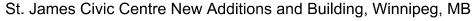
#### **APPENDIX C**

#### **GEOTECHNICAL - TEST HOLE LOGS**

prepared by Trek Geotechnical Inc.

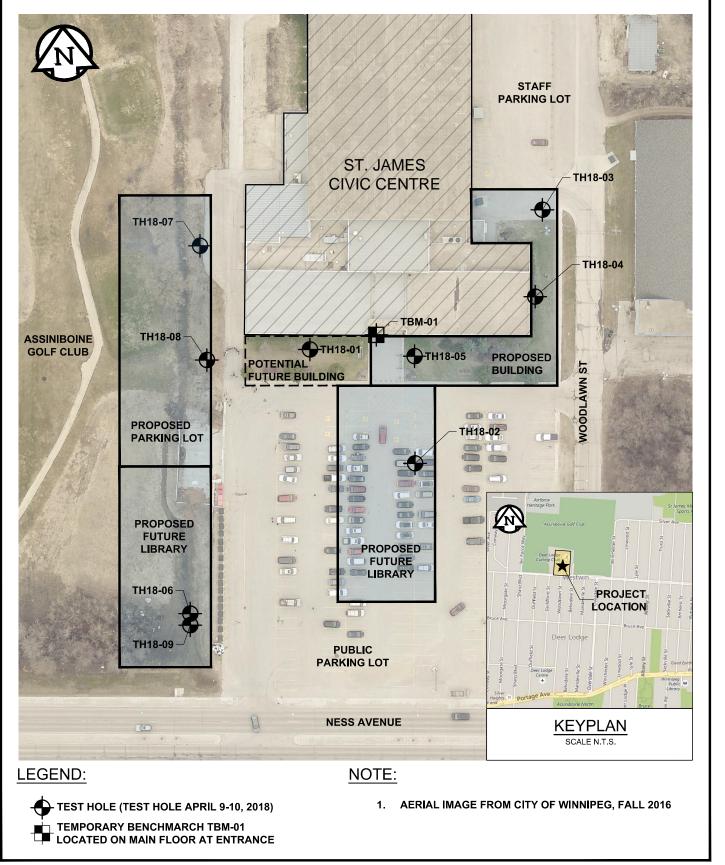
dated May 9, 2019





ANSI full bleed A (8.50 x 11.00 Inches)

Z./Projects/0015 City of Winnipeg/0015 024 00 St. James Civic Centre/3 Survey and Dwg/3.4 CAD/3.4.3 Working Folder/Fig.001 2018-04-11 0\_A\_SL 0015 024 00.dwg, 5/8/2018 9:57:17 AM



10 20 30 40 50 m SCALE = 1:1000 (216 mm x 279 mm)

Figure 01

Test Hole Location Plan



# EXPLANATION OF FIELD AND LABORATORY TESTING

#### **GENERAL NOTES**

- 1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
- 2. Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
- 3. When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Ma	jor Div	isions	USCS Classi- fication	Symbols	Typical Names		Laboratory Classific	cation Criteria		ς,			
	action	gravel no fines)	GW	36	Well-graded gravels, gravel-sand mixtures, little or no fines		$C_U = \frac{D_{60}}{D_{10}}$ greater than 4	4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3		ASTM Sieve sizes	#10 to #4	#40 to #10	< #200
sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	Clean gravel (Little or no fines)	GP	.A.	Poorly-graded gravels, gravel-sand mixtures, little or no fines	urve, 200 sievej nbols*	Not meeting all gradation	requirements for GW	0	STMS	#10	#40 t	* V
No. 200 s	Gray than half o	Gravel with fines (Appreciable amount of fines)	GM		Silty gravels, gravel-sand-silt mixtures	rain size c r than No. g dual sym	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are border-	Particle Size	⋖			
ained soils larger thar	(More	Gravel w (Appre amount	GC		Clayey gravels, gravel-sand-silt mixtures	vel from g on smaller llows: W, SP SM, SC sSM, SC	Atterberg limits above "A" line or P.I. greater than 7	line cases requiring use of dual symbols	Part		22	00 ۾د	9
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	action	sands no fines)	SW	****	Well-graded sands, gravelly sands, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction snaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent GW, GP, SW, SP More than 12 percent GM, GC, SM, SC 6 to 12 percent Borderline case4s requiring dual symbols*	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6	$C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3		E	2.00 to 4.75	0.425 to 2.00	< 0.075
half the r	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SP		Poorly-graded sands, gravelly sands, little or no fines	ages of sarentage of farentage of farentage of farentage of farentage.	Not meeting all gradation	requirements for SW			•	0 0	<i>i</i>
(More than	Sar than half c	Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	ne percentarion percentarion percentarion percentarion percentarion percentarion percentarion 12 percentarion	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are border-	rial				Clay
	(More	Sands w (Appre amount	SC		Clayey sands, sand-clay mixtures	Determin dependin coarse-g Less t More	Atterberg limits above "A" line or P.I. greater than 7	line cases requiring use of dual symbols	Material	0000	Coarse	Medium	Silt or Clay
size)	ys.		ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	80 Plasticity	Plasticity (	Chart	i	Sizes	. <u>.</u> . <u>.</u> :	2	i ii
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Silts and Clar	(Liquid limit less than 50)	CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	70 – 60 –	an 0.425 mm	"I III" I III	9	ASTM Sieve Sizes	3 in. to 12 in.	3/4 in 40 3 in	3/4 III. (0 3 III #4 to 3/4 in.
soils er than No	is.	<u> </u>	OL		Organic silts and organic silty clays of low plasticity	NDEX (%)		CA CA	Particle Size	AS			_
e-Grained al is small	iys	t 50)	MH	Ш	Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts	PLASTICITY INDEX				mm *300	75 to 300	 	19 to 75 4.75 to 19
Fine the materi.	ts and Cla	(Liquid limit greater than 50)	СН		Inorganic clays of high plasticity, fat clays	20 -	0	MH OR OH		<u>-</u>	75 tu		4.75
than half	<u> </u>		ОН		Organic clays of medium to high plasticity, organic silts	7 4 0 10	ML or OL 16 20 30 40 50 LIQUID LIM	60 70 80 90 100 110 IIT (%)	rial	9	S S		
(More	Highly	Organic Soils	Pt	6 46 46 47 47 4	Peat and other highly organic soils	Von Post Class		rong colour or odour, nd often fibrous texture	Material	Double	Cobbles	Gravel	Fine

<sup>\*</sup> Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

#### Other Symbol Types

Asphalt	Bedrock (undifferentiated)	Cobbles
Concrete	Limestone Bedrock	Boulders and Cobbles
Fill	Cemented Shale	Silt Till
	Non-Cemented Shale	Clay Till



# EXPLANATION OF FIELD AND LABORATORY TESTING

#### **LEGEND OF ABBREVIATIONS AND SYMBOLS**

PL - Plastic Limit (%)
PI - Plasticity Index (%)

▼ Water Level at End of Drilling

MC - Moisture Content (%)

Water Level After Drilling as Indicated on Test Hole Logs

SPT - Standard Penetration Test Indicated on Test Hole Logs
RQD - Rock Quality Designation

Su - Undrained Shear Strength VW - Vibrating Wire Piezometer

Qu - Unconfined Compression

SI - Slope Inclinometer

#### FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

#### TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Verv dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

<b>Descriptive Terms</b>	<u>SPT (N) (Blows/300 mm)</u>
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Undrained Shear <u>Strength (kPa)</u>
< 12
12 to 25
25 to 50
50 to 100
100 to 200
> 200





Client:	_	City of Win	nipeg				Project	Number:	0015	024 0	0							
Project N	Name: _	St. James (	Civic Cent	tre New Ad	ditions and B	uilding, Winnipeg,	_MB Locatio	n:	Refe	r to Fig	gure (	01 for	r Test I	Hole loc	ations			
Contract	tor:	Subterrane	an Ltd.				Ground	Elevation	: 99.73	3 m								
Method:	-	406 mm Auge	er, Soilmec	STM-20			_ Date Dr	illed:	April	9, 201	8							
Sar	mple Ty	ре:		Grab (G)		Shelby Tube (T	) Sp	lit Spoon (S	S)	S <sub>r</sub>	olit Ba	arrel (	(SB)		Core (	C)		
Par	rticle Siz	ze Legend:		Fines	Clay	/ Silt	****	Sand		Gra	ivel	Š	<u>~</u> c	obbles	. ,	Во	oulder	s
									a)	er		□В	Bulk Unit (kN/m³) 18 19	Wt			ained S ngth (I	
ioi - E	(m) Soil Symbol								Sample Type	Sample Number	16		18 19 cle Size		21	<u>T</u>	est Typ	<u>be</u>
Elevation (m) Depth	(m)				MATERIAL	DESCRIPTION			nple	. Je	0 :		40 60		00	Po	Cket P	en. 🗭
Ш	Sos								Sar	Samp		PL 	MC	LL —		O Fi	☑ Qu ☑ eld Va	ne 🔾
	- 100	☆ORGAN	IC CLAY	- silty trac	e to some sai	nd, trace gravel (<	10 mm diam	) trace			0 :		40 60	80 10	00 0 4	40 8	30 12	20 16020
99.4	<b>****</b>	rootlets,	black, fro	zen, moist	and stiff whe	n thawed, low to i	ntermediate p	lasticity	/	G01	_	•						
-0.	.5-		ark brown	Ī	_	el (<10 mm diam.	), trace orgar	ncis										
98.8	-			ist and firm te plasticity	when thawe	d				G02		•						
-1.	.0-	SILT - tr	ace clay,	trace sand	trace gravel	(<5 mm diam.)				G03		•						
98.5						thawed, low plast mm diam.), trace		e silt		G04	-							_
1	.5	inclusion		nm diam.)	• •	,,	•		4	G04	-							_
		- fr	ozen to 2.		and stiff whe	en thawed												
2.	.0-	- 111	gh plastic	ліу														
F		- grey be	elow 2.1 n	n						G05		+				4		
-2.	.5-																	
<b> </b>		- stiff to	very stiff	below 2.7 r	n					COG		<u> </u>					<b>AB.</b>	
-3.	.0-		,						4	G06	-	'					<b>△○</b>	
-3.	.5-																	
-2. -3. -3. -4.																		
4	.0-																	
4.	.5-																	
П Г										T07						•		
5.	5.0															<del>  -</del>		
-5. -5. -6. -7. -7. -7.																		
5.	5.5																	
[ <del>-</del> 6.	5.0-	- firm be	elow 6.1 m	า							$\vdash$							
			0.111	•						G08					<b>│</b> ◆			
[ <del>-</del> 6	5.5																	
<u></u> -7.	.0-																	
<del> </del> −7.	.5-	_ trans 4	ll inclusio	ne coft to	firm below 7.6	3 m												
		- trace ti	ii ii iCiuSiO	113, 3011 101	IIIII DEIUW 7.0	ווו ע				G09					••			
Logged I	<b>By</b> : _Be	eta Taryana			Revie	wed By: Nelson	Ferreira		_	Projec	ct En	gine	er: N	lelson F	erreira	a		

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	0	_	rticle S	60 60		Stre	ained sength ( est Typer Torvan cket P Constant Quille Constan	kPa) <u>oe</u> e ∆ 'en. <b>Φ</b>	•
91.5	8.0													
			SILT (TILL) - trace clay, trace sand, trace gravel (<25 mm diam.) - light grey - wet, compact - no to low plasticity  - moist below 10.1 m		G10									
	13.5		- dense below 13.7 m		G12		)							
85.1	14.5													

#### POWER AUGER REFUSAL AT 14.6 m IN SILT (TILL)

SUB-SURFACE LOG LOGS 2018-04-11 ST JAMES CIVIC CENTRE 0 FINAL 0015 024 00.GPJ TREK GEOTECHNICAL.GDT 5/8/18

- Seepage observed between 8.2 m depth and 10.1 m depth in SILT (TILL) layer.
   Sloughing observed between 9.8 m depth and 13.7 m depth in SILT (TILL) layer.
- 3. Unable to recover soil sample between 10.7 m and 13.7 m due to slough material. 4. Test Hole open to 9.4 m depth and groundwater level at 9.1 m depth fifteen minutes
- after drilling.

  5. Test Hole backfilled with auger cuttings.

  6. Elevation relative to the main floor located at south entrance of existing building,
- which was assigned a temporary benchmark elevation of 100.00 m.

Logged By: Beta Taryana Reviewed By: Nelson Ferreira Project Engineer: Nelson Ferreira





Contractor: Method: Sample Ty	St. James Civic Ce Subterranean Ltd. 406 mm Auger, Soilme		ions and Buil	ding, Winnipeg, N				ure 01	for Test	Hole locat	ions		
Method: Sample Ty	406 mm Auger, Soilme	on CTM 20											
Sample Ty		CTM OO			Ground Elevation:	99.10	m						
		C S 1 IVI-20			Date Drilled:	April 9	9, 201	8					
Particle Si	ype:	Grab (G)		Shelby Tube (T)	Split Spoon (S	S)	Sp	olit Bar	rel (SB)	Co	re (C)		
1	ize Legend:	Fines	///// Clay	Silt	Sand		Gra	vel		Cobbles	В	oulders	
Elevation (m) Depth (m)	901100	M	//ATERIAL D	ESCRIPTION		Sample Type	Sample Number	16 17 F 0 20	Particle Size	9 20 21 e (%) 0 80 100 LL	Stre	ained Shength (kFest Type) Forvane ocket Per  Qu⊠ eld Vane  120	Pa) : ∆ n. <b>Ф</b>
99.0 -0.5 - 98.2	- brown - frozen, m - well grade	AVEL (FILL) - 1 noist and compa ed, fine sand to	act when that coarse grave	crushed limeston ved el (<10 mm diam.),			G13	•					
	- black - frozen, m	noist and firm w	hen thawed				014						_
97.6 -2.0 -2.5 -3.0	CLAY - silty, tra inclusions (<15 - brown	2.1 m, moist ar		m diam.), trace ox thawed, high plas			G15		•				
-3.5 -4.0 -4.5							G16				•		
-5.0 -5.5 -6.0							G17		•		0		
-2.5- -3.0- -3.5- -4.0- -4.5- -5.0- -6.5- -7.0- -7.5- -7.5-	- firm to stiff bel						T18				•		
Logged By:	<u>//</u>			ed By: Nelson F					•	Nelson Fer			

### **Sub-Surface Log**

	ıE	UI	EL	HNICAL													
	(m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	0	17	4( artic	MC	9 2 e (%) 0 8	30 100		Stre	ained sength ( est Typ Forvan cket P ⊠ Qu beld Va eld Va	kPa) <u>oe</u> e ∆ en. <b>¶</b> d ne ⊜	•
	00.0	8.0		- trace till inclusions, soft to firm below 7.9 m													$\equiv$
	90.9	8.5-		SILT (TILL) - trace clay, trace sand, trace gravel (<30 mm diam.)  - light grey  - moist to wet, compact  - no to low plasticity	4	G20	•	)									
		9.5-		- trace cobbles, moist and dense below 9.1 m		G21	•										
		11.0				G22	•										
00.GPJ TREK GEOTECHNICAL.GDT 5/8/18		-11.5 -12.0 -12.5 -13.0 -13.5		- reddish grey and very dense below 11.9 m		G23											
/IC CENTRE_0_FINAL 0015 024 00.GPJ		-14.0· -14.5· -15.0· -15.5:				G24 G25	•										
SUB-SURFACE LOG LOGS 2018-04-11 ST JAMES CIVIC CENTRE_0_FINAL 0015 024	<u>55.0</u>	E15.5:		POWER AUGER REFUSAL AT 15.5 m IN SILT (TILL) Notes:  1. Seepage observed between 8.2 m depth and 9.1 m depth in SILT (TILL) layer.  2. Sloughing observed between 0.1 m depth and 0.9 m depth in SAND AND GRAVEL (FILL) layer.  3. Test Hole open to 15.5 m depth and dry fifteen minutes after drilling.  4. Test Hole backfilled with auger cuttings and topped with granular material and cold patch asphalt.  5. Elevation relative to the main floor located at south entrance of existing building, which was assigned a temporary benchmark elevation of 100.00 m.													
L L	ogg	ed By:	Beta	Taryana Reviewed By: Nelson Ferreira	F	Proje	ct E	ngiı	nee	r: _l	Velso	on Fe	rreira				

- Sloughing observed between 0.1 m depth and 0.9 m depth in SAND AND GRAVEL
- 3. Test Hole open to 15.5 m depth and dry fifteen minutes after drilling.
- 4. Test Hole backfilled with auger cuttings and topped with granular material and cold patch asphalt.
- 5. Elevation relative to the main floor located at south entrance of existing building, which was assigned a temporary benchmark elevation of 100.00 m.





Client	t:	City of W	innipeg			Project Number:	0015	024 0	00					
Proje	ct Name	: St. James	s Civic Centre New Ad	ditions and Bui	<u>lding, Winnipeg, M</u>	IB Location:	Refe	to Fig	gure 0	1 for Test	Hole locati	ons		
Contr	actor:	Subterran	iean Ltd.			Ground Elevation:	99.52	2 m						
Metho	od:	406 mm Au	ger, Soilmec STM-20			Date Drilled:	April	9, 201	8					
	Sample 7	Туре:	Grab (G)		Shelby Tube (T)	Split Spoon (S	S) >	Sp	olit Ba	rrel (SB)	Co	re (C)		
	Particle S	Size Legend	l: Fines	Clay	Silt	Sand		Gra	ivel		Cobbles	H	Bould	ers
Elevation (m)	Depth (m)	Soil Symbol		MATERIAL D	ESCRIPTION		Sample Type	Sample Number	0 2	Particle Siz	9 20 21 Ge (%) GO 80 100	•	trength Test 1 Torva Torva Pocket Qu Field	ype ane ∆ Pen. <b>Ф</b>
99.4	0.5	SAND - -		npact when that	wed, well graded, t	ine sand to coarse gra	vel	G26	•					
	1.0	<b>₩</b> -	(FILL) - silty, trace san black frozen, moist and firm intermediate plasticity	when thawed	(<20 mm diam.),	trace organics		G27		•				
97.7	-1.5		alle kan		and the second	Matter too. "		G28		•				
	-2.0 - -2.5	inclusi - -	- silty, trace sand, tracions (<10 mm diam.) brown frozen to 2.1 m, moist high plasticity		•	idation, trace silt		G29	_	•				
	-3.0-	- grey	below 2.7 m					G30		•		•		
Logge	-3.5 -4.0													
	-4.5 - -5.0							G31		•		• 4	7	
	5.5													
	6.0							000						
	-7.0-							G32				•	•	
	7.5	- trace	till inclusions, soft to	firm below 7.3 i	m			T33				•		
1000	od Pro	Beta Taryar		Dandan	ed By: Nelson F	orroiro		Dra! -		vincer:	Nelson Fer	roise		

#### **Sub-Surface Log**

GEOTECHNICAL

**Undrained Shear** Sample Number Strength (kPa) Sample Type 16 20 21 Soil Symbol Test Type Depth (m) Particle Size (%) △ Torvane △

Pocket Pen. MATERIAL DESCRIPTION 20 40 60 80 100 ○ Field Vane ○ 20 40 60 80 100 40 80 120 160200 91.3 SILT (TILL) - trace clay, trace sand, trace gravel (<25 mm diam.) - light grey 8.5 - moist, compact G34 9.0 - trace cobbles, dense below 9.1 m 9.5 10.0 10.5 G35 12.0 G36 12.5 -13.0 13.5 G37 50 mm thick of wet sand seam at 14.0 m 15.0 G38

END OF TEST HOLE AT 15.5 m IN SILT (TILL) Notes:

- 1. Seepage observed between 14.0 m depth and 14.1 m depth in sand seam.
- 2. No sloughing observed.

SUB-SURFACE LOG LOGS 2018-04-11 ST JAMES CIVIC CENTRE 0 FINAL 0015 024 00.GPJ TREK GEOTECHNICAL.GDT 5/8/18

- 3. Test Hole open to 15.5 m depth and dry fifteen minutes after drilling.
- 4. Test Hole backfilled with auger cuttings and topped with granular material and cold patch asphalt.
- 5. TH18-03 moved 0.7 m north and 0.7 m east from its original location due to auger refusal on suspected concrete pad at 0.6 m below existing grade.
- 6. Elevation relative to the main floor located at south entrance of existing building, which was assigned a temporary benchmark elevation of 100.00 m.

Logged By: Beta Taryana Reviewed By: Nelson Ferreira Project Engineer: Nelson Ferreira





Client:	_Cit	y of Winnipeg Projec	t Number:	0015	024 C	)0					—
Project Na	ame: St.	James Civic Centre New Additions and Building, Winnipeg, MB Location				gure (	01 for Tes	t Hole location	ns		
Contractor			d Elevation:								
Method:	_406	6 mm Auger, Soilmec STM-20 Date D		April							_
Samp	ple Type:	Grab (G) Shelby Tube (T) Sp	olit Spoon (S	S) >	S	plit Ba	arrel (SB)	Cor	e (C)		
Partio	cle Size I	_egend: Fines Clay Silt 🚉	Sand		Gra	ivel		Cobbles	В	oulders	
Elevation (m) Depth (m)	Soil Symbol	MATERIAL DESCRIPTION		Sample Type	Sample Number		Particle Si	13) 19 20 21 Ze (%) 60 80 100	Stre	ained Shength (kPength (kPeng	Pa) ∴ △ n. <b>Ф</b>
99.2 0.5		ORGANIC CLAY - silty, trace sand, trace gravel (<10 mm diam.), trace - black - frozen, moist and stiff when thawed - low to intermediate plasticity	rootlets		G39		•				
1.0		CLAY (FILL) - silty, some sand, trace gravel (<15 mm diam.) - brown - frozen, moist and firm when thawed - intermediate plasticity			G40		•				
98.2 1.5 		SILT - trace clay, trace sand, trace gravel (<5 mm diam.) - brown - moist to wet, soft - low plasticity			G41		•				
2.5		CLAY - silty, trace sand, trace gravel (<5 mm diam.), trace silt inclusion diam.) - grey - moist, firm to stiff	s (<25 mm		G42		•		Δ	0	
3.0		- high plasticity			G43		•		△•		
-3.5 -4.0											
5.0					T44		•			1	
5.5											
6.5											
7.0					G45				•••		
-7.5		- firm below 7.6 m			G46		•		•		+

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	0	Par 20 PL	Bulk U (kN/) 18 article S 40 M0	60 60		Stre	ained ength (est Ty) Forvanticket F Qu I eld Va	kPa) <u>oe</u> e ∆ en. <b>•</b>	•
	8.0		- trace till inclusions, soft to firm below 7.9 m				20	40	80	80 100	40 6	30 1.	20 1	50200
91.2	8.5													
	9.0		SILT (TILL) - trace clay, trace sand, trace gravel (<30 mm diam.) - light grey - moist to wet, compact - no to low plasticity		G47	•								
	9.5		- reddish grey to 9.8 m and moist below 9.1 m		G48	•	)							
	10.0													
								-						
	10.5		- trace cobbles, dense below 10.4 m		G49	•								
	11 0													
	11.5													
	40.0													
	-12.0													
	12.5				G50	•								
	13.0													
	13.5				G51									
					-									
	14.0													
	14.5													
84.5	15.0				G52	•	-							
00		الفالنافية	END OF TEST HOLE AT 15.2 m IN SILT (TILL)								 -			_

END OF TEST HOLE AT 15.2 m IN SILT (TILL)

SUB-SURFACE LOG LOGS 2018-04-11 ST JAMES CIVIC CENTRE 0 FINAL 0015 024 00.GPJ TREK GEOTECHNICAL.GDT 5/8/18

- 1. Seepage observed between 1.5 m depth and 2.1 m depth in SILT layer and between 8.5 m depth and 9.1 m depth in SILT (TILL) layer.
  2. No sloughing observed..

- Test Hole open to 15.2 m depth and dry fifteen minutes after drilling.
   Test Hole backfilled with auger cuttings.
   Elevation relative to the main floor located at south entrance of existing building,

which was assigned a temporary benchmark elevation of 100.00 m.

Logged By:	Beta Taryana	Reviewed By:	Nelson Ferreira	Project Engineer:	Nelson Ferreira





Client	t:	_Cit	y of Winn	ipeg							_	Projec	t Number:	_00	015	024 0	0								
Proje	ct Nam	e: <u>St</u> .	James C	ivic Cen	tre New	Additio	ns an	d Buil	lding, '	Winnipe	<u>g, M</u> B	Locati	on:	<u>R</u>	efer	to Fig	ure (	01 for	Test	Hole	locatio	ns			
Contr	actor:	Su	bterranea	n Ltd.								Groun	d Elevatio	n: <u>9</u> 9	9.83	m									
Metho	od:	406	mm Auger	r, Soilmec	STM-20							Date D	rilled:	_A	pril 9	9, 201	8								
	Sample	Type:			Grab (	G)			Shelb	y Tube (	(T)	∑ s₁	olit Spoon (	SS)		Sp	lit Ba	arrel (	SB)		Cor	e (C)			
	Particle	Size I	_egend:		Fines			Clay		IIII Si	lt	••••	Sand	•	X	Gra	vel		_	Cobble	es	H	Βοι	ulders	s
Elevation (m)	Depth (m)	Soil Symbol				MA	ATERI	IAL D	)ESCF	RIPTION					Sample Type	Sample Number		17 1 Partice 20 4 PL	ulk Uni (kN/m³) 8 19 cle Size 10 60 MC	) 9 2 ⊖ (%) 0 8 LL	0 21 0 100 0 100 0	•	Stren Tes △ To Poc ⊠	ined Songth (kost Typervanecket Pervanecket Pervanecke	(Pa) <u>e</u> e ∆ en. <b>Φ</b>
99.5			ORGANI	C CLAY	' - silty, ti en mois	race sa	nd, tra	ace gr	ravel (	<15 mm low to in	diam.	), trace	rootlets			G53		•							
33.3	-0.5-		CLAY (FI	ILL) - sil	ty, trace	sand, t																			
	-1.0		- fro	zen, mo	own and pist and f te plastic	irm whe	en tha	awed							4	G54		•							
																G55						_			_
98.3	-1.5-		CLAY - s	ilty, trac	e sand, t	trace gr	ravel (	<5 m	m diar	m.), trace	e oxida	ation, tra	ice silt												
			inclusions - bro	own												G56									
	-2.0-		- fro - grey bel			oist and	d stiff v	when	thawe	ed, high p	olastic	ity				000									
	-2.5-		0 ,																						
																					_	_			_
	-3.0-															G57					+		Δ	<b>&gt;</b>	$\dashv$
	**************************************																				_				+
	−3.5−																								
	4 0																								
																					_	_			_
	-4.5-																				$\dashv$	_		_	_
			- firm to s	stiff belo	w 4.6 m											G58			•		$\dashv$	•		$\dashv$	_
	5.0																				+	_	+	$\dashv$	_
																						+			+
	-5.5																								
	0.0															G59						•			
	-6.5-																								
			- trace till	Linclusio	ons belov	v 6 7 m	1														$\perp$	_	_	_	_
	-7.0-		u doc dii	. II IOIUSIC		0.7 111															$\dashv$	_	_	_	_
																					-+	_	_		
	-7.5-																				$\dashv$	+	-	$\dashv$	$\dashv$
			- soft to f	irm belo	w 7.6 m											G60					$\dashv$	•	+	$\dashv$	+
1000	<u></u>	D-4-	Taryana				D		- d D	Nelso	n F-:-	oiro			_	)wa! - :	4 -	adre e		- داما	n Ferr	oirc			

# **Sub-Surface Log**

Į	uc	U		nnicac											
	u		pol		ype	mber	16	□ E 17	Bulk Ur (kN/m 18 1	it Wt ) 19 2	20 21		ndraine Strength <u>Test</u>	(kPa)	
	Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	0 :	20	icle Siz 40 6		30 100	۰	△ Torv	ane ∆ Pen. ■	۰
	Ш		Soi		San	Samp		PL —	MC 40 6	LL 50 8	30 100		⊠ Q Field ' 80	/ane C	) 160200
Ī		8.0													
	91.3	8.5-		SILT (TILL) - trace clay, trace sand, trace gravel (<25 mm diam.)											
		<u>-</u>		- light grey - wet, compact	4	G61	•								
		9.0-		- no to low plasticity - moist below 9.1 m		G62	•								
		9.5-				002									
		10.0													
		-10.0													
		10.5													
		11.0			4	G63	•								
		-													
		11.5													
3/18		12.0													
GDT 5/8		12.5				G64	•								
INICAL.		12.5													
OTECH		13.0													
REK G		13.5													
GPJ 1		-		- dense below 13.7 m		G65	•								
5 024 0		14.0													
NAL 001		14.5													
RE 0 FI		- 15.0													
CENTE		-				G66									
SCIVIC	84.3	£15.5:		END OF TEST HOLE AT 15.5 m IN SILT (TILL)		000									
ST JAME				Notes:  1. Seepage observed between 8.5 m depth and 9.1 m depth in SILT (TILL) layer.  2. No sloughing observed.											
8-04-11				<ul><li>3. Test Hole open to 15.5 m depth and dry fifteen minutes after drilling.</li><li>4. Test Hole backfilled with auger cuttings.</li><li>5. Elevation relative to the main floor located at south entrance of existing building,</li></ul>											
GS 201				which was assigned a temporary benchmark elevation of 100.00 m.											
OG LC															
SUB-SURFACE LOG LOGS 2018-04-11 ST JAMES CIVIC CENTRE 0 FINAL 0015 024 00.GPJ TREK GEOTECHNICAL.GDT 5/8/18															
SUB-SU	Logge	ed By:	: Beta	Taryana Reviewed By: Nelson Ferreira	F	Projec	t En	gine	er: _	Nelso	on Fe	rreira			

- Seepage observed between 8.5 m depth and 9.1 m depth in SILT (TILL) layer.
   No sloughing observed.
   Test Hole open to 15.5 m depth and dry fifteen minutes after drilling.

- 4. Test Hole backfilled with auger cuttings.
- 5. Elevation relative to the main floor located at south entrance of existing building, which was assigned a temporary benchmark elevation of 100.00 m.





Project Name: St. James Chric Centre New Additions and Balding, Winnipeg, I/N Location:  Subternament Life Method:  Jobs mi Ager, Soltme STM-26  Sample Type:  Ager Gob (S)  Fines Gob Clay  Fines Clay  Clay  Fin	Clien	nt:	_Cit	ty of Winn	ipeg				Project Number:	0015	024 0	00							
Method: 406 mm Auger, Soilmec STM-20   Date Drilled: April 10, 2018   Sample Type:	Proje	ct Nan	ne: <u>St</u>	. James C	ivic Cent	tre New Ac	dditions and B	uilding, Winnipeg, N	MB Location:	Refe	r to Fig	gure (	01 for	Test F	Hole loca	tions			
Sample Type:    Grab (G)   Shelby Tube (T)   Split Spoon (SS)   Split Barrel (SB)   Core (C)	Cont	ractor:	Su	<u>ıbterranea</u>	n Ltd.				Ground Elevation	n: <u>98.6</u>	5 m								
Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Mean Boulders    Sand   Sand	Meth	od:	_400	6 mm Auger	, Soilmec	STM-20			Date Drilled:	April	10, 20	18							
MATERIAL DESCRIPTION		Sample	e Type:			Grab (G)		Shelby Tube (T)	Split Spoon (S	SS)	Sp	olit Ba	arrel (	(SB)	С	ore (C	;)		
Strength (kPa)   Stre		Particle	e Size I	Legend:		Fines	Clay	/ Silt	Sand		Gra	ivel	5°	<u>~</u> ] c	obbles	1	Во	ulders	s
ORGANIC CLAY - silty, trace sand, trace gravel (<10 mm diam.), trace rootlets - black, frozen, moist and stiff when thawed, low to intermediate plasticity  CLAY - silty, trace sand, trace gravel (<5 mm diam.), trace oxidation, trace silt inlucusions (<10 mm diam.) - brown - frozen to 2.1 m, moist and stiff when thawed - high plasticity  G77  G78  G79  G79										4	ē		□В	ulk Unit	Wt				
ORGANIC CLAY - silty, trace sand, trace gravel (<10 mm diam.), trace rootlets - black, frozen, moist and stiff when thawed, low to intermediate plasticity  CLAY - silty, trace sand, trace gravel (<5 mm diam.), trace oxidation, trace silt inlucusions (<10 mm diam.) - brown - frozen to 2.1 m, moist and stiff when thawed - high plasticity  G77  G78  G79  G79	Б Б	ے	loqu							V	qun	16					Te	est Typ	<u>se</u>
ORGANIC CLAY - silty, trace sand, trace gravel (<10 mm diam.), trace rootlets - black, frozen, moist and stiff when thawed, low to intermediate plasticity  CLAY - silty, trace sand, trace gravel (<5 mm diam.), trace oxidation, trace silt inlucusions (<10 mm diam.) - brown - frozen to 2.1 m, moist and stiff when thawed - high plasticity  G77  G78  G79  G79	evati (m)	Dept (m)	Syn				MATERIAL	DESCRIPTION		el Be	S S	0					Poor	cket Pe	en. 🕶
ORGANIC CLAY - silty, trace sand, trace gravel (<10 mm diam.), trace rootlets - black, frozen, moist and stiff when thawed, low to intermediate plasticity  CLAY - silty, trace sand, trace gravel (<5 mm diam.), trace oxidation, trace silt inlucusions (<10 mm diam.) - brown - frozen to 2.1 m, moist and stiff when thawed - high plasticity  G77  G78  G79  G79	Ĭ		Soil							Sam	amp		PL				⊳	🛚 Qu 🗵	₫
- black, frozen, moist and stiff when thawed, low to intermediate plasticity  CLAY - silty, trace sand, trace gravel (<5 mm diam.), trace oxidation, trace silt inclusions (<10 mm diam.)  - brown  - frozen to 2.1 m, moist and stiff when thawed  - high plasticity  G78  G79  G79			<del></del>	00011	0.01.437			17.40			S	0 :	20 4	40 60	80 100	0 4	0 8	0 12	0 1602
inlcusions (<10 mm diam.) - brown - frozen to 2.1 m, moist and stiff when thawed - high plasticity  G78  G79  G79	98.3			ORGANI - bla	ck, froze	- siity, trac en, moist a	e sand, trace nd stiff when	gravel (<10 mm dia thawed, low to inter	m.), trace rootiets mediate plasticity		G77		•						
- brown - frozen to 2.1 m, moist and stiff when thawed - high plasticity  G78  G78  G79  G79		0.5		CLAY - s	ilty, trace	e sand, tra	ce gravel (<5	mm diam.), trace o	kidation, trace silt										
-1.0 - high plasticity  -1.52.0 - G79				- bro	own						G78								
-1.5 -2.0		1.0		- tro - hig	zen to 2. gh plastic	. 1 m, mois city	t and stiff whe	en tnawed				ـــــ							
-2.0		[ ]										_							
-2.5		15-									G79		•						
2.5																			
-2.5 - grey below 2.4 m  -3.0 - 3.5 - 3.5 - 4.0 - 4.5 - 5.0 - 5.5		20																	
- 2.5	0	2.0									000								
-3.0  -3.0  -3.0  -4.0  -4.0  -4.5  -5.5  -6.0  -6.5  -6.5  -7.0  -5.5  -5.5  -7.5  -5.5  -7.5  -5.5  -7.5  -5.5  -7.5  -5.5  -7.5  -5.5  -7.5  -6.4  -7.5  -6.5  -7.5  -6.5  -7.5	ò ò	2.5		arov bol		<b>~</b>				4	G80						4		
-3.03.54.0 -4.55.56.0 -6.56.57.0 -6.57.	5	2.3		- grey bei	OW 2.4 I	11													
3.5  4.0  4.5  5.0  6.0	1	3 0									G81						•		
-3.5		5.0																	
-4.5 -5.5 -6.5 -6.5 -7.0 -1.5 -5.5 -6.5 -7.0 -7.5 -7.5 -7.5 -7.5 -7.5 -7.5 -7.5 -7.5		2.5																	
4.5  -4.5  -5.5  -6.0  -6.5  -7.0  -7.5  -	4	3.5																	
-4.5 -5.0 -6.0 -6.0 -6.5 -6.5 -7.0 -6.5 -7.5 -7.5 -7.5 -7.5 -7.5 -7.5 -7.5 -7	=																		
-4.5 -5.0 -6.0 -6.5 -6.5 -7.0 -91.6 -7.0 -7.5 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5 -0.5 -0	5	4.0																	
- trace till inclusions below 6.1 m  - 6.5  91.6  - 7.0  SILT (TILL) - trace clay, trace sand, trace gravel (<25 mm diam.)  - brown  - moist, compact - no to low plasticity  G84	† 1000										G82			•			٥		
-5.56.0 -1.5.56.56.57.0 -7.0 -7.56.57.5	8	4.5																	
91.6  7.0  SILT (TILL) - trace clay, trace sand, trace gravel (<25 mm diam.)  - brown  - moist, compact - no to low plasticity  G84	Ĭ																		
91.6 7.0 91.6 7.0 91.6 7.0 91.6 7.0 91.6 7.5 91.6 7.5 91.6 7.5 91.6 7.5 91.6 7.5 91.6 7.5 91.6 91.6 91.6 91.6 91.6 91.6 91.6 91.6		5.0																	
91.6  7.0  91.6  7.0  SILT (TILL) - trace clay, trace sand, trace gravel (<25 mm diam.) - brown - moist, compact - no to low plasticity  G84																			
91.6  7.0  91.6  7.0  SILT (TILL) - trace clay, trace sand, trace gravel (<25 mm diam.) - brown - moist, compact - no to low plasticity  G84	2	5.5																	
- trace till inclusions below 6.1 m  - trace till inclusions below 6.1 m  91.6  - 7.0  91.6  - 7.0  - Trace till inclusions below 6.1 m    T83   Image: Part of the property o	5																		
91.6  91.6  7.0  SILT (TILL) - trace clay, trace sand, trace gravel (<25 mm diam.) - brown - moist, compact - no to low plasticity  G84	SAIME	6.0		- trace till	inclusio	ns below 6	5.1 m												
91.6 7.0 91.6 7.0 SILT (TILL) - trace clay, trace sand, trace gravel (<25 mm diam.) - brown - moist, compact - 7.5 5 1  - no to low plasticity	2										T83						•		
91.6 7.0 91.6 7.0 91.6 7.0 91.6 7.0 91.6 7.0 91.6 7.0 91.6 7.0 91.6 91.6 91.6 91.6 91.6 91.6 91.6 91.6	+	6.5																	
SILT (TILL) - trace clay, trace sand, trace gravel (<25 mm diam.)  - brown - moist, compact - 7.5 - 1.	91.6																		
G84  G84  G84		7.0-				e clay, trac	e sand, trace	gravel (<25 mm dia	am.)										
- no to low plasticity	3			- mo	oist, com	pact					C04								
	1	7.5		- no	to low p	lasticity				4	G04								
<u> </u>	20																		
Logged By: Beta Taryana Reviewed By: Nelson Ferreira Project Engineer: Nelson Ferreira	Logg	ed By:	Beta	Taryana			Revie	wed By: Nelson F	erreira		Projec	ct En	gine	er: N	elson Fe	rreira			

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number		Par 20 PL	MC	ize (% 60 L	80 100	0 4	Stre	ained sength (lest Typerore T	kPa)	'
	8.0 -8.5	K1((1)19)	- reddish grey to 9.1 m below 8.2 m	4	G85	•									
	9.0														
	10.0-														
	10.5			4	G86	•									
	11.5														
5	12.0				G87										
85.5	13.0		POWER AUGER REFUSAL AT 13.1 m IN SILT (TILL)		G88	•									

Notes:

SUB-SURFACE LOG LOGS 2018-04-11 ST JAMES CIVIC CENTRE 0 FINAL 0015 024 00.GPJ TREK GEOTECHNICAL.GDT 5/8/18

- No seepage observed.
   Sloughing observed between 8.5 m depth and 8.7 m depth in SILT (TILL) layer 30.
- 3. Test bell performed at 8.7 m below existing ground in SILT (TILL) layer.
- 4. Test bell remained open with about 100 mm of slough at the base 30 minutes after belling.
- 5. Drilling continued to power auger refusal 30 minutes after test bell performed.
- Test Hole open to 13.1 m depth and dry fifteen minutes after drilling.
   Test Hole backfilled with auger cuttings.
- 8. Elevation relative to the main floor located at south entrance of existing building, which was assigned a temporary benchmark elevation of 100.00 m.

Logged By:     Beta Taryana     Reviewed By:     Nelson Ferreira     Project Engineer:     Nelson Ferreira	
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Client	:	_Ci	ty of Winr	nipeg					Projec	t Number:	0015	024 (	00							
Projec	ct Nam	e: <u>St</u>	James C	Civic Cent	re New Ad	dditions a	and Buil	ding, Winnipeg,	MB <b>Locat</b> i	on:	Refer	to Fig	gure C	1 for T	est Hol	e locat	ions			
Contra	actor:	Su	bterranea	an Ltd.					Groun	d Elevation:	99.21	m								
Metho	d:	40	6 mm Auge	r, Soilmec	STM-20					Orilled:	April 1		)18							
	Sample	e Type	:		Grab (G)			Shelby Tube (T	s	plit Spoon (SS	S) \	s	plit Ba	rrel (SE	3)	Co	re (C	)		
			Legend:	77777	Fines		Clay	Silt		~		Gra		\ \{\rangle}				Bould	ders	
			3	VVVV		V///A	,	шш	<u> </u>				T	Bulk	Unit W			Undraine	ed She	
5		pq									ype	Sample Number	16 1	7 18	l/m³) 19	20 21		Strengt Test	•	
Elevation (m)	Depth (m)	Soil Symbol				MATE	RIAL D	ESCRIPTION			Sample Type	N e	0 2	Particle				△ Tor	ane Z	Δ
_ Ee		Soil									amb	mple		0 40 PL N		80 100 L		□ I OCKE □ □ C □ Field	u 🛛	
		0,									S	Sa	0 2	0 40	60	80 100				1602
00.0		<b>****</b>						avel (<10 mm dawed, low to inte				G67		•						
98.9			SILT - tra	ace clay,	trace sand	d, trace g	ravel (<	5 mm diam.)		lasticity		G68								
98.6	-0.5		- br	own, froz	en, moist	and soft	when th	nawed, low plast			_/4	000								
Ē			inclusion	siity, trace is (<15 m	e sand, tra ım diam.)	ce grave	I (<5 mi	m diam.), trace o	oxidation, tra	ace siit										
Ē	-1.0		- br	own	.1 m, mois	t and stif	f when	thawed												+
Ē				gh plastic		t and oth	· WIICII	ulawca				G69		•				ΔΦ		+
E	-1.5												_							+
Ē																			-	_
-	-2.0-																			_
Ē												G70	_					ΔΦ		_
Ē	-2 5-		- arev he	elow 2.4 n	n							0/0	_							
E											Ц									
96.2			- soft to	firm belov	v 2.7 m							G71			•		ΔΦ	ı		
			Notes: 1. No se 2. Test H 3. Test H 4. Elevat	epage or Hole open Hole back tion relativ	filled with a ve to the m	observed depth and auger cu nain floor	d. d dry fif ttings.	teen minutes aff d at south entrar k elevation of 10	ce of existi	ng building,										
		Data	Taryana			P		ed By: Nelson	Ferreira			Proje	ct En	gineer:	Nels	son Fel	reira			



# GEOTECHNICAL

SUB-SURFACE LOG LOGS 2018-04-11 ST JAMES CIVIC CENTRE\_0\_FINAL 0015 024 00.GPJ TREK GEOTECHNICAL.GDT 5/8/18

### **Sub-Surface Log**

GE	OT	EC	HNICAL													
Clien	t:	Cit	y of Winnipeg				Project Number:	0015	024 0	0						
Proje	ct Nam	e: <u>St</u> .	James Civic Cent	re New Ad	Iditions and Buil	ding, Winnipeg, MI	B Location:	Refer	to Fig	gure 0	1 for Tes	st Hole Ic	cation	s		
Cont	ractor:	Su	bterranean Ltd.				Ground Elevation:	99.12	m							
Meth	od:	406	6 mm Auger, Soilmec	STM-20			Date Drilled:	April '	10, 20	18						
	Sample	Type:		Grab (G)		Shelby Tube (T)	Split Spoon (S	S)	Sp	olit Ba	rrel (SB)		Core	(C)		
	Particle	Size I	Legend:	Fines	Clay	Silt	Sand		Gra	vel	67	Cobbles	<u> </u>	В	oulders	;
Elevation (m)	Depth (m)	Soil Symbol			MATERIAL D	ESCRIPTION		Sample Type	Sample Number		Particle S	n³) 19 20 iize (%) 60 80		Stre	rained Sength (k rest Type Torvane ocket Pe Qu Qu ield Van	Pa) <u>e</u> ∆ •n. <b>•</b>
98.8		<b>****</b>	ORGANIC CLAY			avel (<15 mm dian			G72		•					
97.9	0.5		SILT - trace clay, to brown - wet, soft - low plasticit	trace sand	l, trace gravel (<	5 mm diam.)	·		G73	-	•					
	-1.5 2.0		CLAY - silty, trace inclusions (<15 m - brown - moist, stiff - high plastic	m diam.)	ce gravei (<5 mi	n diam.), trace oxid	dation, trace silt		G74 G75						0	
	2.5		- grey below 2.4 m	า											<u> </u>	
96.1	3.0								G76							
			<ol> <li>No sloughing of</li> <li>Test Hole open</li> <li>Test Hole backf</li> </ol>	ved between to 3.0 m of filled with a verte to the m	en 0.3 m depth a depth and dry fif auger cuttings. nain floor located	I at south entrance	drilling.									

 Logged By:
 Beta Taryana
 Reviewed By:
 Nelson Ferreira
 Project Engineer:
 Nelson Ferreira

#### Test Hole TH18-09

1 of 1



Clier	nt:	_Cit	y of Winn	ipeg					Proje	ct Number:	001	15 O	24 0	0								
Proje	ect Nam	e: <u>St</u> .	James C	ivic Cent	tre New A	dditions and	Building	, Winnipeg,	MB Loca	tion:	Ref	fer to	o Fig	gure (	01 fo	r Test	Hole	locat	ions			
Cont	ractor:	Su	bterranea	n Ltd.					Grou	nd Elevation	: 98.	.66 r	n									
Meth	od:	406	mm Auger	, Soilmec	STM-20				Date	Drilled:	Apr	ril 10	), 20	18								
	Sample	Туре:			Grab (G		She	elby Tube (T)	) 🔀 :	Split Spoon (S	SS)	X	Sp	olit Ba	arrel	(SB)		Co	re (C	)		
	Particle	Size L	egend:		Fines	/// c	lay	Silt	• •	Sand			Gra	vel	_		Cobbl	les	H	Во	ulders	;
Elevation (m)	Depth (m)	Soil Symbol						CRIPTION				Sample Type	Sample Number		Parti	Bulk Un (kN/m 18 1 icle Siz 40 6 MC 40 6	60 8 LL	30 100	•	Stren  Tes  To To  Poc  Fie	ned S gth (k st Typ prvane ket Pe Qu ⊠ ld Var	Pa) <u>e</u> ⊹ ∆ en. <b>Φ</b>
98.4			ORGANI	C CLAY	- silty, tra	ce sand, tra	ce gravel	(<10 mm di d, low to inte	iam.), trac	e rootlets	Ì											
92.0			END OF Notes: 1. No see 2. Test both 3. Test H 4. Test H 4. Test H 5. Elevati	TEST H epage or ell perforole back ow 1.8 r	OLE AT 6 sloughing med at 6. filled with ve to the r	.7 m IN CLA observed. The below eduger cuttin	xy (CLA)  xisting girys 30 mirgs.  cated at at	am.), trace of and SILT ( rade in CLA)	TILL) COI Y layer. pelling.	race silt												
Logg	jed By:	Beta	Taryana			Rev	iewed B	y: Nelson I	Ferreira			Pr	ojec	t En	gine	er:	Nelso	n Fer	reira			