709 m section of Raliegh Street extending north from Springfield Road to Donwood Drive;
- 650 m section of Jamison Avenue extending east from Henderson Highway to Roch Street;
- 220 m section of Talbot Avenue extending east from Grey Street to Foster Street;
- 792 m section of Edison Avenue extending east from Rothesay Street to De Graff Place;
- 723 m section of Sanford Fleming Road extending east from Plessis Road to Devonshire Drive; and



• 521 m section of Day Street extending north from Kildare Avenue West to McMeans Avenue West.

This report details the results of the geotechnical investigation completed by KGS Group in January and February 2019.

2.0 GEOTECHNICAL INVESTIGATION SERVICES

The scope of this assignment included the following:

- **Utility Clearances** Prior to undertaking any drilling activities KGS Group obtained the necessary underground utility clearances.
- **Traffic Protection** KGS Group arranged for traffic protection throughout the geotechnical investigation in accordance with City of Winnipeg Manual for Temporary Traffic Control requirements.
- Geotechnical Investigation A geotechnical investigation was completed to investigate the subsurface conditions below the pavement surface in accordance with City of Winnipeg geotechnical requirements for public works projects. The breakdown of the requested number of pavement cores and test holes by street is outlined in the table below. All test holes were advanced to a total depth of 3.1 m.

STREET NAME	NUMBER OF CORE / TEST HOLES	PAVEMENT CORE HOLES ONLY		
Raleigh Street (North)	7	None		
Raleigh Street (South)	9	None		
Jamison Avenue	7	None		
Talbot Avenue	None	5		
Edison Avenue	None	8		
Sanford Fleming Road	None	8		
Day Street	None	6		
Total	23	27		

• **Laboratory Testing** – Laboratory testing including grain size analyses, Atterberg limits and moisture contents were performed on select soil samples for correlation to relevantengineering properties of the soils.

3.0 GEOTECHNICAL INVESTIGATION

3.1 TEST HOLE DRILLING AND SOIL SAMPLING PROGRAM

A drilling and sampling program consisting of 50 cores through the pavement structure and 23 test holes advanced to depths of 3.1 m were completed from January 24, 2019 to February 14, 2019. Drilling services were provided by Maple Leaf Drilling Ltd. of

Winnipeg, Manitoba with KGS Group supervision. Test holes were completed using a mobile B40 truck mounted drill rig. Test holes were cored through the existing pavement and advanced the remaining depth using 125 mm diameter solid stem continuous flight augers. The locations of the test holes are shown on Figures attached in the Appendices with the approximate UTM coordinates (Zone 14) and ground elevations listed in Table 1 to 7.

The first soil sample in each test hole was obtained no deeper than 0.1 m below the existing pavement structure, with subsequent soil samples recovered at 0.3 m intervals to a total depth of 3.1 m. Soil samples were collected directly off the auger flights and visually classified in the field in accordance with the modified Unified Soil Classification System (USCS). Field Torvane's were complete on the clay soils to estimate the undrained shear strength.

Upon completion of drilling, the test holes were examined for indications of sloughing and seepage, and then backfilled to grade with bentonite chips, auger cuttings and cold-mix asphalt patch to the pavement surface. Detailed summary soil logs incorporating all field observations details are attached in the Appendices.

	APPROXIMATE UT	GROUND ELEV.	
TEST HOLE ID	NORTHING (m) EASTING (m)		(m)
TH19-01	5,533,530	639,164	230.70
TH19-02	5,533,494	639,131	230.76
TH19-03	5,533,452	639,098	230.79
TH19-04	5,533,414	639,074	230.81
TH19-05	5,533,396	639,055	230.86
TH19-06	5,533,373	639,042	230.88
TH19-07	5,533,328	639,002	231.05

TABLE 2

RALEIGH STREET (NORTH) – TEST HOLE COORDINATES AND ELEVATIONS

TABLE 3 RALEIGH STREET (SOUTH) – TEST HOLE COORDINATES AND ELEVATIONS

TEST HOLE ID	APPROXIMATE UT	GROUND ELEV.	
TEST HOLE ID	NORTHING (m) EASTING (m)		(m)
TH19-11	5,530,888	637,114	230.61
TH19-12	5,530,837	637,074	230.75
TH19-13	5,530,769	637,022	230.51
TH19-14	5,530,684	636,960	231.21
TH19-15	5,530,611	636,904	230.77
TH19-16	5,530535	636,845	230.33
TH19-17	5,530,478	636,801	230.53
TH19-18	5,530,392	636,734	230.98
TH19-19	5,530,337	636,693	231.12

TABLE 4

JAMISON AVENUE - TEST HOLE COORDINATES AND ELEVATIONS

TEST HOLE ID	APPROXIMATE UT	GROUND ELEV.	
TEST HOLE ID	NORTHING (m) EASTING (m)		(m)
TH19-21	5,531,328	635,566	231.01
TH19-22	5,531,285	635,653	231.07
TH19-23	5,531,240	635,748	231.21
TH19-24	5,531,211	635,809	230.94
TH19-25	5,531,169	635,897	230.94
TH19-26	5,531,125	635,988	230.27
TH19-27	5,531,072	636,098	230.68

TABLE 5

TALBOT AVENUE – TEST HOLE COORDINATES AND ELEVATIONS

TEST HOLE ID	APPROXIMATE UT	GROUND ELEV.	
TEST HOLE ID	NORTHING (m)	EASTING (m)	(m)
TH19-31	5,529,800	636,853	230.75
TH19-32	5,529,777	636,946	232.32
TH19-33	5,529,764	636,996	230.95
TH19-34	5,529,787	636,906	231.95
TH19-35	5,529,805	636,831	230.87

TABLE 6

EDISON AVENUE – TEST HOLE COORDINATES AND ELEVATIONS

TEST HOLE ID	APPROXIMATE UT	GROUND ELEV.	
TEST HOLE ID	NORTHING (m) EASTING (m)		(m)
TH19-41	5,533,492	637,857	230.46
TH19-42	5,533,448	637,948	230.32
TH19-43	5,533,397	638,052	230.23
TH19-44	5,533,346	638,158	230.05
TH19-45	5,533,301	638,252	230.08
TH19-46	5,533,261	638,336	230.01
TH19-47	5,533,214	638,429	230.18
TH19-48	5,533,159	638,503	230.10

TABLE 7

SANFORD FLEMING ROAD - TEST HOLE COORDINATES AND ELEVATIONS

TEST HOLE ID	APPROXIMATE UT	GROUND ELEV.	
TEST HOLE ID	NORTHING (m)	(m)	
TH19-51	5,530,021	641,834	232.29
TH19-52	5,530,044	641,928	232.81
TH19-53	5,530,077	642,011	232.35
TH19-54	5,530,120	642,102	232.25
TH19-55	5,530,192	642,145	232.21
TH19-56	5,530,276	642,105	232.27
TH19-57	5,530,347	642,071	232.20
TH19-58	5,530,420	642,044	232.01

TABLE 8 DAY STREET – TEST HOLE COORDINATES AND ELEVATIONS

TEST HOLE ID	APPROXIMATE UT	GROUND ELEV.	
TEST HOLE ID	NORTHING (m)	EASTING (m)	(m)
TH19-61	5,529,965	643,432	233.21
TH19-62	5,529,908	643,433	233.18
TH19-63	5,529,809	643,435	232.95
TH19-64	5,529,720	643,436	232.95
TH19-65	5,529,648	643,437	233.04
TH19-66	5,529,530	643,439	232.77

Test hole UTM coordinates were surveyed using a hand held unit (±5 m) with ground elevations selected based on KGS Group's topographic survey.

3.2 LABORATORY TESTING

Laboratory testing was completed on select representative soil samples for correlation to relevant engineering properties of the subsurface soils. Laboratory testing included six (6) particle size analyses, six (6) Atterberg limits and one hundred fifty five (155) moisture contents. Laboratory testing was completed at a Canadian Council of Independent Laboratories (CCIL) certified soil testing laboratory in Winnipeg, Manitoba in general accordance with ASTM Standards.

4.0 INVESTIGATION RESULTS

4.1 STRATIGRAPHY – RALEIGH STREET (NORTH)

Seven (7) test holes were drilled on Raleigh Street extending north from Springfield Road to Donwood Drive. In general, the stratigraphy at the site was interpreted by KGS Group to consist of a concrete pavement structure and granular base, overlying fat clay and silt.

The location of the test holes are provided on Figure A1 in Appendix A. Atterberg limits and grain size analysis results are presented on the attached Figures A2 and A3 in Appendix A.

Concrete Pavement Structure with Partial Asphalt Overlay

The existing pavement structure at the test hole locations with exception to TH19-01 consisted of 140 to 175 mm of concrete. The existing pavement structure at TH19-01 consisted of 50 mm of asphalt. Granular base was encountered below the pavement in all of the test holes and ranged in thickness from 50 to 560 mm. The granular base was brown in colour, frozen, well-graded, and contained fine to coarse grained sand and fine grained gravel. The granular base encountered in TH19-04 contained some clay. The moisture content of the granular base ranged from 3 to 19% as measured from six (6) samples. The granular base sample obtained from TH19-04 had a measured moisture content of 26%.

Fat Clay (CH)

Fat clay was encountered below the granular base in all test holes. In all test holes, the fat clay extended to the end of each test hole at 3.1 m, with the exception of TH19-07 where silt was encountered at 2.1 m extending to the bottom of the test hole. The fat clay was black to brown in colour, damp to moist, stiff in consistency, of high plasticity and contained trace sand. At the time of the investigation the fat clay was frozen to a depth of 0.9 to 1.5 m.

The moisture content of the fat clay ranged from 12 to 45 %, as measured from 28 samples. Atterberg limits on two (2) fat clay samples at depths of 0.9 m measured a liquid limit of 74 to 75, a plastic limit of 20 to 21 and a plasticity index of 54, classifying the material as fat clay (CH). Grain size analyses completed on the same samples measured 71 to 75% clay sized particles, 22 to 24 % silt sized particles, 3 to 5% sand sized particles and 0 % gravel sized particles.

Silt (ML)

A 0.3 to 1.3 m thick layer of silt was encountered within the fat clay at a depth ranging from 1.4 to 2.1 m below the top of pavement in TH19-02, TH19-03, TH19-04, TH19-05, TH19-06, and TH19-07. The silt was light brown in colour, moist, soft in consistency, with no to low plasticity. The moisture content of the silt was 22 to 31% as measured from seven (7) samples.

4.2 STRATIGRAPHY – RALEIGH STREET (SOUTH)

Nine (9) test holes were drilled on Raleigh Street extending north Chalmers Avenue to Monroe Avenue. In general, the stratigraphy at the site was interpreted by KGS Group to consist of a concrete pavement structure and granular base, overlying fat clay and silt.

The location of the test holes are provided on Figure B1 in Appendix B. Atterberg limits and grain size analysis results are presented on the attached Figures B2 and B3 in Appendix B.

Concrete Pavement Structure with Partial Asphalt Overlay

The existing pavement structure at the test hole locations with the exception of TH19-19 consisted of 125 to 255 mm of concrete. A 40 mm asphalt overlay was observed in TH19-19 overlaying 200 mm of concrete and clay fill. Granular base was encountered below the pavement in all of the test holes with exception of TH19-19 and ranged in thickness from 125 to 585 mm. The granular base was brown in colour, frozen, well-graded, and contained medium to coarse grained sand and fine grained gravel. The moisture content of the granular base ranged from 6 to 11% as measured from eight (8) samples.

Fat Clay (CH)

Fat clay was encountered below the granular base in all test holes, with exception of TH19-14, TH19-17 and TH19-19. In all test holes, the fat clay extended to the end of each test hole at 3.1 m, with the exception of TH19-11, TH19-13, TH19-14, and TH19-15 where silt was encountered that extending to the bottom of the test hole. The fat clay was brown in colour, moist, stiff in consistency, of high plasticity. At the time of the investigation the fat clay was frozen to a depth of 1.3 to 1.5 m. In TH19-18, the fat clay contained with fine to coarse grained sand.

The moisture content of the fat clay ranged from 26 to 46 %, as measured from 35 samples. Atterberg limits on two (2) fat clay samples at depths of 0.6 and 0.8 m measured a liquid limit of 65 to 82, a plastic limit of 20 to 25 and a plasticity index of 45 to 57, classifying the material as fat clay (CH). Grain size analyses completed on the same samples measured 57 to 80 % clay sized particles, 18 to 20 % silt sized particles 3 to 20 % sand sized particles and 0 % gravel sized particles. One of the samples tested was from the fat clay with sand layer.

Silt (ML)

A 0.6 to 1.3 m thick layer of silt was encountered within the fat clay at a depth ranging from 1.5 to 2.1 m below the top of pavement in TH19-11, TH19-12, TH19-13, TH19-18, and TH19-19. The silt was light brown in colour, moist, soft in consistency, with no to low plasticity. The moisture content of the silt was 22 to 28% as measured from 19 samples.

Clay Fill (CH)

Clay fill was encountered below the granular base in TH19-14, TH19-17 and TH19-19 at depths ranging from 0.3 to 0.8. The clay fill ranged in thickness from 0.4 to 1.1 m. The clay fill was dark brown to black in colour, of high plasticity and contained trace medium to coarse grained sand and trace fine grained gravel. At the time of the investigation the clay fill was frozen. The moisture content of the clay fill ranged from 27 to 34 %, as measured from seven (7) samples

4.3 STRATIGRAPHY – JAMISON AVENUE

Seven (7) test holes were drilled on Jamison Avenue extending east from Henderson Highway to Roch Street. In general, the stratigraphy at the site was interpreted by KGS Group to consist of a concrete pavement structure, overlying fat clay and silt.

The location of the test holes are provided on Figure C1 in Appendix C. Atterberg limits and grain size analysis results are presented on the attached Figures C2 and C3 in Appendix C.

Concrete Pavement Structure with Partial Asphalt Overlay

The existing pavement structure at the test hole locations consisted of 40 to 85 mm of asphalt overlaying 100 to 185 mm of concrete. Granular base was encountered below the pavement in TH19-25, TH19-26 and TH19-27, ranging in thickness from 100 to 175 mm. The granular base was brown in colour, frozen, well-graded, and contained medium to coarse grained sand and fine grained gravel. The moisture content of the granular base was 10% as measured from one (1) samples.

Fat Clay (CH)

Fat clay was encountered below the pavement structure in all test holes. In all test holes, the fat clay extended to the end of each test hole at 3.1 m. The fat clay was black to brown in colour, moist, stiff in consistency, of high plasticity and contained trace fine to coarse grained sand. At the time of the investigation the fat clay was frozen to a depth of 1.2 to 1.4 m.

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The moisture content of the fat clay ranged from 26 to 49 %, as measured from 34 samples. Atterberg limits on two (2) fat clay samples at depths of 0.6 m measured a liquid limit of 75 to 76, a plastic limit of 23 to 24 and a plasticity index of 52, classifying the material as fat clay (CH). Grain size analyses completed on the same samples measured 77 to 81 % clay sized particles, 18 to 23 % silt sized particles 1 to 2 % sand sized particles and 0 % gravel sized particles.

Silt (ML)

A 0.6 to 1.1 m thick layer of silt was encountered within the fat clay at a depth ranging from 0.9 to 1.3 m below the top of pavement in TH19-23,TH19-24, TH19-25 and TH19-27. The silt was light brown in colour, moist, soft in consistency, with no to low plasticity. The moisture content of the silt was 19 to 28% as measured from 10 samples.

Lean Clay (CL)

A 0.7 m layer of lean clay was encountered within the fat clay deposit in TH19-22 at a depth of 1.2 m below the top of the pavement structure. The lean clay was light brown in colour, moist, firm, and of low to intermediate plasticity. The moisture content of the lean clay ranged from 24 to 33 %, as measured from two (2) samples

4.4 STRATIGRAPHY – TALBOT AVENUE

The existing pavement structure measured at five (5) test hole locations consisted of 35 to 90 mm of asphalt over approximately 175 to 230 mm of concrete, as listed in Table D1 in Appendix D. Only pavement coring was completed on Talbot Avenue.

4.5 STRATIGRAPHY – EDISON AVENUE

The existing pavement structure measured at eight (8) locations consisted of 50 to 120 mm of asphalt over 140 to 210 mm of concrete, as listed in Table E1 in Appendix E. Only pavement coring was completed on Edison Avenue.

4.6 STRATIGRAPHY – SANFORD FLEMING ROAD

The existing pavement structure measured at eight (8) locations consisted of 20 to 45 mm of asphalt over 155 to 220 mm of concrete, as listed in Table F11 in Appendix F. Only pavement coring was completed on Sanford Fleming Road.

4.7 STRATIGRAPHY – DAY STREET

The existing pavement structure measured at six (6) locations consisted of 40 to 90 mm of asphalt over 185 to 210 mm of concrete, as listed in Table G1 in Appendix G. Only pavement coring was completed on Day Street.

4.8 **GROUNDWATER CONDITIONS**

Upon completion of drilling the test holes were left open to observe potential groundwater inflow for five (5) minutes. All test holes were open and remained dry five (5) minutes after the completion of drilling within the exploration depths of 3.1 m.

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Groundwater levels should be expected to fluctuate seasonally and following precipitation events; hence, the actual water level at the time of construction could differ from those reported in this report.

5.0 STATEMENT OF LIMITATIONS AND CONDITIONS

5.1 THIRD PARTY USE OF REPORT

This report has been prepared for KGS Group and any use a third party makes of this report or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

5.2 GEOTECHNICAL INVESTIGATION STATEMENT OF LIMITATIONS

The geotechnical investigation findings and recommendations of this report were prepared in accordance with generally accepted professional engineering principles and practice. The findings and recommendations are based on the results of field and laboratory investigations, combined with an interpolation of soil and groundwater conditions found at and within the depth of the test holes drilled by KGS Group at this site. If conditions encountered during construction appear to be different from those shown by the test holes drilled by KGS Group or if the assumptions stated herein are not in keeping with the design, this office should be notified in order that the recommendations can be reviewed and modified if necessary.

If you have any questions regarding the enclosed information or require additional information, please contact the undersigned.

Prepared By:

Jacqueline MacLennan, P.Eng. Geotechnical Engineer

JRM/jr Enclosure

Approved By: Taunya Ernst, P.E., P.G.

Senior Geotechnical Engineer

APPENDIX A

Raleigh Street (North)

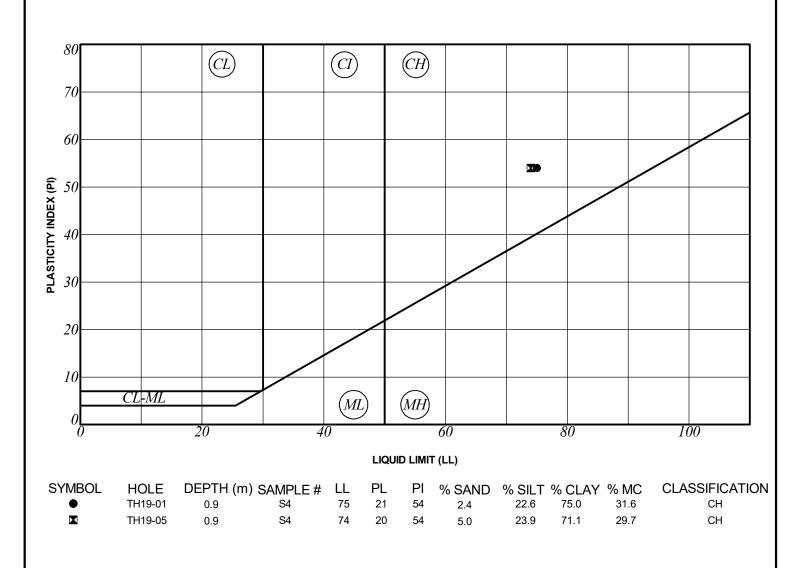
Figure A1 – Test hole Locations Figure A2 – A-Line Plot Figure A3 – Grain Size Analyses Test Hole Logs



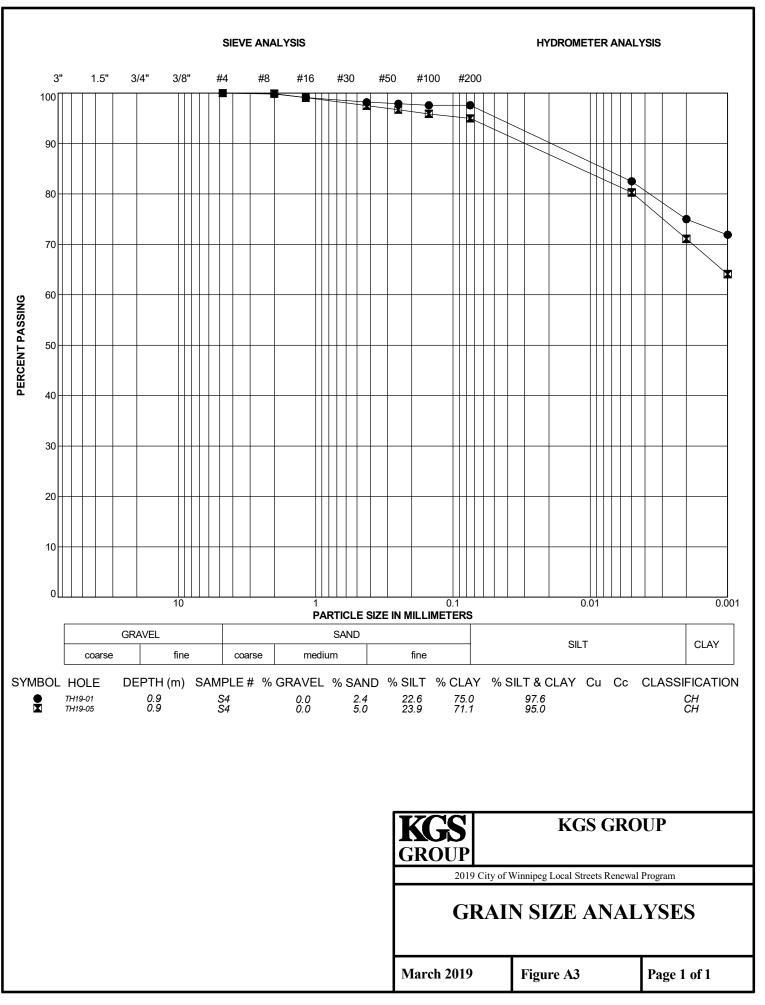


FIGURE A1 RALEIGH STREET (NORTH) – TEST HOLE LOCATIONS





Notes: **KGS GROUP** KGS ML - Low Plasticity Silt ML - Low Plasticity Silt CL-ML - Silty Clay CL - Low Plasticity Clay Cl - Intermediate Plasticity Clay GROUP 2019 City of Winnipeg Local Streets Renewal Program **CH - High Plasticity Clay** LL - Liquid Limit **A-LINE PLOT** PL - Plastic Limit PI - Plasticity Index MC - Moisture Content **NP - Non-Plastic March 2019** Figure A2 Page 1 of 1



KC GRO	SUP		REFERENCE NO.	HOLE NO. TH19-0 1	1	SHEET 1 of 1
CLIENT PROJE SITE LOCAT DRILLI METHO		Raleigh Northbo	ROUP Tity of Winnipeg Local Streets Renewal Program Street Extending North from Springfield Road to Donwood Drive bund Lane, 302 m North of Springfield Road Ø Core Barrel, 125 mm Ø Solid Stem Auger, GeoProbe Drill Rig		JOB NO. GROUND ELEV. TOP OF PVC ELEV WATER ELEV. DATE DRILLED UTM (m)	19-0535-001 230.70 /. 2/14/2019 N 5,533,530 E 639,164
ELEVATION (m)	n) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %		Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) 20 40 60 80 PL MC LL $%$ 20 40 60 80
230.7 - 230 229.8 - 1 - 229 - 229 - 229 - 229 - 229 - 229 - 229 - 229 - 227 - 3 - 3 - 227 - 3 - 3 - 227 - 3 - 3 - 227 - 3 - 3 - 3 - 3 - 3 - 4 - 3 - 3 - 3 - 4 - 3 - 3 - 4 - 3 - 3 - 4 - 3 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4			ASPHALT - 50 mm thickness. GRANULAR BASE - 560 mm thickness, brown, frozen, well-graded, fine to coarse grained sand, 10 mm max particle size. FAT CLAY (CH) - Brown, frozen to 1.5 m, high plasticity. - Grain Size Distribution: Gravel (0.0%), Sand (2.7%), Silt (22.3%) and Clay (75.0% at 0.9 m. - Atterberg Limits: Liquid Limit (75), Plastic Limit (21), Plasticity Index (54) at 0.9 m. - Moist, stiff, trace silt inclusions below 1.5 m. - Moist, stiff, trace silt inclusions below 1.5 m. END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate. Core Barrel	I] ³⁴		
CONTR.	АСТО	R	Core Barrel [] Auger Grab INSPECTOR rilling J. MACLENNAN	APPROVE KWH		DATE /8/19

K GI		S		REFERENCE NO.	HOLE N TH19		2	SHEET 1	of 1
_	ENT DJEC E	т 2	2019 C	ROUP ity of Winnipeg Local Streets Renewal Program Street Extending North from Springfield Road to Donwood Drive			JOB NO. GROUND ELEV. TOP OF PVC ELEV WATER ELEV.	19-0535-00 230.76 /.)1
LOC	CATI	ON S	Southbo	bund Lane, 254 m North of Springfield Road			DATE DRILLED	2/14/2019	
	LLIN		50 mm	ø Core Barrel, 125 mm ø Solid Stem Auger, GeoProbe Drill Rig			UTM (m)	N 5,533,49 E 639,135	
ELEVATION (m)	(m)	DEPTH (#)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu POCKET PEN Cu TORVANE (kP 20 40 60 PL MC ♥ 20 40 60	
				CONCRETE - 140 mm thickness.	S1	1			
230.6	-	-		GRANULAR BASE - 470 mm thickness, brown, frozen, well-graded, fine to coarse grained sand, 10 mm max particle size.		2			
- 230.2		-		FAT CLAY (CH) - Brown, frozen to 1.5 m, high plasticity.		3		······································	·· ·· ··
	1 -				54 55 55				
229.2	-	- 5	<i> </i>	SILT - Light brown, moist, soft, no to low plasticity.					
- 229 228.9		-			₹} } }	6		······································	
	2 –			FAT CLAY (CH) - Brown, damp, stiff, high plasticity.	57				
STREETS.GPJ	-					9			
227.7	3-	-10		END OF TEST HOLE AT 3.05 m	1			-+-+-+-+-+-	
GEOTECHNICAL-SOIL LOG U:FMS/19-0535-001/2019 COW STREETS.GPJ	-			Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location approximate.					
SAN	1PLE	TYPE		Core Barrel Auger Grab		_			
CON 1		CTOR .e Le		INSPECTOR rilling J. MACLENNAN	APPRO KWH	OVEI		DATE 8/8/19	

K GF	G	S JP		REFERENCE NO.	HOLE NO		5	SH	EET 1 of	: 1
CLI PRC SIT	JEC.	г 2	2019 C	GS GROUP 19 City of Winnipeg Local Streets Renewal Program leigh Street Extending North from Springfield Road to Donwood Drive			JOB NO. GROUND ELEV. TOP OF PVC ELE ^V WATER ELEV.	23	0-0535-001 0.79	
LOC	ATIC	ON S	Southbo	ound Lane, 200 m North of Springfield Road			DATE DRILLED		14/2019	
	LLIN		50 mm	ø Core Barrel, 125 mm ø Solid Stem Auger, GeoProbe Drill Rig			UTM (m)	E	5,533,454 639,096	
ELEVATION (m)	(m)	; ; ; ; ; ;	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60		Add Add <th>◆ 30 上L</th>	◆ 30 上L
220.6				CONCRETE - 140 mm thickness.	S1					
230.6		_		<u>GRANULAR BASE</u> - 580 mm thickness, brown, frozen, well-graded, fine to coarse grained sand, fine grained gravel, 10 mm max particle size.	52 52			• • • • • • • • • • • • • • • • • • •		
230.0 - 230 -	-	_		FAT CLAY (CH) - Dark brown, frozen, high plasticity.	15 15 15 15 15 15 15 15 15 15 15 15 15 1					 ·· ··
	1 — - - - -			- Damp, stiff below 1.5 m.	34 55 85 1222222222222222222222222222222222222					
- 2 23 9 _	2	-		SILT (ML) - Light brown, moist, soft, no to low plasticity.	57 57	•				
228.4 - 20.9 20.9 20.9 20.9 20.9 20.9 20.9 20.9		-		FAT CLAY (CH) - Brown, moist, stiff, high plasticity.	777 P2222					
GEOTECHNICAL-SOIL LOG U:FMS(19-0535-001)2019 COW STREETS.GPJ VIVA CON SWW	3	—-10 		END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location approximate						
SAN	IPLE 1	FYPE		Core Barrel Auger Grab						
CON 1000 1000 1000	TRAC			INSPECTOR rilling J. MACLENNAN	APPRO KWH	VEI		DATE 3/8/19		

K G	RC		S P		REFERENCE NO.	HOLE N TH19		ł	SHEET 1 of 1
PR	IEN OJE		2	019 C	ROUP ity of Winnipeg Local Streets Renewal Program			JOB NO. GROUND ELEV. TOP OF PVC ELEV	19-0535-001 230.81 /.
SI				-	Street Extending North from Springfield Road to Donwood Drive bund Lane, 154 m North of Springfield Road			WATER ELEV. DATE DRILLED	2/14/2019
								UTM (m)	N 5,533,412
	TH		1	50 mm	ø Core Barrel, 125 mm ø Solid Stem Auger, GeoProbe Drill Rig				E 639,074
ELEVATION (m)	(r	, DEPTH	(ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUIMBFR	RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu POCKET PEN (kPa) \bigstar Cu TORVANE (kPa) \blacklozenge 20 40 60 80 PL MC LL \checkmark \checkmark \checkmark 20 40 60 80
	╈				CONCRETE - 165 mm thickness.	S1			
230.6	-	-			<u>GRANULAR BASE</u> - 300 mm thickness, brown, frozen, well-graded, fine to coarse grained sand, 5 mm max particle size, some clay.	sz	2		······································
230.4	1	-			FAT CLAY (CH) - Black, frozen, high plasticity, trace organics, trace fine to coarse grained sand.	<u>- 5 L</u>		╾┊╾┟╌┊╌╎╌┊╌	
- 230					- Brown, no organics, no fine to coarse grained sand below 0.8 m.		3		
	1					1777777	4		
229.1	_		- 5		- Damp, stiff below 1.5 m.				· · · · · · · · · · · · · · · · · · ·
- 229	2				<u>SILT (ML)</u> - Light brown, moist, soft, no to low plasticity.	ST ST St			
ි 228.1 9 228.1	_				FAT CLAY (CH) - Brown, moist, stiff, high plasticity.				
/ STRE							9		······································
COTECHNICAL-SOIL LOG U:FMS(19-0535-001)2019 COW STREETS.GPJ 722 - 222 VISA -			-10		END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location approximate.				
SA	MPL	ΕT	YPE		Core Barrel Auger Grab	-			
CO GEOTEC	NTR Mar				INSPECTOR rilling J. MACLENNAN	APPRO KWH	OVE		DATE 3/8/19

	G	S JP		REFERENCE NO.	HOLE N TH19		;	SH	EET 1 of 3	1
CLIE PRO SITE	JEC.	г 2 F	2019 C Raleigh	ROUP Tity of Winnipeg Local Streets Renewal Program Street Extending North from Springfield Road to Donwood Drive			JOB NO. GROUND ELEV. TOP OF PVC ELEV WATER ELEV.	23 /.	-0535-001 0.86	
DRII		G 1		ound Lane, 128 m North of Springfield Road ø Core Barrel, 125 mm ø Solid Stem Auger, GeoProbe Drill Rig			DATE DRILLED UTM (m)	Ν	14/2019 5,533,396 639,053	
ELEVATION (m)	(m)	[] (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60		Add Gamma Bar Bar </th <th>•</th>	•
				CONCRETE - 150 mm thickness.	S1			11		i
230.7 _		-		GRANULAR BASE - 450 mm thickness, brown, frozen, well-graded, fine to coarse grained sand, 5 mm max particle size.	S2			······································	· · · · · · · · · · · · · · · · · · ·	
230.3 _	-	-		FAT CLAY (CH) - Black to brown, frozen, high plasticity, trace organics.						··· ···
	-	-		- Grain Size Distribution: Gravel (0.0%), Sand (5.0%), Silt (23.9%) and Clay (71.1%)			······································		
	1	_		at 0.9 m. - Atterberg Limits: Liquid Limit (74), Plastic Limit (20), Plasticity Index (54) at 0.9 m.) 54				······································	
229.0		— 5 -		- Damp, stiff below 1.5 m. SILT (ML) - Light brown, moist, soft, no to low plasticity.	S6				···················	
	- 2 - - - - - - - - - -	-		<u>ULT (INC)</u> - Light blown, molat, soit, no to low plasticity.	57 58 57171717171717					
227.8 227.8	- - 3 —	-		FAT CLAY (CH) - Mottled brown to grey, moist, stiff, high plasticity.	59 52 52 53					i
CEOTECHNICAL-SOIL LOG U:FMS/19-0535-001/2019 COW STREETS. GPJ 8.222 - 1222 - 2		—-10 		END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location approximate						
SAM	Ľ4⊥ PLF 1	TYPF		Core Barrel [7] Auger Grab				1 1		1
CON	TRAC	TOR		INSPECTOR INSPECTOR INSPECTOR	APPRO KWH	VEI		DATE 3/8/19		

K GF	G	S JP		REFERENCE NO.	HOLE NO TH19		Ì	SH	EET 1 of 1
CLII PRC SITI	JEC	т 2	019 C	ROUP ity of Winnipeg Local Streets Renewal Program Street Extending North from Springfield Road to Donwood Drive			JOB NO. GROUND ELEV. TOP OF PVC ELEV	23	-0535-001 0.88
			-	bund Lane, 102 m North of Springfield Road			WATER ELEV. DATE DRILLED	2/1	14/2019
DRI		G ₁		ø Core Barrel, 125 mm ø Solid Stem Auger, GeoProbe Drill Rig			UTM (m)		5,533,373
MET	THOD	•							639,041 CKET PEN (kPa) ★
ELEVATION (m)	(m)	(ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu TOR 20 PL	40 60 80 40 60 80 MC LL %
				CONCRETE - 140 mm thickness.	S1		$\begin{array}{c} 20 & 40 & 60 \\ \hline \vdots & 1 & \vdots & 1 & \vdots & 1 \end{array}$	20	<u>40 60 80</u>
230.7 _ 230.7 -		-		GRANULAR BASE - 50 mm thickness, brown, frozen, well-graded, fine to coarse grained sand, 5 mm max particle size. FAT CLAY (CH) - Black, frozen, high plasticity, some organics, trace fine to coarse grained sand. - Trace fine to coarse grained sand from 0.2 to 0.8 m.	S2				
- 230 229.5	- - 1 - -	-			33 34 37 37 37 37 37 37 37 37 37 37 37 37 37				
-	1 -			SILT (ML) - Light brown, frozen, no to low plasticity.	55 55				¦ . ▶
- 229	2 — 2 — 	- 5		- Moist, soft below 1.5 m.	56 57 58 TTTTTTTTTTTTTTTTT				
- 1:0:1 -	-	-		FAT CLAY (CH) - Brown, moist, stiff, high plasticity, trace silt inclusions.	Ŧ				
H 228	3_				111159			···	
COTECHNICAL-SOIL LOG U:FMS/19-0535-001/2019 COW STREETS.GPJ	3 —			END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location approximate.					
SAN	PLE	ГҮРЕ		Core Barrel Auger Grab					
CON CON	TRA(INSPECTOR filling J. MACLENNAN	APPRO KWH	VEI		DATE 3/8/19	

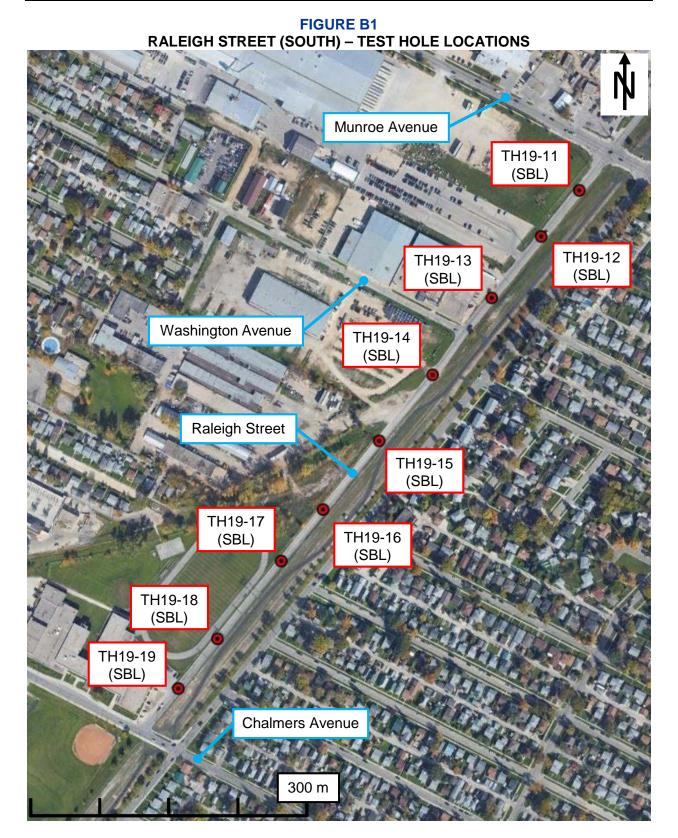
K GF		S JP		REFERENCE NO.	HOLE NO. TH19-0	7	SHEET 1 of 1
	ENT DJEC E	т 2	2019 C	ROUP ity of Winnipeg Local Streets Renewal Program Street Extending North from Springfield Road to Donwood Drive		JOB NO. GROUND ELEV. TOP OF PVC ELEV WATER ELEV.	19-0535-001 231.05 /.
DRI	LLIN FHOD	G 1		ound Lane, 43 m North of Springfield Road ø Core Barrel, 125 mm ø Solid Stem Auger, GeoProbe Drill Rig		DATE DRILLED UTM (m)	2/14/2019 N 5,533,329 E 639,000
ELEVATION (m)	(m)		GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ 20 40 60 80 PL MC LL % 20 40 60 80
- 231 230.9 _ 230.7 _		-		CONCRETE - 150 mm thickness. GRANULAR BASE - 150 mm thickness, brown, frozen, well-graded, fine to coarse grained sand, trace fine grained gravel, 20 mm max particle size. FAT CLAY (CH) - Black, frozen, high plasticity, trace organics.	S1 S1 S2 S2 S3 S3		
- 230	- 1 - - -	-		- Mottled black to brown below 0.9 m. - Brown below 1.0 m.	54 54 55		
- 229 228.9 _	2-	-		- Damp, stiff below 1.5 m. SILT (ML) - Light brown, moist, soft, no to low plasticity.	56 57 58 58 58 58 58		
W STREETS.GPJ		-			58 57 57 59 59		
GEOTECHNICAL-SOIL LOG U:FMS/19-0535-001/2019 COW STREETS.GPJ		- 10		END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location approximate.			
SAN CON	IPLE	TOR		Core Barrel Auger Grab	APPROVE		DATE
н <mark>е п</mark>	mapi	е ге	ar Di	rilling J. MACLENNAN	KWH	-	3/8/19

APPENDIX B

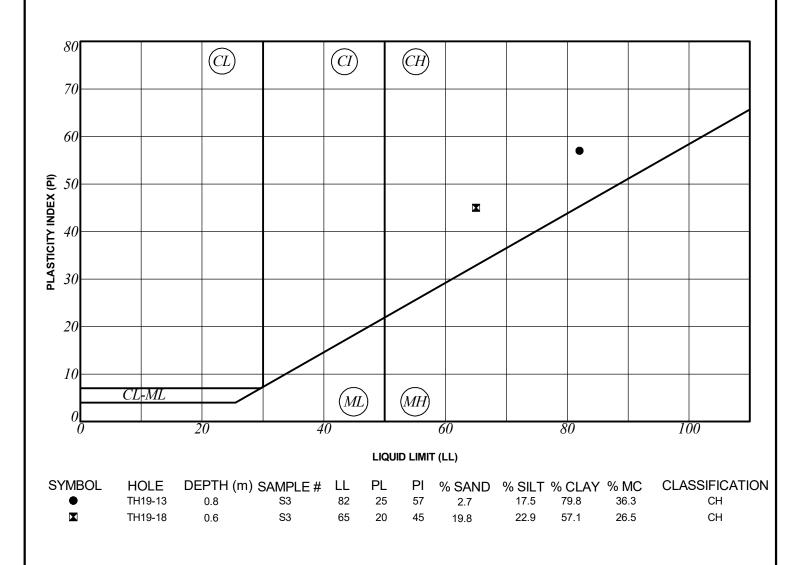
Raleigh Street (South)

Figure B1 – Test hole Locations Figure B2 – A-Line Plot Figure B3 – Grain Size Analyses Test Hole Logs

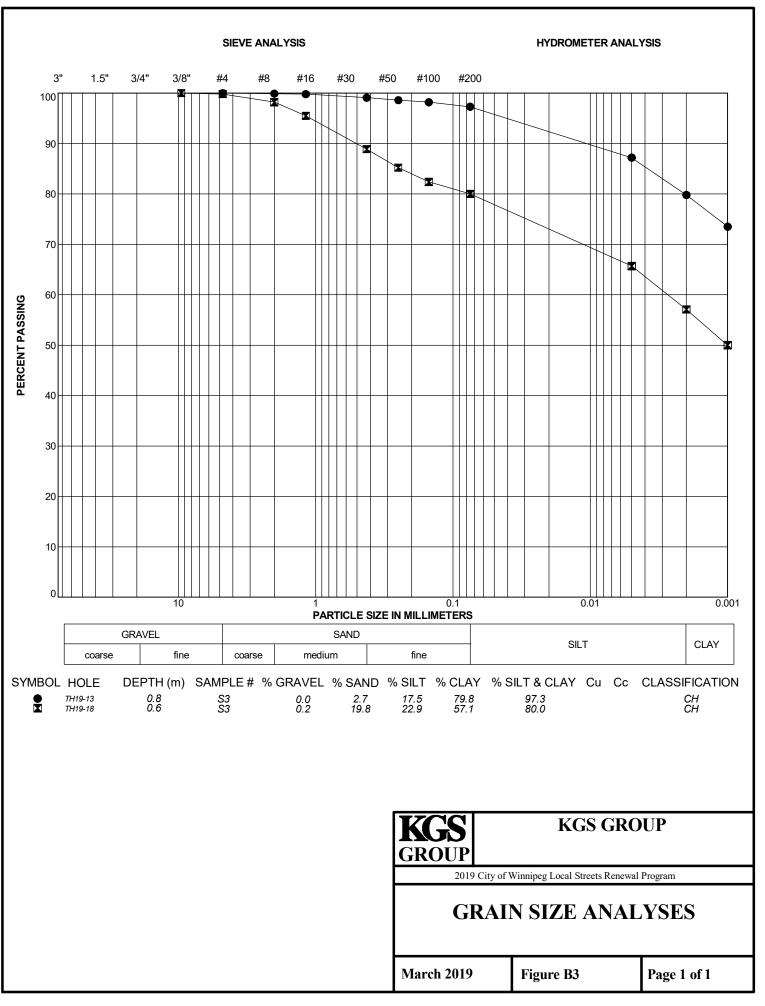








Notes: **KGS GROUP** KGS **ML - Low Plasticity Silt** ML - Low Plasticity Silt CL-ML - Silty Clay CL - Low Plasticity Clay Cl - Intermediate Plasticity Clay GRŌŪP 2019 City of Winnipeg Local Streets Renewal Program **CH - High Plasticity Clay** LL - Liquid Limit **A-LINE PLOT** PL - Plastic Limit PI - Plasticity Index MC - Moisture Content **NP - Non-Plastic March 2019** Figure B2 Page 1 of 1



SIEVE ANALYSIS U:\FMS\19-0535-001\2019 COW STREETS.GPJ

K GR	G	S JP				1	SHEET 1 of 1
PRO	JEC	т 2	2019 C	ity of Winnipeg Local Streets Renewal Program		JOB NO. GROUND ELEV. TOP OF PVC ELEV	19-0535-001 230.61
			-	-		WATER ELEV. DATE DRILLED	1/24/2019
DRII	LLIN	G ₁			ill Ria	UTM (m)	N 5,530,888
MET	HOD) '					E 637,114 Cu POCKET PEN (kPa) ★
ELEVATION (m)		(ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE VUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu TORVANE (kPa) ◆ 20 40 60 80 PL MC LL ● % 1
				CONCRETE - 175 mm thickness.	S1		20 40 60 80
30.4 _	-	-		GRANULAR BASE - 125 mm thickness, brown, frozen, well-graded, medium to coarse grained sand, fine grained gravel, 20 mm max particle size. FAT CLAY (CH) - Brown, frozen to 1.4 m, high plasticity.	S2		· · · · · · · · · · · · · · · · · · ·
230	-	-			54		
	1 — - - -			- Moist, stiff below 1.4 m.	\$5 \$5		
229	- - - - -	- 5			56 57 57		
28.2 _	-	- - - - -		SILT (ML) - Light brown moist soft no to low plasticity	S8		· · · · · · · · · · · · · · · · · · ·
228	- - - -	-			59		
27.6 _		-10		END OF TEST HOLE AT 3.05 m			
227				Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.			
SAM	L ₄ PLE	F FYPE		Core Barrel R Auger Grab	I		
CON	TRAG	CTOR		INSPECTOR	APPROVE KWH		DATE 3/8/19
	CLIE PRO SITE LOC DRII MET (U) NOLVATE 30.4 _ 30.4 _ 230 229 228 228 227 228 227 227 227 227 227 227	CLIENT PROJEC SITE LOCATIC DRILLIN METHOD ()) 0.4 - - - - - - - - - - - - -	PROJECT 2 SITE F LOCATION S DRILLING 1 (ii) HLag (iii) (iiii) 30.4 - 230 - 230 - 229 - 229 - 229 - 229 - 229 - 229 - 229 - 221 - 222 - 223 - 229 - 221 - 222 - 223 - 224 - - - - - - - - - - - - - - - - - - - - - - - - - - - <th>CLIENT KGS G PROJECT 2019 C SITE Raliegh LOCATION Southbo DRILLING 150 mm (U) NOLVATION (U) HLd 9 (m) (ft) 104</th> <th>SUMMARY LOG SUMMARY LOG SUMMARY LOG Colspan="2">Summary Log 2019 City of Winnipeg Local Streets Renewal Program Railegh Street Extending North from Chalmers Avenue to Monroe Avenue LOCATION Southbound Lane, 758 m North of Chalmers Avenue DRILLING 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Dr OUTUNAND CLASSIFICATION OUTUNAND CLA</th> <th>SUMMARY LOG TH19-1: CLIENT KGS GROUP PROJECT 2019 City of Winnipeg Local Streets Renewal Program STET Rallegh Street Extending North for Chalmers Avenue to Monroe Avenue LOCATIO Southbound Lane, 758 m North of Chalmers Avenue to Monroe Avenue DISTET 150 mm or Core Barrel, 125 mm or Solid Stem Auger, B40 Truck Mounted Drill Rig Martinob Iso more Core Barrel, 125 mm or Solid Stem Auger, B40 Truck Mounted Drill Rig Martinob Iso more Core Barrel, 125 mm thickness. Martinob Iso Core Barrel and Anne grand and Anne granded, medium to core Iso and and Anne grand and Anne granded. In minute particle size. Martinob Iso More Iso Anne Iso Anne</th> <th>SUMMARY LOG TH19-11 Chiler KGS GROUP JOB NO. GROUND EXAMPLATE CONTRUCTION JOB NO. GROUND EXAMPLATE CONTRUCTION STE Raiegh Street Extending North from Chainers Avenue to Monore Avenue JOB NO. GROUND EXAMPLATE CONTRUCTION JOB NO. GROUND EXAMPLATE CONTRUCTION DOILTION 50 mm e Core Barrol, 125 mm s Solid Stem Auger, B40 Truck Mounted Driller UM (m) Output 50 mm e Core Barrol, 125 mm s Solid Stem Auger, B40 Truck Mounted Driller UM (m) Output Fig. Street Extending North from Chainers Avenue UM (m) Output Fig. Street Extending North from Chainers Avenue UM (m) Output Fig. Street Extending North Anno Chassification Im (m) Output Fig. Street Extending North Informers. Im (m) Output DESCRIPTION AND CLASSIFICATION <t< th=""></t<></th>	CLIENT KGS G PROJECT 2019 C SITE Raliegh LOCATION Southbo DRILLING 150 mm (U) NOLVATION (U) HLd 9 (m) (ft) 104	SUMMARY LOG SUMMARY LOG SUMMARY LOG Colspan="2">Summary Log 2019 City of Winnipeg Local Streets Renewal Program Railegh Street Extending North from Chalmers Avenue to Monroe Avenue LOCATION Southbound Lane, 758 m North of Chalmers Avenue DRILLING 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Dr OUTUNAND CLASSIFICATION OUTUNAND CLA	SUMMARY LOG TH19-1: CLIENT KGS GROUP PROJECT 2019 City of Winnipeg Local Streets Renewal Program STET Rallegh Street Extending North for Chalmers Avenue to Monroe Avenue LOCATIO Southbound Lane, 758 m North of Chalmers Avenue to Monroe Avenue DISTET 150 mm or Core Barrel, 125 mm or Solid Stem Auger, B40 Truck Mounted Drill Rig Martinob Iso more Core Barrel, 125 mm or Solid Stem Auger, B40 Truck Mounted Drill Rig Martinob Iso more Core Barrel, 125 mm thickness. Martinob Iso Core Barrel and Anne grand and Anne granded, medium to core Iso and and Anne grand and Anne granded. In minute particle size. Martinob Iso More Iso Anne	SUMMARY LOG TH19-11 Chiler KGS GROUP JOB NO. GROUND EXAMPLATE CONTRUCTION JOB NO. GROUND EXAMPLATE CONTRUCTION STE Raiegh Street Extending North from Chainers Avenue to Monore Avenue JOB NO. GROUND EXAMPLATE CONTRUCTION JOB NO. GROUND EXAMPLATE CONTRUCTION DOILTION 50 mm e Core Barrol, 125 mm s Solid Stem Auger, B40 Truck Mounted Driller UM (m) Output 50 mm e Core Barrol, 125 mm s Solid Stem Auger, B40 Truck Mounted Driller UM (m) Output Fig. Street Extending North from Chainers Avenue UM (m) Output Fig. Street Extending North from Chainers Avenue UM (m) Output Fig. Street Extending North Anno Chassification Im (m) Output Fig. Street Extending North Informers. Im (m) Output DESCRIPTION AND CLASSIFICATION Im (m) Output DESCRIPTION AND CLASSIFICATION <t< th=""></t<>

KGS GROUP	REFERENCE NO.	HOLE NO. TH19-12	SHEET 1 of 1
	ROUP ity of Winnipeg Local Streets Renewal Program Street Extending North from Chalmers Avenue to Monroe Avenue	JOB NO. GROUND E TOP OF PV(CELEV.
	bund Lane, 693 m North of Chalmers Avenue	WATER ELE DATE DRILL	
	ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Dr	UTM (m) ill Rig	N 5,530,837 E 637,074
ELEVATION (m) (m) (m) (m) (m) (m) (m) (m)	DESCRIPTION AND CLASSIFICATION	SPT (N) blows/0.15 DYNAMIC C (N) blows/ft 20 40	
230.6	<u>CONCRETE</u> - 175 mm thickness. <u>GRANULAR BASE</u> - 280 mm thickness, brown, frozen, well-graded, medium to coarse grained sand, fine grained gravel, 20 mm max particle size.	S1	
	FAT CLAY (CH) - Dark brown, frozen, high plasticity.		
- 229 - - 229 - 2		\$6	
	FAT CLAY (CH) - Brown, moist, stiff, high plasticity.		
227.7 3 227.7 - 10 - 227.7 - 10 - 110 - 110 - 110 - 110 - 110 - 110 - 110 - 110 - 110 - 110 - 110 - 110 <td< td=""><td>END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.</td><td></td><td></td></td<>	END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.		
SAMPLE TYPE	Core Barrel 🔣 Auger Grab		
CONTRACTOR	INSPECTOR cilling C.FRIESEN	APPROVED KWH	DATE 3/8/19

	G	S		REFERENCE NO.	HOLE NO. TH19- 1		SHEET 1 of 1
CLIE PRO	JEC	г 2	2019 C	ROUP Rity of Winnipeg Local Streets Renewal Program		JOB NO. GROUND ELEV. TOP OF PVC ELE	19-0535-001 230.51 √.
SITE			-	Street Extending North from Chalmers Avenue to Monroe Avenue		WATER ELEV. DATE DRILLED	1/24/2019
DRI		_		ound Lane, 608 m North of Chalmers Avenue		UTM (m)	N 5,530,769
MET			50 mm	ø Ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Dr			E 637,022
ELEVATION (m)	(m)		GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER		Cu POCKET PEN (kPa) \bigstar Cu TORVANE (kPa) \blacklozenge 20 40 60 80 PL MC LL $\%$ 20 40 60 80
				CONCRETE - 175 mm thickness.	S1		
230.3 _ - 230	-	-		<u>GRANULAR BASE</u> - 585 mm thickness, brown, frozen, well-graded, medium to coarse grained sand, fine grained gravel, 20 mm max particle size.	S2		
229.8	-			FAT CLAY (CH) - Dark brown, frozen to 1.4 m, high plasticity, trace fine grained			
	-	-		sand. - Grain Size Distribution: Gravel (0.0%), Sand (2.7%), Silt (17.5%) and Clay (79.8%			
	-	_		at 0.8 m. - Atterberg Limits: Liquid Limit (82), Plastic Limit (25), Plasticity Index (57) at 0.8 m.	54		······································
- 229	-	- 5		- Moist, stiff below 1.4 m.	\$5 \$5 \$5 \$5 \$5 \$5		
- 228.8 _	- - 2 - - - -	-		SILT (ML) - Light brown, moist, soft, no to low plasticity, trace clay pockets.	27 D2222202558		
CAD STREETS OW STREETS	- - - 3 —	- 10		END OF TEST HOLE AT 3.05 m	\$9		
GEOTECHNICAL-SOIL LOG UNFMS/19-0535-001/2019 COW STREETS.GPJ		-		Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.			
SAM	4 PLE	FYPE		Core Barrel 🔣 Auger Grab			
CON CON				INSPECTOR rilling C.FRIESEN	APPROV KWH		DATE 3/8/19

K GR	G	S JP		REFERENCE NO.	HOLE TH1		4	SHEET 1 of 1
	JEC.	т 2	2019 C	ROUP ity of Winnipeg Local Streets Renewal Program			JOB NO. GROUND ELEV. TOP OF PVC ELEV	19-0535-001 231.21
SITE			-	Street Extending North from Chalmers Avenue to Monroe Avenue			WATER ELEV.	1/24/2010
			Southbo	bund Lane, 502 m North of Chalmers Avenue			DATE DRILLED UTM (m)	1/24/2019 N 5,530,684
	HOD		50 mm	ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted D	rill Rig			E 636,960
ELEVATION (m)	(a) Dedtu	(ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu POCKET PEN (kPa) \bigstar Cu TORVANE (kPa) \blacklozenge 20 40 60 80 PL MC LL \checkmark 20 40 60 80
				CONCRETE - 200 mm thickness.		<u> </u>		
- ^{231.0} - 231 -		-		<u>GRANULAR BASE</u> - 560 mm thickness, brown, frozen, well-graded, medium to coarse grained sand, fine grained gravel, 20 mm max particle size.	∎ ₽	S2		
_	- - 1	-		CLAY FILL (CH) - Black, frozen, high plasticity, trace coarse grained sand, trace fine to coarse grained gravel.		S3 S4		
- 2 <u>3</u> 96 -	_	_		FAT CLAY (CH) - Dark brown, frozen to 1.4 m, high plasticity.	ł			······································
	- - - 2 -	- 5		- Moist, stiff below 1.4 m.		S5 S6 S7		· · · · · · · · · · · · · · · · · · ·
- 2 29 9 _	-	_		SILT (ML) - Light brown, moist, soft, no to low plasticity.	1777	S8		
228.2 _				- Clay pocket from 2.7 m to 2.8 m.	22222	S9		
GEOTECHNICAL-SOIL LOG UNFMS/19-0535-001/2019 COW STREETS.GPU				END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.				
SAM	PLE T			Core Barrel Auger Grab	4 DD7			
	TRAC			INSPECTOR c.friesen	APPF KWH			DATE 3/8/19

K GF	G	S JP		REFERENCE NO.	HOLE NO. TH19-1	5	SHEET 1 of 1
CLII PRC SITI	JEC	г 2	2019 C	ROUP ity of Winnipeg Local Streets Renewal Program Street Extending North from Chalmers Avenue to Monroe Avenue		JOB NO. GROUND ELEV. TOP OF PVC ELEV. WATER ELEV.	19-0535-001 230.77 /.
LOC	ATIC	N S	Southbo	bund Lane, 411 m North of Chalmers Avenue		DATE DRILLED	1/24/2019
	LLIN HOD		50 mm	ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Dr	ill Rig	UTM (m)	N 5,530,611 E 636,904
ELEVATION (m)	(m)	; ; ; ; ; ; ;	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N)	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) 20 40 60 80 PL MC LL 60 80 20 40 60 80
230.6 _		_		<u>CONCRETE</u> - 190 mm thickness. <u>GRANULAR BASE</u> - 420 mm thickness, brown, frozen, well-graded, medium to coarse grained sand, fine grained gravel, 20 mm max particle size.	S1		
^{230.2} _ - 230	-	-		FAT CLAY (CH) - Brown, frozen to 1.4 m, high plasticity.	53		
- 229 228.9	1 — - - - - - -			- Moist, stiff below 1.4 m.	54 55 55 56		
	2	_		<u>SILT (ML)</u> - Light brown, moist, soft, no to low plasticity. - Trace clay from 2.1 to 2.3 m.	57 57 58 58		
RETS.GPJ 827 - 827		-		- Increased moisture content between 2.4 to 2.6 m.	11 11 11 11 11 11 11 11 11 11 11 11 11		
HLS 227.7	3-	10			H		
GEOTECHNICAL-SOIL LOG U:FMS:19-0535-00112019 COW STREETS.GPJ 2027 - 222 - 20012019 COW STREETS.GPJ 2027 - 20012019 COW STREETS.GPJ 2027 - 20012019 COW STREETS.GPJ 2027 - 20012019 COW STREETS.GPJ 2027 - 2027	- - - - - -			END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.			
SAM	PLE			Core Barrel Auger Grab			
ON CON	TRAC			INSPECTOR cilling C.FRIESEN	APPROVE KWH		DATE 8/8/19

	GS IOUP		REFERENCE NO.	HOLE NO. TH19-1	6	SHEET 1 of 1
	JECT		ity of Winnipeg Local Streets Renewal Program		JOB NO. GROUND ELEV. TOP OF PVC ELEV	19-0535-001 230.33 V.
SITE			Street Extending North from Chalmers Avenue to Monroe Avenue bund Lane, 313 m North of Chalmers Avenue		WATER ELEV. DATE DRILLED	1/24/2019
			Ø Core Barrel, 125 mm Ø Solid Stem Auger, B40 Truck Mounted D	rill Ria	UTM (m)	N 5,530,535
MET	HOD					E 636,845 Cu POCKET PEN (kPa) ★
ELEVATION (m)	(m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu TORVANE (kPa) \diamond 20 40 60 80 PL MC LL ϕ 20 40 60 80
			CONCRETE - 180 mm thickness.	S1		
230.2 _ - 230 229.7	-		<u>GRANULAR BASE</u> - 430 mm thickness, brown, frozen, well-graded, medium to coarse grained sand, fine grained gravel, 20 mm max particle size.	FTT S2		
223.7			FAT CLAY (CH) - Brown, frozen to 1.3 m, high plasticity.	53 54		
- 2 29 90 -			- Moist, stiff below 1.3 m.			······································
	5 		SILT (ML) - Light brown, moist, soft, no to low plasticity.	S5 56 57		
228.1 _ - 228 - 228	- - - - - - - - - - - - - - - - - - -		FAT CLAY (CH) - Brown, moist, stiff, high plasticity, trace silt nodules.	58 57 57 59 59		
GEOTECHNICAL-SOIL LOG UNFMS/19-0535-001/2019 COW STREETS.GPJ WOO WOO			END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.	<u><u> </u></u>		
SAM	PLE TYP	Έ	Core Barrel Auger Grab			
CON	TRACTO Maple I		INSPECTOR rilling C.FRIESEN	APPROVE KWH		DATE 3/8/19

GR	GS	N P		REFERENCE NO.	HOLE NO. TH19-1	7	SHEET 1 of 1
SITE	JECT E	201 Rali	9 C egh	ROUP ity of Winnipeg Local Streets Renewal Program Street Extending North from Chalmers Avenue to Monroe Avenue		JOB NO. GROUND ELEV. TOP OF PVC ELEV WATER ELEV. DATE DRILLED	19-0535-001 230.53 V. 1/24/2019
DRI	LLING HOD			ound Lane, 242 m North of Chalmers Avenue ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Dr	ill Rig	UTM (m)	N 5,530,478 E 636,801
ELEVATION (m)	Э) DEPTH	ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %		Cu POCKET PEN (kPa) \bigstar Cu TORVANE (kPa) \blacklozenge 20 40 60 80 PL MC LL $\%$ 20 40 60 80
230.3 _				CONCRETE - 255 mm thickness. Top 180 mm intact. Bottom 75 mm very poor quality, broken. GRANULAR BASE - 430 mm thickness, brown, frozen, well-graded, medium to coarse grained sand, fine grained gravel, 20 mm max particle size.	S1		
- 230 229.9 _				CLAY FILL (CH) - Dark brown, frozen, high plasticity, trace coarse grained sand, trace fine grained gravel.	53 53 54		
229.4 _ _ 229.0 _		5		 FAT CLAY (CH) - Brown, frozen to 1.4 m, high plasticity. Moist, stiff below 1.4 m. SILT (ML) - Light brown, moist, soft, no to low plasticity. 	17 17 17 17 17 17 17 15 15		
228.2	- - - 2				S6		
- 228				FAT CLAY (CH) - Brown, moist, stiff, high plasticity, trace silt nodules.	58 59 59		
GEOTECHNICAL-SOIL LOG U:FMS/19-0535-00112019 COW STREETS.GPJ WOO WOO		10		END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.			
SAM	PLE TY TRACT	OR		Core Barrel Auger Grab	APPROVE		DATE
M QEC	aple	Leaf	Dr	cilling C.FRIESEN	KWH		3/8/19

	G	S			HOLE FH1		8	SHEET 1 of 1
	JECI	r 2	019 C	ROUP ity of Winnipeg Local Streets Renewal Program			JOB NO. GROUND ELEV. TOP OF PVC ELE	19-0535-001 230.98 √.
			-	Street Extending North from Chalmers Avenue to Monroe Avenue ound Lane, 132 m North of Chalmers Avenue			WATER ELEV. DATE DRILLED	1/24/2019
	LING	_		ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Dri	Dia		UTM (m)	N 5,530,392
	HOD		50 11111	o Core Barrel, 125 min o Solid Stem Auger, 640 muck woulded Di			1	E 636,734 Cu POCKET PEN (kPa) ★
ELEVATION (m)	Э DEPTH	(ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER RECOVERV %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu TORVANE (kPa) \leftarrow 20 40 60 80 PL MC LL \leftarrow 20 40 60 80
	_			CONCRETE - 200 mm thickness.		S1		
230.8 _	-			<u>GRANULAR BASE</u> - 410 mm thickness, brown, frozen, well-graded, medium to coarse grained sand, fine grained gravel, 20 mm max particle size.		S2		
230.4 _	-			 FAT CLAY WITH SAND (CH) - Grey, frozen, high plasticity, some medium to coarse grained sand, trace fine grained gravel. Grain Size Distribution: Gravel (0.2%), Sand (19.8%), Silt (22.9%) and Clay (57.1% at 0.6 m. Atterberg Limits: Liquid Limit (65), Plastic Limit (20), Plasticity Index (45) at 0.6 m. 	<u>hrrrr</u>	S3		······································
- 28890 _	1	-		FAT CLAY (CH) - Brown, frozen, high plasticity.		S4 S5		
229.5 _ - 229	 2	- 5		SILT (ML) - Light brown, moist, soft, no to low plasticity.	1111	S6 S7		
2	- - - - -				VVVVVV	S8		
IO.STRETS N STRETS N	- - -			FAT CLAY (CH) - Brown, moist, stiff, high plasticity, trace silt nodules.	17777	S9		
GEOTECHNICAL-SOIL LOG UNFMS/19-0535-001/2019 COW STREETS.GPJ 6.227 W XOX 227 W XOX 277 W XOX 2777 W XOX 2777 W XOX 2777 W XOX 2777 W XOX 2777 W XO	3			END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.				
SAM	PLE T			Core Barrel Auger Grab				
E CON M	TRAC [aple			INSPECTOR cilling C.FRIESEN	APPF KWH			DATE 3/8/19

K GF		S		REFERENCE NO.	HOLE I		9	SHEET 1 of 1
	JEC.	г 2	2019 C	ROUP ity of Winnipeg Local Streets Renewal Program			JOB NO. GROUND ELEV. TOP OF PVC ELE	19-0535-001 231.12 V.
			-	Street Extending North from Chalmers Avenue to Monroe Avenue bund Lane, 64 m North of Chalmers Avenue			WATER ELEV. DATE DRILLED	1/24/2019
	LLIN	_		ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Di	ill Dia		UTM (m)	N 5,530,337
	THOD			Core Barrel, 125 mill & Solid Stern Auger, 640 muck Mounted Di				E 636,693
ELEVATION (m)	(m)	; ; ; (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ 20 40 60 80 PL MC LL ● ● % 20 40 60 80
231.1				ASPHALT - 40 mm thickness.	k	51		
- 231 230.9 - 230 229.7 - 229.6 - 229		- - 5		CONCRETE - 200 mm thickness. CLAY FILL (CH) - Black, frozen, high plasticity, trace medium to coarse grained sand, trace fine grained gravel. FAT CLAY (CH) - Brown, frozen, high plasticity. SILT (ML) - Light brown, moist, soft, no to low plasticity.		51 52 53 53 54 55 56 56 57 58		
228.7	-	-		FAT CLAY (CH) - Brown, moist, stiff, high plasticity, trace silt nodules.	Ħ			
GEOTECHNICAL-SOIL LOG UNFMSV19-0535-001/2019 COW STREETS.GPJ		- 		END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.		59		
SAM	IPLE 7			Core Barrel Auger Grab				
EON CON	TRAC			INSPECTOR cilling C.FRIESEN	APPR KWH	OVE		DATE 3/8/19

APPENDIX C

Jamison Avenue

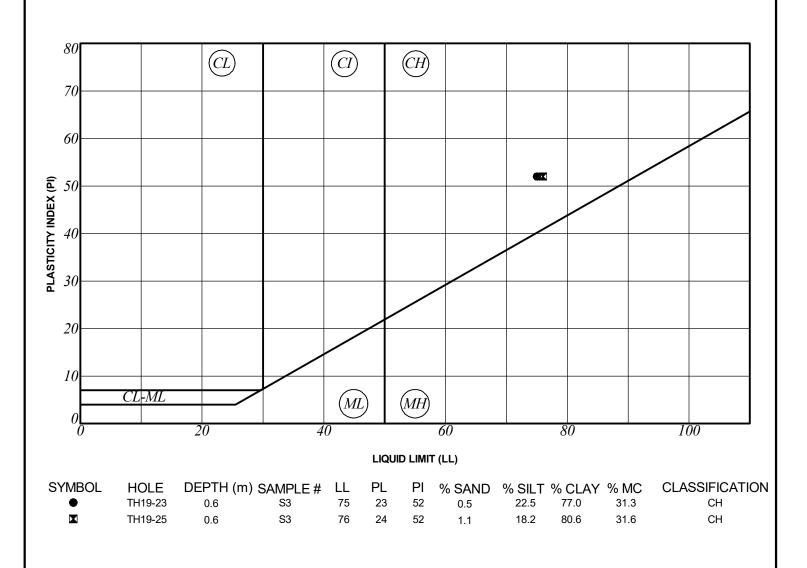
Figure C1 – Test hole Locations Figure C2 – A-Line Plot Figure C3 – Grain Size Analyses Test Hole Logs



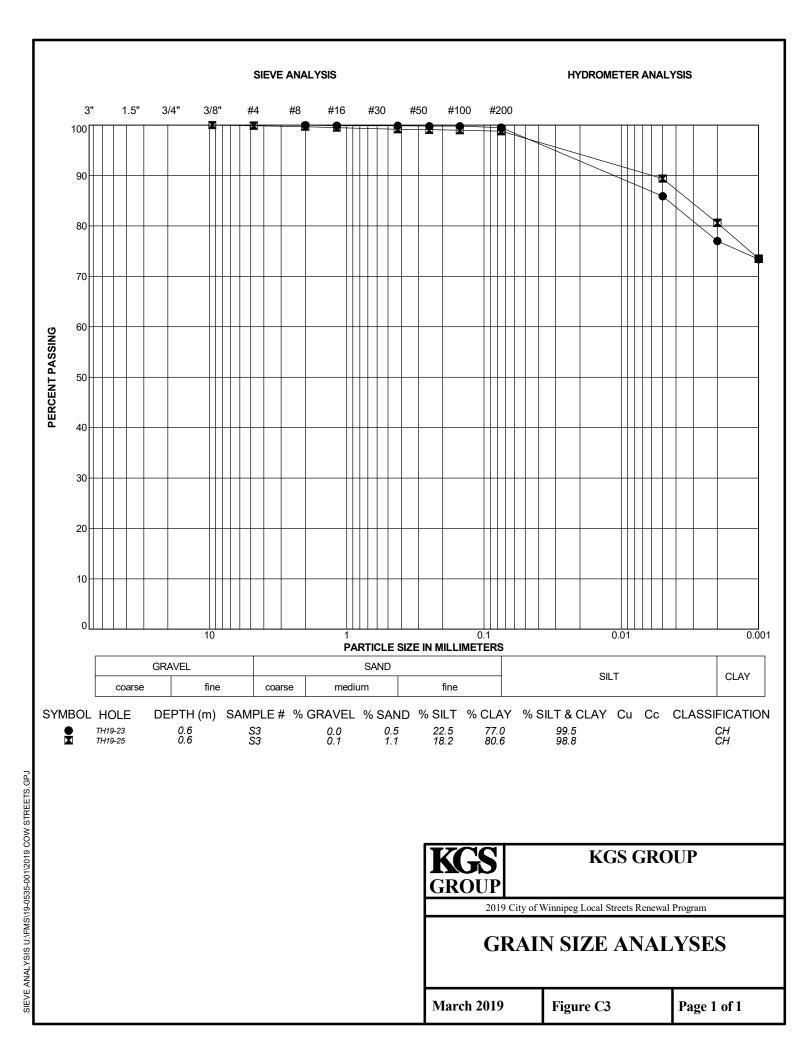
FIGURE C1 JAMISON AVENUE – TEST HOLE LOCATIONS







Notes: **KGS GROUP** KGS **ML - Low Plasticity Silt** ML - Low Plasticity Silt CL-ML - Silty Clay CL - Low Plasticity Clay Cl - Intermediate Plasticity Clay GRŌŪP 2019 City of Winnipeg Local Streets Renewal Program **CH - High Plasticity Clay** LL - Liquid Limit **A-LINE PLOT** PL - Plastic Limit PI - Plasticity Index MC - Moisture Content **NP - Non-Plastic** March 2019 Figure C2 Page 1 of 1



	GS	N P	REFERENCE NO.	HOLE NO. TH19-2	1	SHEET 1 of 1
CLIE PRO.	JECT	2019	GROUP City of Winnipeg Local Streets Renewal Program		JOB NO. GROUND ELEV. TOP OF PVC ELE	19-0535-001 231.01 /.
	ATION	Westb	n Avenue Extending East from Henderson Highway to Roch Street ound Lane, 36 m East of Henderson Highway n ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted D		WATER ELEV. DATE DRILLED UTM (m)	1/25/2019 N 5,531,328 E 635,566
ELEVATION (m)	DEPTH	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ 20 40 60 80 PL MC LL % 20 40 60 80
- 230.8 _ - 230 - 230 - 229		5	ASPHALT - 50 mm thickness. CONCRETE - 140 mm thickness. FAT CLAY (CH) - Black, frozen, high plasticity. - Trace fine to coarse grained gravel at 0.3 m. - Brown, stiff, moist below 1.2 m.	S1 S2 S3 S4 S5 S6 S7 S8 L		
GEOTECHNICAL-SOIL LOG UNFMS/19-0535-001/2019 COW STREETS.GPJ 		10	END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.	59		
SAMF CONT	PLE TY FRACT aple	OR	Core Barrel Auger Grab INSPECTOR rilling C.FRIESEN	APPROVE KWH		DATE 3/8/19

K Gł		S JP		REFERENCE NO.	HOLE I		2	SHEET 1 of 1
	ENT DJEC	т 2	2019 C	ROUP ity of Winnipeg Local Streets Renewal Program			Job No. Ground Elev. Top of PVC Ele ^v	19-0535-001 231.07 V.
				n Avenue Extending East from Henderson Highway to Roch Street und Lane, 134 m East of Henderson Highway			WATER ELEV. DATE DRILLED	1/25/2019
		_					UTM (m)	N 5,531,285
ME	ГНОД		50 mm	ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted D	rill Rig			E 635,653
ELEVATION (m)	(m)	(ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu POCKET PEN (kPa) Cu TORVANE (kPa) 20 40 60 80 PL MC LL 96 20 40 60 80
_ 2 <u>3</u> 3:0 -			P	ASPHALT - 60 mm thickness.		51		
230.9				CONCRETE - 150 mm thickness.				
	-	-		FAT CLAY (CH) - Black, frozen, high plasticity. - Trace fine to coarse grained gravel at 0.3 m.	F			
	-				<u>الإ</u>	52		···[··]··]··]··]··]··]··]··]··]··]··]··]
	-				Į			
	-				Į.	53		
	-				Ŧ	55		•••••••••••••••••••••••••••••••••••••••
	-	-			Ð			
- 230	' -				1	64		······
229.8	-	-		LEAN CLAY (CL) - Light brown, moist, firm, low to intermediate plasticity.				
	-			<u>- Light blown, molat, inn, iow to interindulate plasticity.</u>	<u>ال</u>	65		··· [··· [··]··]·· [··]··]··]··]··
					H			
	-	- 5			Ŧ.			
	-				Ħ	56		·······
	-	-			H.	57		
229.1	2-			FAT CLAY (CH) - Brown, moist, stiff, high plasticity, trace silt nodules.	_11			
- 229	-	-						
	-				E.	58		
	-	-					: : : : 	
2	-							
TS.GP		-			प्त			······································
IREE'	-				Į.	59		
∑ 228.0	3-	-10			Į			
0 228 - 0 61	-	10		END OF TEST HOLE AT 3.05 m				···
001/2(Notes: 1. Open to 3.05 m upon completion of drilling.				
0535-	-	-		 No water observed during drilling within the depth explored. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 				···
1S/19-	-			 Each and some sines in the sines, ager satisfies and sold pater to grade. Test hole location is approximate. 				
U:\FN		-						
LOG	-							
-SOIL	-							
GEOTECHNICAL-SOIL LOG UNFMS/19-0535-001/2019 COW STREETS.GPJ	19LE 1	г ГҮРЕ		Core Barrel 🔣 Auger Grab				
H CON	ITRAC			INSPECTOR	APPR	.OVE		DATE
l ge	Mapl	e Le	eaf Di	cilling C.FRIESEN	KWH			3/8/19

	G	SP		REFERENCE NO.	HOLE TH1		3	SHEET 1 of 1
CLIE PRO SITE	JECI	- 2	2019 C	ROUP ity of Winnipeg Local Streets Renewal Program			JOB NO. GROUND ELEV. TOP OF PVC ELEV	19-0535-001 231.21
				n Avenue Extending East from Henderson Highway to Roch Street and Lane, 240 m East of Henderson Highway			WATER ELEV. DATE DRILLED	1/25/2019
DRIL	LING	_		ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Dr	ill Ria		UTM (m)	N 5,531,240
MET	HOD	-						E 635,748 Cu POCKET PEN (kPa) ★
ELEVATION (m)	Э DEPTH		GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu TORVANE (kPa) \diamond 20 40 60 80 PL MC LL ϕ 20 40 60 80
231.2 -	_			ASPHALT - 50 mm thickness.		s1		
- 231P -	-			<u>CONCRETE</u> - 160 mm thickness, very poor quality, broken, unable to remove core. <u>FAT CLAY (CH)</u> - Brown, frozen, high plasticity.		S2		
	-			- Grain Size Distribution: Gravel (0.0%), Sand (0.5%), Silt (22.5%) and Clay (77.0% at 0.6 m. - Atterberg Limits: Liquid Limit (75), Plastic Limit (23), Plasticity Index (52) at 0.6 m.	4	S3		······································
- 230 229.9 _	1			- Moist, stiff below 1.2 m.		S4		
	- - - - - - - - - - - - - - - - - - -	- 5		<u>SILT (ML)</u> - Light brown, moist, soft, no to low plasticity.		S5 S6 S7		
229.1 _ - 229				FAT CLAY (CH) - Brown, moist, stiff, high plasticity. - Trace silt nodules below 2.4 m.		S8 S9		
228.2 00 00 00 00 00 00 00 00 00 00 00 00 00	3-	-10		END OF TEST HOLE AT 3.05 m	Į			
228.2				 Notes: Open to 3.05 m upon completion of drilling. No water observed during drilling within the depth explored. Backfilled with bentonite chips, auger cuttings and cold patch to grade. Test hole location is approximate. 				
SAM	PLE T	YPE		Core Barrel Auger Grab				
	TRAC aple			INSPECTOR cilling C.FRIESEN	APPF KWH			DATE 3/8/19

K GR	G	S		REFERENCE NO.	HOLE TH1		4	SHEET 1 of 1
	JECI	г 2	2019 C	ROUP hity of Winnipeg Local Streets Renewal Program			Job No. Ground Elev. Top of PVC Elev	19-0535-001 230.94 /.
LOC				n Avenue Extending East from Henderson Highway to Roch Street und Lane, 306 m East of Henderson Highway			WATER ELEV. DATE DRILLED	1/25/2019
DRII	LLING	3 1		ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Di	rill Ria		UTM (m)	N 5,531,211
MET	HOD							E 635,809
ELEVATION (m)	(m) DEPTH	i (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu TORVANE (kPa) \diamond 20 40 60 80 PL MC LL ϕ 20 40 60 80
230.9 - 230.7 _		-		ASPHALT - 50 mm thickness. <u>CONCRETE</u> - 160 mm thickness, very poor quality, broken, unable to remove core. <u>FAT CLAY (CH)</u> - Brown, frozen, high plasticity, trace coarse grained sand.		51		
_ 230.0 _ 230 _	- - 1 - -	-		SILT (ML) - Light brown, moist, soft, no to low plasticity.		53		
229.4 _ - 229	2-	- 5		FAT CLAY (CH) - Brown, moist, stiff, high plasticity.		56		
0.6PJ		-		- Trace silt nodules below 2.1 m.		58		
227.9 - 228 227.9 - 279 227.9 - 279 200 200 200 200 200 200 200 200 200 20	3			END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.		59		
	PLE T			Core Barrel Auger Grab	APPR		D	
				rilling C.FRIESEN	KWH			3/8/19

	G	S P			HOLE N		5	SHEET 1 of 1
CLIE PRO SITE	JECT	2	019 C	ROUP ity of Winnipeg Local Streets Renewal Program Avenue Extending East from Henderson Highway to Roch Street			JOB NO. GROUND ELEV. TOP OF PVC ELEV	19-0535-001 230.94 V.
				und Lane, 401 m East of Henderson Highway			WATER ELEV. DATE DRILLED	1/25/2019
	LING HOD	ⁱ 1	50 mm	ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Dr	ll Rig		UTM (m)	N 5,531,169 E 635,897
ELEVATION (m)	Э DEPTH	(ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu POCKET PEN (kPa) \star Cu TORVANE (kPa) 20 40 60 80 PLMC 96 20 40 80
230.9 -			2 N.A. 8	ASPHALT - 40 mm thickness.	_/ s			
230.8 _ 230.7 _	-			CONCRETE - 140 mm thickness, very poor quality, broken, unable to remove core. GRANULAR BASE - 420 mm thickness, brown, frozen, well-graded, medium to coarse grained sand, fine grained gravel, 20 mm max particle size. FAT CLAY (CH) - Brown, frozen, high plasticity, trace fine to coarse grained sand.				
	-			- Grain Size Distribution: Gravel (0.1%), Sand (1.1%), Silt (18.2%) and Clay (80.6%) at 0.6 m. - Atterberg Limits: Liquid Limit (76), Plastic Limit (24), Plasticity Index (52) at 0.6 m.	111110 s	3		······································
- 230 229.6 _					177777	4		· · · · · · · · · · · · · · · · · · ·
- 229	2	- 5		<u>SILT (ML)</u> - Light brown, moist, soft, no to low plasticity.	LI LILILIA "	6		
228.5 - 228.5 - 228 228 228 228 228 228 228 228 228 22	3			FAT CLAY (CH) - Brown, moist, stiff, high plasticity, trace silt nodules.		9		
GEOTECHNICAL-SOIL LOG UNFMS/19-0535-001/2019 COW STREETS.GPJ M W S 222 M NOO	3	-10		END OF TEST HOLE AT 3.05 m Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.				
SAM	PLE T	YPE		Core Barrel Auger Grab				
CON CON	TRACI aple		af Dr	INSPECTOR cilling C.FRIESEN	APPRO KWH	OVE		DATE 3/8/19

K GF	G	S JP			HOLE NO. TH19-2	6	SHEET 1 of 1
CLII PRO SITI	JEC	т 2	2019 C	ROUP ity of Winnipeg Local Streets Renewal Program Avenue Extending East from Henderson Highway to Roch Street		Job No. Ground Elev. Top of PVC Ele ^x Water Elev.	19-0535-001 230.27
LOC	ΑΤΙΟ			und Lane, 506 m East of Henderson Highway		DATE DRILLED	1/25/2019
	HOD		50 mm	ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Dr	ill Rig	UTM (m)	N 5,531,125 E 635,988
ELEVATION (m)	(m)	(ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △ 20 40 60	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) \blacklozenge 20 40 60 80 PL MC LL \checkmark \checkmark \checkmark 20 40 60 80
230.2 -				ASPHALT - 50 mm thickness.	S1		
230.1 _ 230.0 _ - 230	-	-		<u>CONCRETE</u> - 100 mm thickness. <u>GRANULAR BASE</u> - 420 mm thickness, brown, frozen, well-graded, medium to coarse grained sand, fine grained gravel, 20 mm max particle size. <u>FAT CLAY (CH)</u> - Brown, frozen to 1.4 m, high plasticity, trace coarse grained sand.	S2		
	- - - 1 -	-		- No coarse grained sand below 0.9 m.	53 54		
- 229		- 5		 Increased silt content from 1.2 m to 1.4 m. Moist, stiff below 1.4 m. Increased silt content from 1.5 m to 1.8 m. 	S5 S6		
	- - 2	-		- Firm below 1.8 m.	57 57 57		
- 228		-		- Increased silt content from 2.1 m to 2.4 m.	58 57 57 57 58		
227.2 -	- - 3			END OF TEST HOLE AT 3.05 m	59		
GEOTECHNICAL-SOIL LOG UNFMS/19-0535-001/2019 COW STREETS.GPU WOO NO N	- - - - - - - -	-		Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.			
SAM	PLE	TYPE		Core Barrel 🔄 Auger Grab			
CON CON	TRA([apl			INSPECTOR c.friesen	APPROVE KWH		DATE 3/8/19

KGS GROUP	REFERENCE NO.	HOLE NO. TH19-27	SHEET 1 of 1
	ity of Winnipeg Local Streets Renewal Program	JOB NO. GROUND ELEV. TOP OF PVC ELEV.	19-0535-001 230.68
	n Avenue Extending East from Henderson Highway to Roch Street und Lane, 627 m East of Henderson Highway	WATER ELEV. DATE DRILLED	1/25/2019
	ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Dr	UTM (m) rill Rig	N 5,531,072 E 636,098
ELEVATION (m) (m) (m) (m) (m) (m) (m) (m)	DESCRIPTION AND CLASSIFICATION		u POCKET PEN (kPa) ★ u TORVANE (kPa) \blacklozenge 20 40 60 80 PL MC LL % 20 40 60 80
230.6	ASPHALT - 85 mm thickness. CONCRETE - 185 mm thickness.		
	<u>CONCRETE</u> - 165 mm thickness. <u>GRANULAR BASE</u> - 420 mm thickness, brown, frozen, well-graded, medium to coarse grained sand, fine grained gravel, 20 mm max particle size. <u>FAT CLAY (CH)</u> - Dark grey, frozen, high plasticity.	S1 S2 S2 S3 S3 S1 S3 S1 S3 S3 S3 S3 S3 S3 S3 S3 S3 S3	
	SILT (ML) - Light brown, moist, soft, no to low plasticity.	S4 I I I S5 I I I S5 I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I	
	FAT CLAY (CH) - Brown, moist, stiff, high plasticity, trace silt nodules.	S6	
		S8	
d - 228	END OF TEST HOLE AT 3.05 m	S9	
227.6 3 - 10 227.6 3 - 10 227.6 - 3 - 10 	 Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate. 		
SAMPLE TYPE	Core Barrel Auger Grab		
CONTRACTOR Maple Leaf D:	INSPECTOR rilling C.FRIESEN		ATE 8/19

APPENDIX D

Talbot AvenueFigure D1 – Test hole LocationsTable D1 – Pavement Section Thicknesses



FIGURE D1 TALBOT AVENUE – PAVEMENT CORING LOCATIONS





TABLE D1PAVEMENT SECTION THICKNESSES

Test hole ID	Location	Asphalt Thickness (mm)	Concrete Thickness (mm)
TH19-31	EBL, 54 m E of Grey Street	40 to 70	200 to 230
TH19-32	EBL, 148 m E of Grey Street	35	190
TH19-33	WBL, 198 m E of Grey Street	45	175
TH19-34	WBL, 106 m E of Grey Street	90	180
TH19-35	WBL, 29 m E of Grey Street	80	200



APPENDIX E

Adison Avenue Figure E1 – Test hole Locations Table E1 – Pavement Section Thicknesses



FIGURE E1 EDISON AVENUE – PAVEMENT CORING LOCATIONS

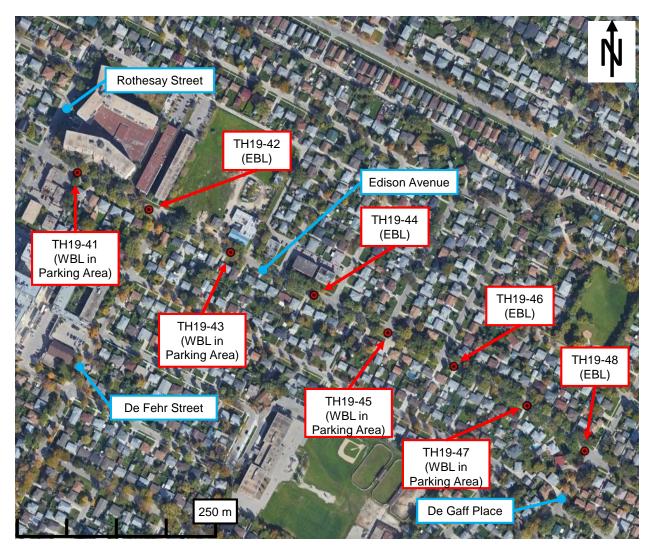




TABLE E1 PAVEMENT SECTION THICKNESSES

Test hole ID	Location	Asphalt Thickness (mm)	Concrete Thickness (mm)	Notes
TH19-41	WBL (Parking Area), 54 m E of Rothesay Street	75	190	
TH19-42	Eastbound Lane, 152 m E of Rothesay Street	50	200	Horizontal crack at 175 mm
TH19-43	WBL (Parking Area), 268 m E of Rothesay Street	50	200	
TH19-44	EBL, 385 m E of Rothesay Street	90 to 100	200 to 210	
TH19-45	WBL (Parking Area), 491 m E of Rothesay Street	55	140	
TH19-46	EBL, 583 m E of Rothesay Street	50 to 55	165 to 170	
TH19-47	WBL (Parking Area), 688 m E of Rothesay Street	75	180	
TH19-48	WBL, 778 m E of Rothesay Street	100 to 120	145 to 165	



APPENDIX F

Sandford Fleming Road Figure F1 – Test hole Locations Table F1 – Pavement Section Thicknesses



FIGURE F1 SANFORD FLEMING ROAD – PAVEMENT CORING LOCATIONS

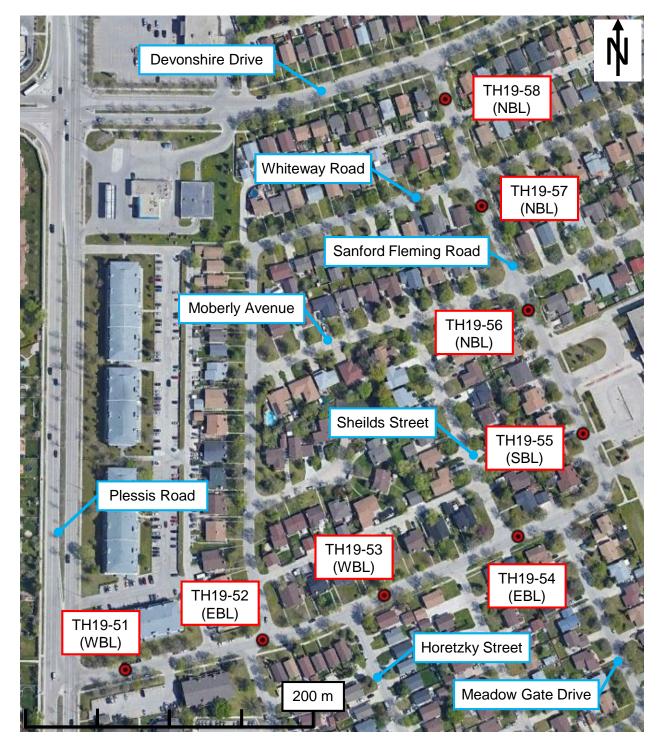




TABLE F1PAVEMENT SECTION THICKNESSES

Test hole ID	Location	Asphalt Thickness (mm)	Concrete Thickness (mm)	Notes
TH19-51	WBL, 46 m E of Sandford Fleming Road	40	180	Upper 80 mm broken and very poor quality unable to remove lower piece of concrete, lower portion of concrete appeared to be intact
TH19-52	EBL, 142 m E of Sandford Fleming Road	20 to 35	205 to 220	Unable to remove bottom 25 to 50 mm of concrete
TH19-53	WBL, 233 m E of Sandford Fleming Road	35	195	Top 75 mm broken and very poor
TH19-54	EBL, 331 m E of Sandford Fleming Road	25	185	Top 30 mm broken and very poor quality
TH19-55	SBL, 279 m S of Devonshire Drive	25	175	Broken, very poor quality
TH19-56	Northbound Lane, 188 m S of Devonshire Drive	40	170	Top 20 to 60 mm poor quality, core remained intact
TH19-57	SBL, 108 m S of Devonshire Drive	45	155	Very poor quality, broken
TH19-58	Northbound Lane, 31 m S of Devonshire Drive	30	200	Very poor quality, broken, unable to remove core



APPENDIX G

Day Street Figure G1 – Test hole Locations Table G1 – Pavement Section Thicknesses









TABLE G1PAVEMENT SECTION THICKNESSES

Test hole ID	Location	Asphalt Thickness (mm)	Concrete Thickness (mm)	Notes
TH19-61	SBL, 459 m N of Kildare Avenue	40 to 60	190 to 210	Horizontal joint ay 130, unable to remove core below joint
TH19-62	NBL, 402 m N of Kildare Avenue	75	190	Top 20 mm slightly broken at asphalt- concrete interface
TH19-63	SBL, 303 m N of Kildare Avenue	75	205	
TH19-64	NBL, 214 m N of Kildare Avenue	60	185	20 to 30 mm of granular frozen to bottom of core
TH19-65	SBL, 142 m N of Kildare Avenue	90	180	Horizontal joint at 210 mm
TH19-66	NBL, 25 m N of Kildare Avenue	80	190	

