APPENDIX ‘A’

GEOTECHNICAL INVESTIGATION REPORT

Final Report - Geotechnical Investigation

City of Winnipeg Street Investigation – Nairn Avenue
Winnipeg, Manitoba
WX19497
26 November 2021

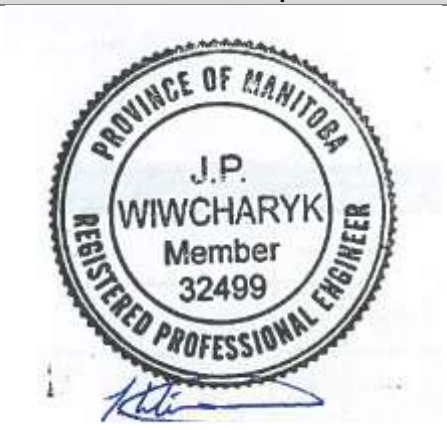
Environment & Infrastructure Solutions
440 Dovercourt Drive, Winnipeg Manitoba, Canada R3Y 1N4
Phone: (204) 488-2997
www.woodplc.com

Final Report - Geotechnical Investigation
City of Winnipeg Street Investigation – Nairn Avenue
Wood Project Number - WX19497

Prepared for:	Dillon Consulting 1558 Willson Place Winnipeg, Manitoba R3T 0Y4
Contact:	Tina Sontag
Report Distribution:	
Dillon Consulting:	Tina Sontag
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	

Rev.	Date	Revision Notes
0	18 Nov. 2021	Issued Preliminary to Client
1	25 Nov. 2021	Issued Final to Client

Permit Stamp	Engineer Seal
	

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Appendix A

Nairn Avenue

1.0 Introduction

At the authorization of Tina Sontag of Dillon Consulting (Dillon), 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 reconstruction and rehabilitation for eight locations along Nairn Avenue 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
Nairn Avenue	Watt Street to Stadacona Street	8	8	TH21-01 to TH21-08
	Total	**8**	**8**	

The geotechnical investigation was completed in accordance with the Scope of Work and Terms and Conditions outlined in Wood Proposal No. WPG2021.647, dated 23 September 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 29 October and 10 November 2021, Wood supervised the drilling and coring of six of the eight test holes along Nairn Avenue, with the remaining two holes (TH21-03 and TH21-07) having been completed on 17 November 2021. The test hole locations are illustrated in Figure A1. All locations were cored using a 150 mm or 200 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 Dillon, however underground utilities required some adjustments to the original test hole locations. Test holes were advanced to depths ranging between about 3 m and 3.7 m below the surface, as required to achieve the target depths requested by Dillon.

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 the Winnipeg laboratory to be measured and photographed. The core photos and underlying pavement structure information are provided in Appendix A.

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 Additional samples were collected at about 3.0 m and 3.7 m at test hole locations TH21-01, TH21-05 and TH21-08. 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 1.1 and 1.4 m below the pavement structure. 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 Appendix A.

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 Appendix A, while laboratory testing result summaries are also provided in Appendix A.

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

Table 3-1: Nairn Avenue Pavement Summary

Test Hole Number	Street Location	Asphalt Thickness (mm)	Concrete Thickness (mm)
TH21-01	314 Nairn Ave, EB Median	50	200 (rubble)
TH21-02	334 Nairn Ave, EB Median	100	150 (rubble)
TH21-03	346 Nairn Ave, EB Median	100	200 (rubble)
TH21-04	375 Nairn Ave, EB Median	50	250
TH21-05	401 Nairn Ave, WB Median	200	200 (rubble)
TH21-06	425 Nairn Ave, EB Median	150	100 (partial rubble)
TH21-07	437 Nairn Ave, EB Median	125	175
TH21-08	459 Nairn Ave, WB Median	50	200

4.0 Soil Condition Summary

4.1 Stratigraphy

Consistent with the regional geology, the stratigraphy encountered at the test holes consisted of the following as noted in descending order from grade:

- Asphalt

- Concrete
- Granular Fill (TH21-06 and TH21-08 only)
- Clay Fill (TH21-05 only)
- High Plastic Clay with Silt Layer

A brief description of each of the soil layers listed above is presented in the following sub-sections. For detailed descriptions, Wood's test hole logs in Appendix A should be consulted.

4.1.1 Asphalt

Asphalt pavement was present at the pavement surface in all test holes and ranged between 50 mm and 200 mm in thickness.

4.1.2 Concrete

Concrete pavement was present below the asphalt at all test hole locations and ranged between 150 mm and 200 mm in thickness. At test hole locations TH21-01, TH21-02, TH21-04 and TH21-05 the concrete was not intact and was either retrieved from the test hole as rubble or could not be retrieved.

4.1.3 Granular Fill

Granular fill materials were present below the concrete in test holes TH21-06 and TH21-08, extending to about 0.6 m below the pavement surface at both locations. The granular fill was sandy (TH21-08 only), poorly graded, medium to coarse grained, compact, damp and brown.

4.1.4 Clay Fill

A layer of clay fill was present below the concrete in test hole TH21-05, extending to about 1.2 m below the pavement surface. The clay fill contained some silt and sand, trace gravel and was high plastic, damp to moist, stiff and dark grey.

4.1.5 Lacustrine Clay with Silt Layer

Below the pavement and fill layers, high plastic lacustrine clay was present and extended to the maximum depths explored. Within test holes TH21-03, TH21-04, TH21-06 and TH21-07, a silt layer was present within the clay. The shallow silt layer and clay are described briefly below.

The silt was low plastic, moist, soft to firm, and brown and contained traces of sand and clay. The moisture content of the silt samples collected ranged from 23% to 34%.

The clay was generally silty, high plastic, damp to moist, very stiff, greyish brown becoming brown below about 1.5 m. The clay contained variable amounts of silt, ranging between 16.1% and 57.7%, while sand contents ranged between 1.3% and 17.3%. Gravel content within the clay was generally 0%. Moisture contents of the clay ranged from about 22% to 54%.

4.1.6 Laboratory Testing Summary

Atterberg limit and hydrometer grain size analysis testing was completed on a total of four samples to date, results of the testing are summarized below.

Table 4-1: Summary of Atterberg Limit and Hydrometer Grain Size Analyses

Test Hole	Depth (m)	Atterberg Limit Testing Results			Hydrometer Testing Results			
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Gravel	% Sand	% Silt	% Clay
TH21-01 (CH Clay)	1.4	59	23	36	0.0	5.7	57.7	36.6
TH21-03 (CL-ML Silt)	1.1	23	18	5	0.0	2.8	83.3	13.9
TH21-05 (Clay Fill)	1.1	74	26	48	2.4	17.3	21.7	58.7
TH21-06 (CL-ML Silt)	1.4	27	17	10	0.0	6.4	82.9	10.7
TH21-08 (CH Clay)	1.1	84	28	56	0.0	1.3	16.1	82.6

5.0 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 Dillon Consulting.

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.

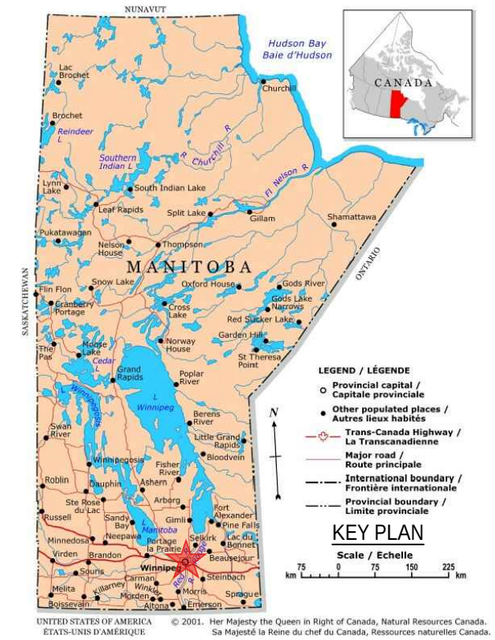
Respectfully submitted,

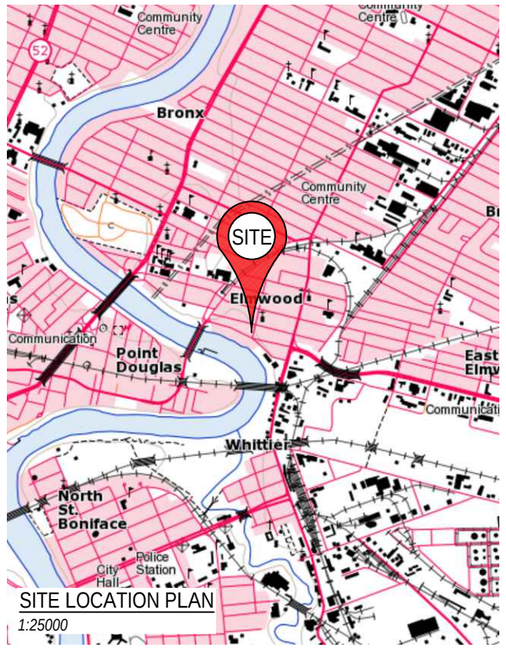
Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited

Appendix A

Nairn Avenue

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





NOTES: SITE FEATURES AND LOCATIONS ARE APPROXIMATE ONLY. IMAGES FROM AUTODESK IMAGERY AND TOPO MAPS.

LEGEND:

TEST HOLE

REVISION	BY	DATE
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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
CITY OF WINNIPEG STREET INVESTIGATION
RFP 437-2021
WINNIPEG, MANITOBA

SITE AND TEST HOLE LOCATION PLAN

DATE:	NOVEMBER 2021
PROJECT NO:	WX19497
REV. NO.:	A
FIGURE NO:	FIGURE 1

Asphalt Thickness (mm)	50
Concrete Thickness (mm)	200

Wood Environment and Infrastructure Solutions

CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE NAIRN AVE-TH21-01
WINNIPEG, MANITOBA

Drawn: JB	Scale: N/A	Date: 17November 2021	Project No.: WX19497	Figure: A2

Asphalt Thickness (mm)	100
Concrete Thickness (mm)	150

Wood Environment and Infrastructure Solutions

CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE NAIRN AVE-TH21-02
WINNIPEG, MANITOBA

Drawn: JB	Scale: N/A	Date: 17 November 2021	Project No.: WX19497	Figure: A3

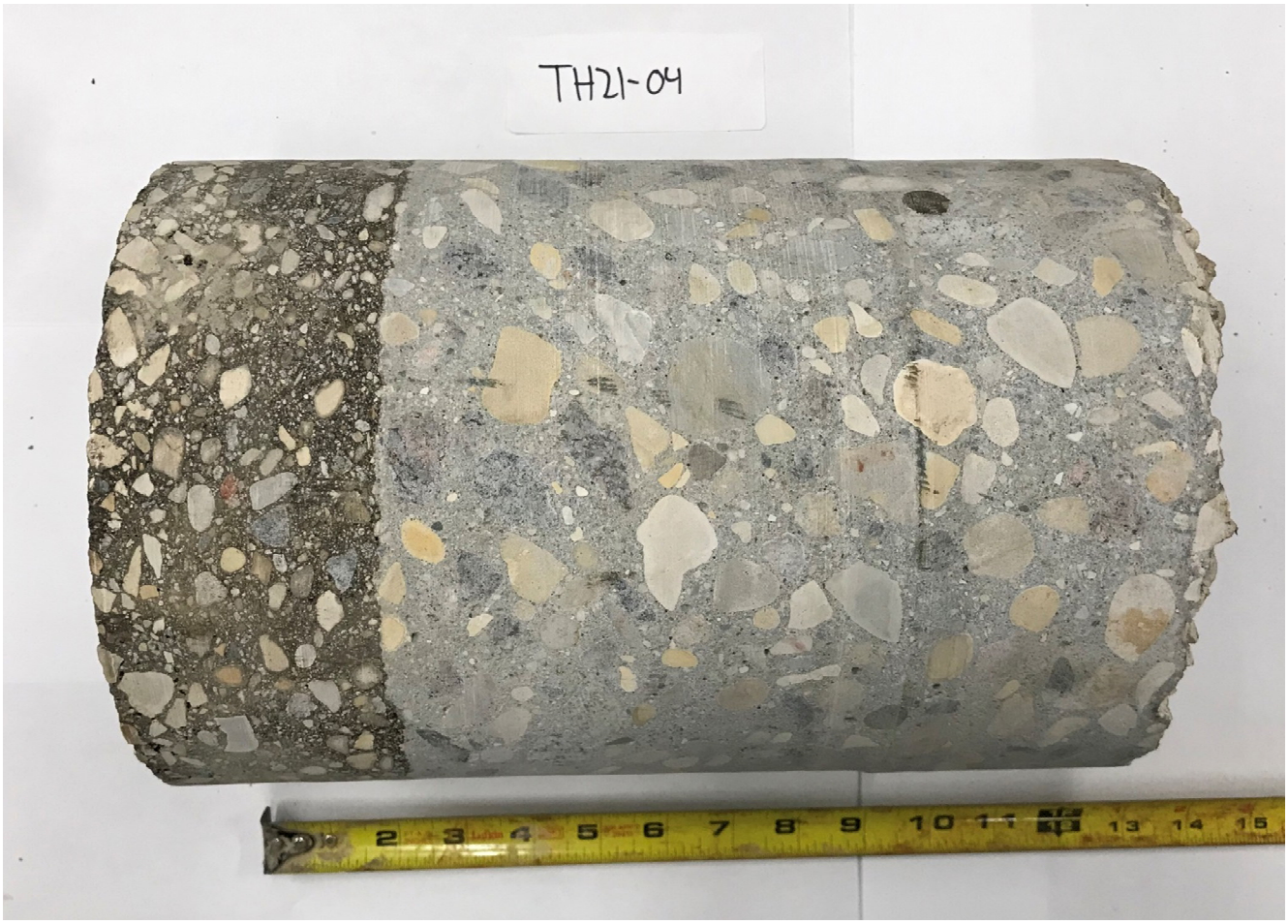
TH21-03

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

CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE NAIRN AVE-TH21-03
WINNIPEG, MANITOBA

Wood Environment and Infrastructure Solutions

Drawn: JB	Scale: N/A	Date: 17 November 2021	Project No.: WX19497	Figure: A4



Asphalt Thickness (mm)	50
Concrete Thickness (mm)	250

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CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE NAIRN AVE-TH21-04
WINNIPEG, MANITOBA

Drawn: JB	Scale: N/A	Date: 17 November 2021	Project No.: WX19497	Figure: A5

Asphalt Thickness (mm)	200
Concrete Thickness (mm)	200 (rubble – no sample)

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CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE NAIRN AVE-TH21-05
WINNIPEG, MANITOBA

Drawn: JB	Scale: N/A	Date: 17 November 2021	Project No.: WX19497	Figure: A6

Asphalt Thickness (mm)	**150**
Concrete Thickness (mm)	**100**

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CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE NAIRN AVE-TH21-06
WINNIPEG, MANITOBA

Drawn: JB	Scale: N/A	Date: 17 November 2021	Project No.: WX19497	Figure: A7

TH21-07

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

CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE NAIRN AVE-TH21-07
WINNIPEG, MANITOBA

Wood Environment and Infrastructure Solutions

Drawn: JB	Scale: N/A	Date: 17 November 2021	Project No.: WX19497	Figure: A8

Asphalt Thickness (mm)	**50**
Concrete Thickness (mm)	**200**

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CORE PHOTOGRAPHS
PAVEMENT CORE SAMPLE NAIRN AVE-TH21-08
WINNIPEG, MANITOBA

Drawn: JB	Scale: N/A	Date: 17 November 2021	Project No.: WX19497	Figure: A9

PROJECT: Nairn Avenue Geotechnical Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **TH21-01**
CLIENT: Dillon Consulting	DRILL RIG: Geoprobe	PROJECT No: WX19497
LOCATION: 314 Nairn Ave, EB Median	DRILL METHOD: 125mm Solid Stem Augers	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 (200mm thick - rubble)		1			
			CLAY - silty, high plastic, damp to moist, very stiff, dark grey, trace organic inclusions					
1			- below 0.6m: and silt, trace sand, moist, dark grey mottled brown, no organic inclusions		2			1
			- below 1.5m: stiff		3			
2		CH			4		Particle Size Analysis - Sample 3 @ 1.4m: Gravel= 0.0% Sand= 5.7% Silt= 57.7% Clay= 36.6%	2
3					5			3
					6			
4			TEST HOLE TERMINATED AT 3.7m BELOW GRADE					4
			NOTES: No sloughing or 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 to match existing.					
5								5
6								6
7								7
8								8
9								9
10								

wood.

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a division of Wood Canada Limited

LOGGED BY: JW	COMPLETION DEPTH: 3.7 m
REVIEWED BY: BW	COMPLETION DATE: October 29, 2021
Figure No. A10	Sheet 1 of 1

WX19497 DILLON CONSULTING - NAIRN AVENUE GEOTECHNICAL INVESTIGATION.GPJ 21/11/25 11:14 AM (WPG - GEOTECH LOG 1 (LABELLED MC))

PROJECT: Nairn Avenue Geotechnical Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **TH21-02**
CLIENT: Dillon Consulting	DRILL RIG: Geoprobe	PROJECT No: WX19497
LOCATION: 334 Nairn Ave, EB Median	DRILL METHOD: 125mm Solid Stem Augers	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
		CONC	CONCRETE (150mm thick - rubble)		1			
			CLAY - silty, high plastic, damp to moist, very stiff, dark grey, trace organic inclusions		2			
1					3			1
					4			
		CH	- below 1.5m: brown		5			
2					6			2
			below 2.4m: stiff					
3			TEST HOLE TERMINATED AT 3.0m BELOW GRADE					3
4			NOTES: No sloughing or 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					4
5								5
6								6
7								7
8								8
9								9
10								

36 31 33 30 30

wood.

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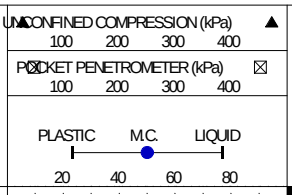
LOGGED BY: JW	COMPLETION DEPTH: 3 m
REVIEWED BY: BW	COMPLETION DATE: October 29, 2021
Figure No. A11	Sheet 1 of 1

WX19497 DILLON CONSULTING - NAIRN AVENUE GEOTECHNICAL INVESTIGATION.GPJ 21/11/25 11:14 AM (WPG - GEOTECH LOG 1 (LABELLED MC))

PROJECT: Nairn Avenue Geotechnical Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **TH21-03**
CLIENT: Dillon Consulting	DRILL RIG: Geoprobe	PROJECT No: WX19497
LOCATION: 346 Nairn, EB Median	DRILL METHOD: 125mm Solid Stem Augers	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



DEPTH (m)	SOIL SYMBOL	MUSCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)
0		ASPH	ASPHALT (100mm thick)					0
		CONC	CONCRETE (200mm thick - rubble)					
			CLAY - silty, high plastic, moist, very stiff, dark grey		1			
1		CH			2			1
			SILT - some clay, trace sand, low plastic, moist, soft, brown		3		Particle Size Analysis - Sample 3 @ 1.1m: Gravel= 0.0% Sand= 2.8% Silt= 83.3% Clay= 13.9%	
2		ML			4			2
					5			
			CLAY - silty, high plastic, moist, stiff, brown		6			
3		CH						3
			TEST HOLE TERMINATED AT 3.0m BELOW GRADE					
4			NOTES: No sloughing or 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					4
5								5
6								6
7								7
8								8
9								9
10								

wood.

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LOGGED BY: JW	COMPLETION DEPTH: 3 m
REVIEWED BY: BW	COMPLETION DATE: November 17, 2021
Figure No. A12	Sheet 1 of 1

PROJECT: Nairn Avenue Geotechnical Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **TH21-04**
CLIENT: Dillon Consulting	DRILL RIG: Geoprobe	PROJECT No: WX19497
LOCATION: 375 Nairn Ave, EB Median	DRILL METHOD: 125mm Solid Stem Augers	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 (250mm thick)					
			CLAY - silty, high plastic, moist, very stiff, dark grey		1			
1		CH			2			1
			SILT - low plastic, very moist, soft, brown		3			
2		ML			4			2
					5			
			CLAY - silty, high plastic, moist, very stiff, brown					
3		CH						3
			TEST HOLE TERMINATED AT 3.0m BELOW GRADE					
			NOTES:					
			No sloughing or 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					
4								4
5								5
6								6
7								7
8								8
9								9
10								

42 (0.5m) 37 (1m) 27 (1.5m) 24 (2m) 33 (2.5m)

WX19497 DILLON CONSULTING - NAIRN AVENUE GEOTECHNICAL INVESTIGATION.GPJ 21/11/25 11:15 AM (WPG - GEOTECH LOG 1 (LABELLED MC))

wood.

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LOGGED BY: JW	COMPLETION DEPTH: 3 m
REVIEWED BY: BW	COMPLETION DATE: October 29, 2021
Figure No. A13	Sheet 1 of 1

PROJECT: Nairn Avenue Geotechnical Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **TH21-05**
CLIENT: Dillon Consulting	DRILL RIG: Mobile B40	PROJECT No: WX19497
LOCATION: 401 Nairn Ave, WB Median	DRILL METHOD: 125mm Solid Stem Augers	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 (200mm thick - rubble)					
		CH	CLAY (FILL) - some silt and sand, trace gravel, high plastic, damp, very stiff, brown		1			
1					2			1
			CLAY - silty, high plastic, moist, stiff, brown				Particle Size Analysis - Sample 2 @ 1.1m: Gravel= 2.4% Sand= 17.3% Silt= 21.7% Clay= 58.7%	
					3			
2		CH			4			2
					5			
3			- below 3.0m: firm					3
					6			
4			TEST HOLE TERMINATED AT 3.7m BELOW GRADE					4
			NOTES: No sloughing or 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					
5								5
6								6
7								7
8								8
9								9
10								

27 29 47 25 44 22

wood.

Wood Environment & Infrastructure Solutions
a division of Wood Canada Limited

LOGGED BY: JW	COMPLETION DEPTH: 3.7 m
REVIEWED BY: BW	COMPLETION DATE: November 5, 2021
Figure No. A14	Sheet 1 of 1

WX19497 DILLON CONSULTING - NAIRN AVENUE GEOTECHNICAL INVESTIGATION.GPJ 21/11/25 11:15 AM (WPG - GEOTECH LOG 1 (LABELLED MC))

PROJECT: Nairn Avenue Geotechnical Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **TH21-06**
CLIENT: Dillon Consulting	DRILL RIG: Mobile B40	PROJECT No: WX19497
LOCATION: 425 Narin Ave, EB Median	DRILL METHOD: 125mm Solid Stem Augers	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 (100mm thick - partial rubble)					
		FILL	GRANULAR FILL - poorly graded, coarse grained, compact (inferred), damp, grey					
			SILT - some clay, trace sand, low plastic, very moist to wet, soft, brown					
1		CL-ML	- below 1.2m: moist					1
2			CLAY - silty, high plastic, moist, stiff, brown				Particle Size Analysis - Sample @1.4m: Gravel= 0.0% Sand= 6.4% Silt= 82.9% Clay= 10.7%	2
3		CH	TEST HOLE TERMINATED AT 3.0m BELOW GRADE					3
			NOTES: No sloughing or 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					
4								4
5								5
6								6
7								7
8								8
9								9
10								

4 34 23 50 37 43

WX19497 DILLON CONSULTING - NAIRN AVENUE GEOTECHNICAL INVESTIGATION.GPJ 21/11/25 11:15 AM (WPG - GEOTECH LOG 1 (LABELLED MC))

wood.

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LOGGED BY: JW	COMPLETION DEPTH: 3 m
REVIEWED BY: BW	COMPLETION DATE: November 5, 2021
Figure No. A15	Sheet 1 of 1

PROJECT: Nairn Avenue Geotechnical Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **TH21-07**
CLIENT: Dillon Consulting	DRILL RIG: Geoprobe	PROJECT No: WX19497
LOCATION: 443 Nairn, EB Median	DRILL METHOD: 125mm Solid Stem Augers	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 (125mm thick)					0
		CONC	CONCRETE (175mm thick)					
		CH	CLAY - silty, high plastic, moist, very stiff, dark grey		1			
			SILT - low plastic, moist, soft, brown		2			
1		ML						1
			CLAY - silty, high plastic, moist, stiff, brown		3			
					4			
2		CH						2
					5			
3					6			3
			TEST HOLE TERMINATED AT 3.0m BELOW GRADE					
			NOTES:					
			No sloughing or 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					
4								4
5								5
6								6
7								7
8								8
9								9
10								

26 (0.5m) 23 (0.8m) 29 (1.3m) 44 (1.8m) 52 (2.4m) 49 (3.0m)

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LOGGED BY: JW	COMPLETION DEPTH: 3 m
REVIEWED BY: BW	COMPLETION DATE: November 17, 2021
Figure No. A16	Sheet 1 of 1

WX19497 DILLON CONSULTING - NAIRN AVENUE GEOTECHNICAL INVESTIGATION.GPJ 21/11/25 11:15 AM (WPG - GEOTECH LOG 1 (LABELLED MC))

PROJECT: Nairn Avenue Geotechnical Investigation	DRILLER: Maple Leaf Drilling	TEST HOLE ID: **TH21-08**
CLIENT: Dillon Consulting	DRILL RIG: Mobile B40	PROJECT No: WX19497
LOCATION: 459 Nairn Ave, WB Median	DRILL METHOD: 125mm Solid Stem Augers	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 (200mm thick)					
		GP	GRAVEL (FILL) - sandy, poorly graded, medium grained, compact (inferred), damp, brown		1			
			- below 0.6m: wet		2			
1			CLAY - some silt, trace sand, high plastic, moist, stiff, brown		3			1
					4		Particle Size Analysis - Sample 3 @ 1.1m: Gravel= 0.0% Sand= 1.3% Silt= 16.1% Clay= 82.6%	
2		CH						2
					5			
3					6			3
4			TEST HOLE TERMINATED AT 3.7m BELOW GRADE					4
5			NOTES: No sloughing or 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 to match existing.					5
6								6
7								7
8								8
9								9
10								

4 17 32 49 54 44

wood.

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LOGGED BY: JW	COMPLETION DEPTH: 3.7 m
REVIEWED BY: BW	COMPLETION DATE: November 5, 2021
Figure No. A17	Sheet 1 of 1

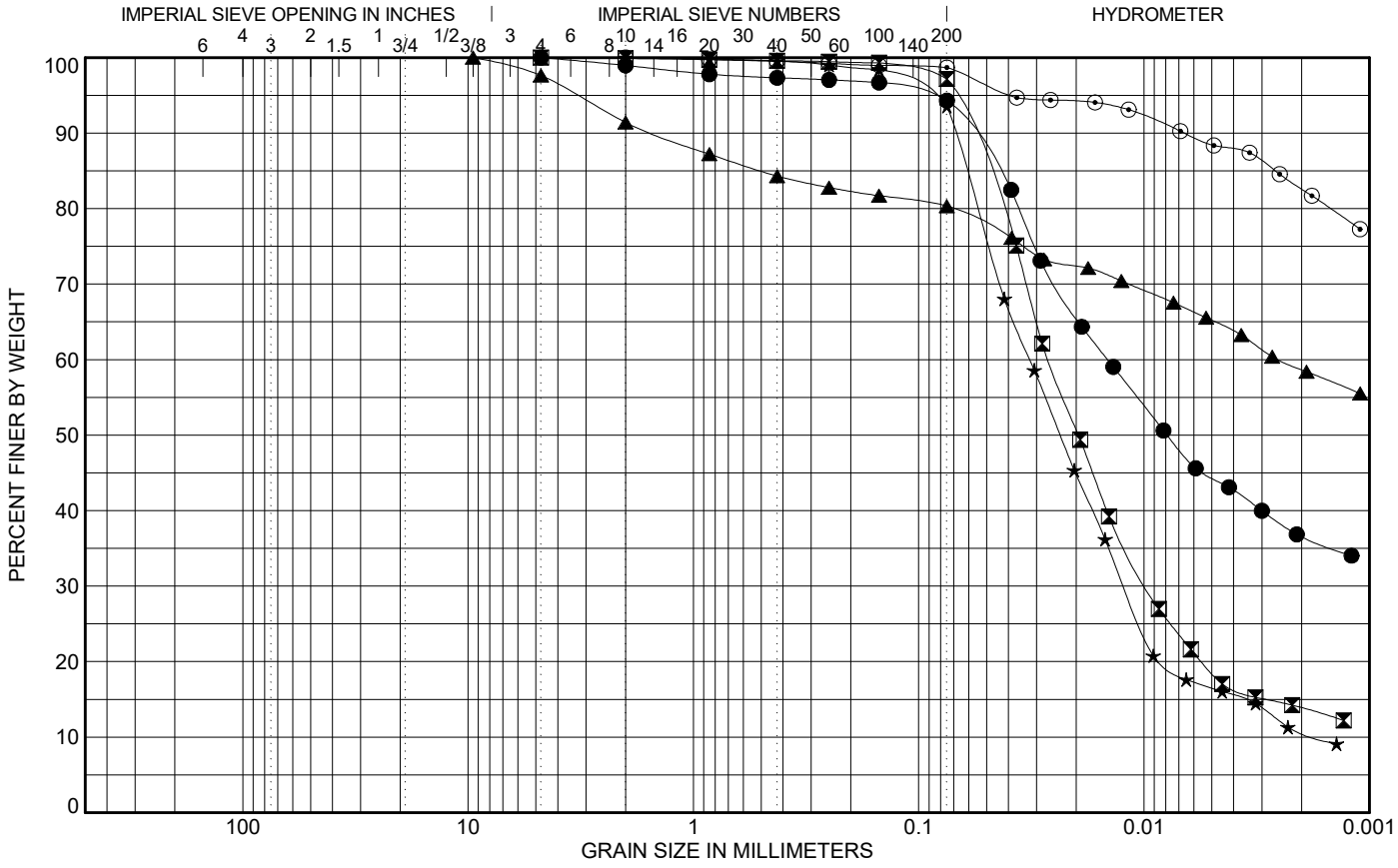
WX19497 DILLON CONSULTING - NAIRN AVENUE GEOTECHNICAL INVESTIGATION.GPJ 21/11/25 11:15 AM (WPG - GEOTECH LOG 1 (LABELLED MC))

PARTICLE SIZE ANALYSIS

Report Date: 25 November 2021

Client		**Project**	
Name:	Dillon Consulting	**Name:**	Nairn Avenue Geotechnical Investigation
Address:	1558 Willson Place, Winnipeg, MB	**Address:**	Nairn Avenue
Attention:	Tina Sontag	**Project No.:**	WX19497
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
●	TH21-01, 1.4 m	CH	29.4	4.8	0			59	23	0	6	58 (Silt) : 37 (Clay)
⊠	TH21-03, 1.1 m	CH	22.8	4.8	0	0		23	18	0	3	83 (Silt) : 14 (Clay)
▲	TH21-05, 1.1 m	CH	29.2	9.5	0			74	26	2	17	22 (Silt) : 59 (Clay)
★	TH21-06, 1.4 m	CH	22.9	2	0	0	0	27	17	0	6	83 (Silt) : 11 (Clay)
⊙	TH21-08, 1.1 m	CH	32.4	2				84	28	0	1	16 (Silt) : 83 (Clay)

California Bearing Ratio

ASTM D1883-16, Soaking Method

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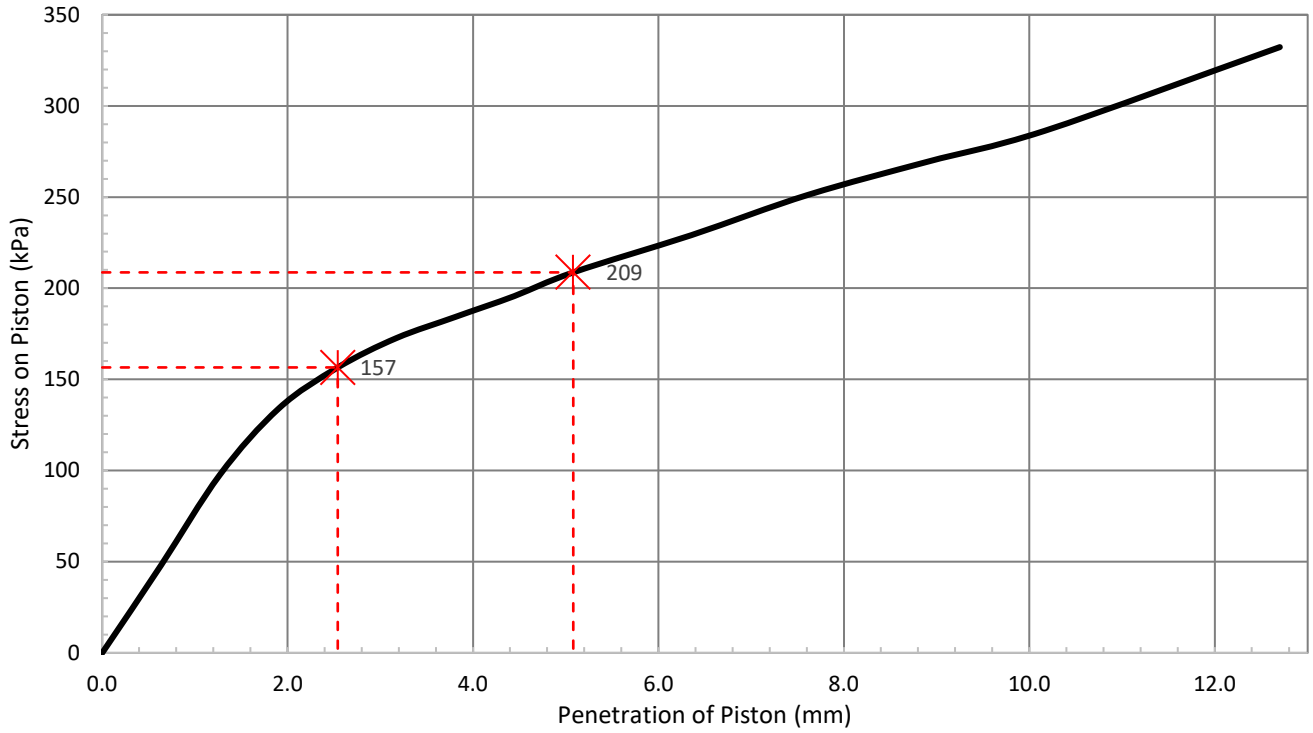
Type of Preparation	Standard ASTM D698	Sample Preparation	Soaked
Maximum Dry Density	1490 kg/m^3	Soaking time	96 hrs
Optimum Moisture Content	25 %	Top 1 Inch Soaked Moisture	33.7 %
Compacted Dry Density	1436 kg/m^3	Bottom 1 Inch Soaked Moisture	32.5 %
Compacted Moisture Content	27.2 %	Average Soaked Moisture	34.7 %
Percent Compaction	96% %	Mass of Surcharge	4.54 kg

Corrected Penetration (mm)	Standard Load of Crushed Stone (kPa)	Corrected Load (kPa)	CBR (%)
2.540	6900	157	**2.3**
5.080	10300	209	**2.0**



Client:	Dillon Consulting	Project:	Nairn Avenue Geotechnical Inv.
Project No:	WX19497	Site Location:	314 Nairn Avenue, EB Median
Date:	November 17, 2021	Test Hole No:	TH21-01
Technologist:	Mdnazri Mohidin	Reviewed By:	Jorden Wiwcharyk

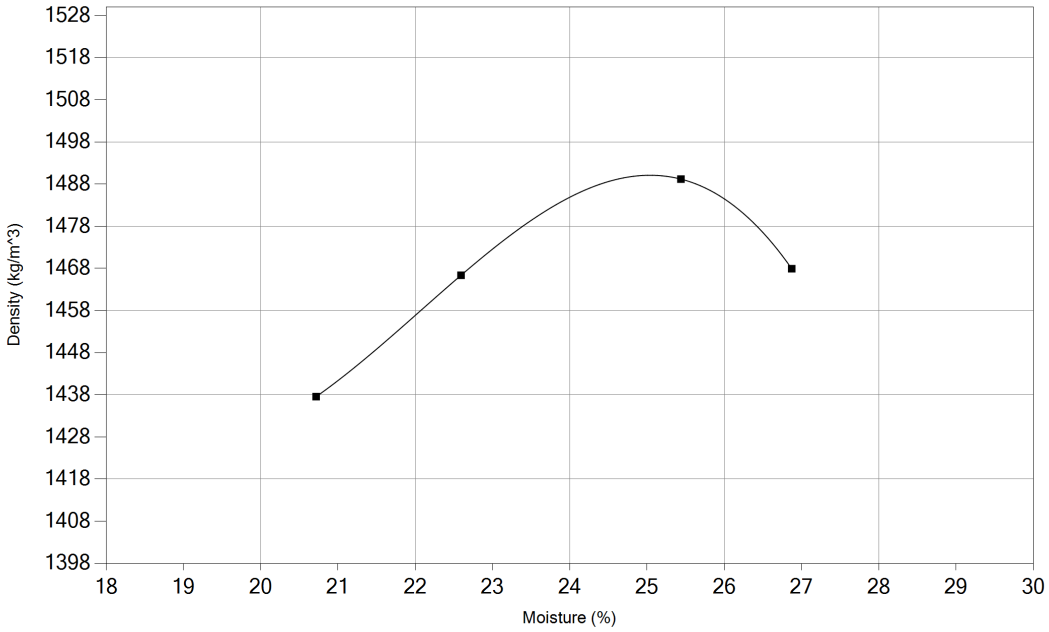
Soil Description: Clay - silty, high plastic, moist, stiff, brown

Liquid Limit 59 Plastic Limit 23 Plasticity Index 36 Swell 7.51%

Moisture / Density Relationship

Report Date: November 17, 2021

Client		Project	
Name:	Dillon Consulting	**Name:**	(WX19497) Nairn Avenue Geotechnical Investigation
Address:	1558 Willson Place Winnipeg, MB R3T 0Y4	**Address:**	Winnipeg, Manitoba
Attention:	William Kavanagh	**Phase:**	NA **Task:** NA
PO Number:		**Manager:**	Jorden Wiwcharyk
Sample Date:	11/5/2021 by Jorden Wiwcharyk	**Lab/Ref. #:**	WX19497-TH01
Source:	TH01- S1 to S6	**Description:**	Clay



Moisture Density Relationship: (ASTM D698-12) Method: A

Preparation Method: Dry **Rammer Type:**Mechanical

Maximum Density (kg/m^3): 1490

Optimum Moisture (%): 25.0

Remarks:

Distribution: Jorden Peter Wiwcharyk

Reviewed By: Jorden Wiwcharyk

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CCIL Certified Aggregate Type C, Type D & Concrete Aggregate Type R in accordance with CSA A283-19

California Bearing Ratio

ASTM D1883-16, Soaking Method

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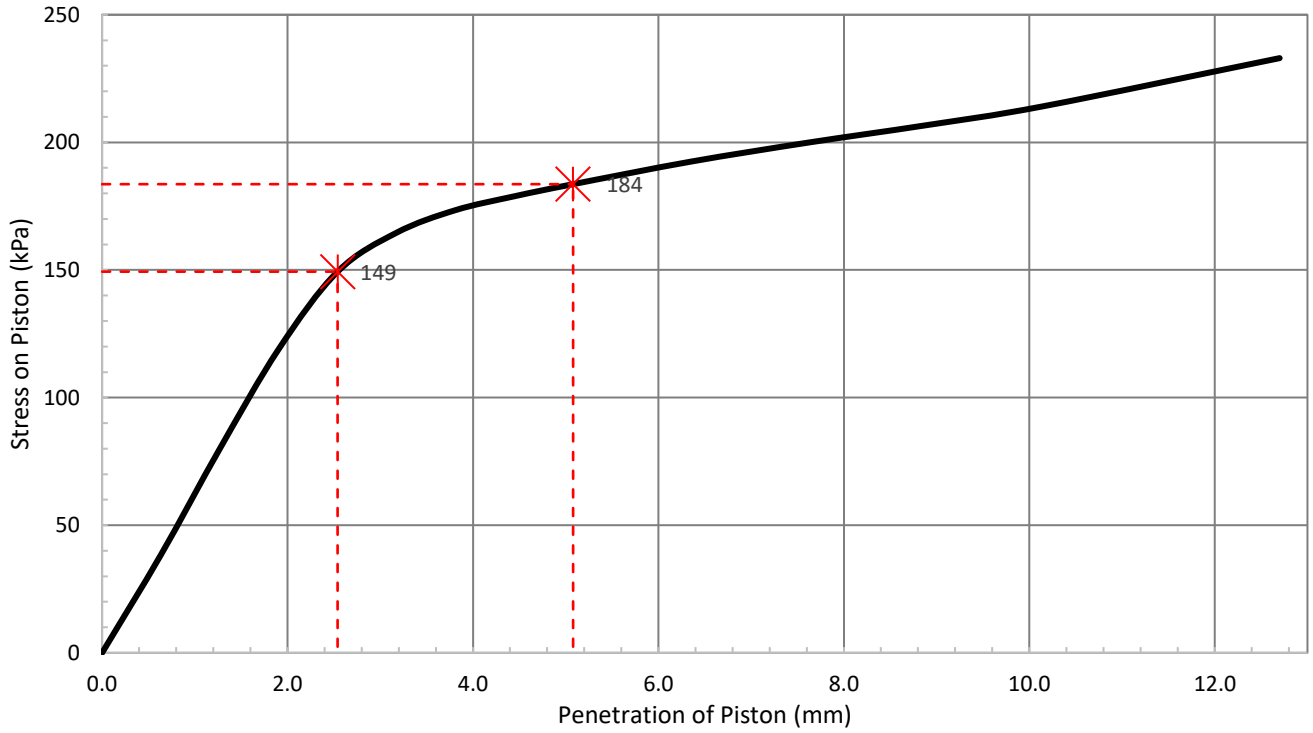
Type of Preparation	Standard ASTM D698	Sample Preparation	Soaked
Maximum Dry Density	1460 kg/m^3	Soaking time	96 hrs
Optimum Moisture Content	28.1 %	Top 1 Inch Soaked Moisture	39.3 %
Compacted Dry Density	1394 kg/m^3	Bottom 1 Inch Soaked Moisture	39.2 %
Compacted Moisture Content	28.4 %	Average Soaked Moisture	37.0 %
Percent Compaction	95% %	Mass of Surcharge	4.54 kg

Corrected Penetration (mm)	Standard Load of Crushed Stone (kPa)	Corrected Load (kPa)	CBR (%)
2.540	6900	149	**2.2**
5.080	10300	184	**1.8**



Client:	Dillon Consulting	Project:	Nairn Avenue Geotechnical Inv.
Project No:	WX19497	Site Location:	346 Nairn Avenue, EB Median
Date:	November 29, 2021	Test Hole No:	TH21-03
Technologist:	Mdnazri Mohidin	Reviewed By:	Jorden Wiwcharyk

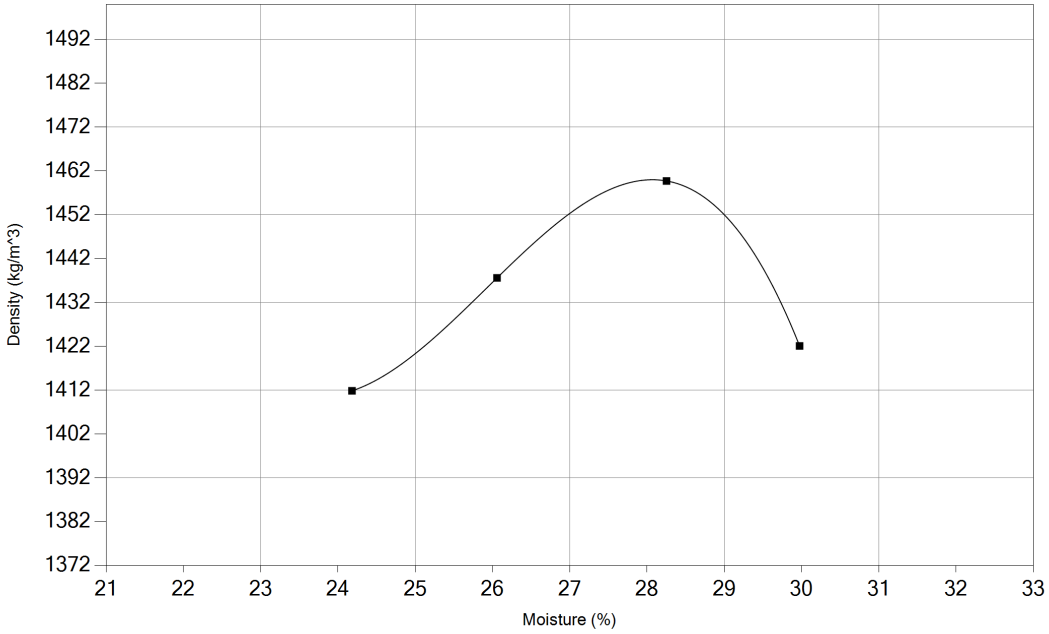
Soil Description: Clay - silty, high plastic, moist, stiff, brown

Liquid Limit - Plastic Limit - Plasticity Index - Swell 8.12%

Moisture / Density Relationship

Report Date: November 25, 2021

Client		Project	
Name:	Dillon Consulting	**Name:**	(WX19497) Nairn Avenue Geotechnical Investigation
Address:	1558 Willson Place Winnipeg, MB R3T 0Y4	**Address:**	Winnipeg, Manitoba
Attention:	William Kavanagh	**Phase:**	NA **Task:** NA
PO Number:		**Manager:**	Jorden Wiwcharyk
Sample Date:	11/5/2021 by Jorden Wiwcharyk	**Lab/Ref. #:**	WX19497-TH03
Source:	TH03 & TH02	**Description:**	Clay



Moisture Density Relationship: (ASTM D698-12) Method: A

Preparation Method: Dry **Rammer Type:**Mechanical

Maximum Density (kg/m^3): 1460

Optimum Moisture (%): 28.1

Remarks:

Distribution: Jorden Peter Wiwcharyk

Reviewed By: Jorden Wiwcharyk

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CCIL Certified Aggregate Type C, Type D & Concrete Aggregate Type R in accordance with CSA A283-19

California Bearing Ratio

ASTM D1883-16, Soaking Method

Wood Environment & Infrastructure Solutions
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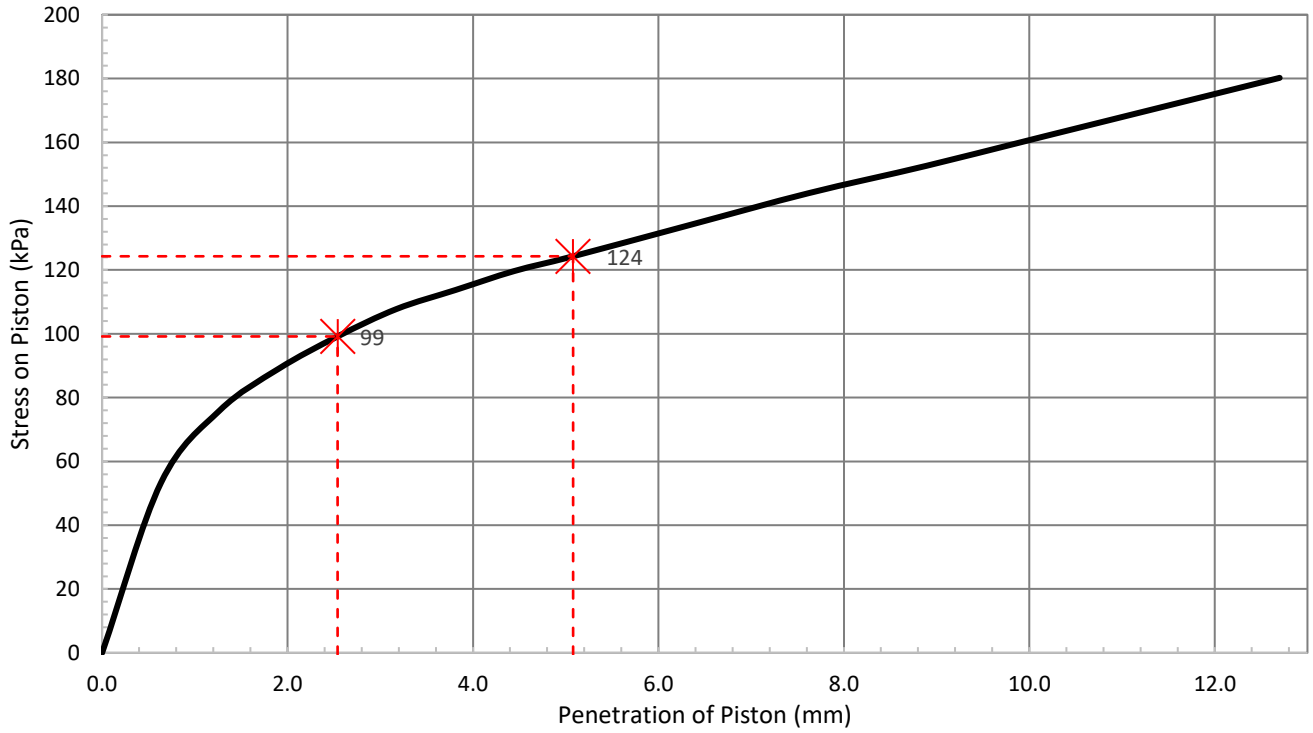
Type of Preparation	Standard ASTM D698	Sample Preparation	Soaked
Maximum Dry Density	1566 kg/m^3	Soaking time	96 hrs
Optimum Moisture Content	22.1 %	Top 1 Inch Soaked Moisture	36.3 %
Compacted Dry Density	1493 kg/m^3	Bottom 1 Inch Soaked Moisture	26.4 %
Compacted Moisture Content	27.2 %	Average Soaked Moisture	29.9 %
Percent Compaction	95% %	Mass of Surcharge	4.54 kg

Corrected Penetration (mm)	Standard Load of Crushed Stone (kPa)	Corrected Load (kPa)	CBR (%)
2.540	6900	99	**1.4**
5.080	10300	124	**1.2**



Client:	Dillon Consulting	Project:	Nairn Avenue Geotechnical Inv.
Project No:	WX19497	Site Location:	401 Nairn Avenue, WB Median
Date:	November 23, 2021	Test Hole No:	TH21-05
Technologist:	Mdnazri Mohidin	Reviewed By:	Jorden Wiwcharyk

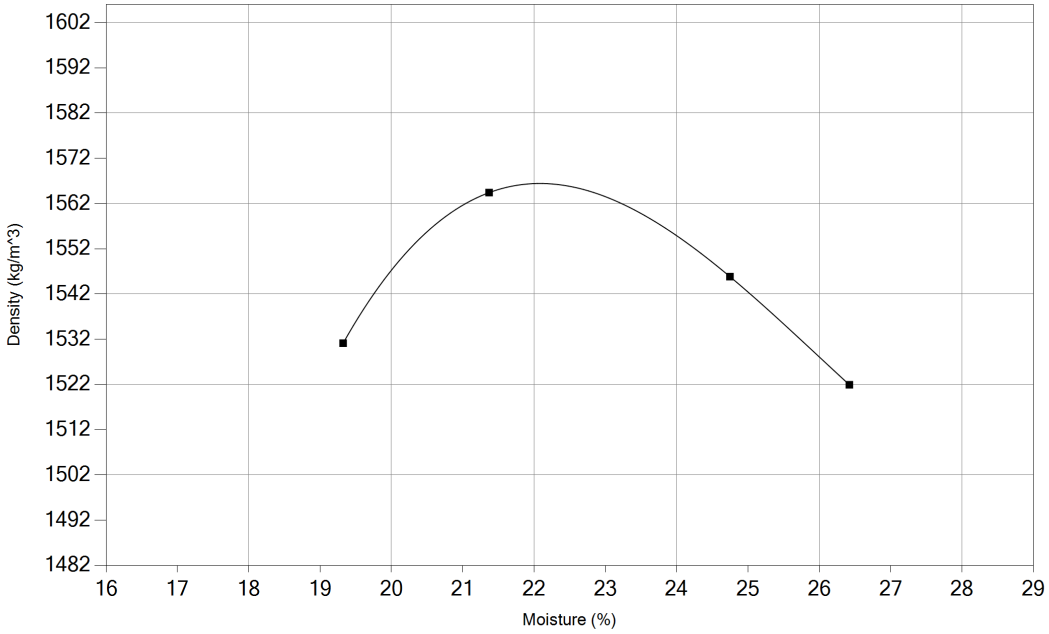
Soil Description: Clay - silty, high plastic, moist, stiff, brown

Liquid Limit 74 Plastic Limit 26 Plasticity Index 48 Swell 16.37%

Moisture / Density Relationship

Report Date: November 25, 2021

Client		Project	
Name:	Dillon Consulting	**Name:**	(WX19497) Nairn Avenue Geotechnical Investigation
Address:	1558 Willson Place Winnipeg, MB R3T 0Y4	**Address:**	Winnipeg, Manitoba
Attention:	William Kavanagh	**Phase:**	NA **Task:** NA
PO Number:		**Manager:**	Jorden Wiwcharyk
Sample Date:	11/5/2021 by Jorden Wiwcharyk	**Lab/Ref. #:**	WX19497-TH05
Source:	TH05- S1 to S6	**Description:**	Clay



Moisture Density Relationship: (ASTM D698-12) Method: A

Preparation Method: Dry **Rammer Type:**Mechanical

Maximum Density (kg/m^3): 1566

Optimum Moisture (%): 22.1

Remarks:

Distribution: Jorden Peter Wiwcharyk

Reviewed By: Jorden Wiwcharyk

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California Bearing Ratio

ASTM D1883-16, Soaking Method

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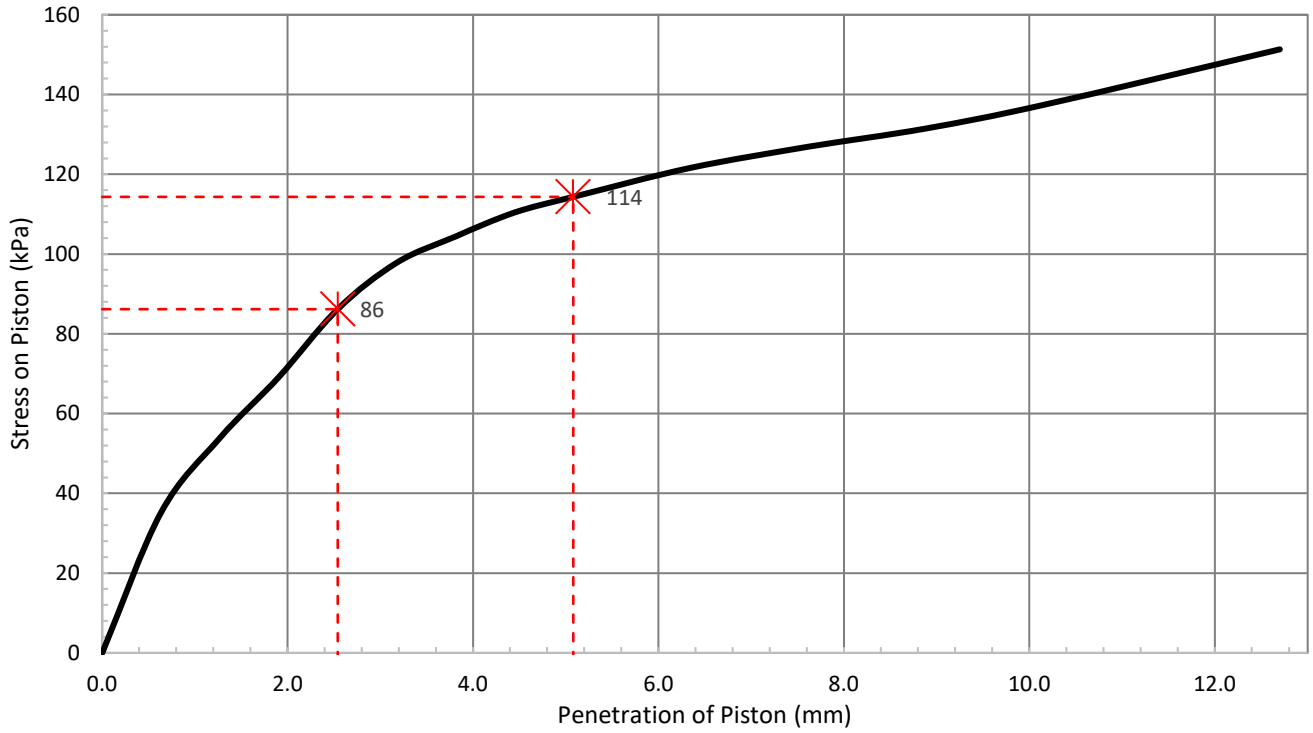
Type of Preparation	Standard ASTM D698	Sample Preparation	Soaked
Maximum Dry Density	1446 kg/m^3	Soaking time	96 hrs
Optimum Moisture Content	27.5 %	Top 1 Inch Soaked Moisture	35.5 %
Compacted Dry Density	1379 kg/m^3	Bottom 1 Inch Soaked Moisture	32.2 %
Compacted Moisture Content	27.2 %	Average Soaked Moisture	33.5 %
Percent Compaction	95% %	Mass of Surcharge	4.54 kg

Corrected Penetration (mm)	Standard Load of Crushed Stone (kPa)	Corrected Load (kPa)	CBR (%)
2.540	6900	86	**1.2**
5.080	10300	114	**1.1**



Client:	Dillon Consulting	Project:	Nairn Avenue Geotechnical Inv.
Project No:	WX19497	Site Location:	425 Nairn Avenue, EB Median
Date:	November 17, 2021	Test Hole No:	TH21-06
Technologist:	Mdnazri Mohidin	Reviewed By:	Jorden Wiwcharyk

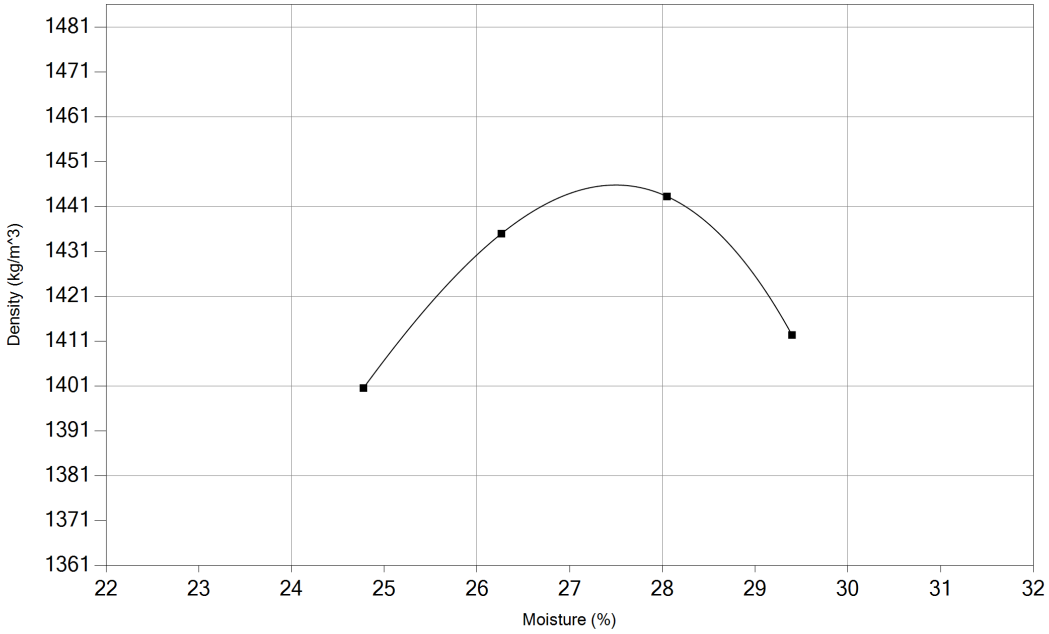
Soil Description: Clay - silty, high plastic, moist, stiff, brown

Liquid Limit - Plastic Limit - Plasticity Index - Swell 14.53%

Moisture / Density Relationship

Report Date: November 25, 2021

Client		Project	
Name:	Dillon Consulting	**Name:**	(WX19497) Nairn Avenue Geotechnical Investigation
Address:	1558 Willson Place Winnipeg, MB R3T 0Y4	**Address:**	Winnipeg, Manitoba
Attention:	William Kavanagh	**Phase:**	NA **Task:** NA
PO Number:		**Manager:**	Jorden Wiwcharyk
Sample Date:	11/5/2021 by Jorden Wiwcharyk	**Lab/Ref. #:**	WX19497-TH06
Source:	TH06 & TH07	**Description:**	Clay



Moisture Density Relationship: (ASTM D698-12) Method: A

Preparation Method: Dry **Rammer Type:**Mechanical

Maximum Density (kg/m^3): 1446

Optimum Moisture (%): 27.5

Remarks:

Distribution: Jorden Peter Wiwcharyk

Reviewed By: Jorden Wiwcharyk

Reporting of these results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

California Bearing Ratio

ASTM D1883-16, Soaking Method

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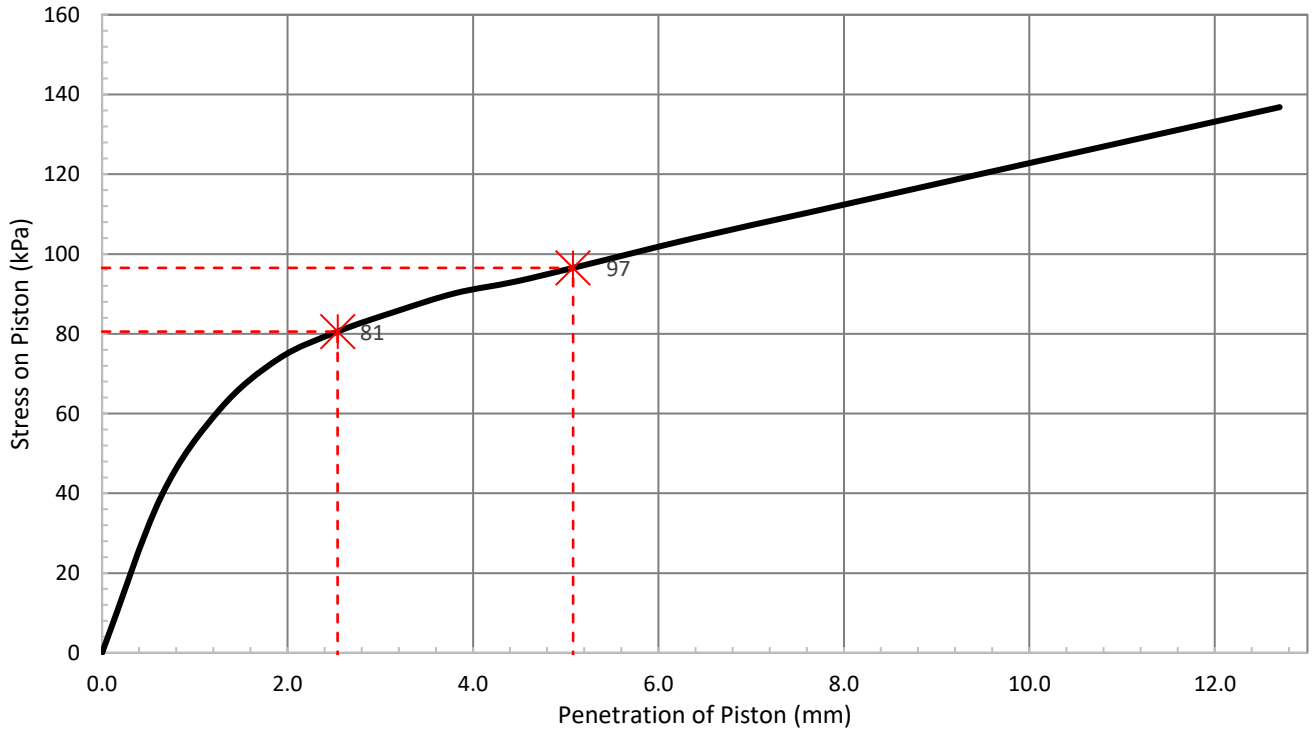
Type of Preparation	Standard ASTM D698	Sample Preparation	Soaked
Maximum Dry Density	1476 kg/m^3	Soaking time	96 hrs
Optimum Moisture Content	26.1 %	Top 1 Inch Soaked Moisture	39.3 %
Compacted Dry Density	1408 kg/m^3	Bottom 1 Inch Soaked Moisture	32.1 %
Compacted Moisture Content	27.2 %	Average Soaked Moisture	34.6 %
Percent Compaction	95% %	Mass of Surcharge	4.54 kg

Corrected Penetration (mm)	Standard Load of Crushed Stone (kPa)	Corrected Load (kPa)	CBR (%)
2.540	6900	81	**1.2**
5.080	10300	97	**0.9**



Client:	Dillon Consulting	Project:	Nairn Avenue Geotechnical Inv.
Project No:	WX19497	Site Location:	459 Nairn Avenue, WB Median
Date:	November 23, 2021	Test Hole No:	TH21-08
Technologist:	Mdnazri Mohidin	Reviewed By:	Jorden Wiwcharyk

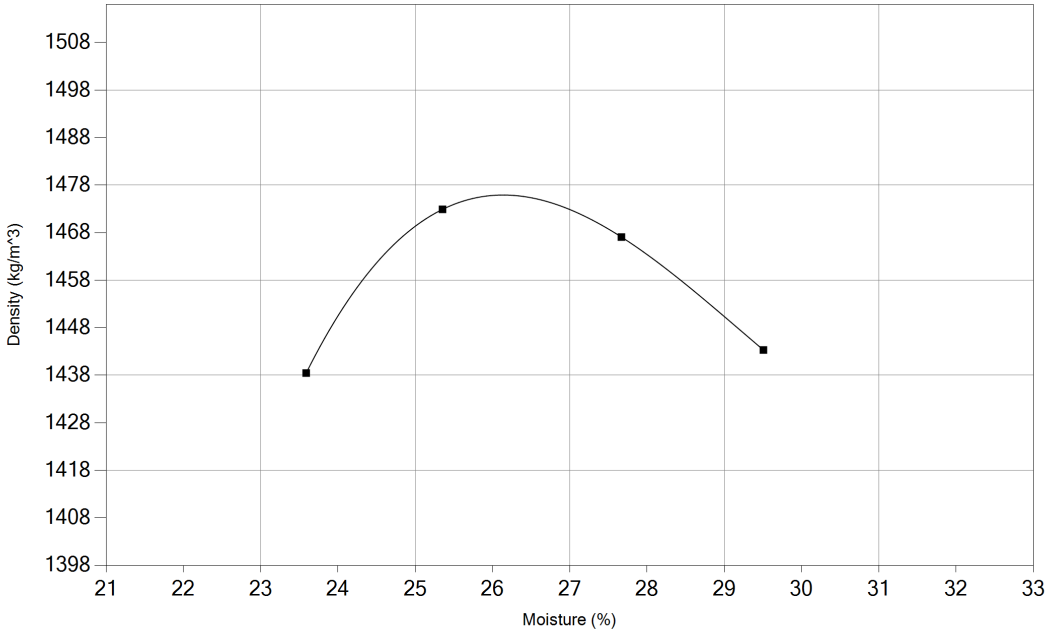
Soil Description: Clay - silty, high plastic, moist, stiff, brown

Liquid Limit 84 Plastic Limit 28 Plasticity Index 56 Swell 1.74%

Moisture / Density Relationship

Report Date: November 25, 2021

Client		Project	
Name:	Dillon Consulting	**Name:**	(WX19497) Nairn Avenue Geotechnical Investigation
Address:	1558 Willson Place Winnipeg, MB R3T 0Y4	**Address:**	Winnipeg, Manitoba
Attention:	William Kavanagh	**Phase:**	NA **Task:** NA
PO Number:		**Manager:**	Jorden Wiwcharyk
Sample Date:	11/5/2021 by Jorden Wiwcharyk	**Lab/Ref. #:**	WX19497-TH08
Source:	TH08- S2 to S6	**Description:**	Clay



Moisture Density Relationship: (ASTM D698-12) Method: A

Preparation Method: Dry **Rammer Type:**Mechanical

Maximum Density (kg/m^3): 1476

Optimum Moisture (%): 26.1

Remarks:

Distribution: Jorden Peter Wiwcharyk

Reviewed By: Jorden Wiwcharyk

Reporting of these results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

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CCIL Certified Aggregate Type C, Type D & Concrete Aggregate Type R in accordance with CSA A283-19