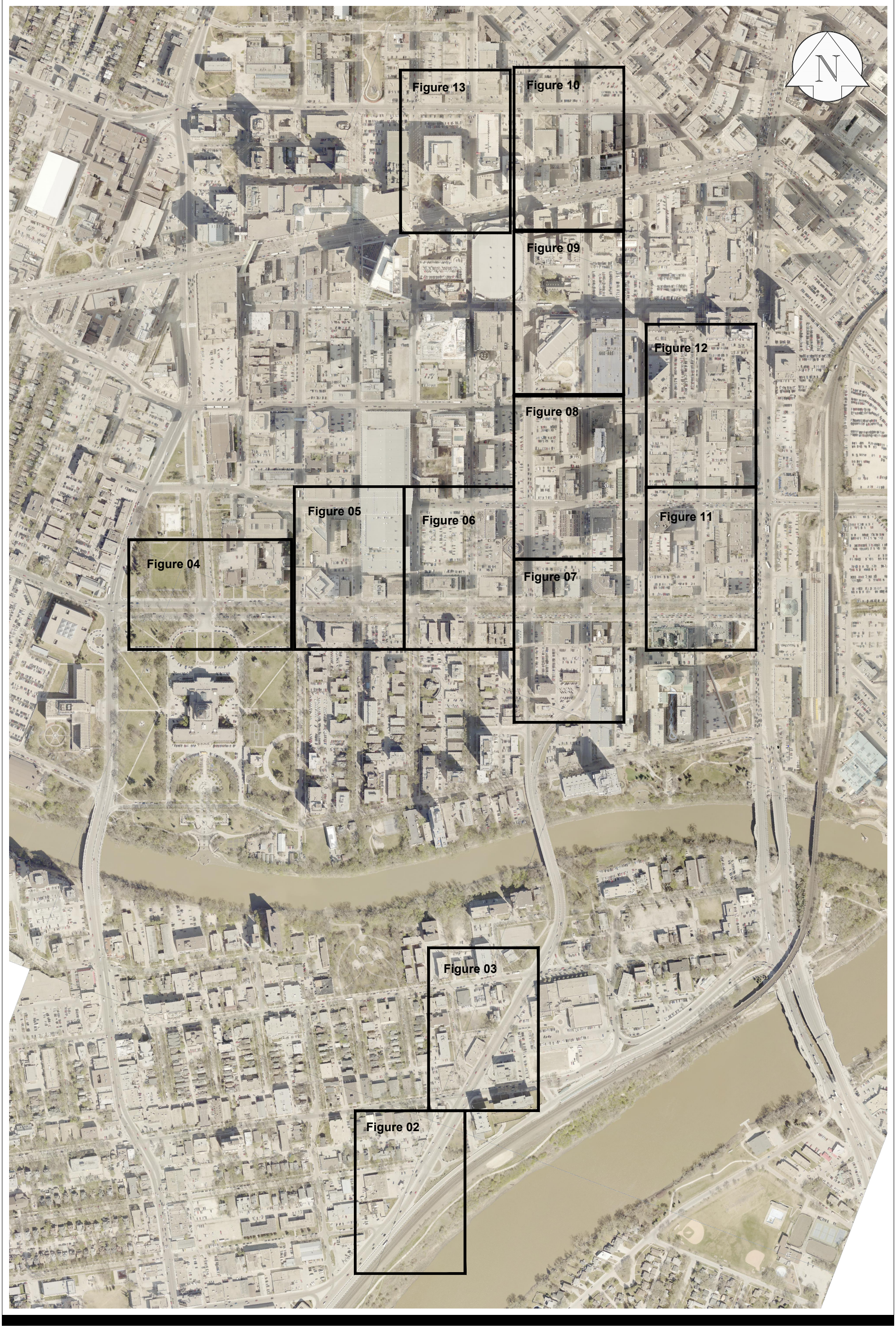
APPENDIX ‘G’

GEOTECHNICAL REPORT

Last saved by: POELSP(2019-10-25) Last Plotted: 2019-10-28
Filename: P:\60607441\900-CAD_GIS\910-CAD\25-SKETCHES\B\60607441-FIG-0-TESTHOLE_PAVEMENT CORE-LOCATION PLAN.DWG

Project Management Initials: Designer: _____ Checked: _____ Approved: _____ ANSI B 279.4mm x 431.8mm



2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

City of Winnipeg
Project No.: 60607441 Date: 2019-09-25

AECOM

Figure: 01

Last saved by: POELSP(2019-09-26) Last Plotted: 2019-09-26
Filename: P:\60607441\900-CAD_GIS\910-CAD\25-SKETCHES\B\60607441-FIG-0-TESTHOLE_PAVEMENT CORE-LOCATION PLAN.DWG

2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

City of Winnipeg
Project No.: 60607441 Date: 2019-09-25

AECOM

Figure: 11

Last saved by: POELSP(2019-09-26) Last Plotted: 2019-09-26
Filename: P:\60607441\900-CAD_GIS\910-CAD\25-SKETCHES\B\60607441-FIG-0-TESTHOLE_PAVEMENT CORE-LOCATION PLAN.DWG

Project Management Initials: Designer: _____ Checked: _____ Approved: _____ ANSI B 279.4mm x 431.8mm

2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

City of Winnipeg
Project No.: 60607441 Date: 2019-09-25

AECOM

Figure: 12

EXPLANATION OF FIELD & LABORATORY TEST DATA

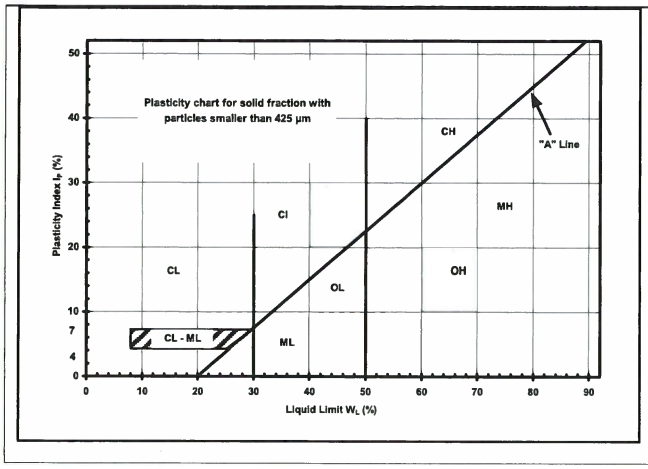
Description				UMA Log Symbols	USCS Classification	Laboratory Classification Criteria			
						Fines (%)	Grading	Plasticity	Notes
COARSE GRAINED SOILS	GRAVELS (More than 50% of coarse fraction of gravel size)	CLEAN GRAVELS (Little or no fines)	Well graded gravels, sandy gravels, with little or no fines		GW	0-5	$C_U > 4$ $1 < C_C < 3$		Dual symbols if 5-12% fines. Dual symbols if above "A" line and $4<W_P<7$ $C_U = \frac{D_{60}}{D_{10}}$ $C_C = \frac{(D_{30})^2}{D_{10} x D_{60}}$
			Poorly graded gravels, sandy gravels, with little or no fines		GP	0-5	Not satisfying GW requirements		
		DIRTY GRAVELS (With some fines)	Silty gravels, silty sandy gravels		GM	> 12		Atterberg limits below "A" line or $W_P<4$	
			Clayey gravels, clayey sandy gravels		GC	> 12		Atterberg limits above "A" line or $W_P<7$	
	SANDS (More than 50% of coarse fraction of sand size)	CLEAN SANDS (Little or no fines)	Well graded sands, gravelly sands, with little or no fines		SW	0-5	$C_U > 6$ $1 < C_C < 3$		
			Poorly graded sands, gravelly sands, with little or no fines		SP	0-5	Not satisfying SW requirements		
		DIRTY SANDS (With some fines)	Silty sands, sand-silt mixtures		SM	> 12		Atterberg limits below "A" line or $W_P<4$	
			Clayey sands, sand-clay mixtures		SC	> 12		Atterberg limits above "A" line or $W_P<7$	
FINE GRAINED SOILS	SILTS (Below 'A' line negligible organic content)	$W_L<50$	Inorganic silts, silty or clayey fine sands, with slight plasticity		ML			Classification is Based upon Plasticity Chart	
		$W_L>50$	Inorganic silts of high plasticity		MH				
	CLAYS (Above 'A' line negligible organic content)	$W_L<30$	Inorganic clays, silty clays, sandy clays of low plasticity, lean clays		CL				
		$30<W_L<50$	Inorganic clays and silty clays of medium plasticity		CI				
		$W_L>50$	Inorganic clays of high plasticity, fat clays		CH				
	ORGANIC SILTS & CLAYS (Below 'A' line)	$W_L<50$	Organic silts and organic silty clays of low plasticity		OL				
		$W_L>50$	Organic clays of high plasticity		OH				
HIGHLY ORGAINIC SOILS			Peat and other highly organic soils		Pt	Von Post Classification Limit		Strong colour or odour, and often fibrous texture	

	Asphalt		Till		
	Concrete		Bedrock (Undifferentiated)		AECOM
	Fill		Bedrock (Limestone)		

When the above classification terms are used in this report or test hole logs, the designated fractions may be visually estimated and not measured.

NOT USED TO CLASSIFY SUBGRADE. REFER TO CITY OF WINNIPEG SPECIFICATIONS FOR GEOTECHNICAL INVESTIGATION REQUIREMENTS FOR PUBLIC WORKS PROJECTS (SEPTEMBER, 2015)

NOT USED TO CLASSIFY SUBGRADE. REFER TO CITY OF WINNIPEG SPECIFICATIONS FOR GEOTECHNICAL INVESTIGATIONS REQUIREMENTS FOR PUBLIC WORKS PROJECTS (SEPTEMBER, 2015)



FRACTION		SEIVE SIZE (mm)		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
		Passing	Retained	Percent	Identifier
Gravel	Coarse	76	19	35-50	and
	Fine	19	4.75		
Sand	Coarse	4.75	2.00	20-35	"y" or "ey" *
	Medium	2.00	0.425		
	Fine	0.425	0.075	10-20	some
Silt (non-plastic) or Clay (plastic)		< 0.075 mm		1-10	trace

* for example: gravelly, sandy clayey, silty

Definition of Oversize Material

COBBLES: 76mm to 300mm diameter
BOULDERS: >300mm diameter

LEGEND OF SYMBOLS

Laboratory and field tests are identified as follows:

- q_u - undrained shear strength (kPa) derived from unconfined compression testing.
- T_v - undrained shear strength (kPa) measured using a torvane
- pp - undrained shear strength (kPa) measured using a pocket penetrometer.
- L_v - undrained shear strength (kPa) measured using a lab vane.
- F_v - undrained shear strength (kPa) measured using a field vane.
- γ - bulk unit weight (kN/m^3).
- SPT - Standard Penetration Test. Recorded as number of blows (N) from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 51 mm O.D. Raymond type sampler 0.30 m into the soil.
- DPPT - Drive Point Pentrometer Test. Recorded as number of blows from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 50 mm drive point 0.30 m into the soil.
- w - moisture content (W_L, W_P)

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

Su (kPa)	CONSISTENCY
<12	very soft
12 – 25	soft
25 – 50	medium or firm
50 – 100	stiff
100 – 200	very stiff
200	hard

The resistance (N) of a non-cohesive soil can be related to compactness condition as follows

N – BLOWS/0.30 m	COMPACTNESS
0 - 4	very loose
4 - 10	loose
10 - 30	compact
30 - 50	dense
50	very dense

F2. SEWER TELEVISING GUIDELINES FOR PUBLIC WORKS PROJECTS (JANUARY 2009)

F2.1 The Consultant is required to assess the extent of Closed Circuit Television (CCTV) inspection for all combined, wastewater, land drainage and storm relief sewers to confirm any sewer repairs required in the right-of-way within the limits of the street renewal.

F2.2 The criteria provided are general guidelines and are not intended to replace sound municipal engineering judgement specific to the individual Project scope and/or location.

F2.3 The available sewer televising information is contained within the City of Winnipeg's Sewer Management System (SMS) application.

F2.4 Confirm televising requirements with Project Manager.

F2.5 CCTV inspection general guidelines:

(a) Confirm CCTV requirements with Water & Waste Department for sewers 1050 mm and larger in diameter;

(b) Televise if no previous CCTV inspections have been completed;

(c) Re-televise sewers in Categories A/B/C/X with a Structural Performance Grade (SPG) of 3 or higher that have not been televised in the previous 5 years;

(d) Sewers located more than two metres from the curb line (i.e. not located under pavement) do not need to be re-televised if previous CCTV inspection data exist. If a sewer repair or renewal requiring excavation is noted, contact the WWD;

(e) On all street reconstructions, regardless of location of the sewer (within the right-of-way);

(f) If the street exhibits obvious distress at/along the underground plant;

(g) Of all CB leads to be reused, as part of a street reconstruction or major rehabilitation.

F2.6 For any uncertain situations and/or locations, contact the Project Manager.

F2.7 The Consultant is required to coordinate the sewer-televising contract and communicate the results to the Water & Waste Department. Any repairs or other activities deemed necessary from these inspections must be coordinated with the Water & Waste Department.

F3. GEOTECHNICAL INVESTIGATION REQUIREMENTS FOR PUBLIC WORKS PROJECTS (OCTOBER 2008)

F3.1 Fieldwork

(a) Clear all underground services at each test-hole location.

(b) As this street project is greater than 500 metres, test holes may be taken every 100 m. More or fewer test-holes may be required depending upon Site conditions – confirm with the Project Manager.

(c) Record location of test-hole (offset from curb, distance from cross street and house number).

(d) Drill 150 mm-diameter cores in pavement.

(e) Drill 125 mm-diameter test-holes into fill materials and subgrade.

(f) If a service trench backfilled with granular materials is encountered, another hole shall be drilled to define the existing sub-surface conditions.

(g) Test-holes shall be drilled to depth of 2 m $\pm$150 mm below surface of the pavement.

(h) Recover pavement core sample and representative samples of soil (fill materials, pavement structure materials and subgrade).

(i) Measure and record pavement section exposed in the test-hole (thickness of concrete or asphalt and different types of pavement structure materials).

(j) Pavement structure materials to be identified as crushed limestone or granular fill and the maximum aggregate size of the material (20 mm, 50 mm or 150 mm).

(k) Log soil profile for the subgrade.

(l) Representative samples of soil must be obtained at the following depths below the bottom of the pavement structure materials – 0.1 m, 0.4 m, 0.7 m, 1.0 m, 1.3 m, 1.6 m, etc. Ensure a sample is obtained from each soil type encountered in the test-hole.

(m) Make note of any water seepage into the test-hole.

(n) Backfill test-hole with native materials and additional granular fill, if required. Patch pavement surface with hot mix asphalt or high strength durable concrete mix.

(o) Return core sample from the pavement and soil samples to the laboratory.

F3.2 Lab Work

(a) Test all soil samples for moisture content.

(b) Photograph core samples recovered from the pavement surface.

(c) Conduct tests for plasticity index and hydrometer analysis on selected soil samples which are between 0.5 m and 1 m below top of pavement (this is the sub-grade on which the pavement and sub-base will be built). The selection will be based upon visual classification and moisture content test results, with a minimum of one sample of each soil type per street to be tested.

(d) Prepare test-hole logs and classify subgrade (based on hydrometer) as follows:

< 30% silt	- classify as clay
30% - 50% silt	- classify as silty clay
50% - 70% silt	- classify as clayey silt
> 70% silt	- classify as silt

(e) For any uncertain situations and/or locations, or clarification of these requirements, contact the Project Manager.

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-34
LOCATION: Fort Street, Broadway to York - Bicycle lane, 107 m N of Broadway, 5.0 m W of E curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (75 mm)				
		CONCRETE (180 mm)				
		CLAY - silty, trace sand, trace gravel - dark brown, dry to moist, soft to firm - high plasticity - organic odour		G16		
				G17	(G17): Gravel: 3.4%, Sand: 7.8%, Silt: 39.7%, Clay: 49.2%	
1				G18		1
		SILT - clayey, trace sand - grey, dry to moist, firm - intermediate plasticity		G19	(G19): Gravel: 0.2%, Sand: 5.1%, Silt: 60.2%, Clay: 34.5%	
				G20		
		CLAY - brown, moist, firm - high plasticity		G21	(G21): Gravel: 0.0%, Sand: 0.5%, Silt: 15.7%, Clay: 83.8%	
2				G22		2
		END OF TEST HOLE AT 2.13 m IN CLAY. NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.				
3						

PENETRATION TESTS: Becker | Dynamic Cone | SPT (Standard Pen Test) (Blows/300mm) 0 20 40 60 80 100 | Total Unit Wt (kN/m^3) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: Torvane | QU/2 | Lab Vane | Pocket Pen. | Field Vane (kPa) 50 100 150 200

AECOM

LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/8/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-35
LOCATION: Fort Street, York to St Mary - West curb lane, 50 m S of St Mary, 1.9 m E of W curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (140 mm)				
		CONCRETE (215 mm) - upper 75 mm crushed concrete				
		CLAY - trace sand - dark brown, moist, firm - high plasticity		G23		
				G24		
1				G25	(G25): Gravel: 0.3%, Sand: 3.9%, Silt: 16.4%, Clay: 79.4%	1
		- dark grey from 1.1 m to 1.5 m		G26		
				G27		
		- brown below 1.5 m		G28		
2				G29		2
		END OF TEST HOLE AT 2.13 m IN CLAY NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.				
3						

PENETRATION TESTS: Becker ✳ | Dynamic Cone ◇ | SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 | Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + | × QU/2 × | □ Lab Vane □ | △ Pocket Pen. △ | ⚉ Field Vane ⚉ (kPa) 50 100 150 200

AECOM

LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/8/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-36
LOCATION: Fort Street, York to St Mary - 2nd lane from West, 62 m N of York, 5.0 m E of W curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ⊠ SPLIT SPOON ▤ BULK ⊘ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		ASPHALT (140 mm)					
		CONCRETE (140 mm)					
		CLAY - trace sand - dark brown, dry to moist, firm to stiff - high plasticity - organic odour to 1.4 m		G30		(G30): Gravel: 0.0%, Sand: 3.6%, Silt: 22.0%, Clay: 74.4%	
				G31			
1				G32			1
				G33			
		- brown, moist, firm below 1.4 m		G34			
				G35			
2				G36			2
		END OF TEST HOLE AT 2.13 m IN CLAY NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.					
3							

PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100; ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21; Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⚉ Field Vane ⚉ (kPa) 50 100 150 200

LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/8/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

AECOM

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-37
LOCATION: Fort Street, St Mary to Graham - West curb lane, 40 m N of St Mary, 1.5 m E of W curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (190 mm)				
		CONCRETE (180 mm)				
		CLAY - trace to some sand - dark brown, dry to moist, firm - high plasticity - organic odour		G37		
				G38		
1				G39		1
		SILT - clayey, trace sand - light brown, moist, soft - intermediate plasticity		G40	(G40): Gravel: 0.0%, Sand: 5.4%, Silt: 68.0%, Clay: 26.6%	
				G41		
		CLAY - trace sand - brown, moist, firm - high plasticity		G42		
2				G43		2
		END OF TEST HOLE AT 2.13 m IN CLAY NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.				
3						

PENETRATION TESTS: Becker | Dynamic Cone | SPT (Standard Pen Test) (Blows/300mm) 0 20 40 60 80 100 | Total Unit Wt (kN/m^3) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH (kPa): Torvane | QU/2 | Lab Vane | Pocket Pen. | Field Vane 50 100 150 200

AECOM	LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
	REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/8/19
	PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-38
LOCATION: Fort Street, St Mary to Graham - East curb lane, 70 m N of St Mary, 1.8 m W of E curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ⊠ SPLIT SPOON ▤ BULK ⊘ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		ASPHALT (75 mm)					
		CONCRETE (190 mm)					
		SAND and GRAVEL - silty, trace clay - light brown, loose, moist	■	G44			
		CLAY - silty, some sand, trace gravel - brown mottled grey, moist, firm - intermediate to high plasticity	■	G45			
1			■	G46	Plastic 20 MC 40 Liquid 60 80 100	(G46): Gravel: 9.3%, Sand: 18.5%, Silt: 32.9%, Clay: 39.2%	1
			■	G47			
			■	G48			
			■	G49			
2			■	G50			2
		END OF TEST HOLE AT 2.13 m IN CLAY NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.					
3							

PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21

UNDRAINED SHEAR STRENGTH: + Torvane + × QU/2 × ☐ Lab Vane ☐ △ Pocket Pen. △ ⬘ Field Vane ⬘ (kPa) 50 100 150 200

AECOM	LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
	REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/8/19
	PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

City of Winnipeg

2019-2023 Downtown Pavement Renewals – Fort Street (Graham Avenue to Broadway)

Geotechnical Investigation

Table 01 - Summary of Laboratory Soil Testing

Test Hole No.	Test Hole Location	Pavement Structure		Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
TH19-34	Fort Street - Bicycle lane, 107 m N of Broadway, 5.0 m W of E curb	Asphalt	75	SILTY CLAY (CH)	0.4								
				SILTY CLAY (CH)	0.7	47.9	3.4	7.8	39.7	49.2	81	32	49
				SILTY CLAY (CH)	1.0								
		Concrete	180	CLAYEY SILT (MI)	1.3	27.9	0.2	5.1	60.2	34.5	46	16	30
				CLAYEY SILT (MI)	1.4								
				CLAY (CH)	1.9	33.9	0.0	0.5	15.7	83.8	84	33	51
				CLAY (CH)	2.1								
TH19-35	Fort Street - W curb lane, 50 m S of St Mary, 1.9 m E of W curb	Asphalt	140	CLAY (CH)	0.5	23.9							
				CLAY (CH)	0.7								
				CLAY (CH)	1.0	34.5	0.3	3.9	16.4	79.4	88	30	58
		Concrete	215	CLAY (CH)	1.3								
				CLAY (CH)	1.4	33.4							
				CLAY (CH)	1.9								
				CLAY (CH)	2.1	44.2							
TH19-36	Fort Street - 2nd lane from W, 62 m N of York, 5.0 m E of W curb	Asphalt	140	CLAY (CH)	0.4	39.1	0.0	3.6	22.0	74.4	94	31	63
				CLAY (CH)	0.7	37							
				CLAY (CH)	1.0								
		Concrete	140	CLAY (CH)	1.3	33.3							
				CLAY (CH)	1.4								
				CLAY (CH)	1.9	33.8							
				CLAY (CH)	2.1								
TH19-37	Fort Street - W curb lane, 40 m N of St Mary, 1.5 m E of W curb	Asphalt	190	CLAY (CH)	0.4								
				CLAY (CH)	0.7								
				CLAY (CH)	1.0								
		Concrete	180	CLAYEY SILT (MI)	1.3	26.5	0.0	5.4	68.0	26.6	42	16	26
				CLAYEY SILT (MI)	1.4								
				CLAY (CH)	1.9	39.9							
				CLAY (CH)	2.1								
TH19-38	Fort Street - E curb lane, 70 m N of St Mary, 1.8 m W of E curb	Asphalt	75	SAND AND GRAVEL	0.4								
				SILTY CLAY (CI-CH)	0.7								
				SILTY CLAY (CI-CH)	1	24.4	9.3	18.5	32.9	39.2	49	18	31
		Concrete	190	SILTY CLAY (CI-CH)	1.3								
				SILTY CLAY (CI-CH)	1.4	28.2							
				SILTY CLAY (CI-CH)	1.9								
				SILTY CLAY (CI-CH)	2.1								

* Subgrade Description based on City of Winnipeg Specifications for Geotechnical Investigation Requirements for Public Works Projects (September 2015)

H. MANALO CONSULTING LTD.

1402 Notre Dame Ave, Winnipeg MB R3E 3G5
Phone: 204-697-3854 Cell: 204-997-1355
Email: hmanalo@mts.net

CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883

CLIENT:	AECOM	PROJECT NO.:	112-1915
	99 Commerce Drive	TEST NO.:	1
	Winnipeg MB R3P 0Y7	LAB NO.:	HM 522
ATTENTION:	Ryan Harras	DATE RECEIVED :	30-Oct-19
PROJECT:	2019-2023 Downtown Streets Renewal (60607441)	DATE TESTED / BY:	Nov 4-8, 2019 / IA
	Winnipeg, MB		

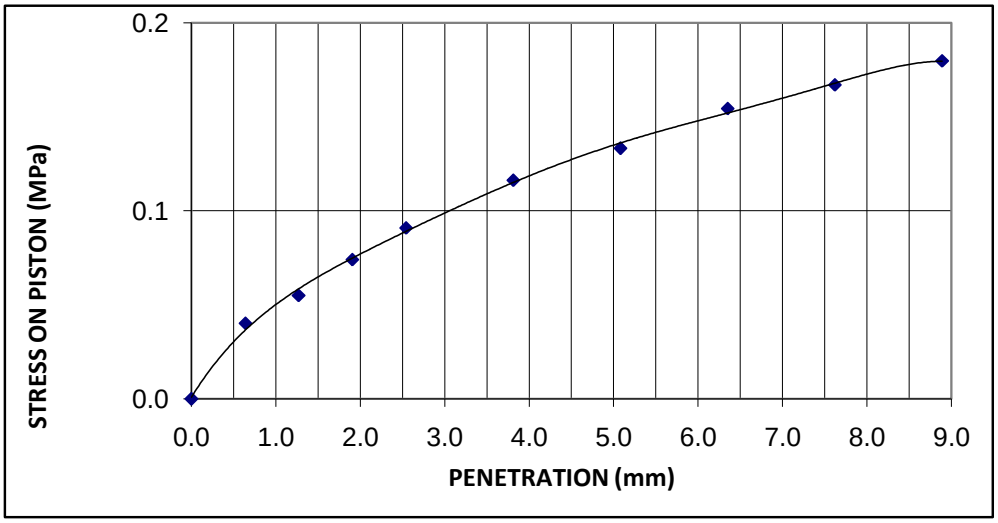
SAMPLE DATA			
Sample Type:	**CLAY**		
Source:	N/P		
Sampled by:	Client		
Optimum Moisture Content:	**19.1%**		
Maximum Dry Density:	**1618 kg/m^3**		
Method of Compaction:	Standard Proctor		
Tested by:	IA	Date Tested:	01-Nov-19

SPECIMEN DATA		
DESCRIPTION	Before Soaking	After Testing
Moisture Content (MC), %	**18.4**	
MC of top 25mm layer, %		**31.2**
Dry Density, kg/m^3	**1615**	
Compaction,%	-	-
Surcharge Weight, grams	4546	
Swell, %	9.02	

LOAD DATA

PENETRATION mm	STRESS MPa
0	0.00
0.64	0.04
1.27	0.06
1.91	0.07
2.54	0.09
3.81	0.12
5.08	0.13
6.35	0.15
7.62	0.17
8.89	0.18

LOAD PENETRATION CURVE



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD ACTUAL MPa	TEST LOAD CORRECTED MPa	**BEARING RATIO (soaked)** at **2.5** mm penetration	**BEARING RATIO (soaked)** at **5.1** mm penetration
2.54	6.9	0.09	0.09	**1.3**	-
5.08	10.3	0.13	0.13	-	**1.3**

Remarks: 4 days soaked

Reviewed by:

Gladys Paciente, P.Eng

H. MANALO CONSULTING LTD.
1402 Notre Dame Avenue, Winnipeg, MB R3E 3G5
Phone: 204 697-3854 Cell: 204 997-1355
hmanalo@mts.net

MAXIMUM DRY DENSITY AND MOISTURE CONTENT - Proctor Method (ASTM D698)

CLIENT:	AECOM 99 Commerce Drive Winnipeg MB R3P 0Y7	PROJECT NO.:	112-1915
		TEST NO.:	1
ATTENTION:	Ryan Harras		
PROJECT:	2019-2023 Downtown Streets Renewal (60607441) Winnipeg, MB		

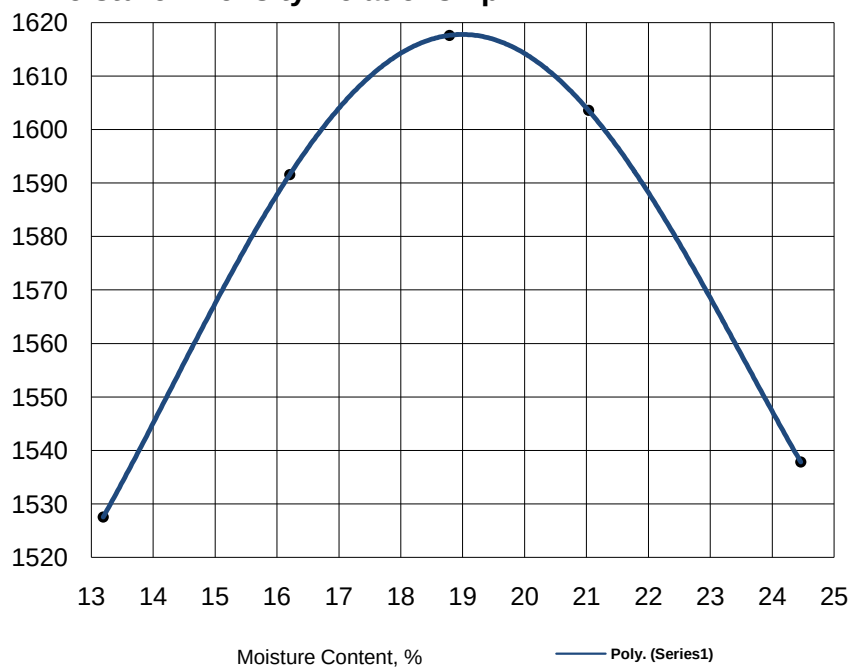
Date Sampled:	unknown	Date Received:	30-Oct-19
Sampled By:	Client	Date Tested:	01-Nov-19

MATERIAL INFORMATION

Material Type:	Clay		
Material Use:	Backfill	Material Supplier:	
Maximum Size:		Material Source:	

PROCEDURE	A
PREPARATION	Dry
COMPACTION METHOD	Manual
BLOWS PER LAYER	25
NO. OF LAYERS	3
MOLD SIZE	100 mm
MOLD VOLUME	0.910
WEIGHT OF HAMMER	2.5 kg

Test No.	1	2	3	4	5
Wet Density	1729	1849	1922	1941	1914
Moisture Content	13.2	16.2	18.8	21.0	24.5
Dry Density	1528	1592	1618	1604	1538



Maximum Dry Density (MDD): 1618 kg/m³

Optimum Moisture Content 19.1 %

STONE CORRECTION (ASTM D 4718)

Retained on 4.75 mm sieve: ____ %

Corrected Moisture: **19.1** %

Corrected Maximum Dry Density: **1618** kg/m³

Remarks:

Tested by: IA

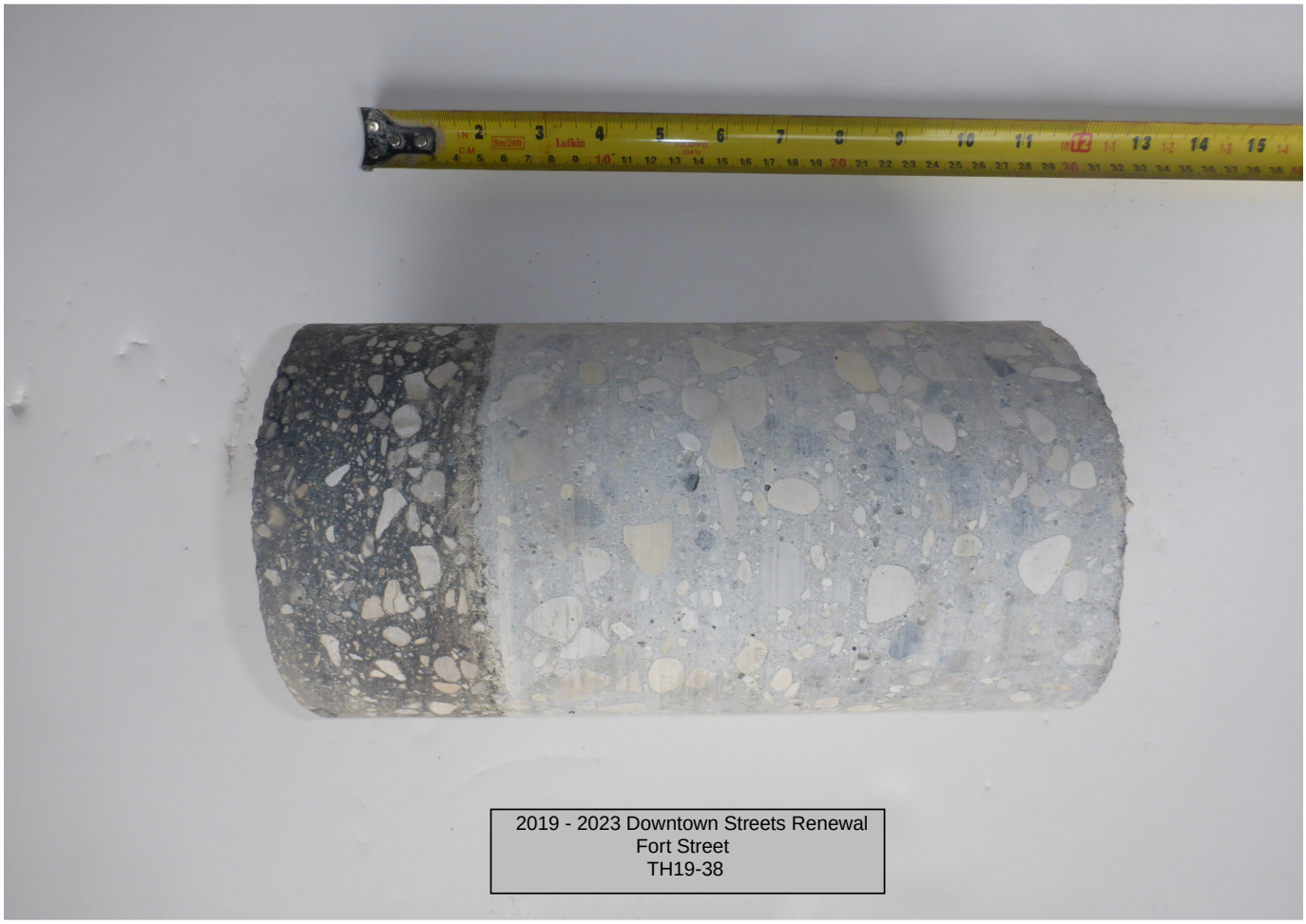
Reviewed By: Hermie Manalo

2019 - 2023 Downtown Streets Renewal
Fort Street
TH19-34

2019 - 2023 Downtown Streets Renewal
Fort Street
TH19-35

2019 - 2023 Downtown Streets Renewal
Fort Street
TH19-36

2019 - 2023 Downtown Streets Renewal
Fort Street
TH19-37



2019 - 2023 Downtown Streets Renewal
Fort Street
TH19-38

Last saved by: POELSP(2019-10-25) Last Plotted: 2019-10-28
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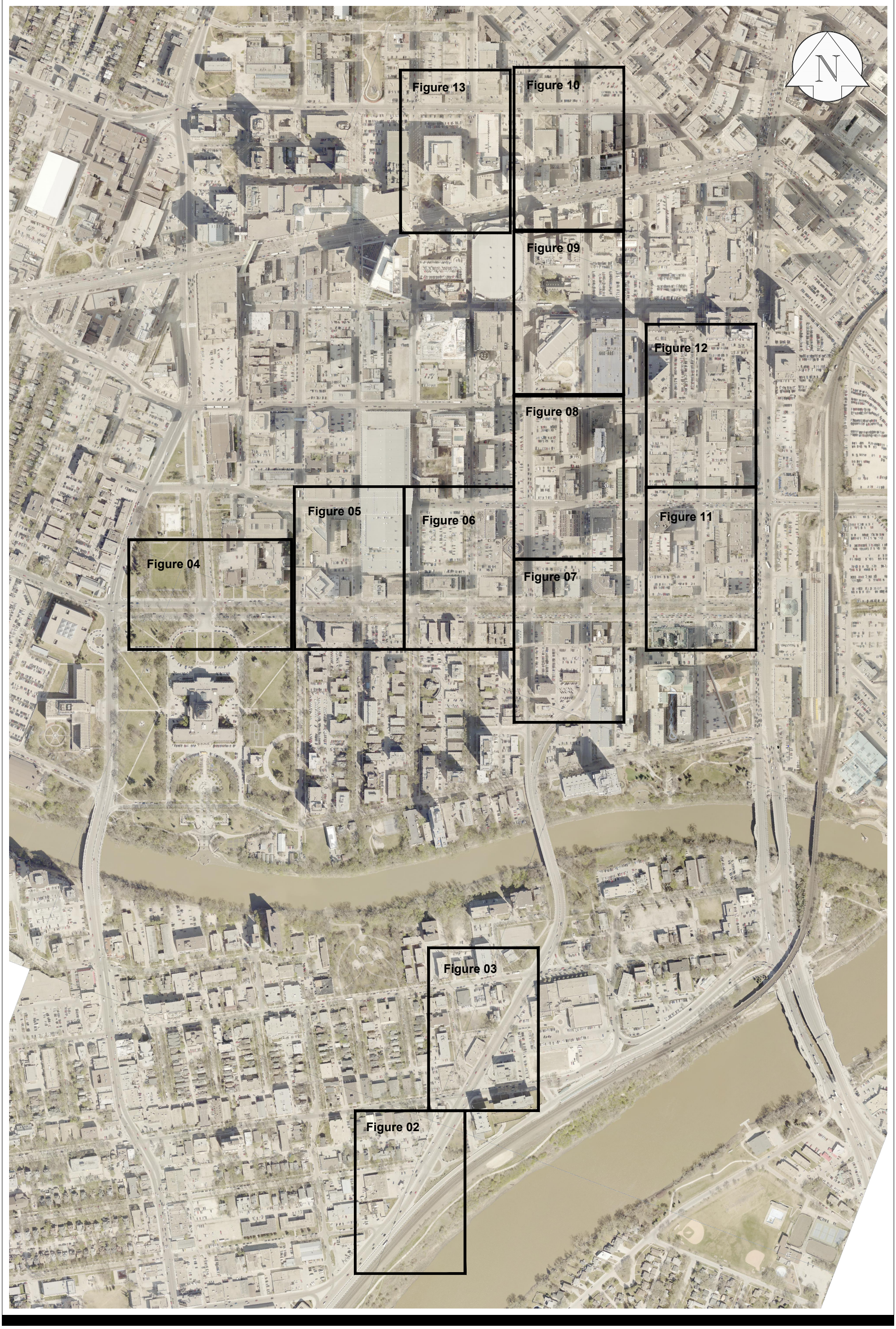
Project Management Initials: Designer: _____ Checked: _____ Approved: _____ ANSI B 279.4mm x 431.8mm



2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

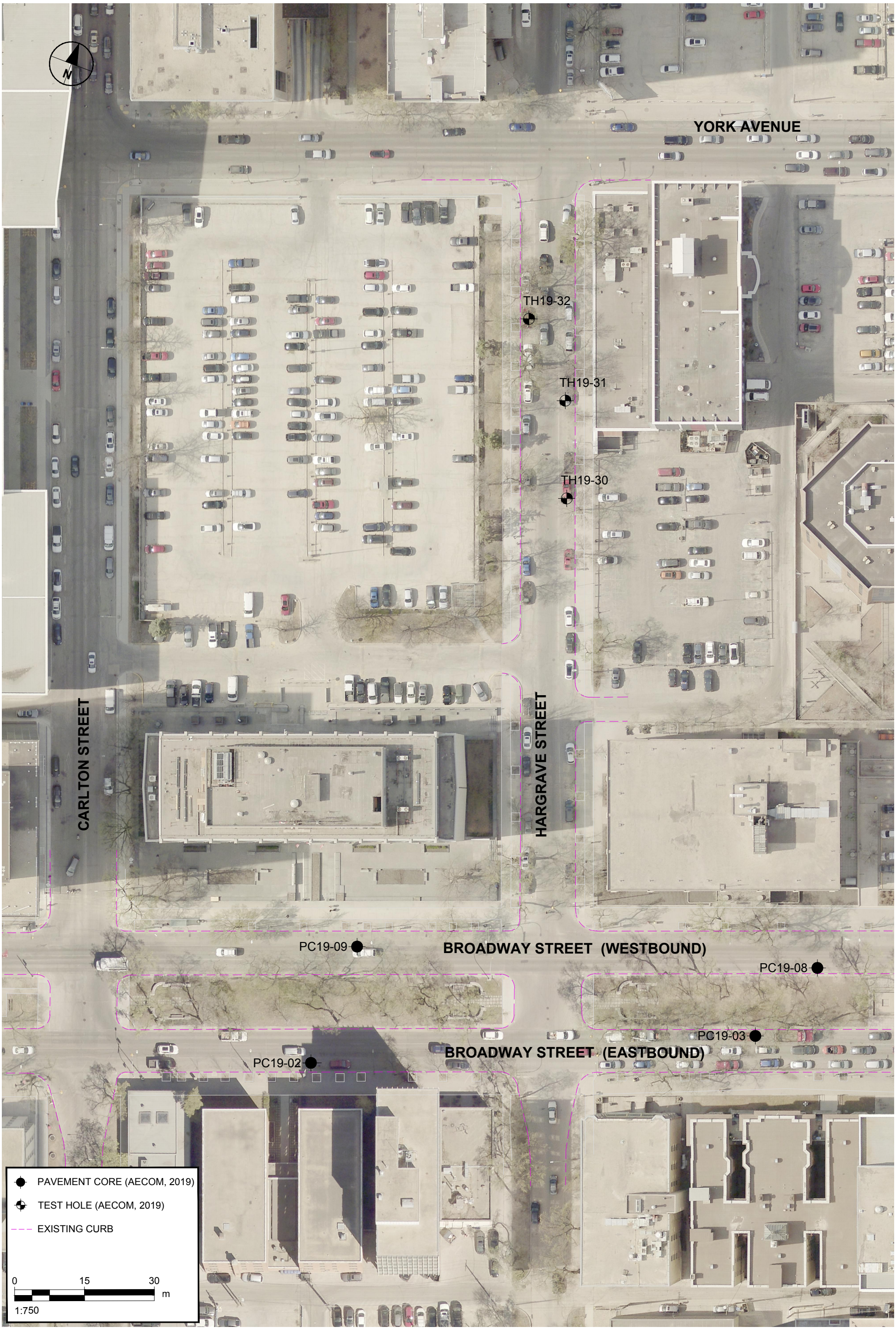
City of Winnipeg
Project No.: 60607441 Date: 2019-09-25

AECOM

Figure: 01

Last saved by: POELSP(2019-10-28) Last Plotted: 2019-10-31
Filename: P:\60607441\900-CAD_GIS\910-CAD\25-SKETCHES\B\60607441-FIG-0-TESTHOLE_PAVEMENT CORE-LOCATION PLAN.DWG

Project Management Initials: Designer: _____ Checked: _____ Approved: _____ ANSI B 279.4mm x 431.8mm



2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

City of Winnipeg
Project No.: 60607441 Date: 2019-09-25

AECOM

Figure: 06

Last saved by: POELSP(2019-10-25) Last Plotted: 2019-10-28
Filename: P:\60607441\900-CAD_GIS\910-CAD\25-SKETCHES\B\60607441-FIG-0-TESTHOLE_PAVEMENT CORE-LOCATION PLAN.DWG

Project Management Initials: Designer: _____ Checked: _____ Approved: _____ ANSI B 279.4mm x 431.8mm

2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

City of Winnipeg
Project No.: 60607441 Date: 2019-09-25

AECOM

Figure: 13

EXPLANATION OF FIELD & LABORATORY TEST DATA

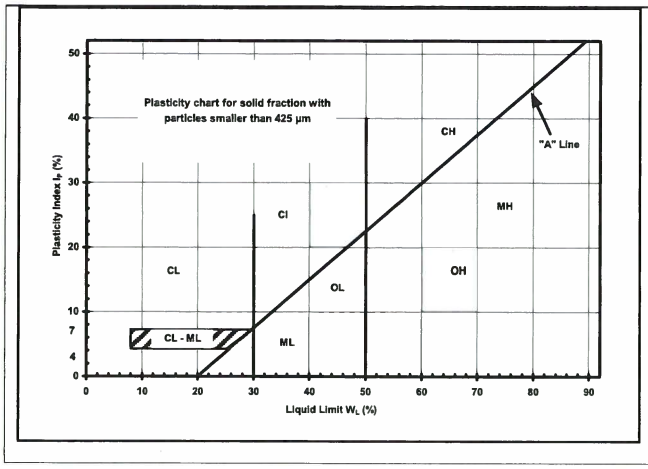
Description				UMA Log Symbols	USCS Classification	Laboratory Classification Criteria			
						Fines (%)	Grading	Plasticity	Notes
COARSE GRAINED SOILS	GRAVELS (More than 50% of coarse fraction of gravel size)	CLEAN GRAVELS (Little or no fines)	Well graded gravels, sandy gravels, with little or no fines		GW	0-5	$C_U > 4$ $1 < C_C < 3$		Dual symbols if 5-12% fines. Dual symbols if above "A" line and $4<W_P<7$ $C_U = \frac{D_{60}}{D_{10}}$ $C_C = \frac{(D_{30})^2}{D_{10} x D_{60}}$
			Poorly graded gravels, sandy gravels, with little or no fines		GP	0-5	Not satisfying GW requirements		
		DIRTY GRAVELS (With some fines)	Silty gravels, silty sandy gravels		GM	> 12		Atterberg limits below "A" line or $W_P<4$	
			Clayey gravels, clayey sandy gravels		GC	> 12		Atterberg limits above "A" line or $W_P<7$	
	SANDS (More than 50% of coarse fraction of sand size)	CLEAN SANDS (Little or no fines)	Well graded sands, gravelly sands, with little or no fines		SW	0-5	$C_U > 6$ $1 < C_C < 3$		
			Poorly graded sands, gravelly sands, with little or no fines		SP	0-5	Not satisfying SW requirements		
		DIRTY SANDS (With some fines)	Silty sands, sand-silt mixtures		SM	> 12		Atterberg limits below "A" line or $W_P<4$	
			Clayey sands, sand-clay mixtures		SC	> 12		Atterberg limits above "A" line or $W_P<7$	
FINE GRAINED SOILS	SILTS (Below 'A' line negligible organic content)	$W_L<50$	Inorganic silts, silty or clayey fine sands, with slight plasticity		ML			Classification is Based upon Plasticity Chart	
		$W_L>50$	Inorganic silts of high plasticity		MH				
	CLAYS (Above 'A' line negligible organic content)	$W_L<30$	Inorganic clays, silty clays, sandy clays of low plasticity, lean clays		CL				
		$30<W_L<50$	Inorganic clays and silty clays of medium plasticity		CI				
		$W_L>50$	Inorganic clays of high plasticity, fat clays		CH				
	ORGANIC SILTS & CLAYS (Below 'A' line)	$W_L<50$	Organic silts and organic silty clays of low plasticity		OL				
		$W_L>50$	Organic clays of high plasticity		OH				
HIGHLY ORGAINIC SOILS			Peat and other highly organic soils		Pt	Von Post Classification Limit		Strong colour or odour, and often fibrous texture	

	Asphalt		Till		
	Concrete		Bedrock (Undifferentiated)		AECOM
	Fill		Bedrock (Limestone)		

When the above classification terms are used in this report or test hole logs, the designated fractions may be visually estimated and not measured.

NOT USED TO CLASSIFY SUBGRADE. REFER TO CITY OF WINNIPEG SPECIFICATIONS FOR GEOTECHNICAL INVESTIGATION REQUIREMENTS FOR PUBLIC WORKS PROJECTS (SEPTEMBER, 2015)

NOT USED TO CLASSIFY SUBGRADE. REFER TO CITY OF WINNIPEG SPECIFICATIONS FOR GEOTECHNICAL INVESTIGATIONS REQUIREMENTS FOR PUBLIC WORKS PROJECTS (SEPTEMBER, 2015)



FRACTION		SEIVE SIZE (mm)		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
		Passing	Retained	Percent	Identifier
Gravel	Coarse	76	19	35-50	and
	Fine	19	4.75		
Sand	Coarse	4.75	2.00	20-35	"y" or "ey" *
	Medium	2.00	0.425		
	Fine	0.425	0.075	10-20	some
Silt (non-plastic) or Clay (plastic)		< 0.075 mm		1-10	trace

* for example: gravelly, sandy clayey, silty

Definition of Oversize Material

COBBLES: 76mm to 300mm diameter
BOULDERS: >300mm diameter

LEGEND OF SYMBOLS

Laboratory and field tests are identified as follows:

- q_u - undrained shear strength (kPa) derived from unconfined compression testing.
- T_v - undrained shear strength (kPa) measured using a torvane
- pp - undrained shear strength (kPa) measured using a pocket penetrometer.
- L_v - undrained shear strength (kPa) measured using a lab vane.
- F_v - undrained shear strength (kPa) measured using a field vane.
- γ - bulk unit weight (kN/m^3).
- SPT - Standard Penetration Test. Recorded as number of blows (N) from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 51 mm O.D. Raymond type sampler 0.30 m into the soil.
- DPPT - Drive Point Pentrometer Test. Recorded as number of blows from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 50 mm drive point 0.30 m into the soil.
- w - moisture content (W_L, W_P)

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

Su (kPa)	CONSISTENCY
<12	very soft
12 – 25	soft
25 – 50	medium or firm
50 – 100	stiff
100 – 200	very stiff
200	hard

The resistance (N) of a non-cohesive soil can be related to compactness condition as follows

N – BLOWS/0.30 m	COMPACTNESS
0 - 4	very loose
4 - 10	loose
10 - 30	compact
30 - 50	dense
50	very dense

F2. SEWER TELEVISING GUIDELINES FOR PUBLIC WORKS PROJECTS (JANUARY 2009)

F2.1 The Consultant is required to assess the extent of Closed Circuit Television (CCTV) inspection for all combined, wastewater, land drainage and storm relief sewers to confirm any sewer repairs required in the right-of-way within the limits of the street renewal.

F2.2 The criteria provided are general guidelines and are not intended to replace sound municipal engineering judgement specific to the individual Project scope and/or location.

F2.3 The available sewer televising information is contained within the City of Winnipeg's Sewer Management System (SMS) application.

F2.4 Confirm televising requirements with Project Manager.

F2.5 CCTV inspection general guidelines:

(a) Confirm CCTV requirements with Water & Waste Department for sewers 1050 mm and larger in diameter;

(b) Televise if no previous CCTV inspections have been completed;

(c) Re-televise sewers in Categories A/B/C/X with a Structural Performance Grade (SPG) of 3 or higher that have not been televised in the previous 5 years;

(d) Sewers located more than two metres from the curb line (i.e. not located under pavement) do not need to be re-televised if previous CCTV inspection data exist. If a sewer repair or renewal requiring excavation is noted, contact the WWD;

(e) On all street reconstructions, regardless of location of the sewer (within the right-of-way);

(f) If the street exhibits obvious distress at/along the underground plant;

(g) Of all CB leads to be reused, as part of a street reconstruction or major rehabilitation.

F2.6 For any uncertain situations and/or locations, contact the Project Manager.

F2.7 The Consultant is required to coordinate the sewer-televising contract and communicate the results to the Water & Waste Department. Any repairs or other activities deemed necessary from these inspections must be coordinated with the Water & Waste Department.

F3. GEOTECHNICAL INVESTIGATION REQUIREMENTS FOR PUBLIC WORKS PROJECTS (OCTOBER 2008)

F3.1 Fieldwork

(a) Clear all underground services at each test-hole location.

(b) As this street project is greater than 500 metres, test holes may be taken every 100 m. More or fewer test-holes may be required depending upon Site conditions – confirm with the Project Manager.

(c) Record location of test-hole (offset from curb, distance from cross street and house number).

(d) Drill 150 mm-diameter cores in pavement.

(e) Drill 125 mm-diameter test-holes into fill materials and subgrade.

(f) If a service trench backfilled with granular materials is encountered, another hole shall be drilled to define the existing sub-surface conditions.

(g) Test-holes shall be drilled to depth of 2 m $\pm$150 mm below surface of the pavement.

(h) Recover pavement core sample and representative samples of soil (fill materials, pavement structure materials and subgrade).

(i) Measure and record pavement section exposed in the test-hole (thickness of concrete or asphalt and different types of pavement structure materials).

(j) Pavement structure materials to be identified as crushed limestone or granular fill and the maximum aggregate size of the material (20 mm, 50 mm or 150 mm).

(k) Log soil profile for the subgrade.

(l) Representative samples of soil must be obtained at the following depths below the bottom of the pavement structure materials – 0.1 m, 0.4 m, 0.7 m, 1.0 m, 1.3 m, 1.6 m, etc. Ensure a sample is obtained from each soil type encountered in the test-hole.

(m) Make note of any water seepage into the test-hole.

(n) Backfill test-hole with native materials and additional granular fill, if required. Patch pavement surface with hot mix asphalt or high strength durable concrete mix.

(o) Return core sample from the pavement and soil samples to the laboratory.

F3.2 Lab Work

(a) Test all soil samples for moisture content.

(b) Photograph core samples recovered from the pavement surface.

(c) Conduct tests for plasticity index and hydrometer analysis on selected soil samples which are between 0.5 m and 1 m below top of pavement (this is the sub-grade on which the pavement and sub-base will be built). The selection will be based upon visual classification and moisture content test results, with a minimum of one sample of each soil type per street to be tested.

(d) Prepare test-hole logs and classify subgrade (based on hydrometer) as follows:

< 30% silt	- classify as clay
30% - 50% silt	- classify as silty clay
50% - 70% silt	- classify as clayey silt
> 70% silt	- classify as silt

(e) For any uncertain situations and/or locations, or clarification of these requirements, contact the Project Manager.

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-30
LOCATION: Hargrave Street, Broadway to York - East curb lane, 93 m N of Broadway, 1.7 m W of E curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

PENETRATION TESTS: Becker; Dynamic Cone; SPT (Standard Pen Test) (Blows/300mm); Total Unit Wt (kN/m³); Plastic / MC / Liquid

UNDRAINED SHEAR STRENGTH (kPa): Torvane; QU/2; Lab Vane; Pocket Pen.; Field Vane

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (195 mm)				
		CONCRETE (165 mm)				
		CLAY - silty, trace sand - dark brown, moist, firm - high plasticity		G1		
		- greyish brown below 0.6 m		G2	(G2): Gravel: 0.0%, Sand: 7.2%, Silt: 38.0%, Clay: 54.8%	
1				G3		1
		CLAY - some sand - brown, firm, moist - high plasticity - silt laminations < 2 mm thick		G4		
				G5		
				G6		
2				G7		2
		END OF TEST HOLE AT 2.13 m IN CLAY NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings, bentonite seal and asphalt patch.				
3						

AECOM

LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/7/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-31
LOCATION: Hargrave Street, Broadway to York - East curb lane, 114 m N of Broadway, 2.0 m W of E curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

PENETRATION TESTS: Becker; Dynamic Cone; SPT (Standard Pen Test) (Blows/300mm); Total Unit Wt (kN/m^3); Plastic / MC / Liquid

UNDRAINED SHEAR STRENGTH (kPa): Torvane; QU/2; Lab Vane; Pocket Pen.; Field Vane

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (205 mm)				
		CONCRETE (150 mm)				
		CLAY - silty, trace sand, trace gravel - brown mottled dark brown, moist, soft to firm - high plasticity		G8	(G8): Gravel: 1.9%, Sand: 2.9%, Silt: 33.3%, Clay: 61.8%	
				G9		
1		SILT - clayey, sandy - brown, moist, soft to firm - intermediate plasticity		G10		1
		CLAY - trace sand, trace gravel - brown, moist, firm - high plasticity		G11	(G11): Gravel: 1.6%, Sand: 2.0%, Silt: 23.5%, Clay: 72.9%	
				G12		
				G13		
2				G14		2
		END OF TEST HOLE AT 2.13 m IN CLAY NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.				
3						

AECOM

LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/7/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-32
LOCATION: Hargrave Street, Broadway to York - West curb lane, 30 m S of York, 1.7 m E of W curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ▤ BULK ▨ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		ASPHALT (260 mm)					
		CONCRETE (160 mm)					
		CLAY - silty, trace sand - brown mottled dark brown, moist, soft to firm - high plasticity		G15			
		AUGER REFUSAL AT 0.46 m ON SUSPECTED COBBLES NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.					
1							1
2							2
3							

PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100; ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21; Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + × QU/2 × ☐ Lab Vane ☐ △ Pocket Pen. △ ⬘ Field Vane ⬘ (kPa) 50 100 150 200

AECOM	LOGGED BY: Tessa Christi	COMPLETION DEPTH: 0.46 m
	REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/7/19
	PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

City of Winnipeg

2019-2023 Downtown Pavement Renewals – Hargrave Street (Ellice Avenue to Portage Avenue and York Avenue to Broadway)

Geotechnical Investigation

Table 01 - Summary of Laboratory Soil Testing

Test Hole No.	Test Hole Location	Pavement Structure		Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
TH19-30	Hargrave Street - E curb lane, 93 m N of Broadway, 1.7 m W of E curb	Asphalt	195	SILTY CLAY (CH)	0.4	32							
				SILTY CLAY (CH)	0.7	30.3	0.0	7.2	38.0	54.8	63	20	43
				SILTY CLAY (CH)	1.0	32.1							
		Concrete	165	CLAY (CH)	1.3	33.8							
				CLAY (CH)	1.5	33.2							
				CLAY (CH)	1.9								
				CLAY (CH)	2.1								
TH19-31	Hargrave Street - E curb lane, 114 m N of Broadway, 2.0 m W of E curb	Asphalt	205	SILTY CLAY (CH)	0.4	36.9	1.9	2.9	33.3	61.8	78	22	56
				SILTY CLAY (CH)	0.7	34.4							
				CLAYEY SILT (MI)	1.0								
		Concrete	150	CLAY (CH)	1.3	32.9	1.6	2.0	23.5	72.9	85	25	60
				CLAY (CH)	1.4	36.5							
				CLAY (CH)	1.9								
				CLAY (CH)	2.1								
TH19-32	Hargrave Street - W curb lane, 30 m S of York, 1.7 m E of W curb	Asphalt	260	SILTY CLAY (CH)	0.4								
		Concrete	160										
PC19-30	Hargrave Street - 15 m N of Portage, 1.8 m W of E curb	Asphalt	115										
		Concrete	230										
PC19-31	Hargrave Street - 20 m S of Ellice, 2.2 m W of E curb	Asphalt	175										
		Concrete	190										

* Subgrade Description based on City of Winnipeg Specifications for Geotechnical Investigation Requirements for Public Works Projects (September 2015)

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1402 Notre Dame Ave, Winnipeg MB R3E 3G5
Phone: 204-697-3854 Cell: 204-997-1355
Email: hmanalo@mts.net

CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883

CLIENT:	AECOM	PROJECT NO.:	112-1915
	99 Commerce Drive	TEST NO.:	1
	Winnipeg MB R3P 0Y7	LAB NO.:	HM 522
ATTENTION:	Ryan Harras	DATE RECEIVED :	30-Oct-19
PROJECT:	2019-2023 Downtown Streets Renewal (60607441)	DATE TESTED / BY:	Nov 4-8, 2019 / IA
	Winnipeg, MB		

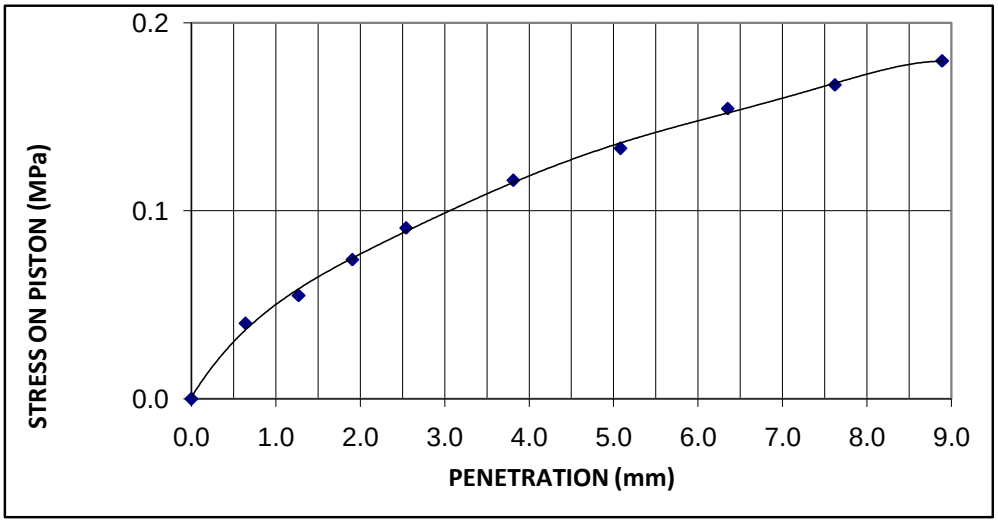
SAMPLE DATA			
Sample Type:	**CLAY**		
Source:	N/P		
Sampled by:	Client		
Optimum Moisture Content:	**19.1%**		
Maximum Dry Density:	**1618 kg/m^3**		
Method of Compaction:	Standard Proctor		
Tested by:	IA	Date Tested:	01-Nov-19

SPECIMEN DATA		
DESCRIPTION	Before Soaking	After Testing
Moisture Content (MC), %	**18.4**	
MC of top 25mm layer, %		**31.2**
Dry Density, kg/m^3	**1615**	
Compaction,%	-	-
Surcharge Weight, grams	4546	
Swell, %	9.02	

LOAD DATA

PENETRATION mm	STRESS MPa
0	0.00
0.64	0.04
1.27	0.06
1.91	0.07
2.54	0.09
3.81	0.12
5.08	0.13
6.35	0.15
7.62	0.17
8.89	0.18

LOAD PENETRATION CURVE



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD ACTUAL MPa	TEST LOAD CORRECTED MPa	**BEARING RATIO (soaked)** at **2.5** mm penetration	**BEARING RATIO (soaked)** at **5.1** mm penetration
2.54	6.9	0.09	0.09	**1.3**	-
5.08	10.3	0.13	0.13	-	**1.3**

Remarks: 4 days soaked

Reviewed by:

Gladys Paciente, P.Eng

H. MANALO CONSULTING LTD.
1402 Notre Dame Avenue, Winnipeg, MB R3E 3G5
Phone: 204 697-3854 Cell: 204 997-1355
hmanalo@mts.net

MAXIMUM DRY DENSITY AND MOISTURE CONTENT - Proctor Method (ASTM D698)

CLIENT:	AECOM 99 Commerce Drive Winnipeg MB R3P 0Y7	PROJECT NO.:	112-1915
		TEST NO.:	1
ATTENTION:	Ryan Harras		
PROJECT:	2019-2023 Downtown Streets Renewal (60607441) Winnipeg, MB		

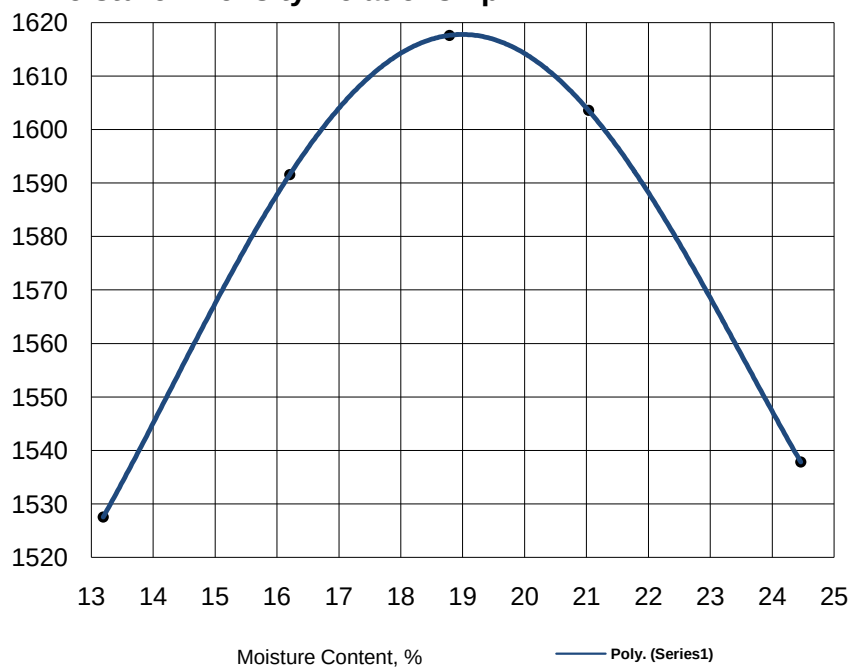
Date Sampled:	unknown	Date Received:	30-Oct-19
Sampled By:	Client	Date Tested:	01-Nov-19

MATERIAL INFORMATION

Material Type:	Clay		
Material Use:	Backfill	Material Supplier:	
Maximum Size:		Material Source:	

PROCEDURE	A
PREPARATION	Dry
COMPACTION METHOD	Manual
BLOWS PER LAYER	25
NO. OF LAYERS	3
MOLD SIZE	100 mm
MOLD VOLUME	0.910
WEIGHT OF HAMMER	2.5 kg

Test No.	1	2	3	4	5
Wet Density	1729	1849	1922	1941	1914
Moisture Content	13.2	16.2	18.8	21.0	24.5
Dry Density	1528	1592	1618	1604	1538



Maximum Dry Density (MDD): 1618 kg/m³

Optimum Moisture Content 19.1 %

STONE CORRECTION (ASTM D 4718)

Retained on 4.75 mm sieve: ____ %

Corrected Moisture: **19.1** %

Corrected Maximum Dry Density: **1618** kg/m³

Remarks:

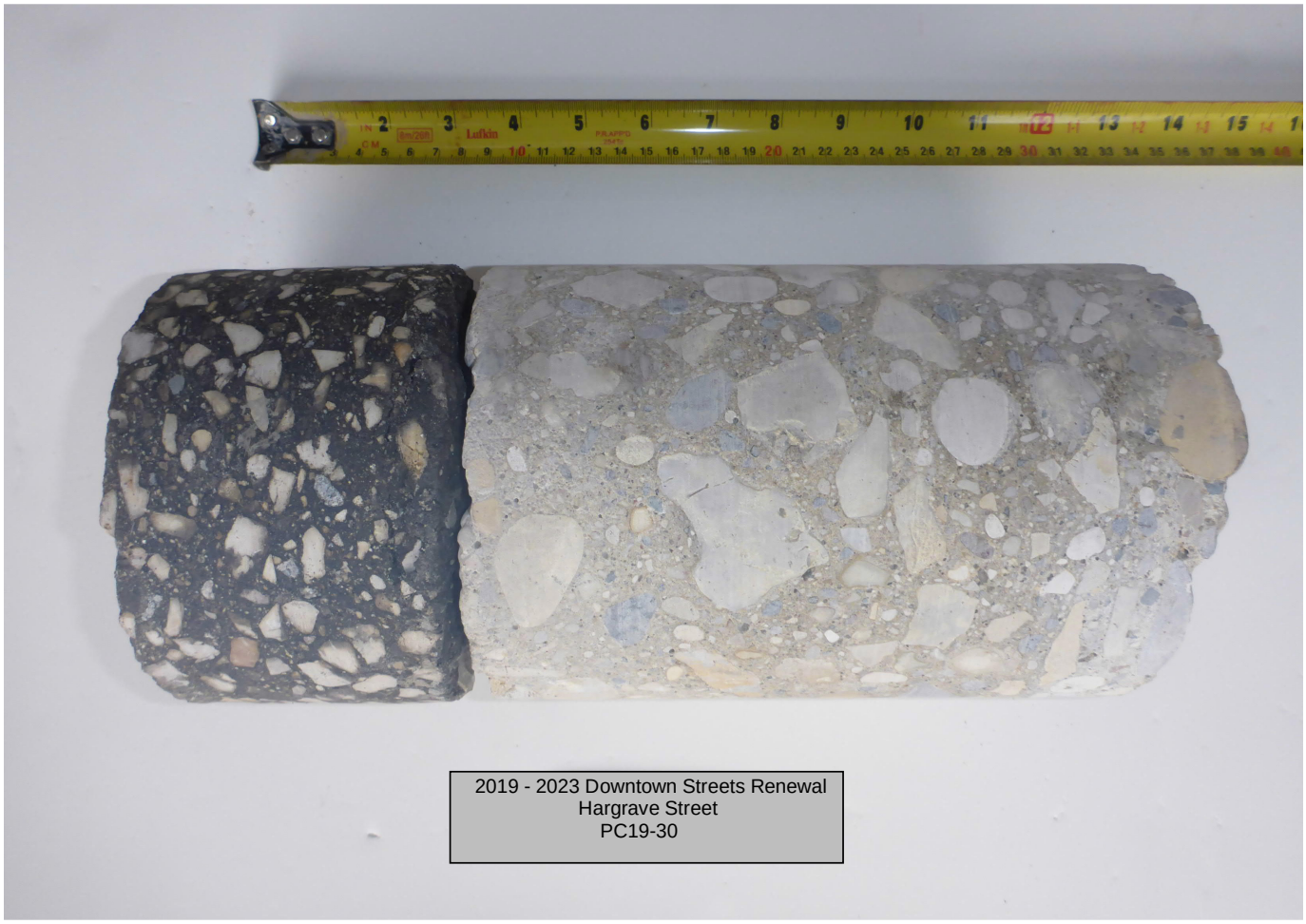
Tested by: IA

Reviewed By: Hermie Manalo

2019 - 2023 Downtown Streets Renewal
Hargrave Street
TH19-30

2019 - 2023 Downtown Streets Renewal
Hargrave Street
TH19-31

2019 - 2023 Downtown Streets Renewal
Hargrave Street
TH19-32



2019 - 2023 Downtown Streets Renewal
Hargrave Street
PC19-30


2019 - 2023 Downtown Streets Renewal
Hargrave Street
PC19-31

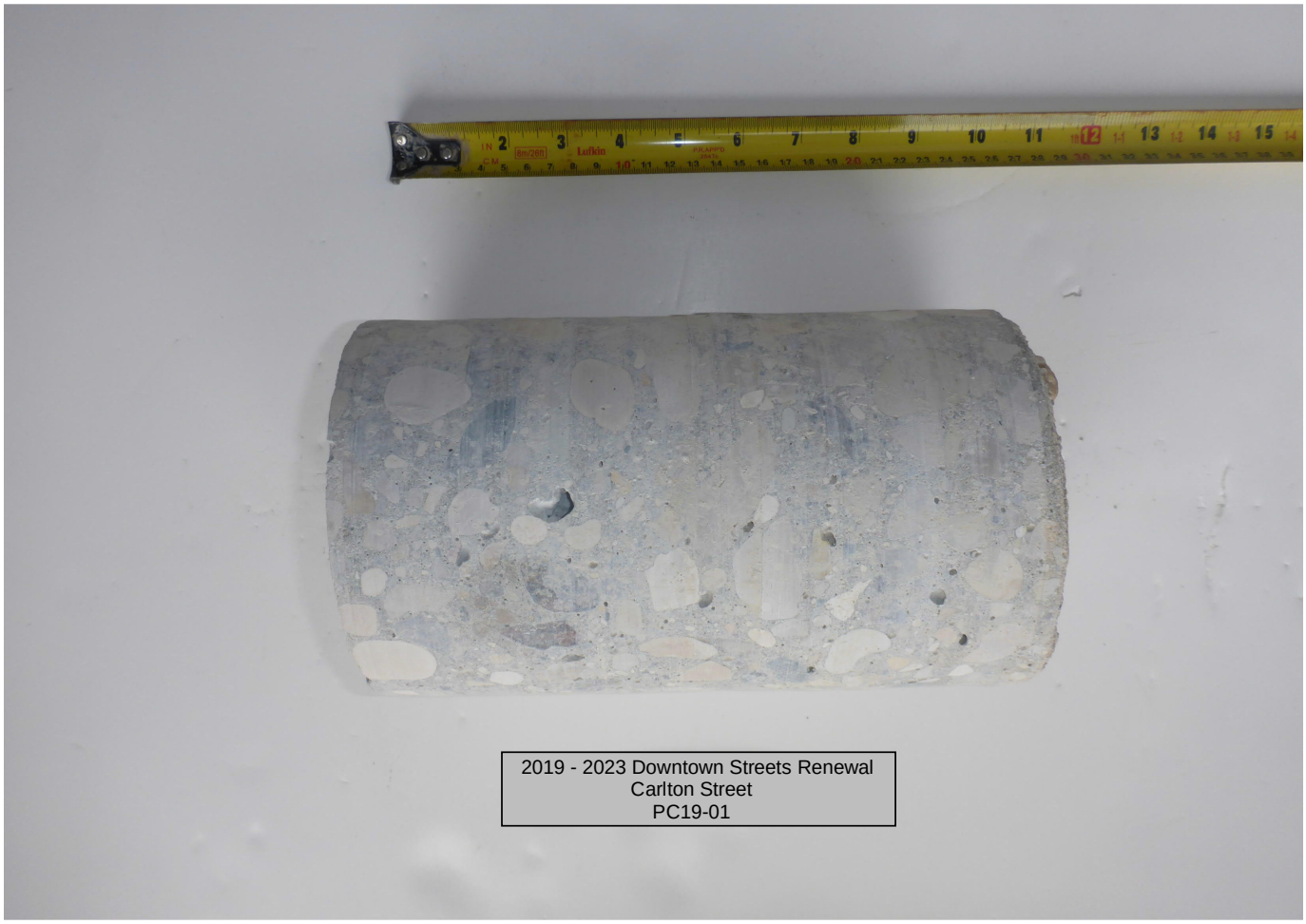
City of Winnipeg

2019-2023 Downtown Pavement Renewals – Carlton Street (Ellice Avenue to Portage Avenue)

Geotechnical Investigation

Table 01 - Summary of Laboratory Soil Testing

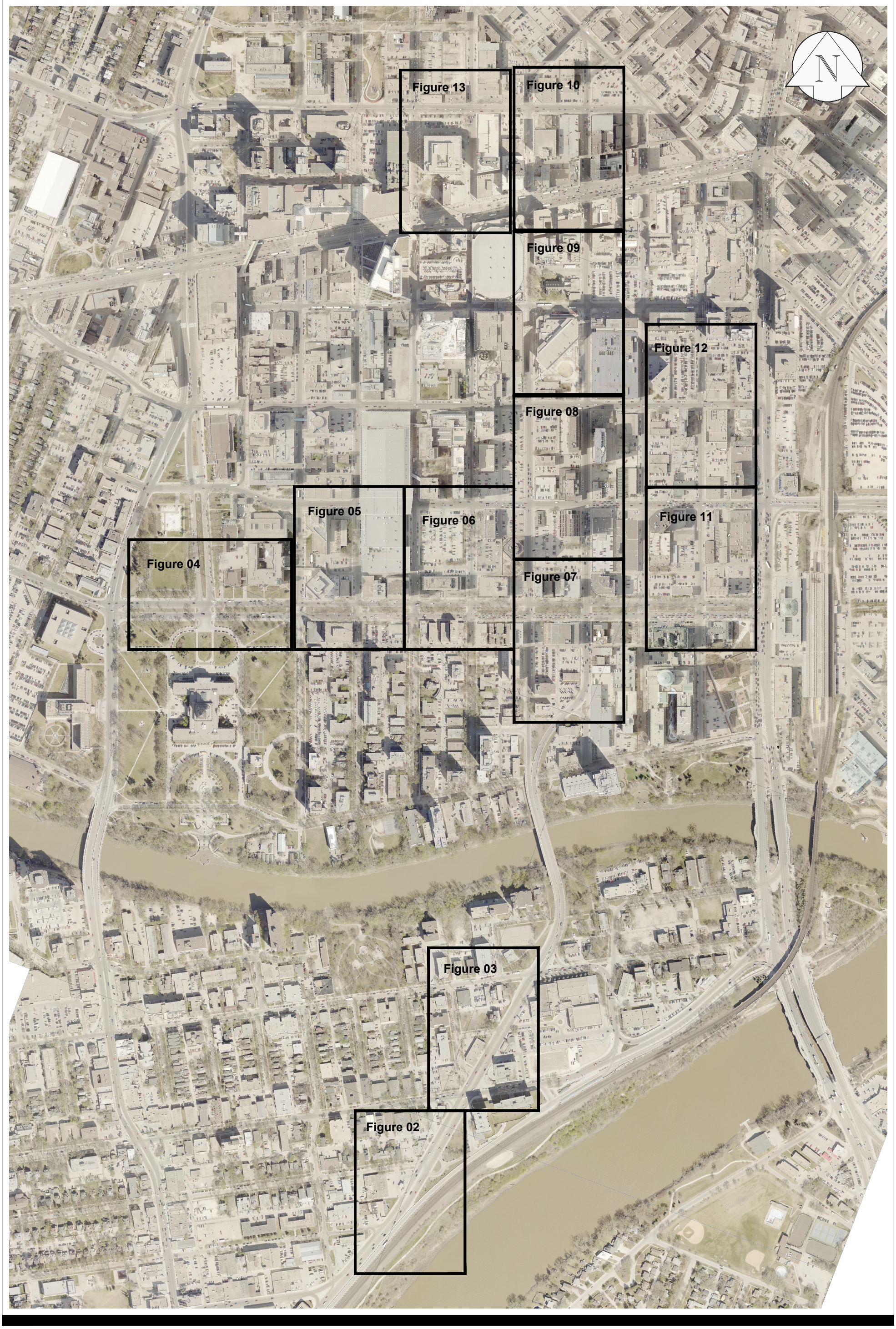
Test Hole No.	Test Hole Location	Pavement Structure		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
PC19-01	Carlton Street – 47 m S of Ellice, 5.0 m E of W curb	Asphalt	0										
		Concrete	255										



2019 - 2023 Downtown Streets Renewal
Carlton Street
PC19-01

Last saved by: POELSP(2019-10-25) Last Plotted: 2019-10-28
Filename: P:\60607441\900-CAD_GIS\910-CAD\25-SKETCHES\B\60607441-FIG-0-TESTHOLE_PAVEMENT CORE-LOCATION PLAN.DWG

Project Management Initials: Designer: _____ Checked: _____ Approved: _____ ANSI B 279.4mm x 431.8mm



2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

City of Winnipeg
Project No.: 60607441 Date: 2019-09-25

AECOM

Figure: 01

Last saved by: POELSP(2019-09-26) Last Plotted: 2019-09-26
Filename: P:\60607441\900-CAD_GIS\910-CAD\25-SKETCHES\B\60607441-FIG-0-TESTHOLE_PAVEMENT CORE-LOCATION PLAN.DWG

2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

City of Winnipeg
Project No.: 60607441 Date: 2019-09-25

AECOM

Figure: 11

Last saved by: POELSP(2019-09-26) Last Plotted: 2019-09-26
Filename: P:\60607441\900-CAD_GIS\910-CAD\25-SKETCHES\B\60607441-FIG-0-TESTHOLE_PAVEMENT CORE-LOCATION PLAN.DWG

Project Management Initials: Designer: _____ Checked: _____ Approved: _____ ANSI B 279.4mm x 431.8mm

2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

City of Winnipeg
Project No.: 60607441 Date: 2019-09-25

AECOM

Figure: 12

EXPLANATION OF FIELD & LABORATORY TEST DATA

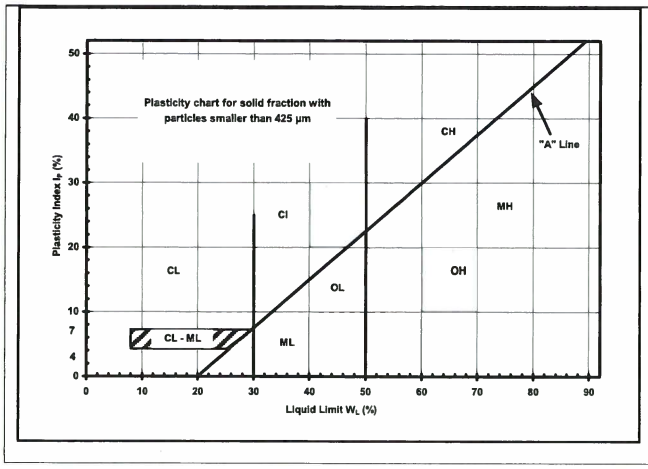
Description				UMA Log Symbols	USCS Classification	Laboratory Classification Criteria			
						Fines (%)	Grading	Plasticity	Notes
COARSE GRAINED SOILS	GRAVELS (More than 50% of coarse fraction of gravel size)	CLEAN GRAVELS (Little or no fines)	Well graded gravels, sandy gravels, with little or no fines		GW	0-5	$C_U > 4$ $1 < C_C < 3$		Dual symbols if 5-12% fines. Dual symbols if above "A" line and $4<W_P<7$ $C_U = \frac{D_{60}}{D_{10}}$ $C_C = \frac{(D_{30})^2}{D_{10} x D_{60}}$
			Poorly graded gravels, sandy gravels, with little or no fines		GP	0-5	Not satisfying GW requirements		
		DIRTY GRAVELS (With some fines)	Silty gravels, silty sandy gravels		GM	> 12		Atterberg limits below "A" line or $W_P<4$	
			Clayey gravels, clayey sandy gravels		GC	> 12		Atterberg limits above "A" line or $W_P<7$	
	SANDS (More than 50% of coarse fraction of sand size)	CLEAN SANDS (Little or no fines)	Well graded sands, gravelly sands, with little or no fines		SW	0-5	$C_U > 6$ $1 < C_C < 3$		
			Poorly graded sands, gravelly sands, with little or no fines		SP	0-5	Not satisfying SW requirements		
		DIRTY SANDS (With some fines)	Silty sands, sand-silt mixtures		SM	> 12		Atterberg limits below "A" line or $W_P<4$	
			Clayey sands, sand-clay mixtures		SC	> 12		Atterberg limits above "A" line or $W_P<7$	
FINE GRAINED SOILS	SILTS (Below 'A' line negligible organic content)	$W_L<50$	Inorganic silts, silty or clayey fine sands, with slight plasticity		ML			Classification is Based upon Plasticity Chart	
		$W_L>50$	Inorganic silts of high plasticity		MH				
	CLAYS (Above 'A' line negligible organic content)	$W_L<30$	Inorganic clays, silty clays, sandy clays of low plasticity, lean clays		CL				
		$30<W_L<50$	Inorganic clays and silty clays of medium plasticity		CI				
		$W_L>50$	Inorganic clays of high plasticity, fat clays		CH				
	ORGANIC SILTS & CLAYS (Below 'A' line)	$W_L<50$	Organic silts and organic silty clays of low plasticity		OL				
		$W_L>50$	Organic clays of high plasticity		OH				
HIGHLY ORGAINIC SOILS			Peat and other highly organic soils		Pt	Von Post Classification Limit		Strong colour or odour, and often fibrous texture	

	Asphalt		Till		
	Concrete		Bedrock (Undifferentiated)		AECOM
	Fill		Bedrock (Limestone)		

When the above classification terms are used in this report or test hole logs, the designated fractions may be visually estimated and not measured.

NOT USED TO CLASSIFY SUBGRADE. REFER TO CITY OF WINNIPEG SPECIFICATIONS FOR GEOTECHNICAL INVESTIGATION REQUIREMENTS FOR PUBLIC WORKS PROJECTS (SEPTEMBER, 2015)

NOT USED TO CLASSIFY SUBGRADE. REFER TO CITY OF WINNIPEG SPECIFICATIONS FOR GEOTECHNICAL INVESTIGATIONS REQUIREMENTS FOR PUBLIC WORKS PROJECTS (SEPTEMBER, 2015)



FRACTION		SEIVE SIZE (mm)		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
		Passing	Retained	Percent	Identifier
Gravel	Coarse	76	19	35-50	and
	Fine	19	4.75		
Sand	Coarse	4.75	2.00	20-35	"y" or "ey" *
	Medium	2.00	0.425		
	Fine	0.425	0.075	10-20	some
Silt (non-plastic) or Clay (plastic)		< 0.075 mm		1-10	trace

* for example: gravelly, sandy clayey, silty

Definition of Oversize Material

COBBLES: 76mm to 300mm diameter
BOULDERS: >300mm diameter

LEGEND OF SYMBOLS

Laboratory and field tests are identified as follows:

- q_u - undrained shear strength (kPa) derived from unconfined compression testing.
- T_v - undrained shear strength (kPa) measured using a torvane
- pp - undrained shear strength (kPa) measured using a pocket penetrometer.
- L_v - undrained shear strength (kPa) measured using a lab vane.
- F_v - undrained shear strength (kPa) measured using a field vane.
- γ - bulk unit weight (kN/m^3).
- SPT - Standard Penetration Test. Recorded as number of blows (N) from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 51 mm O.D. Raymond type sampler 0.30 m into the soil.
- DPPT - Drive Point Pentrometer Test. Recorded as number of blows from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 50 mm drive point 0.30 m into the soil.
- w - moisture content (W_L, W_P)

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

Su (kPa)	CONSISTENCY
<12	very soft
12 – 25	soft
25 – 50	medium or firm
50 – 100	stiff
100 – 200	very stiff
200	hard

The resistance (N) of a non-cohesive soil can be related to compactness condition as follows

N – BLOWS/0.30 m	COMPACTNESS
0 - 4	very loose
4 - 10	loose
10 - 30	compact
30 - 50	dense
50	very dense

F2. SEWER TELEVISING GUIDELINES FOR PUBLIC WORKS PROJECTS (JANUARY 2009)

F2.1 The Consultant is required to assess the extent of Closed Circuit Television (CCTV) inspection for all combined, wastewater, land drainage and storm relief sewers to confirm any sewer repairs required in the right-of-way within the limits of the street renewal.

F2.2 The criteria provided are general guidelines and are not intended to replace sound municipal engineering judgement specific to the individual Project scope and/or location.

F2.3 The available sewer televising information is contained within the City of Winnipeg's Sewer Management System (SMS) application.

F2.4 Confirm televising requirements with Project Manager.

F2.5 CCTV inspection general guidelines:

(a) Confirm CCTV requirements with Water & Waste Department for sewers 1050 mm and larger in diameter;

(b) Televise if no previous CCTV inspections have been completed;

(c) Re-televise sewers in Categories A/B/C/X with a Structural Performance Grade (SPG) of 3 or higher that have not been televised in the previous 5 years;

(d) Sewers located more than two metres from the curb line (i.e. not located under pavement) do not need to be re-televised if previous CCTV inspection data exist. If a sewer repair or renewal requiring excavation is noted, contact the WWD;

(e) On all street reconstructions, regardless of location of the sewer (within the right-of-way);

(f) If the street exhibits obvious distress at/along the underground plant;

(g) Of all CB leads to be reused, as part of a street reconstruction or major rehabilitation.

F2.6 For any uncertain situations and/or locations, contact the Project Manager.

F2.7 The Consultant is required to coordinate the sewer-televising contract and communicate the results to the Water & Waste Department. Any repairs or other activities deemed necessary from these inspections must be coordinated with the Water & Waste Department.

F3. GEOTECHNICAL INVESTIGATION REQUIREMENTS FOR PUBLIC WORKS PROJECTS (OCTOBER 2008)

F3.1 Fieldwork

(a) Clear all underground services at each test-hole location.

(b) As this street project is greater than 500 metres, test holes may be taken every 100 m. More or fewer test-holes may be required depending upon Site conditions – confirm with the Project Manager.

(c) Record location of test-hole (offset from curb, distance from cross street and house number).

(d) Drill 150 mm-diameter cores in pavement.

(e) Drill 125 mm-diameter test-holes into fill materials and subgrade.

(f) If a service trench backfilled with granular materials is encountered, another hole shall be drilled to define the existing sub-surface conditions.

(g) Test-holes shall be drilled to depth of 2 m $\pm$150 mm below surface of the pavement.

(h) Recover pavement core sample and representative samples of soil (fill materials, pavement structure materials and subgrade).

(i) Measure and record pavement section exposed in the test-hole (thickness of concrete or asphalt and different types of pavement structure materials).

(j) Pavement structure materials to be identified as crushed limestone or granular fill and the maximum aggregate size of the material (20 mm, 50 mm or 150 mm).

(k) Log soil profile for the subgrade.

(l) Representative samples of soil must be obtained at the following depths below the bottom of the pavement structure materials – 0.1 m, 0.4 m, 0.7 m, 1.0 m, 1.3 m, 1.6 m, etc. Ensure a sample is obtained from each soil type encountered in the test-hole.

(m) Make note of any water seepage into the test-hole.

(n) Backfill test-hole with native materials and additional granular fill, if required. Patch pavement surface with hot mix asphalt or high strength durable concrete mix.

(o) Return core sample from the pavement and soil samples to the laboratory.

F3.2 Lab Work

(a) Test all soil samples for moisture content.

(b) Photograph core samples recovered from the pavement surface.

(c) Conduct tests for plasticity index and hydrometer analysis on selected soil samples which are between 0.5 m and 1 m below top of pavement (this is the sub-grade on which the pavement and sub-base will be built). The selection will be based upon visual classification and moisture content test results, with a minimum of one sample of each soil type per street to be tested.

(d) Prepare test-hole logs and classify subgrade (based on hydrometer) as follows:

< 30% silt	- classify as clay
30% - 50% silt	- classify as silty clay
50% - 70% silt	- classify as clayey silt
> 70% silt	- classify as silt

(e) For any uncertain situations and/or locations, or clarification of these requirements, contact the Project Manager.

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-34
LOCATION: Fort Street, Broadway to York - Bicycle lane, 107 m N of Broadway, 5.0 m W of E curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (75 mm)				
		CONCRETE (180 mm)				
		CLAY - silty, trace sand, trace gravel - dark brown, dry to moist, soft to firm - high plasticity - organic odour		G16		
				G17	(G17): Gravel: 3.4%, Sand: 7.8%, Silt: 39.7%, Clay: 49.2%	
1				G18		1
		SILT - clayey, trace sand - grey, dry to moist, firm - intermediate plasticity		G19	(G19): Gravel: 0.2%, Sand: 5.1%, Silt: 60.2%, Clay: 34.5%	
				G20		
		CLAY - brown, moist, firm - high plasticity		G21	(G21): Gravel: 0.0%, Sand: 0.5%, Silt: 15.7%, Clay: 83.8%	
2				G22		2
		END OF TEST HOLE AT 2.13 m IN CLAY. NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.				
3						

PENETRATION TESTS: Becker | Dynamic Cone | SPT (Standard Pen Test) (Blows/300mm) 0 20 40 60 80 100 | Total Unit Wt (kN/m^3) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: Torvane | QU/2 | Lab Vane | Pocket Pen. | Field Vane (kPa) 50 100 150 200

AECOM

LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/8/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-35
LOCATION: Fort Street, York to St Mary - West curb lane, 50 m S of St Mary, 1.9 m E of W curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (140 mm)				
		CONCRETE (215 mm) - upper 75 mm crushed concrete				
		CLAY - trace sand - dark brown, moist, firm - high plasticity		G23		
				G24		
1				G25	(G25): Gravel: 0.3%, Sand: 3.9%, Silt: 16.4%, Clay: 79.4%	1
		- dark grey from 1.1 m to 1.5 m		G26		
				G27		
		- brown below 1.5 m		G28		
2				G29		2
		END OF TEST HOLE AT 2.13 m IN CLAY NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.				
3						

PENETRATION TESTS: Becker ✳ | Dynamic Cone ◇ | SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 | Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + | × QU/2 × | □ Lab Vane □ | △ Pocket Pen. △ | ⚉ Field Vane ⚉ (kPa) 50 100 150 200

AECOM

LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/8/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-36
LOCATION: Fort Street, York to St Mary - 2nd lane from West, 62 m N of York, 5.0 m E of W curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ⊠ SPLIT SPOON ▤ BULK ⊘ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		ASPHALT (140 mm)					
		CONCRETE (140 mm)					
		CLAY - trace sand - dark brown, dry to moist, firm to stiff - high plasticity - organic odour to 1.4 m		G30		(G30): Gravel: 0.0%, Sand: 3.6%, Silt: 22.0%, Clay: 74.4%	
				G31			
1				G32			1
				G33			
		- brown, moist, firm below 1.4 m		G34			
				G35			
2				G36			2
		END OF TEST HOLE AT 2.13 m IN CLAY NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.					
3							

PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100; ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21; Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ⚉ Field Vane ⚉ (kPa) 50 100 150 200

LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/8/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

AECOM

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-37
LOCATION: Fort Street, St Mary to Graham - West curb lane, 40 m N of St Mary, 1.5 m E of W curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (190 mm)				
		CONCRETE (180 mm)				
		CLAY - trace to some sand - dark brown, dry to moist, firm - high plasticity - organic odour		G37		
				G38		
1				G39		1
		SILT - clayey, trace sand - light brown, moist, soft - intermediate plasticity		G40	(G40): Gravel: 0.0%, Sand: 5.4%, Silt: 68.0%, Clay: 26.6%	
				G41		
		CLAY - trace sand - brown, moist, firm - high plasticity		G42		
2				G43		2
		END OF TEST HOLE AT 2.13 m IN CLAY NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.				
3						

PENETRATION TESTS: Becker | Dynamic Cone | SPT (Standard Pen Test) (Blows/300mm) 0 20 40 60 80 100 | Total Unit Wt (kN/m^3) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH (kPa): Torvane | QU/2 | Lab Vane | Pocket Pen. | Field Vane 50 100 150 200

AECOM	LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
	REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/8/19
	PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-38
LOCATION: Fort Street, St Mary to Graham - East curb lane, 70 m N of St Mary, 1.8 m W of E curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ⊠ SPLIT SPOON ▤ BULK ⊘ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		ASPHALT (75 mm)					
		CONCRETE (190 mm)					
		SAND and GRAVEL - silty, trace clay - light brown, loose, moist	■	G44			
		CLAY - silty, some sand, trace gravel - brown mottled grey, moist, firm - intermediate to high plasticity	■	G45			
1			■	G46	Plastic 20 MC 40 Liquid 60 80 100	(G46): Gravel: 9.3%, Sand: 18.5%, Silt: 32.9%, Clay: 39.2%	1
			■	G47			
			■	G48			
			■	G49			
2			■	G50			2
		END OF TEST HOLE AT 2.13 m IN CLAY NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.					
3							

PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21

UNDRAINED SHEAR STRENGTH: + Torvane + × QU/2 × ☐ Lab Vane ☐ △ Pocket Pen. △ ⬘ Field Vane ⬘ (kPa) 50 100 150 200

AECOM	LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
	REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/8/19
	PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

City of Winnipeg

2019-2023 Downtown Pavement Renewals – Fort Street (Graham Avenue to Broadway)

Geotechnical Investigation

Table 01 - Summary of Laboratory Soil Testing

Test Hole No.	Test Hole Location	Pavement Structure		Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
TH19-34	Fort Street - Bicycle lane, 107 m N of Broadway, 5.0 m W of E curb	Asphalt	75	SILTY CLAY (CH)	0.4								
				SILTY CLAY (CH)	0.7	47.9	3.4	7.8	39.7	49.2	81	32	49
				SILTY CLAY (CH)	1.0								
		Concrete	180	CLAYEY SILT (MI)	1.3	27.9	0.2	5.1	60.2	34.5	46	16	30
				CLAYEY SILT (MI)	1.4								
				CLAY (CH)	1.9	33.9	0.0	0.5	15.7	83.8	84	33	51
				CLAY (CH)	2.1								
TH19-35	Fort Street - W curb lane, 50 m S of St Mary, 1.9 m E of W curb	Asphalt	140	CLAY (CH)	0.5	23.9							
				CLAY (CH)	0.7								
				CLAY (CH)	1.0	34.5	0.3	3.9	16.4	79.4	88	30	58
		Concrete	215	CLAY (CH)	1.3								
				CLAY (CH)	1.4	33.4							
				CLAY (CH)	1.9								
				CLAY (CH)	2.1	44.2							
TH19-36	Fort Street - 2nd lane from W, 62 m N of York, 5.0 m E of W curb	Asphalt	140	CLAY (CH)	0.4	39.1	0.0	3.6	22.0	74.4	94	31	63
				CLAY (CH)	0.7	37							
				CLAY (CH)	1.0								
		Concrete	140	CLAY (CH)	1.3	33.3							
				CLAY (CH)	1.4								
				CLAY (CH)	1.9	33.8							
				CLAY (CH)	2.1								
TH19-37	Fort Street - W curb lane, 40 m N of St Mary, 1.5 m E of W curb	Asphalt	190	CLAY (CH)	0.4								
				CLAY (CH)	0.7								
				CLAY (CH)	1.0								
		Concrete	180	CLAYEY SILT (MI)	1.3	26.5	0.0	5.4	68.0	26.6	42	16	26
				CLAYEY SILT (MI)	1.4								
				CLAY (CH)	1.9	39.9							
				CLAY (CH)	2.1								
TH19-38	Fort Street - E curb lane, 70 m N of St Mary, 1.8 m W of E curb	Asphalt	75	SAND AND GRAVEL	0.4								
				SILTY CLAY (CI-CH)	0.7								
				SILTY CLAY (CI-CH)	1	24.4	9.3	18.5	32.9	39.2	49	18	31
		Concrete	190	SILTY CLAY (CI-CH)	1.3								
				SILTY CLAY (CI-CH)	1.4	28.2							
				SILTY CLAY (CI-CH)	1.9								
				SILTY CLAY (CI-CH)	2.1								

* Subgrade Description based on City of Winnipeg Specifications for Geotechnical Investigation Requirements for Public Works Projects (September 2015)

H. MANALO CONSULTING LTD.

1402 Notre Dame Ave, Winnipeg MB R3E 3G5
Phone: 204-697-3854 Cell: 204-997-1355
Email: hmanalo@mts.net

CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883

CLIENT:	AECOM	PROJECT NO.:	112-1915
	99 Commerce Drive	TEST NO.:	1
	Winnipeg MB R3P 0Y7	LAB NO.:	HM 522
ATTENTION:	Ryan Harras	DATE RECEIVED :	30-Oct-19
PROJECT:	2019-2023 Downtown Streets Renewal (60607441)	DATE TESTED / BY:	Nov 4-8, 2019 / IA
	Winnipeg, MB		

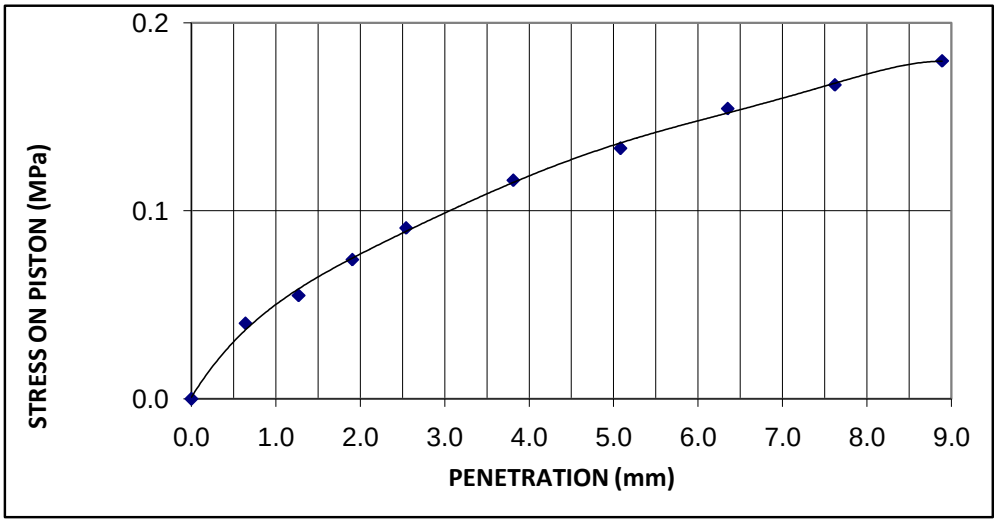
SAMPLE DATA			
Sample Type:	**CLAY**		
Source:	N/P		
Sampled by:	Client		
Optimum Moisture Content:	**19.1%**		
Maximum Dry Density:	**1618 kg/m^3**		
Method of Compaction:	Standard Proctor		
Tested by:	IA	Date Tested:	01-Nov-19

SPECIMEN DATA		
DESCRIPTION	Before Soaking	After Testing
Moisture Content (MC), %	**18.4**	
MC of top 25mm layer, %		**31.2**
Dry Density, kg/m^3	**1615**	
Compaction,%	-	-
Surcharge Weight, grams	4546	
Swell, %	9.02	

LOAD DATA

PENETRATION mm	STRESS MPa
0	0.00
0.64	0.04
1.27	0.06
1.91	0.07
2.54	0.09
3.81	0.12
5.08	0.13
6.35	0.15
7.62	0.17
8.89	0.18

LOAD PENETRATION CURVE



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD ACTUAL MPa	TEST LOAD CORRECTED MPa	**BEARING RATIO (soaked)** at **2.5** mm penetration	**BEARING RATIO (soaked)** at **5.1** mm penetration
2.54	6.9	0.09	0.09	**1.3**	-
5.08	10.3	0.13	0.13	-	**1.3**

Remarks: 4 days soaked

Reviewed by:

Gladys Paciente, P.Eng

H. MANALO CONSULTING LTD.
1402 Notre Dame Avenue, Winnipeg, MB R3E 3G5
Phone: 204 697-3854 Cell: 204 997-1355
hmanalo@mts.net

MAXIMUM DRY DENSITY AND MOISTURE CONTENT - Proctor Method (ASTM D698)

CLIENT:	AECOM 99 Commerce Drive Winnipeg MB R3P 0Y7	PROJECT NO.:	112-1915
		TEST NO.:	1
ATTENTION:	Ryan Harras		
PROJECT:	2019-2023 Downtown Streets Renewal (60607441) Winnipeg, MB		

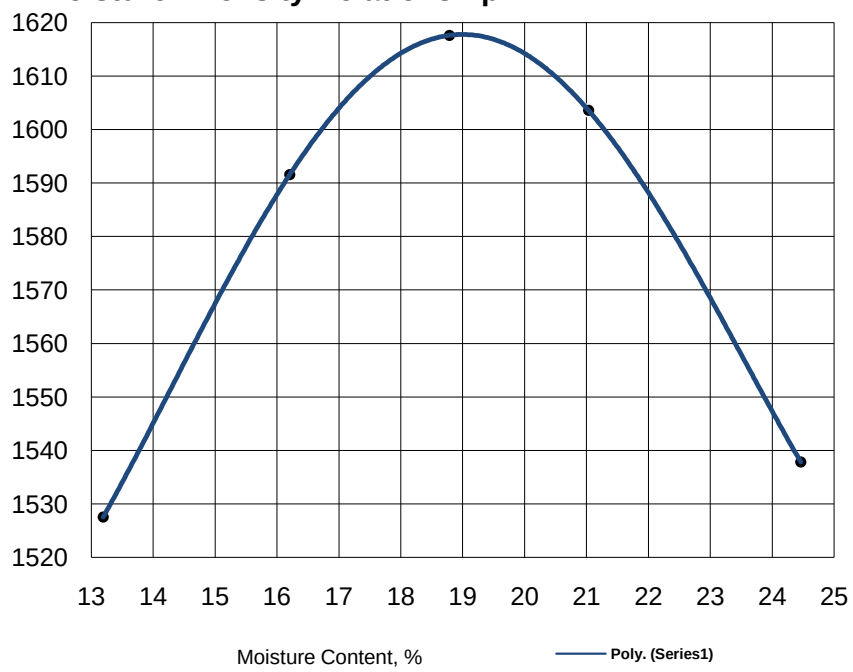
Date Sampled:	unknown	Date Received:	30-Oct-19
Sampled By:	Client	Date Tested:	01-Nov-19

MATERIAL INFORMATION

Material Type:	Clay		
Material Use:	Backfill	Material Supplier:	
Maximum Size:		Material Source:	

PROCEDURE	A
PREPARATION	Dry
COMPACTION METHOD	Manual
BLOWS PER LAYER	25
NO. OF LAYERS	3
MOLD SIZE	100 mm
MOLD VOLUME	0.910
WEIGHT OF HAMMER	2.5 kg

Test No.	1	2	3	4	5
Wet Density	1729	1849	1922	1941	1914
Moisture Content	13.2	16.2	18.8	21.0	24.5
Dry Density	1528	1592	1618	1604	1538



Maximum Dry Density (MDD): 1618 kg/m³

Optimum Moisture Content 19.1 %

STONE CORRECTION (ASTM D 4718)

Retained on 4.75 mm sieve: ____ %

Corrected Moisture: **19.1** %

Corrected Maximum Dry Density: **1618** kg/m³

Remarks:

Tested by: IA

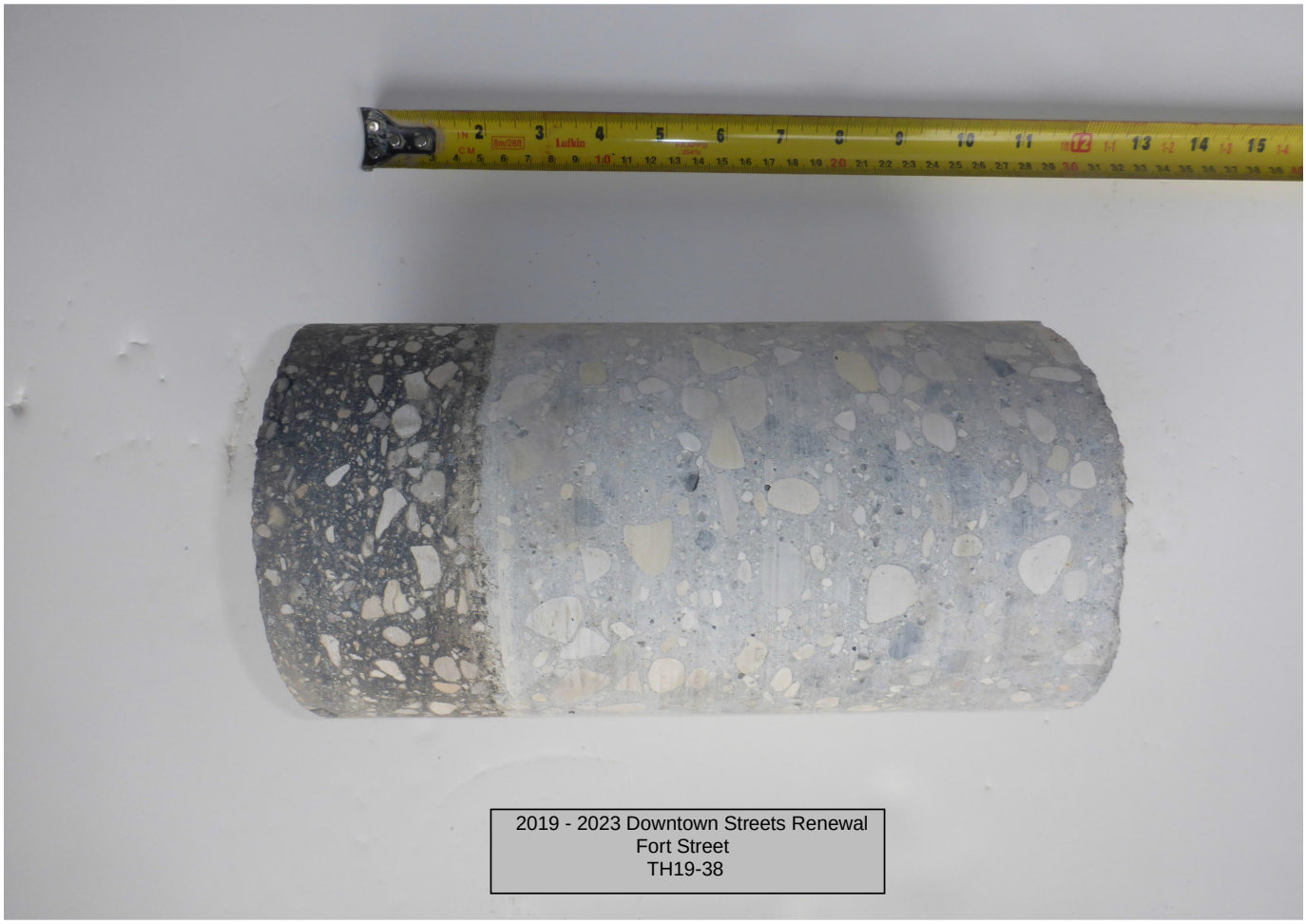
Reviewed By: Hermie Manalo

2019 - 2023 Downtown Streets Renewal
Fort Street
TH19-34

2019 - 2023 Downtown Streets Renewal
Fort Street
TH19-35

2019 - 2023 Downtown Streets Renewal
Fort Street
TH19-36

2019 - 2023 Downtown Streets Renewal
Fort Street
TH19-37



2019 - 2023 Downtown Streets Renewal
Fort Street
TH19-38

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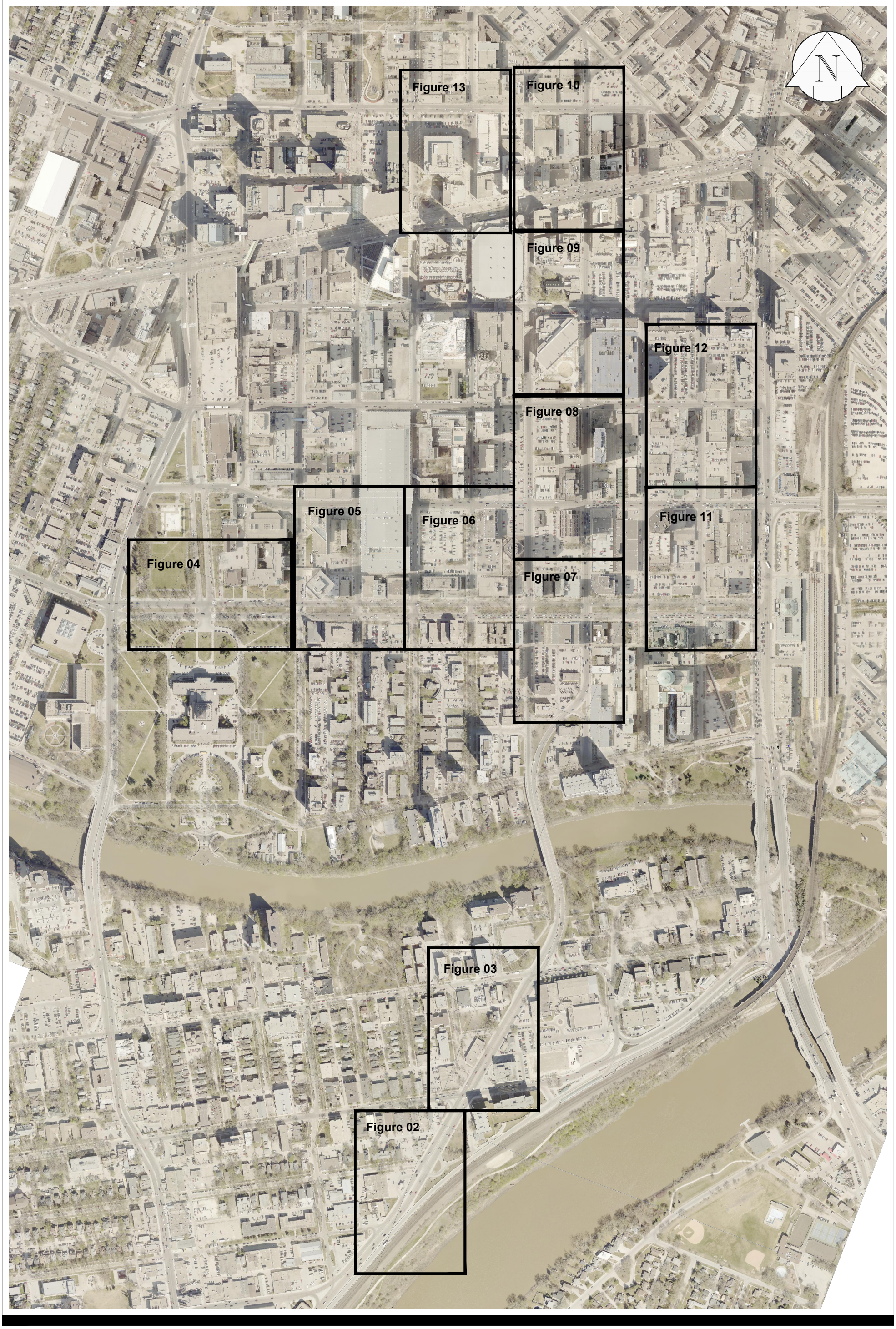
Project Management Initials: Designer: _____ Checked: _____ Approved: _____ ANSI B 279.4mm x 431.8mm



2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

City of Winnipeg
Project No.: 60607441 Date: 2019-09-25

AECOM

Figure: 01

Last saved by: POELSP(2019-10-28) Last Plotted: 2019-10-31
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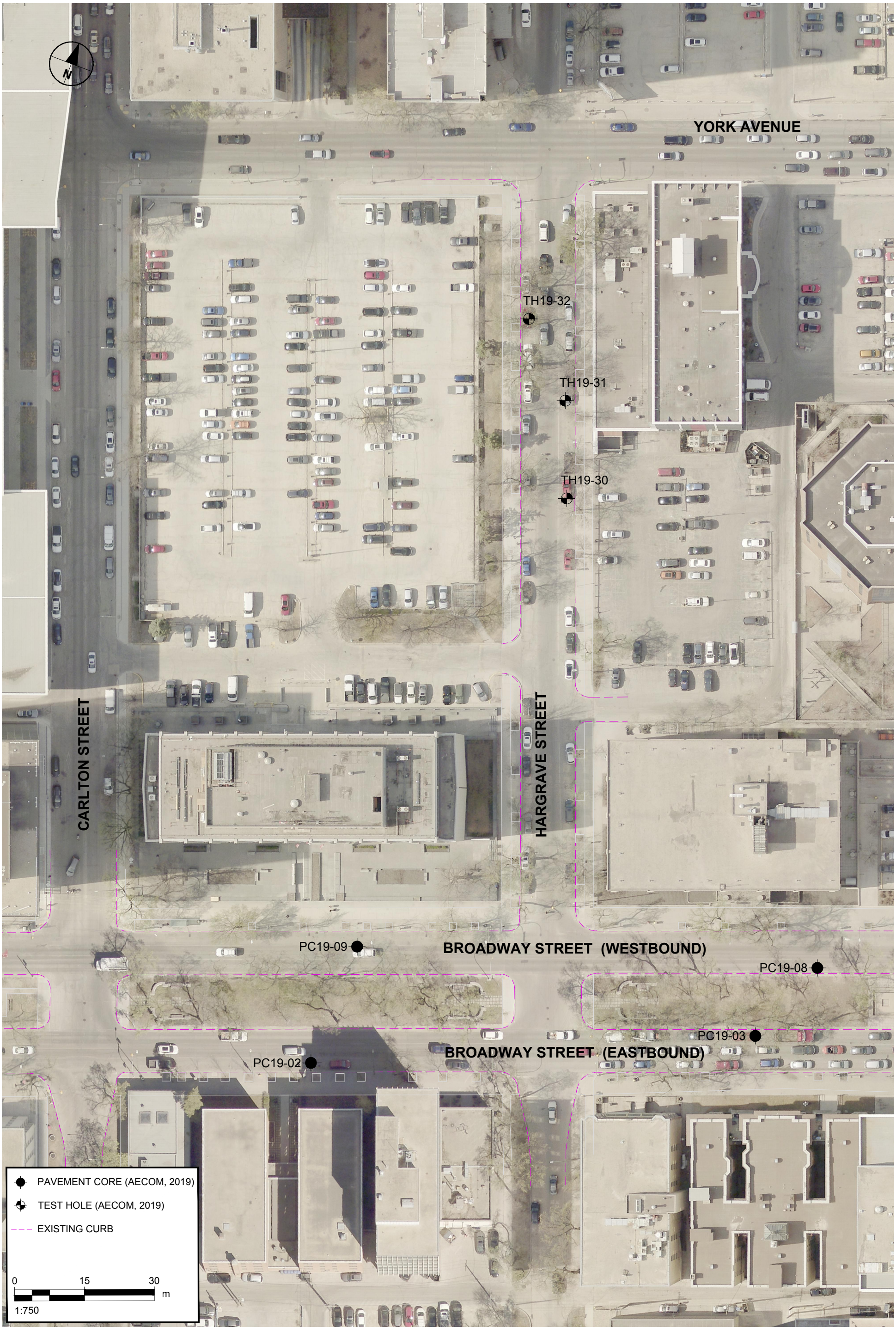
Project Management Initials: Designer: _____ Checked: _____ Approved: _____ ANSI B 279.4mm x 431.8mm



2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

City of Winnipeg
Project No.: 60607441 Date: 2019-09-25

AECOM

Figure: 06

Last saved by: POELSP(2019-10-25) Last Plotted: 2019-10-28
Filename: P:\60607441\900-CAD_GIS\910-CAD\25-SKETCHES\B\60607441-FIG-0-TESTHOLE_PAVEMENT CORE-LOCATION PLAN.DWG

Project Management Initials: Designer: _____ Checked: _____ Approved: _____ ANSI B 279.4mm x 431.8mm

2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

City of Winnipeg
Project No.: 60607441 Date: 2019-09-25

AECOM

Figure: 13

EXPLANATION OF FIELD & LABORATORY TEST DATA

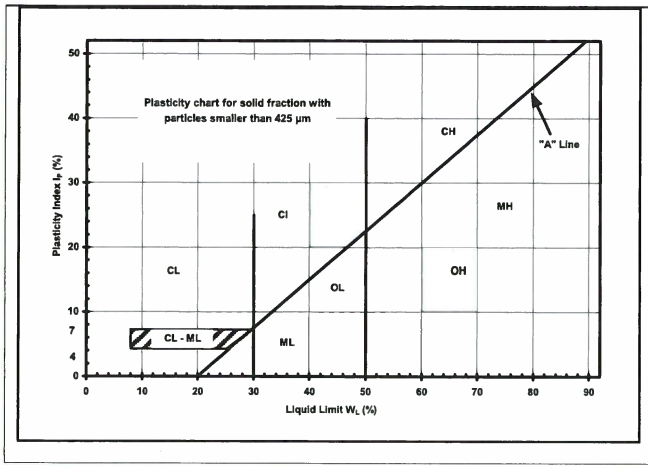
Description				UMA Log Symbols	USCS Classification	Laboratory Classification Criteria			
						Fines (%)	Grading	Plasticity	Notes
COARSE GRAINED SOILS	GRAVELS (More than 50% of coarse fraction of gravel size)	CLEAN GRAVELS (Little or no fines)	Well graded gravels, sandy gravels, with little or no fines		GW	0-5	$C_U > 4$ $1 < C_C < 3$		Dual symbols if 5-12% fines. Dual symbols if above "A" line and $4<W_P<7$ $C_U = \frac{D_{60}}{D_{10}}$ $C_C = \frac{(D_{30})^2}{D_{10} x D_{60}}$
			Poorly graded gravels, sandy gravels, with little or no fines		GP	0-5	Not satisfying GW requirements		
		DIRTY GRAVELS (With some fines)	Silty gravels, silty sandy gravels		GM	> 12		Atterberg limits below "A" line or $W_P<4$	
			Clayey gravels, clayey sandy gravels		GC	> 12		Atterberg limits above "A" line or $W_P<7$	
	SANDS (More than 50% of coarse fraction of sand size)	CLEAN SANDS (Little or no fines)	Well graded sands, gravelly sands, with little or no fines		SW	0-5	$C_U > 6$ $1 < C_C < 3$		
			Poorly graded sands, gravelly sands, with little or no fines		SP	0-5	Not satisfying SW requirements		
		DIRTY SANDS (With some fines)	Silty sands, sand-silt mixtures		SM	> 12		Atterberg limits below "A" line or $W_P<4$	
			Clayey sands, sand-clay mixtures		SC	> 12		Atterberg limits above "A" line or $W_P<7$	
FINE GRAINED SOILS	SILTS (Below 'A' line negligible organic content)	$W_L<50$	Inorganic silts, silty or clayey fine sands, with slight plasticity		ML			Classification is Based upon Plasticity Chart	
		$W_L>50$	Inorganic silts of high plasticity		MH				
	CLAYS (Above 'A' line negligible organic content)	$W_L<30$	Inorganic clays, silty clays, sandy clays of low plasticity, lean clays		CL				
		$30<W_L<50$	Inorganic clays and silty clays of medium plasticity		CI				
		$W_L>50$	Inorganic clays of high plasticity, fat clays		CH				
	ORGANIC SILTS & CLAYS (Below 'A' line)	$W_L<50$	Organic silts and organic silty clays of low plasticity		OL				
		$W_L>50$	Organic clays of high plasticity		OH				
HIGHLY ORGAINIC SOILS			Peat and other highly organic soils		Pt	Von Post Classification Limit		Strong colour or odour, and often fibrous texture	

	Asphalt		Till		
	Concrete		Bedrock (Undifferentiated)		AECOM
	Fill		Bedrock (Limestone)		

When the above classification terms are used in this report or test hole logs, the designated fractions may be visually estimated and not measured.

NOT USED TO CLASSIFY SUBGRADE. REFER TO CITY OF WINNIPEG SPECIFICATIONS FOR GEOTECHNICAL INVESTIGATION REQUIREMENTS FOR PUBLIC WORKS PROJECTS (SEPTEMBER, 2015)

NOT USED TO CLASSIFY SUBGRADE. REFER TO CITY OF WINNIPEG SPECIFICATIONS FOR GEOTECHNICAL INVESTIGATIONS REQUIREMENTS FOR PUBLIC WORKS PROJECTS (SEPTEMBER, 2015)



FRACTION		SEIVE SIZE (mm)		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
		Passing	Retained	Percent	Identifier
Gravel	Coarse	76	19	35-50	and
	Fine	19	4.75		
Sand	Coarse	4.75	2.00	20-35	"y" or "ey" *
	Medium	2.00	0.425		
	Fine	0.425	0.075	10-20	some
Silt (non-plastic) or Clay (plastic)		< 0.075 mm		1-10	trace

* for example: gravelly, sandy clayey, silty

Definition of Oversize Material

COBBLES: 76mm to 300mm diameter
BOULDERS: >300mm diameter

LEGEND OF SYMBOLS

Laboratory and field tests are identified as follows:

- q_u - undrained shear strength (kPa) derived from unconfined compression testing.
- T_v - undrained shear strength (kPa) measured using a torvane
- pp - undrained shear strength (kPa) measured using a pocket penetrometer.
- L_v - undrained shear strength (kPa) measured using a lab vane.
- F_v - undrained shear strength (kPa) measured using a field vane.
- γ - bulk unit weight (kN/m^3).
- SPT - Standard Penetration Test. Recorded as number of blows (N) from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 51 mm O.D. Raymond type sampler 0.30 m into the soil.
- DPPT - Drive Point Pentrometer Test. Recorded as number of blows from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 50 mm drive point 0.30 m into the soil.
- w - moisture content (W_L, W_P)

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

Su (kPa)	CONSISTENCY
<12	very soft
12 – 25	soft
25 – 50	medium or firm
50 – 100	stiff
100 – 200	very stiff
200	hard

The resistance (N) of a non-cohesive soil can be related to compactness condition as follows

N – BLOWS/0.30 m	COMPACTNESS
0 - 4	very loose
4 - 10	loose
10 - 30	compact
30 - 50	dense
50	very dense

F2. SEWER TELEVISING GUIDELINES FOR PUBLIC WORKS PROJECTS (JANUARY 2009)

F2.1 The Consultant is required to assess the extent of Closed Circuit Television (CCTV) inspection for all combined, wastewater, land drainage and storm relief sewers to confirm any sewer repairs required in the right-of-way within the limits of the street renewal.

F2.2 The criteria provided are general guidelines and are not intended to replace sound municipal engineering judgement specific to the individual Project scope and/or location.

F2.3 The available sewer televising information is contained within the City of Winnipeg's Sewer Management System (SMS) application.

F2.4 Confirm televising requirements with Project Manager.

F2.5 CCTV inspection general guidelines:

(a) Confirm CCTV requirements with Water & Waste Department for sewers 1050 mm and larger in diameter;

(b) Televise if no previous CCTV inspections have been completed;

(c) Re-televise sewers in Categories A/B/C/X with a Structural Performance Grade (SPG) of 3 or higher that have not been televised in the previous 5 years;

(d) Sewers located more than two metres from the curb line (i.e. not located under pavement) do not need to be re-televised if previous CCTV inspection data exist. If a sewer repair or renewal requiring excavation is noted, contact the WWD;

(e) On all street reconstructions, regardless of location of the sewer (within the right-of-way);

(f) If the street exhibits obvious distress at/along the underground plant;

(g) Of all CB leads to be reused, as part of a street reconstruction or major rehabilitation.

F2.6 For any uncertain situations and/or locations, contact the Project Manager.

F2.7 The Consultant is required to coordinate the sewer-televising contract and communicate the results to the Water & Waste Department. Any repairs or other activities deemed necessary from these inspections must be coordinated with the Water & Waste Department.

F3. GEOTECHNICAL INVESTIGATION REQUIREMENTS FOR PUBLIC WORKS PROJECTS (OCTOBER 2008)

F3.1 Fieldwork

(a) Clear all underground services at each test-hole location.

(b) As this street project is greater than 500 metres, test holes may be taken every 100 m. More or fewer test-holes may be required depending upon Site conditions – confirm with the Project Manager.

(c) Record location of test-hole (offset from curb, distance from cross street and house number).

(d) Drill 150 mm-diameter cores in pavement.

(e) Drill 125 mm-diameter test-holes into fill materials and subgrade.

(f) If a service trench backfilled with granular materials is encountered, another hole shall be drilled to define the existing sub-surface conditions.

(g) Test-holes shall be drilled to depth of 2 m $\pm$150 mm below surface of the pavement.

(h) Recover pavement core sample and representative samples of soil (fill materials, pavement structure materials and subgrade).

(i) Measure and record pavement section exposed in the test-hole (thickness of concrete or asphalt and different types of pavement structure materials).

(j) Pavement structure materials to be identified as crushed limestone or granular fill and the maximum aggregate size of the material (20 mm, 50 mm or 150 mm).

(k) Log soil profile for the subgrade.

(l) Representative samples of soil must be obtained at the following depths below the bottom of the pavement structure materials – 0.1 m, 0.4 m, 0.7 m, 1.0 m, 1.3 m, 1.6 m, etc. Ensure a sample is obtained from each soil type encountered in the test-hole.

(m) Make note of any water seepage into the test-hole.

(n) Backfill test-hole with native materials and additional granular fill, if required. Patch pavement surface with hot mix asphalt or high strength durable concrete mix.

(o) Return core sample from the pavement and soil samples to the laboratory.

F3.2 Lab Work

(a) Test all soil samples for moisture content.

(b) Photograph core samples recovered from the pavement surface.

(c) Conduct tests for plasticity index and hydrometer analysis on selected soil samples which are between 0.5 m and 1 m below top of pavement (this is the sub-grade on which the pavement and sub-base will be built). The selection will be based upon visual classification and moisture content test results, with a minimum of one sample of each soil type per street to be tested.

(d) Prepare test-hole logs and classify subgrade (based on hydrometer) as follows:

< 30% silt	- classify as clay
30% - 50% silt	- classify as silty clay
50% - 70% silt	- classify as clayey silt
> 70% silt	- classify as silt

(e) For any uncertain situations and/or locations, or clarification of these requirements, contact the Project Manager.

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-30
LOCATION: Hargrave Street, Broadway to York - East curb lane, 93 m N of Broadway, 1.7 m W of E curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

PENETRATION TESTS: Becker; Dynamic Cone; SPT (Standard Pen Test) (Blows/300mm); Total Unit Wt (kN/m³); Plastic / MC / Liquid

UNDRAINED SHEAR STRENGTH (kPa): Torvane; QU/2; Lab Vane; Pocket Pen.; Field Vane

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (195 mm)				
		CONCRETE (165 mm)				
		CLAY - silty, trace sand - dark brown, moist, firm - high plasticity		G1		
		- greyish brown below 0.6 m		G2	(G2): Gravel: 0.0%, Sand: 7.2%, Silt: 38.0%, Clay: 54.8%	
1				G3		1
		CLAY - some sand - brown, firm, moist - high plasticity - silt laminations < 2 mm thick		G4		
				G5		
				G6		
2				G7		2
		END OF TEST HOLE AT 2.13 m IN CLAY NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings, bentonite seal and asphalt patch.				
3						

AECOM

LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/7/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-31
LOCATION: Hargrave Street, Broadway to York - East curb lane, 114 m N of Broadway, 2.0 m W of E curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

PENETRATION TESTS: Becker; Dynamic Cone; SPT (Standard Pen Test) (Blows/300mm); Total Unit Wt (kN/m^3); Plastic / MC / Liquid

UNDRAINED SHEAR STRENGTH (kPa): Torvane; QU/2; Lab Vane; Pocket Pen.; Field Vane

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (205 mm)				
		CONCRETE (150 mm)				
		CLAY - silty, trace sand, trace gravel - brown mottled dark brown, moist, soft to firm - high plasticity		G8	(G8): Gravel: 1.9%, Sand: 2.9%, Silt: 33.3%, Clay: 61.8%	
				G9		
1		SILT - clayey, sandy - brown, moist, soft to firm - intermediate plasticity		G10		1
		CLAY - trace sand, trace gravel - brown, moist, firm - high plasticity		G11	(G11): Gravel: 1.6%, Sand: 2.0%, Silt: 23.5%, Clay: 72.9%	
				G12		
				G13		
2				G14		2
		END OF TEST HOLE AT 2.13 m IN CLAY NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.				
3						

AECOM

LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/7/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

PROJECT: 2019-2023 Downtown Pavement Renewals	CLIENT: City of Winnipeg	TESTHOLE NO: TH19-32
LOCATION: Hargrave Street, Broadway to York - West curb lane, 30 m S of York, 1.7 m E of W curb		PROJECT NO.: 60607441
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ▤ BULK ▨ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		ASPHALT (260 mm)					
		CONCRETE (160 mm)					
		CLAY - silty, trace sand - brown mottled dark brown, moist, soft to firm - high plasticity		G15			
		AUGER REFUSAL AT 0.46 m ON SUSPECTED COBBLES NOTES: 1. No sloughing. 2. No seepage. 3. Test hole backfilled with auger cuttings and bentonite seal, and asphalt patch at surface.					
1							1
2							2
3							

PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100; ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21; Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + × QU/2 × ☐ Lab Vane ☐ △ Pocket Pen. △ ⬘ Field Vane ⬘ (kPa) 50 100 150 200

AECOM	LOGGED BY: Tessa Christi	COMPLETION DEPTH: 0.46 m
	REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 8/7/19
	PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE DRAFT 2019-10-30-THL_CONTRACT 2_60481153.GPJ UMA WINN.GDT 10/30/19

City of Winnipeg

2019-2023 Downtown Pavement Renewals – Hargrave Street (Ellice Avenue to Portage Avenue and York Avenue to Broadway)

Geotechnical Investigation

Table 01 - Summary of Laboratory Soil Testing

Test Hole No.	Test Hole Location	Pavement Structure		Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
TH19-30	Hargrave Street - E curb lane, 93 m N of Broadway, 1.7 m W of E curb	Asphalt	195	SILTY CLAY (CH)	0.4	32							
				SILTY CLAY (CH)	0.7	30.3	0.0	7.2	38.0	54.8	63	20	43
				SILTY CLAY (CH)	1.0	32.1							
		Concrete	165	CLAY (CH)	1.3	33.8							
				CLAY (CH)	1.5	33.2							
				CLAY (CH)	1.9								
				CLAY (CH)	2.1								
TH19-31	Hargrave Street - E curb lane, 114 m N of Broadway, 2.0 m W of E curb	Asphalt	205	SILTY CLAY (CH)	0.4	36.9	1.9	2.9	33.3	61.8	78	22	56
				SILTY CLAY (CH)	0.7	34.4							
				CLAYEY SILT (MI)	1.0								
		Concrete	150	CLAY (CH)	1.3	32.9	1.6	2.0	23.5	72.9	85	25	60
				CLAY (CH)	1.4	36.5							
				CLAY (CH)	1.9								
				CLAY (CH)	2.1								
TH19-32	Hargrave Street - W curb lane, 30 m S of York, 1.7 m E of W curb	Asphalt	260	SILTY CLAY (CH)	0.4								
		Concrete	160										
PC19-30	Hargrave Street - 15 m N of Portage, 1.8 m W of E curb	Asphalt	115										
		Concrete	230										
PC19-31	Hargrave Street - 20 m S of Ellice, 2.2 m W of E curb	Asphalt	175										
		Concrete	190										

* Subgrade Description based on City of Winnipeg Specifications for Geotechnical Investigation Requirements for Public Works Projects (September 2015)

H. MANALO CONSULTING LTD.

1402 Notre Dame Ave, Winnipeg MB R3E 3G5
Phone: 204-697-3854 Cell: 204-997-1355
Email: hmanalo@mts.net

CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883

CLIENT:	AECOM	PROJECT NO.:	112-1915
	99 Commerce Drive	TEST NO.:	1
	Winnipeg MB R3P 0Y7	LAB NO.:	HM 522
ATTENTION:	Ryan Harras	DATE RECEIVED :	30-Oct-19
PROJECT:	2019-2023 Downtown Streets Renewal (60607441)	DATE TESTED / BY:	Nov 4-8, 2019 / IA
	Winnipeg, MB		

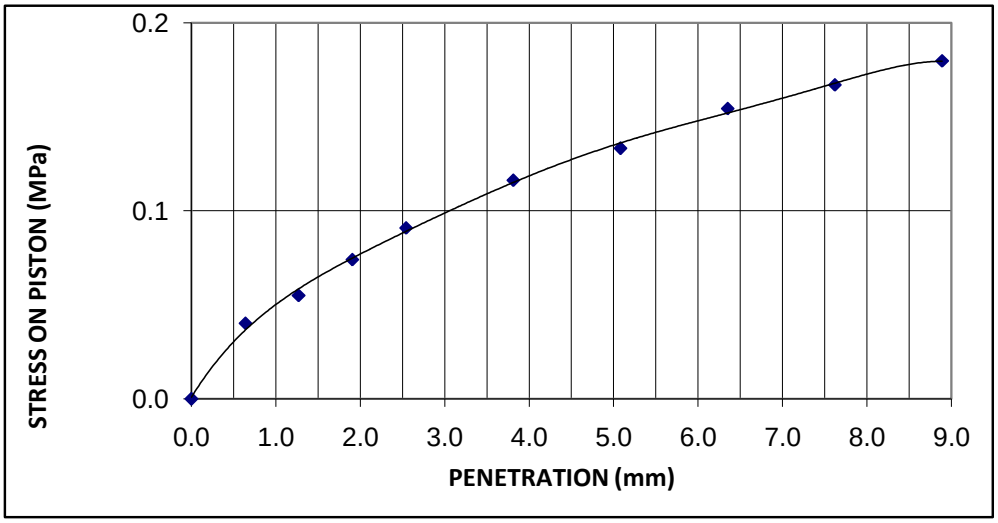
SAMPLE DATA			
Sample Type:	**CLAY**		
Source:	N/P		
Sampled by:	Client		
Optimum Moisture Content:	**19.1%**		
Maximum Dry Density:	**1618 kg/m^3**		
Method of Compaction:	Standard Proctor		
Tested by:	IA	Date Tested:	01-Nov-19

SPECIMEN DATA		
DESCRIPTION	Before Soaking	After Testing
Moisture Content (MC), %	**18.4**	
MC of top 25mm layer, %		**31.2**
Dry Density, kg/m^3	**1615**	
Compaction,%	-	-
Surcharge Weight, grams	4546	
Swell, %	9.02	

LOAD DATA

PENETRATION mm	STRESS MPa
0	0.00
0.64	0.04
1.27	0.06
1.91	0.07
2.54	0.09
3.81	0.12
5.08	0.13
6.35	0.15
7.62	0.17
8.89	0.18

LOAD PENETRATION CURVE



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD ACTUAL MPa	TEST LOAD CORRECTED MPa	**BEARING RATIO (soaked)** at **2.5** mm penetration	**BEARING RATIO (soaked)** at **5.1** mm penetration
2.54	6.9	0.09	0.09	**1.3**	-
5.08	10.3	0.13	0.13	-	**1.3**

Remarks: 4 days soaked

Reviewed by:

Gladys Paciente, P.Eng

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1402 Notre Dame Avenue, Winnipeg, MB R3E 3G5
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hmanalo@mts.net

MAXIMUM DRY DENSITY AND MOISTURE CONTENT - Proctor Method (ASTM D698)

CLIENT:	AECOM 99 Commerce Drive Winnipeg MB R3P 0Y7	PROJECT NO.:	112-1915
		TEST NO.:	1
ATTENTION:	Ryan Harras		
PROJECT:	2019-2023 Downtown Streets Renewal (60607441) Winnipeg, MB		

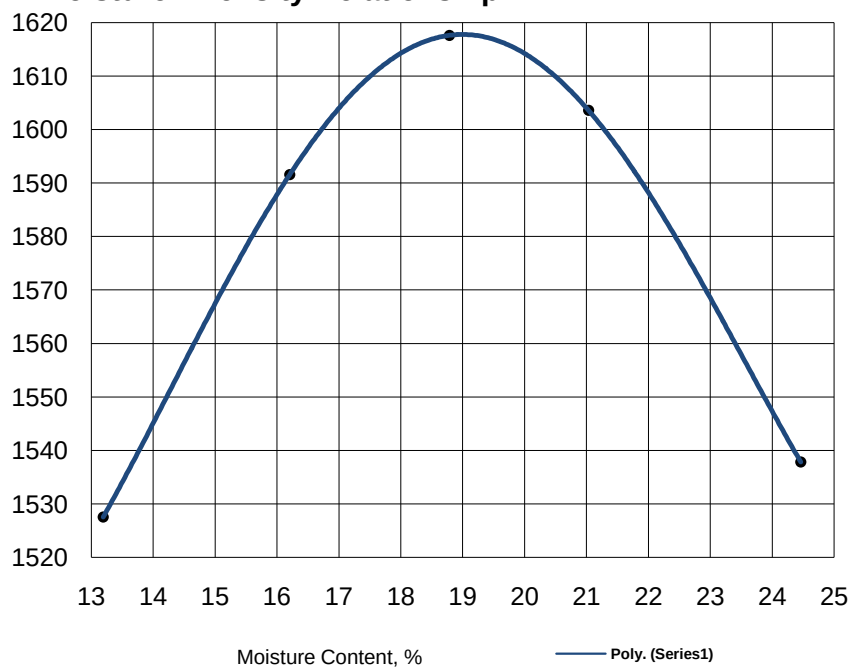
Date Sampled:	unknown	Date Received:	30-Oct-19
Sampled By:	Client	Date Tested:	01-Nov-19

MATERIAL INFORMATION

Material Type:	Clay		
Material Use:	Backfill	Material Supplier:	
Maximum Size:		Material Source:	

PROCEDURE	A
PREPARATION	Dry
COMPACTION METHOD	Manual
BLOWS PER LAYER	25
NO. OF LAYERS	3
MOLD SIZE	100 mm
MOLD VOLUME	0.910
WEIGHT OF HAMMER	2.5 kg

Test No.	1	2	3	4	5
Wet Density	1729	1849	1922	1941	1914
Moisture Content	13.2	16.2	18.8	21.0	24.5
Dry Density	1528	1592	1618	1604	1538



Maximum Dry Density (MDD): 1618 kg/m³

Optimum Moisture Content 19.1 %

STONE CORRECTION (ASTM D 4718)

Retained on 4.75 mm sieve: ____ %

Corrected Moisture: **19.1** %

Corrected Maximum Dry Density: **1618** kg/m³

Remarks:

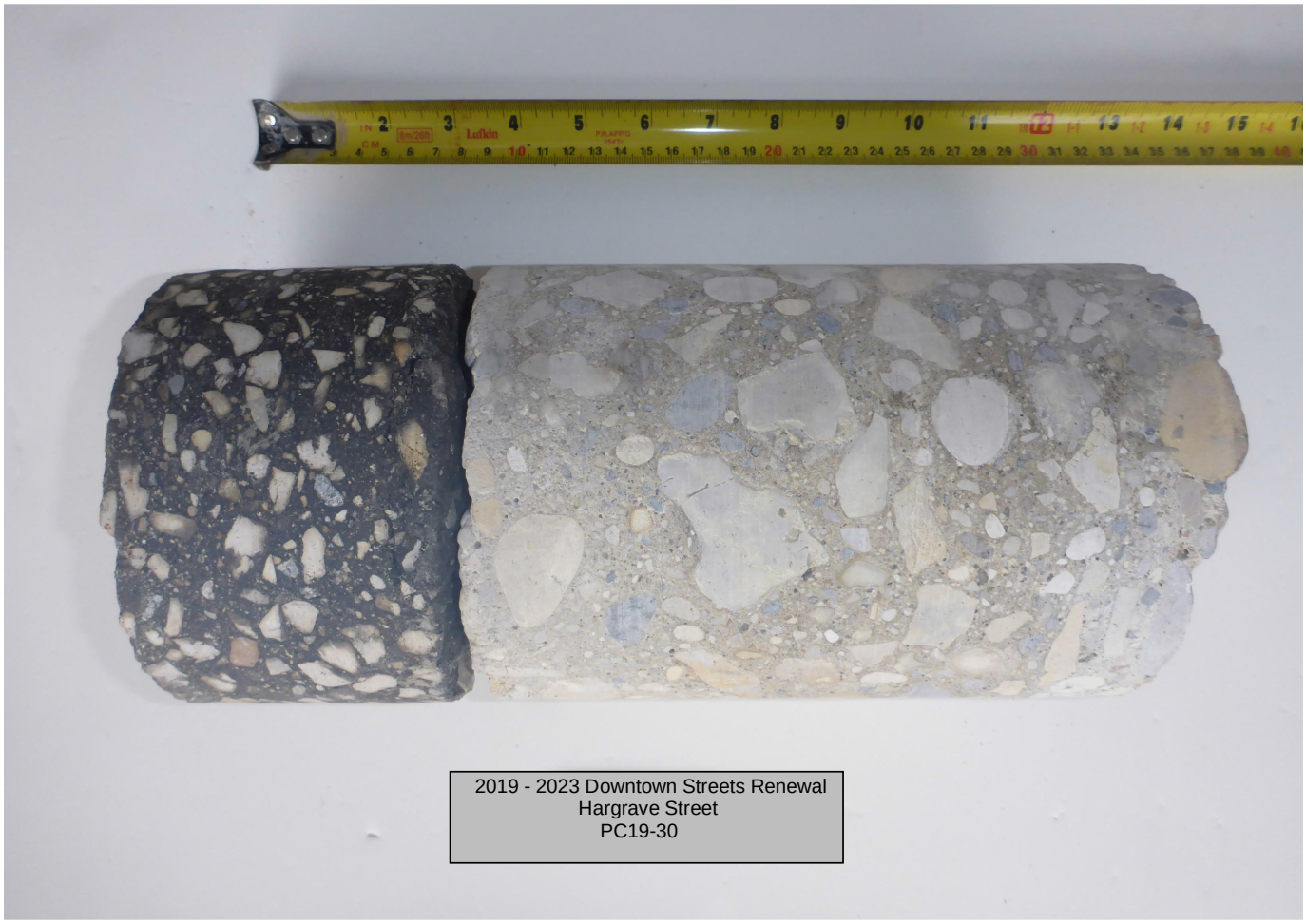
Tested by: IA

Reviewed By: Hermie Manalo

2019 - 2023 Downtown Streets Renewal
Hargrave Street
TH19-30

2019 - 2023 Downtown Streets Renewal
Hargrave Street
TH19-31

2019 - 2023 Downtown Streets Renewal
Hargrave Street
TH19-32



2019 - 2023 Downtown Streets Renewal
Hargrave Street
PC19-30


2019 - 2023 Downtown Streets Renewal
Hargrave Street
PC19-31

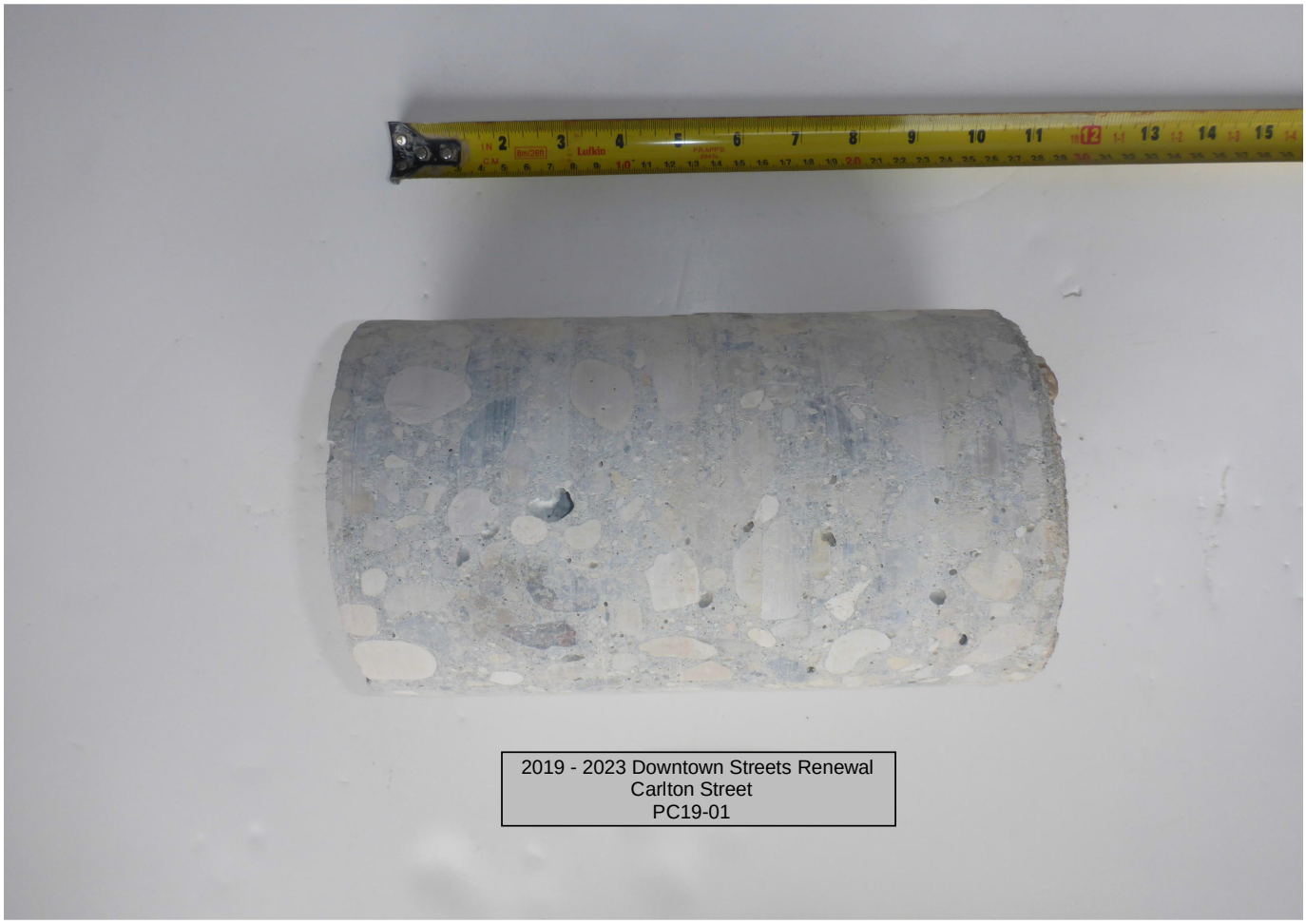
City of Winnipeg

2019-2023 Downtown Pavement Renewals – Carlton Street (Ellice Avenue to Portage Avenue)

Geotechnical Investigation

Table 01 - Summary of Laboratory Soil Testing

Test Hole No.	Test Hole Location	Pavement Structure		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
PC19-01	Carlton Street – 47 m S of Ellice, 5.0 m E of W curb	Asphalt	0										
		Concrete	255										



2019 - 2023 Downtown Streets Renewal
Carlton Street
PC19-01