# **APPENDIX 'A'**

# **GEOTECHNICAL REPORT**



## Morrison Hershfield Salter Street Rehabilitation Sub-Surface Investigation

#### **Prepared for:**

#### **Distribution:**

Morrison Hershfield 25 Scurfield Blvd, Unit 1 Winnipeg, MB R3Y 1G4 Attention: Ron Bruce Brad Sacher, P.Eng.

**Project Number:** 0035-045-00

#### Date:

April 6, 2017 Final Report



Quality Engineering | Valued Relationships

April 6, 2017

Our File No. 0035-045-00

Brad Sacher, P.Eng. Morrison Hershfield 59 Scurfield Blvd, Unit 1 Winnipeg, MB R3Y 1V2

#### RE: Salter Street Rehabilitation Sub-Surface Investigation Report

TREK Geotechnical Inc. is pleased to submit our report for the sub-surface investigations for the Salter Street Rehabilitation project.

Please contact the undersigned if you have any questions. Thank you for the opportunity to serve you on this assignment.

Sincerely,

TREK Geotechnical Inc. Per:

Brent Hay, P. Eng. Geotechnical Engineer Tel: 204.975.9433 ext. 105

cc: Paul Bevel, B.Sc., (TREK Geotechnical)

### **Revision History**

Revision No.	Author	Issue Date	Description
0	SGBR	April 6, 2017	Final Report

## **Authorization Signatures**

**Prepared By:** 

Shane Broderick, Assistant Lab and Field Services Manager.



**Reviewed By**:

Brent Hay, P.Eng. Geotechnical Engineer



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### 1.0 Introduction

This report summarizes the results of the sub-surface investigation completed for the 2017 Residential Street Renewal Program. The streets investigation includes Salter Street. The information collected describes the pavement structure of the existing road as well as the soil stratigraphy beneath the pavement structure.

### 2.0 Sub-Surface Investigation and Laboratory Program

For each street, test holes were drilled approximately every 50 m of street length with specific locations shown in Figure 01. The test holes were drilled to determine sub-surface conditions for the reconstruction of the road.

The sub-surface investigation was conducted on March 13<sup>th</sup>, 2017. The test holes were drilled to a depth of 3.1 m below road surface by Paddock Drilling Ltd. using an Acker MP8 truck mounted drill rig equipped with 125 mm diameter solid stem augers. The pavement structure (asphalt or concrete) was cored by Paul Bevel of Trek Geotechnical, using a portable coring press equipped with a hollow 150 mm diameter diamond core drill bit. The sub-surface conditions were observed during drilling and visually classified by Shane Broderick of TREK. Other pertinent information such as groundwater and drilling conditions were also recorded during drilling. Disturbed (auger cuttings) samples retrieved during the sub-surface investigation were transported to TREK's material testing laboratory for further testing. Core samples were also retrieved and logged at TREK's material testing laboratory.

The laboratory testing program consisted of moisture content determination, Atterberg limits, and grain size analysis (mechanical sieve and hydrometer methods). Information gathered for each street is included in separate appendices (Appendix A). The information provided in the Appendices includes test hole logs, laboratory testing summary tables and results, and photos of the concrete cores.

Test hole locations noted on the test hole logs and shown on Figure 01 are based on measured distances from the nearest address, edge of pavement or other permanent features.

### 3.0 Closure

The geotechnical information provided in this report is in accordance with current engineering principles and practices (Standard of Practice). The findings of this report were based on information provided (field investigation and laboratory testing). Soil conditions are natural deposits that can be highly variable across a site. If subsurface conditions are different than the conditions previously encountered on-site or those presented here, we should be notified to adjust our findings if necessary.

All information provided in this report is subject to our standard terms and conditions for engineering services, a copy of which is provided to each of our clients with the original scope of work, or a mutually executed standard engineering services agreement. If these conditions are not attached, and you are not already in possession of such terms and conditions, contact our office and you will be promptly provided with a copy.

This report has been prepared by TREK Geotechnical Inc. (the Consultant) for the exclusive use of Morrison Hershfield Ltd. (the Client) and their agents for the work product presented in the report. Any findings or recommendations provided in this report are not to be relied upon by any third parties, except as agreed to in writing by the Client and Consultant prior to use.



Figures



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ion Plan 0

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SCALE = 1 : 2 000 (216 mm x 279 mm)

TEST HOLE (TREK, 2017)

WINNIPEG 2016.

Figure 01 **Test Hole Location Plan** 

### EXPLANATION OF FIELD AND LABORATORY TESTING

#### GENERAL NOTES

GEOT

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	ajor Div	isions	USCS Classi- fication	Symbols	Typical Names		Laboratory Classif	fication C	riteria		ş				
	raction	gravel no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines		$C_{U} = \frac{D_{60}}{D_{10}}$ greater than	<sup>n 4;</sup> C <sub>c</sub> = <u> </u>	$\frac{(D_{30})^2}{(10 \times D_{60})^2}$ between 1 and 3		ieve size	5 #4	o #10	to #40	200
sieve size	vels of coarse f	Clean (Little or	GP		Poorly-graded gravels, gravel-sand mixtures, little or no fines	urve, 200 sieve nbols*	Not meeting all gradatio	on requiren	nents for GW	ە	STM S	#10	#401	#500	¥
s No. 200	Gra than half o	vith fines sciable of fines)	GM		Silty gravels, gravel-sand-silt mixtures	r than No. g dual syn	Atterberg limits below "A line or P.I. less than 4	'A"	Above "A" line with P.I. between 4 and 7 are border-	ticle Siz	٩			+	
ained soils larger thar	(More	Gravel w (Appre amount	GC		Clayey gravels, gravel-sand-silt mixtures	wel from g ion smalle ilows: W, SP SM, SC ts requirin	Atterberg limits above "A line or P.I. greater than 7	'A" 7	line cases requiring use of dual symbols	Par		Ľ	, 8	25	
Coarse-Gr naterial is	action	sands no fines)	SW	*****	Well-graded sands, gravelly sands, little or no fines	nd and gra ines (fracti sified as fo sw, GP, S GM, GC, thine case	$C_{U} = \frac{D_{60}}{D_{10}}$ greater than	<sup>n 6;</sup> C <sub>c</sub> =	$\frac{(D_{30})^2}{(10 \times D_{60})^2}$ between 1 and 3		шш	2 UU tO 4 7		.075 to 0.4	c / N.N >
n half the r	nds of coarse fr an 4 75 mi	Clean (Little or	SP		Poorly-graded sands, gravelly sands, little or no fines	ages of sa entage of 1 s are class cent srcent	Not meeting all gradatio	on requiren	nents for SW				. 0	0	
(More thai	Sal Sal Saller th	vith fines sciable of fines)	SM		Silty sands, sand-silt mixtures	le percent of on perc rained soil than 5 per than 12 per than 12 per than 2 percent.	Atterberg limits below "A line or P.I. less than 4	'A"	Above "A" line with P.I. between 4 and 7 are border-	lai	5				Clay
	(More	Sands w (Appre amount	SC		Clayey sands, sand-clay mixtures	Determir dependir coarse-g Less More 6 to 1	Atterberg limits above "A line or P.I. greater than 7	'A" 7	line cases requiring use of dual symbols	Mate	ואומר	Sand	Mediu	Fine Citt or	oll oi
e size)	, As		ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	80 Plasticity	Plasticity	/ Chart			e Sizes		-	i i i	
. 200 sieve	ts and Cla	Liquid limit sss than 50	CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	70 - 60 -	an 0.425 mm		,U LI . A LINE	e	TM Sieve	> 12 in 2 in to 12	2	3/4 in. to 3 #4 to 3/4	15 2 14
soils er than No	Si		OL	==	Organic silts and organic silty clays of low plasticity	- 00 (%) 00 (%)		CH		rticle Siz	ASI	+	_		_
e-Grained al is small	ski	t 50)	MH		Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts					Pa	m	300 200	222	to 75	P 10
Fine the materi	ts and Cla	Liquid limi ater than (	СН		Inorganic clays of high plasticity, fat clays	20-			MH OR OH		L	75 1		191 4 75	) F
than half	N	gre	OH		Organic clays of medium to high plasticity, organic silts		ML OR OL 16 20 30 40 50 LIQUID LI	60 70 _IMIT (%)	80 90 100 110		5	ers	3_		-
(More	Highly	Organic Soils	Pt	<u>6 76 76</u> <u>70 77 7</u>	Peat and other highly organic soils	Von Post Class	sification Limit a	Strong co and often	lour or odour, fibrous texture	Mate	ואומוכ	Bould	Grave	Coarse	

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)	63	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

- LL Liquid Limit (%)
- PL Plastic Limit (%)
- PI Plasticity Index (%)
- MC Moisture Content (%)
- SPT Standard Penetration Test
- RQD- Rock Quality Designation
- Qu Unconfined Compression
- Su Undrained Shear Strength
- VW Vibrating Wire Piezometer
- SI Slope Inclinometer

- ☑ Water Level at Time of Drilling
- ▼ Water Level at End of Drilling
- ☑ Water Level After Drilling as Indicated on Test Hole Logs

#### 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	
	Very dense	> 50	
The Standard Penetration Test	blow count (N) of a cor	nesive soil can be related to its c	consistency as follows:

Descriptive TermsSPT (N) (Blows/300 mm)Very soft< 2</td>Soft2 to 4Firm4 to 8Stiff8 to 15Very stiff15 to 30Hard> 30

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

Descriptive Terms	Undrained Shear <u>Strength (kPa)</u>
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200





Appendix A

Test Hole Logs

	R	EK
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## Sub-Surface Log

Client:	Mo	orrison He	rshfield			Project Number:	0035-	045-0	00									
Project Nam	e: _Sa	lter Street	Rehabilitation Su	ub-Surface Inve	estigation	Location:	UTM	N-55	32422	, E-634	162.1							
Contractor:	Pa	ddock Dri	lling Ltd.		Ground Elevation:				231.36 m									
Method:	125	5mm Solid St	tem Auger, Acker MP	8 Truck Mount		Date Drilled:	13 Ma	arch 2	2017									
Sampl	е Туре	:	Grab (G	)	Shelby Tube (T)	Split Spoon (St	S)	S	olit Bar	rel (SB		ore (C)						
Particl	e Size	Legend:	Fines	Clay	Silt	Sand		Gra	ivel	БЯ	Cobbles		Boulde	rs				
		-						۲ N				Un	drained	Shear				
5 _	lod						ype	mbe	16 17	18	19 20 2	1 S	trength ( Test Tv	kPa) pe				
(m) (m)	Syn			MATERIAL D	ESCRIPTION		ole T	e Nc	F	Particle S	ize (%)		Torvan					
	Soil						amp	mple	F									
	0,						<sup>o</sup>	Sa	0 20	40	60 80 10	0 0 50	100 1	50 200				
231.3		ASPHAL	T (90 mm THICK)	)														
	2 4 4 7 4 4 4	CONCRE	ETE (215 mm THI	CK)														
231.1			LL) como oilt tr	and trans	aroual (<15 mm	dia) light to dork brown		C01	-									
231.0		frozen, m	oist and soft whe	n thawed, high	plasticity	dia), light to dark brown	1, <b>1</b>	GUI		•								
-0.5-		CLAY - si	ilty					G02		•								
		- dar - froz	zen, moist and firi	m to stiff when	thawed													
		- hig	h plasticity					G03		•			_					
1 1								000										
-1.0-																		
								G04		•								
: :								G05		•								
1								005										
-1.5-		-trace fine	e sand, trace silt i	nclusions (<50	mm), light to dark	brown below 1.52 m												
: :																		
[ ]																		
-2.0-													_					
								G06		•			•					
; ;																		
-2.5-																		
[ ]																		
228.6			me clay low place	ticity														
[ ]		SILT - SOI - MO	ttled light brown t	o brown				C07										
228 3 -3 0-		- froz - low	zen, moist and ve / plasticitv	ry soft when the	awed			001		-								
220.5		END OF	TEST HOLE AT 3	3.1 m IN SILT									1					
		Notes: 1) No slou	ughing or seepag	e observed.														
		2) Test ho	ole backfilled with	auger cuttings	, bentonite, sand,	and cold patch asphal	t											
		3) Test ho	ole location in the	northbound la	ne, 30.4 m south o	of the intersection of												
		Inkster Bl	vd and Salter Stroordinates and el	eet, 1.8 m west	of Salter Street e ed by Morrison He	ast curb. ershfield.												
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Longer Dr	Ch c			Dauda				)	A Ener		Nolos- 5	orroi						
годдеа ву:	Snai	ie ploaeli	UK	Keviewe	u by: Brent Ha	у	. 1	-roje(	u ⊏ngi	neer:	iverson F	eneira						



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GE	UT	EC	HNIU	-HL													
Clien	t:	Mo	orrison Her	rshfield			Pi	roject Number:	0035	-045-0	00						
Proje	ct Name	: <u>Sa</u>	lter Street	Rehabilitation Su	ub-Surface Inve	stigation	Lo	ocation:	UTM	N-55	3237	7, E-63	4170.8				
Cont	ractor:	Pa	ddock Dril	lling Ltd.			G	round Elevation:	231.0	06 m							
Meth	od:	125	5mm Solid St	tem Auger, Acker MP	3 Truck Mount		Da	ate Drilled:	13 M	arch 2	2017						
	Sample	Туре	:	Grab (G)		Shelby Tube	(T)	Split Spoon (	SS)	< s	plit Ba	arrel (SE	3)	Core (	C)		
	Particle	Size	Legend:	Fines	Clay	s 🛄 s	iilt	Sand		Gra	ivel	67	Cobble	s 💽	Bo	oulder	s
										er		Bulk	Unit Wt /m <sup>3</sup> )		Undra	ained S	Shear
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230.8		444	CONCRE	TE (135 mm THI	CK)												
230.7	FR	$\otimes$	SAND AN	JD GRAVEL(<20	mm dia) - some	e clay, trace s	ilt, light b	prown, frozen, mo	oist	G08	•						
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	-0.5-		- darl	k green to black	n when thawed					G09							
			- high	h plasticity	in when thewed						-						
										G10		•					
			cilt inclu	sions(<25 mm di	a) bolow 0.01 r	n					-						
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220.8										011							
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			- froz - low	en, moist and ve	ry soft when that	awed				G12		•					
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			- froz	zen, moist and sti	ff when thawed					G13		•			•		
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228.6											-						
	-2.5-		- ligh	it brown													
			- froz - higł	en, moist and firr	n to stiff when t	hawed											
			0	. ,													
										G15		•		4	¢		
228.0	-3.0-																
			END OF Notes:	IEST HOLE AT 3	3.1 m IN CLAY												
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			to surface														
			Inkster Bl	vd and Salter Str	eet, 10.6 m wes	st of Salter Str	reet east	curb.									
			4) UTM co	oordinates and el	evation surveye	ed by Morriso	n Hershf	ïeld.									
Logg	ed By:	Shar	ne Broderi	ck	Reviewe	d By: Brent	t Hay			Projec	ct Eng	gineer:	Nelson	Ferreira	a		



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Clier	nt:	Мо	rrison Hei	rshfield			Project Number:	0035	-045-0	00							
Proje	ect Name:	Sal	Iter Street	Rehabilitation Su	b-Surface Inves	stigation	Location:	UTM	N-55	32345	5, E-6	34162	.1				
Cont	ractor:	Pa	ddock Dril	lling Ltd.			Ground Elevation:	230.9	94 m								
Meth	od:	125	mm Solid St	tem Auger, Acker MP8	Truck Mount		Date Drilled:	13 M	arch 2	2017							
	Sample T	ype		Grab (G)		Shelby Tube (T)	Split Spoon (S	S) 🕨	< s	olit Ba	rrel (S	SB)	C	ore (C	C)		
	Particle S	ize l	Legend:	Fines	Clay	Silt	Sand		Gra	vel	57	Cot	bles	•	Вс	ulder	S
Elevation (m)	Depth (m)				MATERIAL DE	ESCRIPTION		Sample Type	Sample Number	16 17 0 20 0 20	□ Bulk 7 18 Particle 0 40 PL 1 0 40 0 40	k Unit W N/m <sup>3</sup> ) 19 60 60 MC 60	/t 20 21 %) 80 100 LL 1 80 100	0 5	Undra <u>Strei</u> △ T ● Poo ○ Fie 0 Fie 0 10	ained S ngth (k est Typ orvane cket Pe Q Qu X eld Van 00 150	hear Pa) ≘ ∴ ∆ en. ● e ⊖ 200 2:
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Client	:	Mo	rrison Her	shfield					_ P	Project Number:	0035-	045-0	00						
Projec	ct Name:	Sal	ter Street	Rehabi	litation Su	b-Surfa	ce Inves	tigation	_ L	ocation:	UTM	N-55	32282	2, E-63	4125.8				
Contra	actor:	Pad	dock Dril	ling Ltd.					_ 0	Ground Elevation:	230.7	8 m							
Metho	od:	125	mm Solid Ste	em Auger	, Acker MP8	Truck Mo	ount		_ C	Date Drilled:	13 Ma	arch 2	2017						
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												G18	_	•			<b>/©</b>		
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Contro	t name:	<u>Sailer Street</u>		D-Surface inve	sugation	Location:	220.0	<u>cc-vi</u>	032230	0, <b>⊏-</b> 034	4111.2				
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5	Sample	Гуре:	Grab (G)		Shelby Tube (T)	Split Spoon (S	is)		plit Ba	rrel (SE	3)	Core	e (C)		
P	Particle S	Size Legend:	Fines	Clay	Silt	Sand [		Gra	ivel	62	Cobb	les	B	oulder	S
230.8 230.7 230.7	2°article \$	Size Legend:	Fines Fines Fines Fines Fines Fines Fines Fines Fines Fines Fines Fines Fines Fines Fines Fines Fines Fines	Clay MATERIAL D	ESCRIPTION	Sand	Sample Type	Graa JagumN aldues G44 G45 G46 G47 G48 G48 G48 G48		Bulk     (kN/     Particle S     40	Cobb Unit Wt (m1) 2 Size (%) 60 8 C LL 60 8			ender ained S ength (k est Typ forvane 20 00 15 10 1	S Shear Pa) e a a a a a a a a a a a a a a a a a
227.8	-3.0-	END OF <sup>-</sup> Notes: 1) No slou 2) Test ho to surface 3) Test ho Inkster Bi 4) UTM co	TEST HOLE AT 3. Jughing or seepage ble backfilled with 2. Dle location in the vd and Salter Stre oordinates and ele	1 m IN SILT e observed. auger cuttings, northbound lar et, 4.8 m west evation surveye	, bentonite, sand, ne, 237.1 m south of Salter Street e ed by Morrison He	and cold patch aspha of the intersection of ast curb. ershfield.	alt	G50							
Logge	d Bv:	Shane Broderi	ck	Reviewe	d Bv: Brent Hav	,		Projec	ct Eng	ineer:	Nelso	n Ferre	eira		

SEREK
GEOTECHNICAL

uc	UI																					
Clien	t:	Μ	orrison He	rshfield	ł					Projec	t Number:	0035	-045-0	00								_
Proje	ct Nam	e: <u>S</u> a	alter Street	Rehat	oilitation Su	ub-Surfa	ice Invest	tigatio	<u>1</u>	Locati	on:	UTM	N-55	53220	4, E-	63408	9.2					_
Cont	ractor:	_Pa	addock Dri	lling Lt	d.					Groun	d Elevation:	230.8	81 m									_
Meth	od:	12	5mm Solid St	em Auge	er, Acker MP8	3 Truck Mo	ount			Date D	rilled:	13 M	arch 2	2017								_
	Sample	е Туре	ə:		Grab (G)		S	Shelby	Tube (T)	⊠ s	plit Spoon (S	S)	< s	plit Ba	arrel	(SB) [	(	Core (	C)			
	Particle	e Size	Legend:		Fines		Clay		]] Silt	••••	Sand		Gra	avel	5	2 Co	obbles		Вс	oulder	s	
		_										Ō	ber	10 1	⊟Bi	ulk Unit kN/m³)	Wt	24	Undra Stre	ained S ngth (k	Shear (Pa)	
tion	₽_	nbo										Typ	Ium		Partic	o ig	(%)	-	<u>Te</u>	est Typ	<u>be</u>	
eva (m	де Дер	I Sy				MATE	RIAL DE	SCRIF	TION			lple	le N	0 2	20 4	0 60	80 10	00		cket P	e 🛆 en. 🗣	
		Soi										San	amp		PL	MC			0 Fi∉	⊴ Qu ⊵ eld Vai	a ne O	
				c /7c									S	0 2	20 4	0 60	80 10	00 0 5	50 10	00 15	0 20	0 25
230.7		8 A 4		TF (15	1m THICK) 50 mm THI	CK)								1								
230.6							1	d a al a la			<b>6</b>											
230.5		$\sim$	thawed, h	LL) - tra igh pla	ace siit, tra asticity	ce sand	, light to	dark d	rown, mo	ist and so	π wnen		G23	-	•							
			CLAY - si	lty									004						i l			
	-0.5-		- dar - froz	k greei zen, mo	n oist and firr	n to stiff	when the	awed					G24									
			- higl	h plast	icity									-								
													G25					4	5			
														-								
	-1.0-												G26									
													620						Ī			
														-								
													G27		•				•			
	-1.5-																					
														]								
	EJ																					
5																						
2000 7	-2.0-																					
220.7			SILT - sor	ne cla	у									1								
			- bro - froz	wn zen. ma	oist to wet a	and verv	/ soft whe	en thav	ved				G28		•							
	[ ]		- low	plastic	city																	
	-2.5-																					
	‡ ‡																					
228.1	÷ →		CLAY - so	ome sil	t light brow	wn																
			- froz	zen, mo	pist and stil	ff when	thawed						G29									
227 8	-3.0-		- higi	n plast	icity								520									
			END OF	TEST	HOLE AT 3	8.1 m IN	CLAY											-				
			1) No slou	ughing	or seepag	e observ	ved.															
			2) Test ho	ple bac	kfilled with	auger o	cuttings, t	benton	ite, sand,	and cold	patch aspha	lt										
			3) Test ho	ble loca	ation in the	southbo	ound lane	e, 275.	2 m sout	h of the in	tersection of											
			Inkster Bl 4) UTM c	vd and oordina	salter Streates and el	eet, 10.9 evation	em west surveved	ot Salt by Mo	er Street	east curb ershfield.	).											
			, -				- ,															
	ed By:	Sha	ne Broderi	ck			eviewod	By:	Brent Ho	V			Proje	rt En	ainee	N/	alson E	orroir	a			
Logg	eu by:	Sna	ne broueri	υN		R	eviewed	ъу	ыені па	у		_ '	roje	or Ellé	ymee	a. <u>IN</u> E		enella	a			

GEOTECHNICAL

Clien	t:	М	orrison Her	rshfield				Project Number:	0035	-045-0	00								_
Proje	ct Nam	e: Sa	lter Street	Rehab	ilitation Sul	o-Surface In	vestigation	Location:	UTM	N-55	3213	31, E-	63406	65.5					
Contr	ractor:	Pa	ddock Dril	lling Lto	1.			Ground Elevation:	: 230.8	37 m									
Methe	od:	125	5mm Solid St	em Auae	er. Acker MP8	Truck Mount		Date Drilled:	13 M	arch 2	2017								-
	Sampl				Grab (G)		Shalby Tuba (T)	Split Spoon (	(22		olit P	arrol			Corc				_
	Samp								55) 🔽	<u>।</u>			(SD) जि		Core	:(0)			
	Particle	e Size	Legend:		Fines	Clay		Sand .		Gra	ivel	2			es 🖌		Bould	ers	
Elevation (m)	Depth (m)	Soil Symbol				MATERIAL	DESCRIPTION		Sample Type	Sample Number	16 · 0 2 0 2	17 1 Partic 20 4 PL 20 4	$\begin{array}{c} \text{kN/m}^{3} \\ \text{kN/m}^{3} \\ \text{s} \\ $	20 20 (%) 80 LL 80	21 100 100 0	0n St • F 0 50	Tength Test T Torva Ocket ⊠ Qu Field V	I Snear (kPa) ype ne $\triangle$ Pen. $\clubsuit$ ane $\bigcirc$ 150 20	02
230.8		- K. 4	ASPHALT	Г (110 r	nm THICK						4								
230.6	EI	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	CONCRE	IE (17	0 mm THIC	;К)													
200.0			CLAY - si	lty, trac	e sand, tra	ce organics	to 0.46 m			G37	1								
			- lign - froz	t browr zen, mo	i to black	when thaw	ed			007									
			- higł	h plasti	city					G38		•			!	0			
										G39		•				4			
229.7	-1.0-									G40				A		\$			
	-1.5-		SILT - sor - ligh - froz - low	ne clay t browr zen, mo plastic	n ist to wet a ity	nd very soft	when thawed			G41		•							
228.4										G42	_	•							
	-2.5-		CLAY - so - brov - froz - higł	ome silt wn to lig zen, mo h plasti	ght brown list and stiff city	when thaw	ed												
227.8	-3.0-									G43			•			<b>/</b> ©			
			END OF 1 Notes: 1) No slou 2) Test ho to surface 3) Test ho Inkster Bh 4) UTM co	TEST H ughing ble back of ble loca vd and pordina	IOLE AT 3. or seepage (filled with a tion in the r Salter Stre tes and ele	1 m IN CLA observed. auger cutting northbound l et, 1.9 m we vation surve	y gs, bentonite, sand ane, 351.6 m soutt st of Salter Street e eyed by Morrison H	and cold patch asph of the intersection of east curb. ershfield.	alt f										_
	ad Dav	01	a Prodori	ck		Povio	und Duy Droot Lio			Ducia	-4 5-10								_

SEREK
GEOTECHNICAL

Client:	Morrison He	ershfield			Project Number:	0035	-045-0	00					
Project Name:	Salter Stree	t Rehabilitation Su	b-Surface Inve	estigation	Location:	UTM	N-55	32101	, E-6340	41.6			
Contractor:	Paddock Dr	illing Ltd.			Ground Elevation:	230.9	90 m						
Method:	125mm Solid S	Stem Auger, Acker MP8	Truck Mount		Date Drilled:	13 M	arch 2	2017					
Sample T	vne:	Grab (G)		Shelby Tube (T)	Split Spoon (S	35)		olit Rai	rel (SB)		ore (C)		
Deutiele 0	ype.											Develop	
Particle S	ize Legend:	Fines					Gra			t Wt		Boulde	rs Shor
Cation (m) (m) (m) (m) (m) (m) (m)	ASPHAL	T (90 mm THICK)	MATERIAL D	ESCRIPTION		Sample Type	Sample Number	16 17 F 0 20 F 0 20	(kN/m <sup>3</sup> 18 11 Particle Siz 40 6 21 MC 40 6	) 9 20 21 e (%) 0 80 100 LL 0 80 100	St St O 0 50	Tength ( <u>Test Ty</u> ∆ Torvan Pocket F ⊠ Qu I Field Va 100 1	$\frac{kPa)}{pe}$ $\frac{pe}{2}$ $\frac{2}{2}$ $\frac{2}{3}$
230.0		ETE (215 mm THI	CK)										
230.6	CLAY (F	ILL) - some clay, s	ome silt, trace	sand, trace grave	l, light to dark brown,		G30		•				-
-0.5	frozen, rr CLAY - s - da - fro - hig	noist and soft wher ilty, trace sand, tra rk green to black zen, moist and firn gh plasticity	thawed, high ce organics to to stiff when	plasticity 0.67 m thawed			G31		•		•		
							G32		•		4		
-1.0-							G33		•		ΔΦ		
-1.5-							G34		•				
-2.0-													
	SILT - sc - brc - fro - lov	ome clay own zen, moist to wet a v plasticity	ind very soft w	hen thawed			G35						
228.3	CLAY - s - ligi - fro - hir	ome silt ht to dark brown zen, moist and stif ah plasticity	f when thawed	1									
227.9 -3.0-	END OF	TEST HOLE AT 3	.1 m IN CLAY				G36		•				
	Notes: 1) No slo 2) Test h to surfac 3) Test h Inkster B 4) UTM o	oughing or seepage ole backfilled with e. ole location in the lvd and Salter Stre coordinates and ele	e observed. auger cuttings southbound la et, 10.7 m wes evation survey	, bentonite, sand, ne, 388.9 m south st of Salter Street ed by Morrison He	and cold patch asph: of the intersection o east curb. rrshfield.	alt f							
	hane Broder	ick	Reviewe	ad Bv: Brent Hay	/		Proiec	t Engi	neer: N	Jelson Fe	erreira		



Appendix B

## Lab Testing Summary and Lab Testing Results - Salter Street



Project No. Client Project	0035-045-00 Morrison Hershfie Salter Street Reh	eld abilition				
Test Hole Sample # Depth (m)	TH17-03 G54 0.9 - 1.2					
Sample Date	13-Mar-17				Liquid Limit	25
Test Date	22-Mar-17				Plastic Limit	15
Technician	SX				Plasticity Index	10
Liquid Limit						
Frial #		1	2	3	4	5
Number of Blow	ws (N)	15	23	30		
Mass Wet Soil	+ Tare (g)	27.984	28.329	27.798		
Mass Dry Soil +	Fare (g)	25.101	25.496	25.129		
Mass Tare (g)		14.319	14.184	14.148		
Mass Water (g)		2.883	2.833	2.669		
Mass Dry Soil (	g)	10.782	11.312	10.981		
35 34 33 32 31 30 29 28 27 27 26 25 24	•		y = -3.5	53ln(x) + 36.313 2 = 0.9921		
22						
23 + 10		Nu	25 umber of Blo	ws (N)		100

Plastic Limit					
Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.572	21.068			
Mass Dry Soil + Tare (g)	19.744	20.165			
Mass Tare (g)	14.321	14.075			
Mass Water (g)	0.828	0.903			
Mass Dry Soil (g)	5.423	6.090			
Moisture Content (%)	15.268	14.828			



Project No. Client Project	0035-045-00 Morrison Hershfie Slater Street Reh	eld abilitation				
Test Hole	TH17-05					
Sample #	G44					
Depth (m)	0.2 - 0.3					
Sample Date	13-Mar-17				Liquid Limit	71
Test Date	22-Mar-17				Plastic Limit	28
Technician	SX				Plasticity Index	43
Liquid Limit						
Trial #		1	2	3	4	5
Number of Blow	/s (N)	20	25	33		
Mass Wet Soil +	Tare (g)	23.495	24.402	25.304		
Mass Dry Soil +	Tare (g)	19.571	20.153	20.604		
Mass Tare (g)		14.176	14.221	13.786		
Mass Water (g)		3.924	4.249	4.700		
Mass Dry Soil (g	1)	5.395	5.932	6.818		
<b>Moisture Conter</b>	nt (%)	72.734	71.628	68.935		
79         77         77         77         77         77         75         74         75         74         73         72         71         71         71         71         69         69         69         69         69			γ =	= -7.671ln(x) + 95 R <sup>2</sup> = 0.97	5.929	
67 +		1				
10		N	25 u <b>mber of Blo</b>	ws (N)		100

Plastic Limit					
Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.178	19.801			
Mass Dry Soil + Tare (g)	18.910	18.590			
Mass Tare (g)	14.433	14.281			
Mass Water (g)	1.268	1.211			
Mass Dry Soil (g)	4.477	4.309			
Moisture Content (%)	28.323	28.104			



roject No.	0035-045-00					
lient	Morrison Hershfie	eld				
oject	Salter Street Reh	abilitation				
est Hole	TH17-05					
ample #	G46					
epth (m)	0.7 - 0.9					
ample Date	13-Mar-17				Liquid Limit	76
est Date	22-Mar-17				Plastic Limit	25
chnician	SX				Plasticity Index	51
quid Limit						
ial #		1	2	3	4	5
Imber of Blov	vs (N)	18	25	30		
ass Wet Soil -	⊦ Tare (g)	23.964	25.590	24.698		
ass Dry Soil +	Tare (g)	19.593	20.680	20.231		
ass Tare (g)		13.930	14.166	14.261		
ass Water (g)		4.371	4.910	4.467		
ass Dry Soil (	g)	5.663	6.514	5.970		
oisture Conte	nt (%)	77.185	75.376	74.824		
84         84           Woistnre Content (%)         83           83         83           84         83           85         81           87         81           88         83           76         75           74         74			y = -4.7	728ln(x) + 90.783 R <sup>2</sup> = 0.982	3 	
70						
/3 +				I	I I	
10			25			100

Plastic Limit					
Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	20.180	19.890			
Mass Dry Soil + Tare (g)	18.979	18.743			
Mass Tare (g)	14.106	14.056			
Mass Water (g)	1.201	1.147			
Mass Dry Soil (g)	4.873	4.687			
Moisture Content (%)	24.646	24.472			



roject No.	0035-045-00					
Client	Morrison Hershfie	eld				
roject	Salter Street Reh	abilitation				
est Hole	TH17-07					
ample #	G40					
epth (m)	0.9 - 1.2					
ample Date	13-Mar-17				Liquid Limit	67
est Date	22-Mar-17				Plastic Limit	21
echnician	SX				Plasticity Index	45
quid Limit						
ial #		1	2	3	4	5
umber of Blov	vs (N)	21	26	32		
ass Wet Soil -	F Tare (g)	26.058	26.253	24.836		
ass Dry Soil +	Tare (g)	21.247	21.521	20.629		
ass Tare (g)		14.182	14.378	14.180		
ass Water (g)		4.811	4.732	4.207		
ass Dry Soil (	a)	7.065	7.143	6.449		
oisture Conte	nt (%)	68 096	66 247	65 235		
<b>Noisture Content (%)</b> <b>Noisture Content (%)</b> <b>Noist</b>			y =	-6.802ln(x) + 88. R <sup>2</sup> = 0.9748	674	
65 —						
64 —						
•••						

Plastic Limit					
Trial #	1	2	3	4	5
Mass Wet Soil + Tare (g)	21.052	20.149			
Mass Dry Soil + Tare (g)	19.835	19.122			
Mass Tare (g)	14.211	14.293			
Mass Water (g)	1.217	1.027			
Mass Dry Soil (g)	5.624	4.829			
Moisture Content (%)	21.639	21.267			



Project No.	0035-045-00			
Client	Morrison Hershfield			
Project	Slater Street Rehabilitation			
Test Hole	TH17-03			
Sample #	G54			
Depth (m)	0.9 - 1.2	Gravel	0.0%	
Sample Date	13-Mar-17	Sand	2.6%	
Test Date	20-Mar-17	Silt	70.4%	
Technician	SX	Clay	27.0%	



34.26

30.45

29.18

25.69

23.78

0.0045 0.0027

0.0024

0.0018

0.0008



Project No.	0035-045-00			
Client	Morrison Hershfield			
Project	Slater Street Rehabilitation			
Test Hole	TH17-05			
Sample #	G44			
Depth (m)	0.2 - 0.3	Gravel	0.0%	
Sample Date	13-Mar-17	Sand	7.0%	
Test Date	21-Mar-17	Silt	36.9%	
Technician	SX	Clay	56.1%	



58.51

55.04

47.15

0.0024

0.0018

0.0008



Project No.	0035-045-00			
Client	Morrison Hershfield			
Project	Slater Street Rehabilitation			
Test Hole	TH17-05			
Sample #	G46			
Depth (m)	0.7 - 0.9	Gravel	0.0%	
Sample Date	13-Mar-17	Sand	1.8%	
Test Date	21-Mar-17	Silt	21.5%	
Technician	SX	Clay	76.6%	





Project No.	0035-045-00			
Client	Morrison Hershfield			
Project	Slater Street Rehabilitation			
Test Hole	TH17-07			
Sample #	G40			
Depth (m)	0.9 - 1.2	Gravel	0.0%	
Sample Date	13-Mar-17	Sand	2.1%	
Test Date	20-Mar-17	Silt	29.2%	
Technician	SX	Clay	68.7%	





#### Local Street Renewal (Salter Street) Sub-Surface Investigation Summary Table

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material			Sample Depth (m)		Moisture	Grain Size Analysis				Atterberg Limits		
		Туре	Thickness (mm)	Туре	Thickness (mm)	Subgrade Description	Top (m)	Bottom (m)	Content (%)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid	Plastic	Plasticity Index
TH17-01	U14 (5532422m N, 634201m E) 30.4 meters south of the intersection of Salter Street and Inkster Blvd, northbound lane, 1.8	Asphalt	90	Concrete	215				-							
						CLAY FILL	0.2	0.3	29.0							
						CLAY	0.3	0.7	34.3							
						CLAY	0.7	0.9	33.8							
						CLAY	0.9	1.2	29.8							
						CLAY	1.2	1.5	29.3							
	meters west of east					CLAY	2.1	2.4	36.1							
	Guib					SILT	2.7	3.0	27.9							
TH17-02	U14 (5532377m N,	Asphalt	115	Concrete	135											
						SAND AND GRAVEL	0.2	0.3	14.2							
	634171M E) 84.1 meters south of the					CLAY TRACE ORGANICS	0.3	0.7	36.0							
	intersection of Salter					CLAY	0.7	0.9	35.2							
	Street and Inkster Blvd,					CLAY	0.9	1.2	33.6							
	southbound lane, 10.6					SILT	1.2	1.5	22.0							
	meters west of east					CLAY	1.5	1.8	38.5							
	cuib					SILT	2.1	2.4	24.1							
						CLAY	2.7	3.0	41.5							
		Asphalt	95	Concrete	180											
	U14 (5532345m N,					CLAY FILL	0.2	0.3	19.3							
	634162m E)					CLAY TRACE ORGANICS	0.3	0.7	35.1							
TH17-03	116.8 meters south of					SILT	0.7	0.9	35.9							
	the intersection of Salter Street and Inkster Blud					SILT	0.9	1.2	24.4	0	3	70	27	25	15	10
	northbound lane. 4.9					SILT	1.2	1.5	23.9							
	meters west of east					CLAY and SILT	1.8	2.1	23.9							
	curb					CLAY	2.1	2.4	45.4							
						CLAY	2.7	3.0	53.0							
TH17-04		Asphalt	140	Concrete	110											
	U14 (5532282m N,					SAND AND GRAVEL	0.2	0.3	11.8							
	189 2 meters south of					CLAY	0.3	0.7	35.4							
	the intersection of Salter					CLAY	0.7	0.9	33.1							
	Street and Inkster Blvd,					CLAY	0.9	1.2	30.7							
	southbound lane, 11.1					CLAY	1.2	1.5	29.9							
	meters west of east					SILT	2.1	2.4	23.8							
	ouib					CLAY	2.7	3.0	43.6							



#### Local Street Renewal (Salter Street) Sub-Surface Investigation Summary Table

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material			Sample Depth (m)		Moisture	Grain Size Analysis				Atterberg Limits		
		Туре	Thickness (mm)	Туре	Thickness (mm)	Subgrade Description	Top (m)	Bottom (m)	Content (%)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid	Plastic	Plasticity Index
TH17-05	114.4 (EE22220m N	Asphalt	75	Concrete	155											
	634111m F)					CLAY TRACE ORGANICS	0.2	0.3	32.0	0	7	37	56	71	28	43
	237.1 meters south of					CLAY	0.3	0.7	36.3							
	the intersection of Salter					CLAY	0.7	0.9	32.9	0	2	22	77	76	25	51
	Street and Inkster Blvd,					CLAY	0.9	1.2	30.8							
	northbound lane, 4.8					CLAY	1.2	1.5	29.0							
	meters west of east					SILT	2.1	2.4	23.4							
	dina					SILT	2.7	3.0	24.4							
TH17-06	1114 (5532204m N	Asphalt	75	Concrete	150											
	634090m E)					CLAY FILL	0.2	0.3	36.6							
	275.2 meters south of					CLAY	0.3	0.7	36.6							
	the intersection of Salter					CLAY	0.7	0.9	34.8							
	Street and Inkster Blvd,					CLAY	0.9	1.2	30.2							
	southbound lane, 10.9					CLAY	1.2	1.5	24.3							
	meters west of east					SILT	2.1	2.4	38.8							
	diub					CLAY	2.7	3.0	30.5							
	LI14 (5532131m N	Asphalt	110	Concrete	170											
	634066m E) 351.6 meters south of					CLAY	0.2	0.3	22.1							
						CLAY TRACE ORGANICS	0.3	0.7	34.9							
TH17-07	the intersection of Salter					CLAY	0.7	0.9	31.7							
	Street and Inkster Blvd,					CLAY	0.9	1.2	31.2	0	2	29	69	67	21	45
	northbound lane, 1.9					SILT	1.2	1.5	23.0							
	meters west of east					SILT	2.1	2.4	24.6							
	dub					CLAY	2.7	3.0	42.2							
TH17-08	U14 (5532101m N, 634042m E)	Asphalt	110	Concrete	115											
						CLAY	0.2	0.3	30.5							
	388.9 meters south of					CLAY TRACE ORGANICS	0.3	0.7	37.4							
	the intersection of Salter					CLAY	0.7	0.9	37.1							
	Street and Inkster Blvd,					CLAY	0.9	1.2	34.2							
	southbound lane, 10.7					CLAY	1.2	1.5	31.1							
	meters west or east					SILT	2.1	2.4	24.6							
	cuib					CLAY	2.7	3.0	49.3							



Appendix C

Photographs of Pavement Core Samples





Photo 1: Pavement Core Sample at Test Hole TH17-01



Photo 2: Pavement Core Sample at Test Hole TH17-02





Photo 3: Pavement Core Sample at Test Hole TH17-03



Photo 4: Pavement Core Sample at Test Hole TH17-04





Photo 5: Pavement Core Sample at Test Hole TH17-05



Photo 6: Pavement Core Sample at Test Hole TH17-06





Photo 7: Pavement Core Sample at Test Hole TH17-07



Photo 8: Pavement Core Sample at Test Hole TH17-08