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 <u>www.woodplc.com</u>									
	Final Report - Geotechnical Investigation City of Winnipeg Street Investigation – Nairn Avenue Wood Project Number - WX19497								
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Nairn Avenue

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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.

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	

Table	1-1	1:	Street	Location	and	Investigation	Scope
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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 onsite. 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 \pm 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.

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

Table 3-1: Nairn Avenue Pavement Summary

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

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. . .

- 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.



	Denth	Atterber	g Limit Testir	Hydrometer Testing Results				
Test Hole	(m)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Gravel	% Sand	% Silt	% Clay
TH21-01	1 /	50	22	36	0.0	57	577	36.6
(CH Clay)	1.4		25	50	0.0	5.7	57.7	50.0
TH21-03	11	22	18	5	0.0	2.8	82.3	12.0
(CL-ML Silt)	1.1	25	10		0.0	2.0	05.5	13.9
TH21-05	1.1	74	26	48	2.4	17.3	21.7	58.7
(Clay Fill)								
TH21-06	11	27	17	10	0.0	64	82.9	10.7
(CL-ML Silt)	1.4			10	0.0	0.4	02.5	10.7
TH21-08	1 1	04	20	EG	0.0	1 2	16 1	02 C
(CH Clay)	1.1	04	20	00	0.0	1.5	10.1	02.0

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

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







LEGEND:		REVISION	BY	DATE	CLIENT:		DWN BY:	
TEST HOLE	→						MD CHK'D BY:	
	Γ						JW	CITY
	Γ				CITY OF WINNIPEG		DATUM:	
	[440 DOVERCOURT DRIVE	PROJECTION:	
	[WINNIPEG, MANITOBA R3Y IN4 PHONE: 204.488.2997 FAX:204.489.8261	 SCALE:	ci
							AS SHOWN	JI

ITE AND TEST HOLE LOCATION PLAN

FIGURE 1

FIGURE NO:

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		TH2-OI		8 9 10 11	
	Asphalt T	hickness (mm)		50	
	Concrete T	hickness (mm)		200	
Wood Envir Infrastructu	ood. ronment and are Solutions	PAVEME	CORE NT CORE S WINNIF	PHOTOGRAPHS SAMPLE NAIRN AVE-T PEG, MANITOBA	
Drawn: JB	Scale: N/A	Date: 17November 20)21	Project No.: WX19497	Figure: A2



				1. 203 264 205 T B 311/4 2 2 4 5	
	Asphalt T	hickness (mm)	100		
	Concrete 1	Thickness (mm)	200		
Wood E	ood.	PAVEMEN	CORE PHOTOGR CORE SAMPLE N WINNIPEG, MANI	APHS AIRN AVE-TH2 TOBA	1-03

		TH21-04		
	Asphalt TI	hickness (mm)	50	
	Concrete T	hickness (mm)	250	
Wood E Infrastru	nvironment and ucture Solutions	PAVEMENT	CORE PHOTOGRAPHS CORE SAMPLE NAIRN AVE-TH WINNIPEG, MANITOBA	121-04
Drawn: JB	Scale: N/A	Date: 17 November 2021	Project No.: WX19497	Figure: A5





1

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-	12 yes	A A A	1 Dit	- Contraction of the second	
	Asphalt TI	nickness (mm)		125	
	Concrete T	hickness (mm)		175	
Wood Environ	ment and	PAVEM	CORE F ENT CORE S WINNIP	PHOTOGRAPHS AMPLE NAIRN AVE-TH EG, MANITOBA	121-07
Drawn: JB	Solutions Scale: N/A	Date: 17 November 2	2021	Project No.: WX19497	Figure: A8

A DE LA DE L		TH2HO8		
	Asphalt T	hickness (mm)	50	
	Concrete T	Thickness (mm)	200	
Wood E Infrastru	ood. nvironment and acture Solutions	PAVEMENT	CORE PHOTOGRAPHS CORE SAMPLE NAIRN AVI WINNIPEG, MANITOBA	E-TH21-08

F	PROJECT: Naim Avenue Geotechnical Investigation					gation	DRILLER: Maple Leaf Drilling						TEST HOLE ID: TH21-01				
C	CLIEN	vT: Dillon Con	sulting				DRILL RIG: Geoprobe						PROJ	ECT No: WX19497			
L	LOCA	ATION: 314 Na	iirn Ave, EB Medi	an			DRILL	VIETHOD: 125m	m Solid S	Stem Augers			ELEVA	ATION: Not Surveyed			
S	SAMF	PLE TYPE	Shelby Tub	e		No Recove	əry	SPT (N)	E	Grab Sample		\square	Split-Pe	n Core			
E	BACK	FILL TYPE	Bentonite			Pea Grave	ł	Drill Outtings	0	Grout			Slough	:: Sand			
	DEPTH (m)	UNCONFINED COM 100 200 POSCKET PENETR 100 200 PLASTIC	PRESSION (kPa) ▲ 300 400 OMETER (kPa) ⊠ 300 400 M.C. LIQUID	SOIL SYMBOL			DE	SOIL SCRIPTIO	N		SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	DEPTH (m)		
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	2	≫ ³⁵		c	н		Jun					4		Particle Size Analysis - Sample 3 @ 1.4m Gravel= 0.0% Sand= 5.7% Silt= 57.7% Clay= 36.6%	- - - - - - - - - -		
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PF	PROJECT: Naim Avenue Geotechnical Investigation					DRILLER: Maple Leaf Drilling					TEST HOLE ID: TH21-02			
CL	JENT: Dillon Con	sulting			DRILL RIG: Geoprobe					PROJECT No: WX19497				
LC	CATION: 334 Na	irn Ave, EB Media	n		DRILLI	METHOD: 125mm S	Solid Stem Augers	;		ELEVA	ATION: Not Surveyed			
SA	MPLE TYPE	Shelby Tube)	No Recov	ery	SPT (N)	Grab Sample	е		Split-Pe	n Core			
BA	ACKFILL TYPE	Bentonite		Pea Grave	a	Drill Cuttings	Grout			Slough	ैःे Sand			
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PRO.	JECT: Naim Av	enue Geotechnica	al Inves	tigation	DRILLER: Maple Leaf Drilling						TEST HOLE ID: TH21-05			
CLIE	NT: Dillon Con	sulting			DRILL RIG: Mobile B40					PROJ	ECT No: WX19497			
LOCA	ATION: 401 Na	im Ave, WB Media	an		DRILLI	METHOD: 125m	m Solid Ste	m Augers			ELEV	ATION: Not Surveyed		
SAM	PLE TYPE	Shelby Tube		No Recove	ery	SPT (N)		Grab Sample			Split-Pe	n Core		
BACK		Bentonite		Pea Grave	k	Drill Cuttings	• • •∰	Grout			Slough	Sand :		
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	25	44	сн	- below 3.0m	firm					4		Clay= 58.7%	3	
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PRC	QECT: Naim A	venue Geotechnic	al Inve	estigation	DRILLI	ER: Maple Leaf D	Drilling				TEST	HOLE ID: TH2	1-06	
CLIE	ENT: Dillon Co	nsulting			DRILL	RIG: Mobile B40					PROJ	ECT No: WX19	9497	
LCC	CATION: 425 N	larin Ave, EB Media	an		DRILL	METHOD: 125m	m Solid Ste	m Augers			ELEV	ATION: Not Su	irveyed	
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BAC	XFILL TYPE	Bentonite		Pea Grav	el	Drill Cuttings		Grout		[]]	Slough	• •	Sand	-
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PRO	PROJECT: Naim Avenue Geotechnical Investigation					DRILLER: Maple Leaf Drilling					TEST HOLE ID: TH21-08				
CLIE	NT: Dillon Con	sulting			DRILL RIG: Mobile B40						PROJ	ECT No: WX19497			
LOC	ATION: 459 Na	airn Ave, WB Med	ian		DRILL	/IETHOD: 125m	nm Solid Ste	em Augers			ELEVA	ATION: Not Surveyed			
SAM	PLE TYPE	Shelby Tub	e	No Recov	ery	SPT (N)		Grab Sample		Π	Split-Pe	n Core			
BAC	KFILL TYPE	Bentonite		Pea Grave	el	Drill Outtings	100 - 100 100 - 100	Grout		\square	Slough	::: Sand	_		
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- 0	•4		CONC CONC © GP	ASPHALT (50 CONCRETE (GRAVEL (FIL (inferred), dan)mm thick) (200mm thic L) - sandy, j np, brown	ik) poorly graded, medi	ium grained, c	ompact		1			- - - -		
- - 1 -	•" ⊠ ₽	······································		below Ó.6m CLAY - some	wet silt, trace sa	and, high plastic, m	oist, stiff, brow	n		2 3			- - 1		
2	×	49	ан							4		Particle Size Analysis - Sample 3 @ 1.1m Gravel= 0.0% Sand= 1.3% Silt= 16.1% Clay= 82.6%	2		
		5 4								5					
o 1 (LABELLEU		44		TEST HOLE T	TERMINATI	ED AT 3.7m BELOV	WGRADE			6					
- 4 				No sloughing o Test hole rem Test hole back repaired to ma	or seepage ained open kfilled with a atch existing	observed during dri to full depth and wa auger cuttings and b 3.	illing. as dry prior to l pentonite, pave	oadkfilling. ement surface					-4		
													5 		
													6 		
													- 7		
													- -9 - - - - -		
		Wood Environ	ment &	Infrastructu	re Solutio	ons	LOGGED BY:	JW			α	MPLETION DEPTH: 3.7 m	I		
	Wood Environment & Infrastructure a division of Wood Canada L			Limited	REVIEWED BY: BW Figure No. A17					COMPLETION DATE: November 5, 2021 Sheet 1 of 1					

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:



	Sample ID	mUSCS	MC	D100	D60	D30	D10	LL	PL	% Gravel	% Sand	% Fines
٠	TH21-01, 1.4 m	СН	29.4	4.8	0			59	23	0	6	58 (Silt) : 37 (Clay)
	TH21-03, 1.1 m	СН	22.8	4.8	0	0		23	18	0	3	83 (Silt) : 14 (Clay)
	TH21-05, 1.1 m	СН	29.2	9.5	0			74	26	2	17	22 (Silt) : 59 (Clay)
*	TH21-06, 1.4 m	СН	22.9	2	0	0	0	27	17	0	6	83 (Silt) : 11 (Clay)
\odot	TH21-08, 1.1 m	СН	32.4	2				84	28	0	1	16 (Silt) : 83 (Clay)

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California Bearing Ratio ASTM D1883-16, Soaking Method

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Wood Environment & Infrastructure Solutions a Division of Wood Canada Limited

Type of Prenaration	Standard ASTM D698	Sample P	renaration		Soaked
Maximum Dry Density	1/190 kg/m ³	Soaking t	ime		96 hrs
Optimum Moisture Content	25 %	Top 1 Inc	h Soaked Mois	sture	33.7 %
Compacted Dry Density	1436 kg/m^3	Bottom 1	Inch Soaked N	Aoisture	32.5 %
Compacted Moisture Content	27.2 %	Average 9	re	34.7 %	
Percent Compaction	96% %	Mass of S	urcharge		4.54 ka
			a chaige		
Со	rrected Standar	d Load of	Corrected	CBR	
Penetr	ation (mm) Crushed	Stone (kPa)	Load (kPa)	(%)	
	2.540 6	900	157	2.3	
	5.080	1300	209	2.0	
350					
-					
300					
250					
(a)					
(KP		209			
g 200		209			
Pist					
5 ₁₅₀	157				
Less					
St St					
100					
50	<u> </u>				
0.0 2.0	4.0	6.0	8.0	10.0	12.0
	Per	netration of P	iston (mm)		
Client: Dillon	Consulting	_	Project:	Nairn Avenue	Geotechnical Inv.
Project No: W	X19497	_	Site Location:	314 Nairn Av	enue, EB Median
Date: Novem	ber 17, 2021	_ 1	est Hole No:	TH	121-01
Technologist:	Mdnazri Mohidin	_	Reviewed By:	Jorden	Wiwcharyk
Soil Description: Clay - si					
boli bescription. <u>elay</u> si	lty, high plastic, moist,	stiff, brown			
	lty, high plastic, moist,	stiff, brown		26	

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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: APreparation Method:DryRammer Type:MechanicalMaximum Density (kg/m^3):1490Optimum Moisture (%):25.0Remarks:

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 a Division of Wood Canada Limited

Maximum Dry Density 1460 kg/m³ Soaking time Optimum Moisture Content 28.1 % Top 1 Inch Soaked Mo Compacted Dry Density 1394 kg/m³ Bottom 1 Inch Soaked Compacted Moisture Content 28.4 % Average Soaked Mois Percent Compaction 95% % Mass of Surcharge Corrected	oisture I Moisture ture	96 hrs 39.3 %
Optimum Moisture Content 28.1 % Top 1 Inch Soaked Mo Compacted Dry Density 1394 kg/m³ Bottom 1 Inch Soaked Compacted Moisture Content 28.4 % Average Soaked Mois Percent Compaction 95% % Mass of Surcharge Corrected Standard Load of Corrected	bisture Moisture ture	39.3 %
Compacted Dry Density1394 kg/m³Bottom 1 Inch SoakedCompacted Moisture Content28.4 %Average Soaked MoisPercent Compaction95% %Mass of SurchargeCorrectedStandard Load ofCorrected	l Moisture ture	20.2.0/
Compacted Moisture Content28.4 %Average Soaked MoisPercent Compaction95% %Mass of SurchargeCorrectedStandard Load ofCorrected	ture	39.2 %
Percent Compaction 95% % Mass of Surcharge Corrected Standard Load of Corrected		37.0 %
Corrected Standard Load of Corrected		4.54 kg
	CBR	
Penetration (mm) Crushed Stone (kPa) Load (kPa)	(%)	
2.540 6900 149	2.2	
5.080 10300 184	1.8	
250		
230		
200		
-		
Бай са		
sto		
id c		
ts		
50		
0		
0.0 2.0 4.0 6.0 8.0	10.0	12.0
Penetration of Piston (mm)		
Client: Dillon Consulting Project	:: Nairn Avenue (eotechnical Inv.
Project No: WX19497 Site Location	: 346 Nairn Ave	nue, EB Median
Date: November 29, 2021 Test Hole No	: <u> </u>	21-03
Technologist: Mdnazri Mohidin Reviewed By	r: Jorden V	Viwcharyk
Soil Description: Clay - silty, high plastic, moist, stiff, brown		
Liquid Limit - Plastic Limit - Plasticity Index	x -	Swell 8.12%

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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: APreparation Method: DryRammer Type:MechanicalMaximum Density (kg/m^3):1460Optimum Moisture (%):28.1

Remarks:

Distribution: Jorden Peter Wiwcharyk **Reviewed By:** Jorden Wiwcharyk

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Wood Environment & Infrastructure Solutions - 440 Dovercourt Drive - Winnipeg, MB - R3Y 1N4

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 a Division of Wood Canada Limited

Type of Preparat	tion	Standard A	ASTM D698	Sample Pr	reparation		Soak	ed
Maximum Dry Density		1566 kg/m ³		Soaking time			96 ł	nrs
Optimum Moisture Content		22.1 %		Top 1 Inch Soaked Moisture			36.3 9	%
Compacted Dry Density		1493	kg/m ³	Bottom 1	Inch Soaked I	Moisture	26.4 9	%
Compacted Moi	sture Content	27.2	27.2 %		oaked Moistu	ire	29.9 9	%
Percent Compac	tion	95% %		Mass of Surcharge			4.54	٨g
	Co	rrected	Standard	Load of	Corrected	CBR		
	Penetr	ation (mm)	Crushed St	one (kPa)	Load (kPa)	(%)		
		2.540	690	00	99	1.4		
		5.080	103	00	124	1.2		
							4	
200					1	1		
-								
180								
160								
100								
140								
(Pa)				124				
L) 120				124				
		00						
H I I I I I I I I I I I I I I I I I I I		99						
SS 80								
Stre								
60	/							
40								
20			1					
0	2.0	л. <u></u>	0	60	8.0	10.0	13	20
0.0	2.0	-	.o Pene	tration of P	iston (mm)	10.0	12	
Client:	Dillon	Consulting			Project:	Nairn Avenu	ue Geotechni	ical Inv.
Project No:	WX19497			Site Location: 401 Nairn Avenue, WB Media			Median	
Date: November 23, 2021			Test Hole No: TH21-05					
Technologist: Mdnazri Mohidin Reviewed By: Jorden Wiwchary						<		
Soil Descr	ription: <u>Clay - si</u>	ilty, high plas	stic, moist, st	iff, brown				
		D I						4.6.0-04
Liquid Limit	/4	Plastic Limit	26	Pla	asticity Index	48	Swell	16.37%

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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: APreparation Method: DryRammer Type:MechanicalMaximum Density (kg/m^3):1566Optimum Moisture (%):22.1

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 a Division of Wood Canada Limited

Type of Preparation		Standard A	ASTM D698	Sample P	reparation		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	e Content	27.2	27.2 %		Soaked Moist	ure	33.5 %	
Percent Compaction		95% %		Mass of S	Mass of Surcharge		4.54 kg	
	Cor	rected	Standard	Load of	Corrected	CBR		
	Penetra	ation (mm)	Crushed St	one (kPa)	Load (kPa)	(%)		
	2	.540	690	00	86	1.2		
	5	.080	103	00	114	1.1		
160								
140								
-								
120								
_				114				
ed 100		/						
) uc								
08 Pist		86						
uo I								
S 60		 						
Str		1						
40		l						
40		1						
20		l l						
20		1						
		1 1						
	2 0		.0	6.0	8.0	10.0	12 0	
0.0	2.0		Pene	tration of P	iston (mm)	10.0		
Client:	: Dillon Consulting			Project: Nairn Aver		e Geotechnical Inv.		
Project No:	WX19497			Site Location: 425 N		425 Nairn A	Nairn Avenue, EB Median	
Date: November 17, 2021			Test Hole No: TH21-06			FH21-06		
Technologist: Mdnazri Mohidin				Reviewed By:	Jorde	n Wiwcharyk		
Soil Descriptic	on: <u>Clay - sil</u>	ty, high plas	stic, moist, st	iff, brown				
				_ •				
Liquid Limit -		Plastic Limit	-	PI	asticity Index	-	Swell 14.53%	

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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: APreparation Method:DryRammer Type:MechanicalMaximum Density (kg/m^3):1446

Optimum Moisture (%): 27.5 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 a Division of Wood Canada Limited

Type of Prepar	ation		Standard A	ASTM D698	Sample P	reparation		Soaked
Maximum Dry Density		1476 ka/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 N	/loisture	32.1 %	
Compacted Mo	oisture C	ontent	27.2 %		Average S	Soaked Moistu	re	34.6 %
Percent Compa	action		95%	%	Mass of S	urcharge		4.54 kg
		Cor	rected	Standard	Load of	Corrected	CBR	
		Penetra	ation (mm)	Crushed St	one (kPa)	Load (kPa)	(%)	
		2	.540	690	00	81	1.2	
		5	.080	103	00	97	0.9	
160								
-								
140								
-								
120 —								
-								
dy 100					17	-		
uo					97			
ee 08 Pist			81					
uo			l ¹ l					
	/		 					
st								
40	_/							
-	/							
20	/							
/			 					
o 🖊								
0.0		2.0	4	.0	6.0	8.0	10.0	12.0
				Pene	tration of P	iston (mm)		
Client:		Dillon	Consulting			Project:	Nairn Avenue	
Project No:		WX19497			Site Location: 459 Naim Avenue WR		venue WB Median	
Date: November 23, 2021			Test Hole No: TH21-08			H21-08		
Technologist: Mdnazri Mohidin			Reviewed By: Jorden Wiwcharvk					
						· ····		,
Soil Des	cription:	Clay - sil	ty, high plas	stic, moist, st	iff, brown			
	-	÷						
Liquid Limit	84		Plastic Limit	28	Pl	asticity Index	56	Swell <u>1.74%</u>
						-		

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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:
 1476

Distribution: Jorden Peter Wiwcharyk **Reviewed By:** Jorden Wiwcharyk

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