APPENDIX 'A'

GEOTECHNICAL REPORT

Geotechnical Investigation

City of Winnipeg Street Investigation
Winnipeg, Manitoba
WX19432
28 September 2021

wood.
Environment & Infrastructure Solutions
440 Dovercourt Drive, Winnipeg Manitoba, Canada R3Y 1N4
Phone: (204) 488-2997
www.woodplc.com

Geotechnical Investigation
City of Winnipeg Street Investigation
Wood Project Number - WX19432

Prepared for:	Morrison Hershfield Suite 1 – 59 Scurfield Boulevard Winnipeg, Manitoba R3Y 1V2		
Contact:	Ron Bruce, P.Eng.		
Report Distribution:			
Morrison Hershfield:	Ron Bruce, P.Eng.		
Third Party:			
Report Classification:	Confidential		
	Name	**Job Title**	**Signature**
Prepared by:	Jorden Wiwcharyk, P.Eng.	Geotechnical Engineer	
Reviewed by:	Brad Wiebe., P.Eng.	Senior Associate Geotechnical Engineer	
Project Manager:	Jorden Wiwcharyk, P.Eng.	Geotechnical Engineer	
Other Technical Contributors			

Rev.	**Date**	**Revision Notes**
0	**28 Sept 2021**	Issued Final to Client

Permit Stamp	**Engineer Seal**
	

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1.0 Introduction

At the authorization of Mr. Ron Bruce, P. Eng., of Morrison Hershfield, Wood Environment & Infrastructure Solutions, a division of Wood Canada Limited (Wood), completed a pavement coring and test hole drilling program related to the pavement evaluation and potential asphalt reconstruction and rehabilitation for twenty-five (25) street locations in the City of Winnipeg, Manitoba. Locations and scope are itemized in Table 1-1.

Table 1-1: Street Location and Investigation Scope

Street Name	Location	Number of Cores	Number of Test Holes	Test Hole Numbers
Mountain Avenue	Arlington Street to McPhillips Street	12	12	Mountain – TH01 to Mountain - TH12
~~McGregor Street~~ (South)	~~Mountain Avenue to~~ Church Avenue	6	6	~~MS1 – MS6~~
~~McGregor Street~~ (North)	~~McAdam Avenue to~~ Seven Oaks Avenue	7	7	~~MN1 – MN7~~
	Total	**25**	**25**	

The geotechnical investigation was completed in accordance with the Scope of Work and Terms and Conditions outlined in Wood Proposal No. WPG2021.462Rev01, dated 30 June 2021.

2.0 Geotechnical Investigation

Prior to initiating drilling, Wood notified public utility providers (i.e. Manitoba Hydro, MTS, Shaw, etc.) of the intent to drill in order to clear public utilities, and where required, met with said representatives on-site. Additionally, Wood utilized the services of ATS Traffic to provide traffic control during drilling. All drilling was completed without incident,

Between 4 and 30 August 2021, Wood supervised the drilling and coring of twenty-five test holes along Mountain Avenue and McGregor Street. The test hole locations are illustrated in Figures A1, B1 and C1. All locations were cored using a 150 mm diameter core barrel, while test hole drilling was conducted using a truck mounted Mobile B40LX or Geoprobe drill rig equipped with 125 mm solid stem augers, owned and operated by Maple Leaf Drilling of Springfield, Manitoba. Coring and test hole locations were initially selected by Morrison Hershfield, however underground utilities required some adjustments to the original test hole locations.

During coring, Wood field personnel identified pavement types and thicknesses, as well as underlying granular structure, while during drilling, Wood field personnel visually classified the soil stratigraphy within the test holes in accordance with ASTM D3282 and ASTM D2487, as well as noted observed seepage and/or sloughing conditions where present. Soil sampling consisted of grab samples of the auger cuttings at all test hole locations. All grab samples were retained in sealed plastic bags and shipped to Wood's Winnipeg laboratory for review and selected testing. All pavement core samples were shipped to Winnipeg laboratory to be measured and photographed. The core photos and underlying pavement structure information are provided in Appendices A, B and C for Mountain Avenue, McGregor South and McGregor North, respectively.

During drilling, Wood field personnel visually classified the soil stratigraphy within the test holes in accordance with ASTM D2487 – *Standard Practice for Classification of Soils for Engineering Purposes* and recorded observed seepage and/or sloughing conditions. Soil sampling consisted of grab samples of the auger cuttings at all test hole locations at depths of about 0.6 m, 0.9 m, 1.2 m, 1.6 m, 2.0 m, and 2.5 m. Test holes were advanced to a depth of about 3.0 m below the pavement surface. The in-situ relative consistency of cohesive soil (i.e. clay) was evaluated during drilling using a pocket penetrometer.

Following completion of the field drilling program, a laboratory testing program was conducted on all soil samples obtained from the test holes. The laboratory testing program consisted of moisture content determinations on all samples, as well as Atterberg limits, particle size distributions (hydrometer method), Standard Proctor Testing and California Bearing Ratio (CBR) evaluations on selected samples of the anticipated subgrade soils at approximate depths between 0.6 and 1.2 m below the pavement structure. It should be noted that all the above testing has been completed with the exception of CBR testing, which is currently underway. Laboratory testing results and detailed test hole logs summarizing the sampling, field testing, laboratory test results, and subsurface conditions encountered at the test hole locations are presented in Appendices A, B and C for Mountain Avenue, McGregor South and McGregor North, respectively. CBR results will be issued under separate cover as they become available. Actual depths noted on the test hole logs may vary by ± 0.3 m from those recorded due to the method by which the soil cuttings are returned to the surface.

3.0 Pavement Summary

The following sections provide summaries of the pavement structure encountered at each test hole location. Details of the soil structure underlying the pavements observed at each test hole can be found on the test hole logs found in Appendices A, B and C, while laboratory testing result summaries are also provided in Appendices A, B and C.

3.1 Mountain Avenue

Table 3-1 provides a summary of the pavement type and thickness encountered at each of the test locations on Mountain Avenue.

Table 3-1: Mountain Avenue Pavement Summary

Test Hole Number	Street Location	Asphalt Thickness (mm)	Concrete Thickness (mm)
Mountain – TH01	EB Median, 50m East of McPhillips	150	250
Mountain – TH02	WB Median, 1120 Mountain	175	125
Mountain – TH03	EB Curb, 1084 Mountain	85	200
Mountain – TH04	EB Curb, 1040 Mountain	50	275 (rubble)
Mountain – TH05	EB Median, 1006 Mountain	115	165 (rubble)
Mountain – TH06	EB Median, 972 Mountain	50	175
Mountain – TH07	WB Median, 958 Mountain	200	150
Mountain – TH08	WB Median, 902 Mountain	200	300
Mountain – TH09	WB Median, 862 Mountain	150	200
Mountain – TH10	WB Median, 834 Mountain	175	325
Mountain – TH11	EB Median, 794 Mountain	100	275

Mountain – TH12	WB Median, 772 Mountain	100	200

3.2 McGregor Street (South)

Table 3 provides a summary of the pavement type and thickness encountered at each of the test hole locations on McGregor Avenue (South).

Table 3-2: McGregor (South) Pavement Summary

Test Hole Number	Street Location	Asphalt Thickness (mm)	Concrete Thickness (mm)
MS1	NB Median, 394 McGregor	100	100
MS2	NB Median, 410 McGregor	50	175
MS3	NB Median, 416 McGregor	100	175
MS4	SB Median, 442 McGregor	175	125
MS5	SB Median, 453 McGregor	150	150
MS6	SB Median, 463 McGregor	140	160

3.3 McGregor Street (North)

Table 3-3 provides a summary of the pavement type and thickness encountered at each of the test hole locations on McGregor Avenue (North).

Table 3-3: McGregor (North) Pavement Summary

Test Hole Number	Street Location	Asphalt Thickness (mm)	Concrete Thickness (mm)
MN1	NB Curb, 682 McGregor	165	225
MN2	SB Curb, 692 McGregor	90	215
MN3	NB Curb, 696 McGregor	90	135 (rubble)
MN4	SB Curb, 3m North of Rupertsland	60	215
MN5	SB Median, 20m South of Enniskillen	90	200 (rubble)
MN6	NB Curb, 20m North of Enniskillen	120	205
MN7	SB Curb, 5m South of Enniskilen	90	225

4.0 Closure

The findings of this report were based on the results of field and laboratory investigations at test hole locations determined based on the requirements provided by Morrison Hershfield.

The site investigation was conducted for the sole purpose of profiling the pavement and subsurface conditions. Although no environmental issues were identified during the fieldwork, this does not indicate that no such issues exist. If the owner or other parties have any concern regarding the presence of environmental issues, then an appropriate level environmental assessment should be conducted.

Soil conditions, by their nature, can be highly variable across a site. The placement of fill and prior construction activities on a site can contribute to the variability especially near surface soil conditions. A contingency should always be included in any construction budget to allow for the possibility of variation in soil conditions, which may result in modification of any potential design and construction procedures which may arise from this factual investigative report.

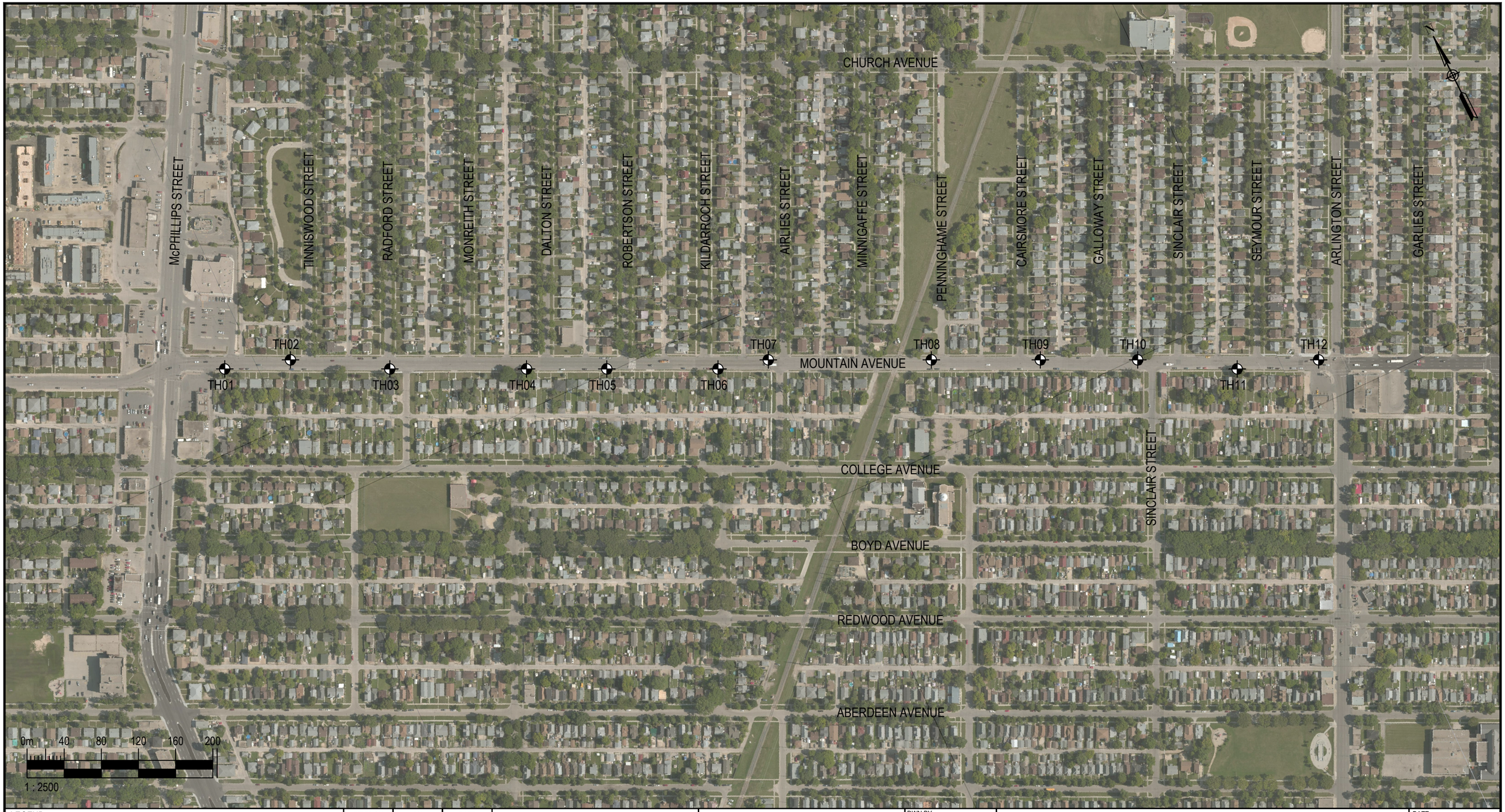
Respectfully submitted,

Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited

Appendix A

Mountain Avenue

- Test and Core Hole Location Plan
- Core Photos
- Test Hole Logs
- Laboratory Summary



LEGEND:

TEST HOLE

REVISION	BY	DATE
----	----	----

CLIENT:

CITY OF WINNIPEG

wood.

440 DOVERCOURT DRIVE
WINNIPEG, MANITOBA R3Y 1N4
PHONE: 204.488.2997 FAX:204.489.8261

DWN BY:	MD
CHK'D BY:	JW
DATUM:	---
PROJECTION:	---
SCALE:	AS SHOWN

GEOTECHNICAL INVESTIGATION
MOUNTAIN AVENUE
(McPHILLIPS STREET TO ARLINGTON STREET)
WINNIPEG, MANITOBA

TEST HOLE LOCATION PLAN

DATE:	AUGUST 2021
PROJECT NO:	WX19432
REV. NO.:	A
FIGURE NO:	FIGURE A1

Asphalt Thickness (mm)	150
Concrete Thickness (mm)	250

CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE MOUNTAIN-TH1
WINNIPEG, MANITOBA

Wood Environment and Infrastructure Solutions

Drawn: JW	Scale: N/A	Date: 13 September 2021	Project No.: WX19432	Figure: A2

Asphalt Thickness (mm)	**175**
Concrete Thickness (mm)	**125**

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CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE MOUNTAIN-TH2
WINNIPEG, MANITOBA

Drawn: JW	Scale: N/A	Date: 13 September 2021	Project No.: WX19432	Figure: A3

Asphalt Thickness (mm)	85
Concrete Thickness (mm)	200

CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE MOUNTAIN-TH3
WINNIPEG, MANITOBA

Wood Environment and Infrastructure Solutions

Drawn: JW	Scale: N/A	Date: 13 September 2021	Project No.: WX19432	Figure: A4

Asphalt Thickness (mm)	50
Concrete Thickness (mm)	275 (rubble only – no sample)

CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE MOUNTAIN-TH4
WINNIPEG, MANITOBA

Wood Environment and Infrastructure Solutions

Drawn: JW	Scale: N/A	Date: 13 September 2021	Project No.: WX19432	Figure: A5

Asphalt Thickness (mm)	115
Concrete Thickness (mm)	165 (rubble only – no sample)

wood. Wood Environment and Infrastructure Solutions		**CORE PHOTOGRAPHS PAVEMENT CORE SAMPLE MOUNTAIN-TH5 WINNIPEG, MANITOBA**		
Drawn: JW	Scale: N/A	Date: 13 September 2021	Project No.: WX19432	Figure: A6

Asphalt Thickness (mm)	50
Concrete Thickness (mm)	175

CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE MOUNTAIN-TH6
WINNIPEG, MANITOBA

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Drawn: JW	Scale: N/A	Date: 13 September 2021	Project No.: WX19432	Figure: A7

Asphalt Thickness (mm)	200
Concrete Thickness (mm)	150

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CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE MOUNTAIN-TH7
WINNIPEG, MANITOBA

Drawn: JW	Scale: N/A	Date: 13 September 2021	Project No.: WX19432	Figure: A8

Asphalt Thickness (mm)	200
Concrete Thickness (mm)	300 (rubble – only portion of sample collected)

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CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE MOUNTAIN-TH8
WINNIPEG, MANITOBA

Drawn: JW	Scale: N/A	Date: 13 September 2021	Project No.: WX19432	Figure: A9

Asphalt Thickness (mm)	150
Concrete Thickness (mm)	200

CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE MOUNTAIN-TH9
WINNIPEG, MANITOBA

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Drawn: JW	Scale: N/A	Date: 13 September 2021	Project No.: WX19432	Figure: A10

Asphalt Thickness (mm)	175
Concrete Thickness (mm)	325

CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE MOUNTAIN-TH10
WINNIPEG, MANITOBA

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Drawn: JW	Scale: N/A	Date: 13 September 2021	Project No.: WX19432	Figure: A11

Asphalt Thickness (mm)	100
Concrete Thickness (mm)	275

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CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE MOUNTAIN-TH11
WINNIPEG, MANITOBA

Drawn: JW	Scale: N/A	Date: 13 September 2021	Project No.: WX19432	Figure: A12

Asphalt Thickness (mm)	100
Concrete Thickness (mm)	200

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CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE MOUNTAIN-TH12
WINNIPEG, MANITOBA

Drawn: JW	Scale: N/A	Date: 13 September 2021	Project No.: WX19432	Figure: A13

PROJECT: City of Winnipeg 2021 Streets Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **Mountain - TH01**
CLIENT: Morrison Hershfield	DRILL RIG: Mobile B40	PROJECT No: WX19432
LOCATION: EB Median, 50m East of McPhillips	DRILL METHOD: 125mm Solid Stem Auger	ELEVATION: Not Surveyed

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

UNCONFINED COMPRESSION (kPa) ▲ 100 200 300 400

POCKET PENETROMETER (kPa) ⊠ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	MUSCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)
0		SPH	ASPHALT (150mm thick)					0
		CONC	CONCRETE (250mm thick)					
		CH	CLAY - silty, high plastic, moist, stiff, brown		1			
			SILT - low plastic, moist, soft, brown		2			
1		ML			3			1
2					4			2
					5			
		CH	CLAY - silty, high plastic, moist, stiff, brown		6			
3			TEST HOLE TERMINATED AT 3.0M BELOW PAVEMENT SURFACE					3
4								4
5								5
6								6
7								7
8								8
9								9
10								

30 15 25 23 27 31

NOTES:
Neither sloughing nor seepage observed during drilling
Test hole remained open to full depth and was dry prior to backfilling.
Test hole backfilled with auger cuttings and bentonite, pavement surface repaired with asphalt.

WX19432 MORRISON HERSHFIELD - CITY OF WINNIPEG STREETS INVESTIGATION 2021.GPJ 21/09/28 08:10 AM (WPG - GEOTECH LOG 1 (LABELLED MC))

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REVIEWED BY: BW	COMPLETION DATE: August 18, 2021
Figure No. A14	Sheet 1 of 1

PROJECT: City of Winnipeg 2021 Streets Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **Mountain - TH02**
CLIENT: Morrison Hershfield	DRILL RIG: Mobile B40	PROJECT No: WX19432
LOCATION: WB Median, 1120 Mountain	DRILL METHOD: 125mm Solid Stem Auger	ELEVATION: Not Surveyed

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

UNCONFINED COMPRESSION (kPa) 100 200 300 400

POCKET PENETROMETER (kPa) 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	MUSCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)
0		SPH	ASPHALT (175mm thick)					0
		CONC	CONCRETE (125mm thick)					
			CLAY - silty, high plastic, moist,s tiff, brown, occasional sulphate inclusions		1			
1					2			1
					3			
		CH					Particle Size Analysis - Sample 3 @ 1.2m: Gravel= 0.0% Sand= 1.8% Silt= 20.9% Clay= 77.3%	
2					4			2
					5			
3					6			3
			TEST HOLE TERMINATED AT 3.0M BELOW PAVEMENT SURFACE					
			NOTES: Neither sloughing nor seepage observed during drilling Test hole remained open to full depth and was dry prior to backfilling. Test hole backfilled with auger cuttings and bentonite, pavement surface repaired with asphalt.					
4								4
5								5
6								6
7								7
8								8
9								9
10								

51 54 33 42 38 33

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Figure No. A15	Sheet 1 of 1

PROJECT: City of Winnipeg 2021 Streets Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **Mountain - TH03**
CLIENT: Morrison Hershfield	DRILL RIG: Geoprobe	PROJECT No: WX19432
LOCATION: EB Curb, 1084 Mountain	DRILL METHOD: 125mm Solid Stem Auger	ELEVATION: Not Surveyed

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

UNCONFINED COMPRESSION (kPa) ▲ 100 200 300 400

POCKET PENETROMETER (kPa) ⊠ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	MUSCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)
0		ASPH	ASPHALT (85mm thick)					0
		CONC	CONCRETE (200mm thick)					
		GP	GRAVEL (FILL) - poorly graded, fine to medium grained, damp to moist, compact (inferred), brown		1			
1					2			1
					3			
			CLAY - sandy, some silt, high plastic, damp to moist, soft to firm, dark grey		4		Particle Size Analysis - Sample 4 @ 1.2m: Gravel= 0.7% Sand= 56.3% Silt= 15.2% Clay= 27.8%	
2		CH	- below 1.8m, trace sand, silty, moist		5			2
					6			
3					7			3
			TEST HOLE TERMINATED AT 3.0M BELOW PAVEMENT SURFACE					
4			NOTES: Neither sloughing nor seepage observed during drilling. Test hole remained open to full depth and was dry prior to backfilling. Test hole backfilled with auger cuttings and bentonite, pavement surface repaired with asphalt.					4
5								5
6								6
7								7
8								8
9								9
10								

3 4 5 20 48 47 47

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Figure No. A16	Sheet 1 of 1

PROJECT: City of Winnipeg 2021 Streets Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **Mountain - TH04**
CLIENT: Morrison Hershfield	DRILL RIG: Geoprobe	PROJECT No: WX19432
LOCATION: EB Curb, 1040 Mountain	DRILL METHOD: 125mm Solid Stem Auger	ELEVATION: Not Surveyed

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

UNCONFINED COMPRESSION (kPa) ▲ 100 200 300 400

POCKET PENETROMETER (kPa) ⊠ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	MUSCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)
0		ASPH	ASPHALT (50mm thick)					0
		CONC	CONCRETE (275mm thick)					
			CLAY - silty, high plastic, moist, soft, grey mottled brown, frequent soft silt layers		1			
1					2			1
			- At 0.9m: 150mm thick silt layer		3			
		CH			4			
2					5			2
			- below 2.1m, firm, no silt layers, occasional oxidation					
					6			
3			TEST HOLE TERMINATED AT 3.0M BELOW PAVEMENT SURFACE					3
			NOTES: Neither sloughing nor seepage observed during drilling. Test hole remained open to full depth and was dry prior to backfilling. Test hole backfilled with auger cuttings and bentonite, pavement surface repaired with asphalt.					
4								4
5								5
6								6
7								7
8								8
9								9
10								

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Figure No. A17	Sheet 1 of 1

PROJECT: City of Winnipeg 2021 Streets Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **Mountain - TH05**
CLIENT: Morrison Hershfield	DRILL RIG: Geoprobe	PROJECT No: WX19432
LOCATION: EB Median, 1006 Mountain	DRILL METHOD: 125mm Solid Stem Auger	ELEVATION: Not Surveyed

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

UNCONFINED COMPRESSION (kPa) ▲ 100 200 300 400

POCKET PENETROMETER (kPa) ⊠ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	MUSCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)
0		ASPH	ASPHALT (115mm thick)					0
		CONC	CONCRETE (165mm thick)					
		CH	CLAY (FILL) - gravelly, silty, high plastic, moist, friable, dark grey		1			
			SILT - some clay and sand, low plastic, moist, soft, brown		2			
1		ML			3		Particle Size Analysis - Sample 3 @ 0.9m: Gravel= 0.0% Sand= 13.9% Silt= 73.4% Clay= 12.6%	1
					4			
2			CLAY - silty, high plastic, moist, stiff, brown		5			2
		CH						
3			TEST HOLE TERMINATED AT 3.0M BELOW PAVEMENT SURFACE		6			3
4			NOTES: Neither sloughing nor seepage observed during drilling. Test hole remained open to full depth and was dry prior to backfilling. Test hole backfilled with auger cuttings and bentonite, pavement surface repaired with asphalt.					4
5								5
6								6
7								7
8								8
9								9
10								

20 31 21 20 48 51

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REVIEWED BY: BW	COMPLETION DATE: August 4, 2021
Figure No. A18	Sheet 1 of 1

PROJECT: City of Winnipeg 2021 Streets Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **Mountain - TH06**
CLIENT: Morrison Hershfield	DRILL RIG: Geoprobe	PROJECT No: WX19432
LOCATION: EB Median, 972 Mountain	DRILL METHOD: 125mm Solid Stem Auger	ELEVATION: Not Surveyed

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

UNCONFINED COMPRESSION (kPa) ▲ 100 200 300 400

POCKET PENETROMETER (kPa) ⊠ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	MUSCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)
0		SPH	ASPHALT (50mm thick)					0
		CONC	CONCRETE (175mm thick)		1			
			GRAVEL (FILL) - poorly graded, medium grained, compact (inferred), damp to moist, brown		2			
1		GP			3			1
					4			
2			CLAY - silty, high plastic, moist, stiff, brown		5			2
		CH			6			
3			TEST HOLE TERMINATED AT 3.0M BELOW PAVEMENT SURFACE					3
4			NOTES: Neither sloughing nor seepage observed during drilling. Test hole remained open to full depth and was dry prior to backfilling. Test hole backfilled with auger cuttings and bentonite, pavement surface repaired with asphalt.					4
5								5
6								6
7								7
8								8
9								9
10								

11 10 7 8 41 44

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REVIEWED BY: BW	COMPLETION DATE: August 4, 2021
Figure No. A19	Sheet 1 of 1

PROJECT: City of Winnipeg 2021 Streets Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **Mountain - TH07**
CLIENT: Morrison Hershfield	DRILL RIG: Mobile B40	PROJECT No: WX19432
LOCATION: WB Median, 958 Mountain	DRILL METHOD: 125mm Solid Stem Auger	ELEVATION: Not Surveyed

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

UNCONFINED COMPRESSION (kPa) ▲ 100 200 300 400

POCKET PENETROMETER (kPa) ⊠ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	MUSCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)
0		SPH	ASPHALT (200mm thick)					0
		CONC	CONCRETE (150mm thick)					
			CLAY - silty, high plastic, moist, friable, dark grey to black, occasional organic inclusions		1			
1			- below 0.6m, firm to stiff, brown, no organic inclusions		2			1
					3			
		CH			4		Particle Size Analysis - Sample 3 @ 1.2m: Gravel= 0.0% Sand= 2.4% Silt= 23.7% Clay= 73.9%	
2					5			2
					6			
3			TEST HOLE TERMINATED AT 3.0M BELOW PAVEMENT SURFACE					3
			NOTES: Neither sloughing nor seepage observed during drilling. Test hole remained open to full depth and was dry prior to backfilling. Test hole backfilled with auger cuttings and bentonite, pavement surface repaired with asphalt.					
4								4
5								5
6								6
7								7
8								8
9								9
10								

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LOGGED BY: JW	COMPLETION DEPTH: 3 m
REVIEWED BY: BW	COMPLETION DATE: August 18, 2021
Figure No. A20	Sheet 1 of 1

WX19432 MORRISON HERSHFIELD - CITY OF WINNIPEG STREETS INVESTIGATION 2021.GPJ 21/09/28 08:10 AM (WPG - GEOTECH LOG 1 (LABELLED MC))

PROJECT: City of Winnipeg 2021 Streets Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **Mountain - TH08**
CLIENT: Morrison Hershfield	DRILL RIG: Geoprobe	PROJECT No: WX19432
LOCATION: WB Median, 902 Mountain	DRILL METHOD: 125mm Solid Stem Auger	ELEVATION: Not Surveyed

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

UNCONFINED COMPRESSION (kPa) ▲ 100 200 300 400

POCKET PENETROMETER (kPa) ⊠ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	USCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)
0		SPH	ASPHALT (200mm thick)					0
		CONC	CONCRETE (300 mm thick)					
		CH	CLAY - silty, high plastic, moist, friable, dark grey, occasional organic inclusions		1			
					2			
1			SILT - low plastic, moist, soft, brown					1
		ML			3			
			- below 1.5m, and clay, stiff		4			
2			CLAY - silty, trace sand, high plastic, moist, stiff, brown					2
					5			
		CH					Particle Size Analysis - Sample 5 @ 2.1m: Gravel= 0.0% Sand= 1.1% Silt= 24.0% Clay= 74.9%	
3					6			3
			TEST HOLE TERMINATED AT 3.0M BELOW PAVEMENT SURFACE					
			NOTES: Neither sloughing nor seepage observed during drilling. Test hole remained open to full depth and was dry prior to backfilling. Test hole backfilled with auger cuttings and bentonite, pavement surface repaired with asphalt.					
4								4
5								5
6								6
7								7
8								8
9								9
10								

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LOGGED BY: JW	COMPLETION DEPTH: 3 m
REVIEWED BY: BW	COMPLETION DATE: August 5, 2021
Figure No. A21	Sheet 1 of 1

PROJECT: City of Winnipeg 2021 Streets Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **Mountain - TH09**
CLIENT: Morrison Hershfield	DRILL RIG: Geoprobe	PROJECT No: WX19432
LOCATION: WB Median, 862 Mountain	DRILL METHOD: 125mm Solid Stem Auger	ELEVATION: Not Surveyed

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

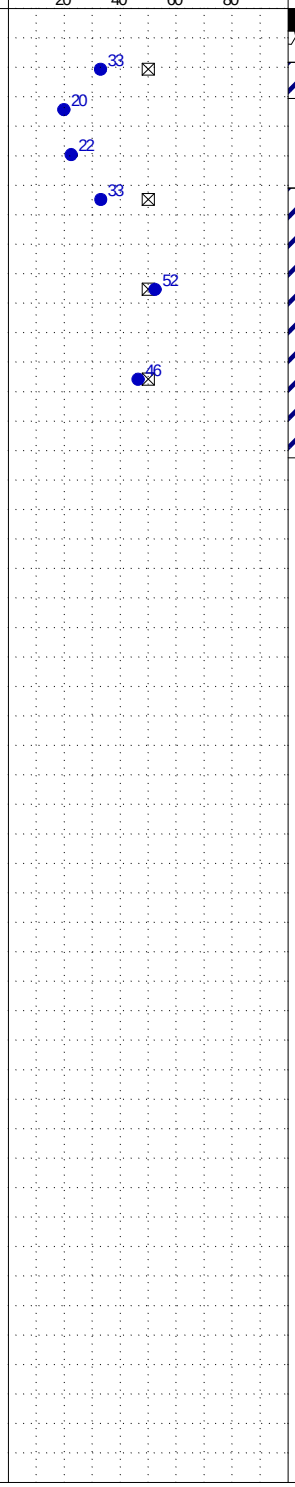
BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

UNCONFINED COMPRESSION (kPa) ▲ 100 200 300 400

POCKET PENETROMETER (kPa) ⊠ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	MUSCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)
0		SPH	ASPHALT (150mm thick)					0
		CONC	CONCRETE (200mm thick)					
		CH	CLAY - silty, high plastic, moist, very stiff, dark grey, occasional organic inclusions		1			
			SILT - trace clay and sand, low plastic, moist, soft brown		2			
1		ML			3			1
			CLAY - silty, high plastic, moist, very stiff, brown		4			
2		CH			5			2
					6			
3			TEST HOLE TERMINATED AT 3.0M BELOW PAVEMENT SURFACE					3
			NOTES: Neither sloughing nor seepage observed during drilling. Test hole remained open to full depth and was dry prior to backfilling. Test hole backfilled with auger cuttings and bentonite, pavement surface repaired with asphalt.					
4								4
5								5
6								6
7								7
8								8
9								9
10								



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LOGGED BY: JW	COMPLETION DEPTH: 3 m
REVIEWED BY: BW	COMPLETION DATE: August 4, 2021
Figure No. A22	Sheet 1 of 1

WX19432 MORRISON HERSHFIELD - CITY OF WINNIPEG STREETS INVESTIGATION 2021.GPJ 21/09/28 08:10 AM (WPG - GEOTECH LOG 1 (LABELLED MC))

PROJECT: City of Winnipeg 2021 Streets Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **Mountain - TH10**
CLIENT: Morrison Hershfield	DRILL RIG: Geoprobe	PROJECT No: WX19432
LOCATION: WB Median, 834 Mountain	DRILL METHOD: 125mm Solid Stem Auger	ELEVATION: Not Surveyed

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

UNCONFINED COMPRESSION (kPa) 100 200 300 400

POCKET PENETROMETER (kPa) 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	USCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)
0		SPH	ASPHALT (175mm thick)					0
		CONC	CONCRETE (325mm thick)					
		CH	CLAY - silty, high plastic, moist, friable, dark grey, occasional organic inclusions		1			
					2			
1		ML	SILT - low plastic, moist, soft, brown					1
					3			
			CLAY - silty, high plastic, moist, stiff, brown		4		Particle Size Analysis - Sample 4 @ 1.5m: Gravel= 0.0% Sand= 0.5% Silt= 14.5% Clay= 85.0%	
2		CH			5			2
3					6			3
			TEST HOLE TERMINATED AT 3.0M BELOW PAVEMENT SURFACE					
			NOTES: Neither sloughing nor seepage observed during drilling. Test hole remained open to full depth and was dry prior to backfilling. Test hole backfilled with auger cuttings and bentonite, pavement surface repaired with asphalt.					
4								4
5								5
6								6
7								7
8								8
9								9
10								

28 24 21 54 50 41

WX19432 MORRISON HERSHFIELD - CITY OF WINNIPEG STREETS INVESTIGATION 2021.GPJ 21/09/28 08:10 AM (WPG - GEOTECH LOG 1 (LABELLED MC))

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LOGGED BY: JW	COMPLETION DEPTH: 3 m
REVIEWED BY: BW	COMPLETION DATE: August 5, 2021
Figure No. A23	Sheet 1 of 1

PROJECT: City of Winnipeg 2021 Streets Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **Mountain - TH11**
CLIENT: Morrison Hershfield	DRILL RIG: Mobile B40	PROJECT No: WX19432
LOCATION: EB Median, 794 Mountain	DRILL METHOD: 125mm Solid Stem Auger	ELEVATION: Not Surveyed

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

UNCONFINED COMPRESSION (kPa) 100 200 300 400

POCKET PENETROMETER (kPa) 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	MUSCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)
0		SPH	ASPHALT (100mm thick)					0
		GP	GRAVEL (FILL) - poorly graded, coarse grained, loose (inferred), wet, brown		1			
		CONC	CONCRETE (275mm thick)					
			CLAY - silty, high plastic, moist, firm to stiff, brown		2			
1			- at 1.2m, soft to firm "and silt" layer 150 mm thick		3			1
		CH	- below 1.5m, stiff		4			
2					5			2
					6			
3			TEST HOLE TERMINATED AT 3.0M BELOW PAVEMENT SURFACE					3
4			NOTES: Neither sloughing nor seepage observed during drilling. Test hole remained open to full depth and was dry prior to backfilling. Test hole backfilled with auger cuttings and bentonite, pavement surface repaired with asphalt.					4
5								5
6								6
7								7
8								8
9								9
10								

34 31 25 40 47 65

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LOGGED BY: JW	COMPLETION DEPTH: 3 m
REVIEWED BY: BW	COMPLETION DATE: August 19, 2021
Figure No. A24	Sheet 1 of 1

WX19432 MORRISON HERSHFIELD - CITY OF WINNIPEG STREETS INVESTIGATION 2021.GPJ 21/09/28 08:10 AM (WPG - GEOTECH LOG 1 (LABELLED MC))

PROJECT: City of Winnipeg 2021 Streets Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **Mountain - TH12**
CLIENT: Morrison Hershfield	DRILL RIG: Mobile B40	PROJECT No: WX19432
LOCATION: WB Median, 772 Mountain	DRILL METHOD: 125mm Solid Stem Auger	ELEVATION: Not Surveyed

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

UNCONFINED COMPRESSION (kPa) 100 200 300 400

POCKET PENETROMETER (kPa) 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	USCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)
0	ASPH		ASPHALT (100mm thick)					0
	CONC		CONCRETE (200 mm thick)					
		CH	CLAY - silty, high plastic, moist, friable, black, frequent organic inclusions		1			
			SILT - low plastic, moist, soft, brown		2			
1		ML						1
			CLAY - silty, high plastic, moist, firm to stiff, brown		3			
2		CH			4			2
					5			
3			TEST HOLE TERMINATED AT 3.0M BELOW PAVEMENT SURFACE					3
4								4
5								5
6								6
7								7
8								8
9								9
10								

NOTES:
Neither sloughing nor seepage observed during drilling
Test hole remained open to full depth and was dry prior to backfilling.
Test hole backfilled with auger cuttings and bentonite, pavement surface repaired with asphalt.

Unconfined compression (kPa): 24, 24, 34, 28, 54

WX19432 MORRISON HERSHFIELD - CITY OF WINNIPEG STREETS INVESTIGATION 2021.GPJ 21/09/28 08:10 AM (WPG - GEOTECH LOG 1 (LABELLED MC))

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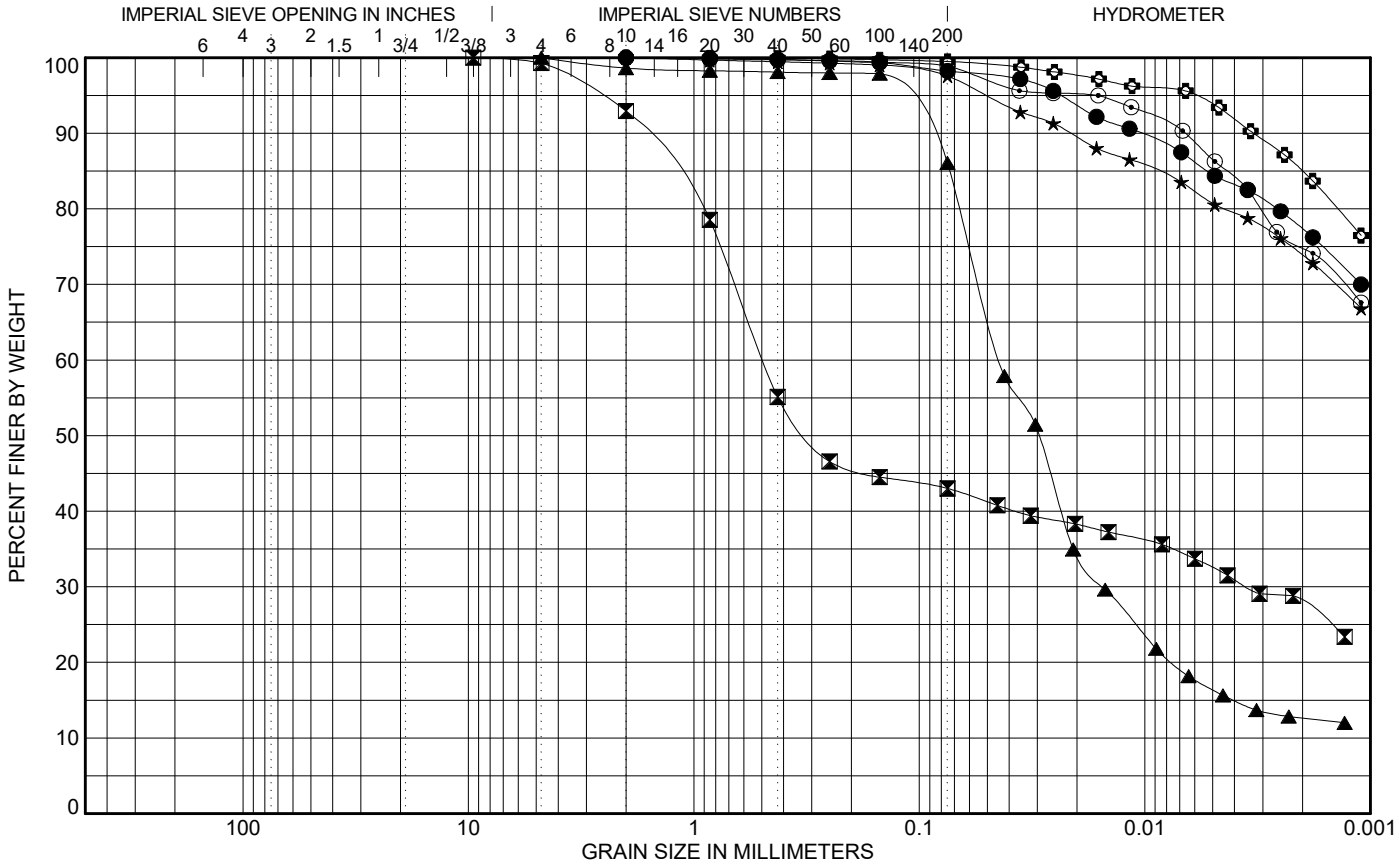
LOGGED BY: JW	COMPLETION DEPTH: 3 m
REVIEWED BY: BW	COMPLETION DATE: August 18, 2021
Figure No. A25	Sheet 1 of 1

PARTICLE SIZE ANALYSIS

Report Date: 28 September 2021

Client		**Project**	
Name:	Morrison Hershfield	**Name:**	City of Winnipeg 2021 Streets Investigation
Address:		**Address:**	Mountain Avenue / McGregor Street
Attention:		**Project No.:**	WX19432
PO Number:		**Manager:**	JW

Gradation Specification:



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample ID	mUSCS	MC	D100	D60	D30	D10	LL	PL	% Gravel	% Sand	% Fines
● Mountain - TH02, 1.2 m	CH	33.1	2				81	22	0	2	21 (Silt) : 77 (Clay)
⊠ Mountain - TH03, 1.2 m	SC	20.1	9.5	0.5	0		53	15	1	56	15 (Silt) : 28 (Clay)
▲ Mountain - TH05, 0.9 m	CH	20.9	4.8	0	0		21	17	0	14	73 (Silt) : 13 (Clay)
★ Mountain - TH07, 1.2 m	CH	37.9	2				67	21	0	2	24 (Silt) : 74 (Clay)
⊙ Mountain - TH08, 2.1 m	CH	43.4	2				79	22	0	1	24 (Silt) : 75 (Clay)
✿ Mountain - TH10, 1.5 m	CH	53.7	2				91	25	0	1	15 (Silt) : 85 (Clay)