APPENDIX ‘G’

GEOTECHNICAL REPORT

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Mr. Kevin Rae
AECOM Canada Ltd.
99 Commerce Drive
Winnipeg, MB R3P 0Y7

November 13, 2019

Project #
60607441

Dear Mr. Rae:

Subject: City of Winnipeg 2019 - 2023 Downtown Pavement Renewals
Smith Street (Notre Dame Avenue to Midtown Bridge) - Geotechnical Data Report

This geotechnical data report provides the results of a geotechnical investigation performed by AECOM Canada Ltd. (AECOM) for the proposed reconstruction of Smith Street between Notre Dame Avenue and Graham Avenue rehabilitation of Smith Street between Graham Avenue and the Midtown Bridge as part of the City of Winnipeg's 2019-2023 Downtown Pavement Renewal Program. The main objective of the geotechnical investigation was to determine the thickness of the existing pavement structure for the reconstruction and rehabilitation, and to determine the subsurface conditions below the existing pavement structure for reconstruction portions of the street.

Four test holes (TH19-39 to TH19-42) were drilled on Smith Street between Notre Dame Avenue and Graham Avenue. Three pavement core holes (PC19-27 to PC19-29) were completed on Smith Street between Graham Avenue and the Midtown Bridge. Locations of these test holes and pavement core holes are presented on **Figures 01**, **Figure 07** to **Figure 10** in **Appendix A**. Due to road closures at the time of drilling, it was not possible to complete test holes or pavement cores on Smith Street between Ellice Avenue and Notre Dame Avenue and between St. Mary Avenue and York Avenue. Soil logs providing detailed descriptions of subsurface conditions encountered at the test hole locations are presented in **Appendix B**. A summary of the pavement thickness encountered at each test hole and pavement core hole location is summarized in **Appendix C**.

The site investigation was completed by Maple Leaf Drilling Ltd. using a truck-mounted drill rig equipped with 125 mm diameter solid stem augers. The test holes were drilled to depths of approximately 2 m below the existing road surface. During the drilling, AECOM personnel observed subsurface conditions and visually classified the collected soil samples according to the *City of Winnipeg Geotechnical Investigation Requirements for Public Works Projects* specifications. Other pertinent information such as groundwater and drilling conditions were also recorded. Disturbed soil samples collected during the investigation were transported to Eng-Tech's Materials Laboratory in Winnipeg, Manitoba and H. Manalo Consulting Limited's Materials Laboratory in Winnipeg, Manitoba for further testing and classification.

The laboratory soil testing consisted of determination of moisture contents, Atterberg Limits, and grain size distribution. The test results are shown on the test hole logs and in the laboratory testing summary in **Appendix C.** A single CBR test was completed on a bulk soil sample comprised of highly plastic clay grab samples within 1.5 m of existing ground surface that were collected from test holes completed on Fort Street, Smith Street, Donald Street, and Hargrave Street as part of the 2019-2023 Downtown Pavement Renewal Program. The results of this test indicate a CBR value of 1.3 for the high plasticity clay. A copy of the lab testing report is included in **Appendix C**.

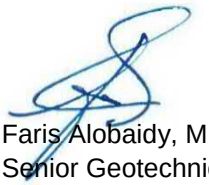
Pavement coring was completed using a hollow 150 mm diameter diamond core drill bit. Core samples were recovered and logged at AECOM's Materials Laboratory in Winnipeg, Manitoba. Photos of core samples are included in **Appendix D**.

Sincerely,
AECOM Canada Ltd.

Prepared by

Ryan Harras, B.Sc.
Geotechnical Engineer in Training

Reviewed by:



Faris Alobaidy, M.Sc., P.Eng
Senior Geotechnical Engineer

RH:rz
Encl.

Statement of Qualifications and Limitations

The attached Report (the "Report") has been prepared by AECOM Canada Ltd. ("Consultant") for the benefit of the client ("Client") in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the "Agreement").

The information, data, recommendations and conclusions contained in the Report (collectively, the "Information"):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the "Limitations");
- represents Consultant's professional judgement in light of the Limitations and industry standards for the preparation of similar reports;
- may be based on information provided to Consultant which has not been independently verified;
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued;
- must be read as a whole and sections thereof should not be read out of such context;
- was prepared for the specific purposes described in the Report and the Agreement; and
- in the case of subsurface, environmental or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time.

Consultant shall be entitled to rely upon the accuracy and completeness of information that was provided to it and has no obligation to update such information. Consultant accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared and, in the case of subsurface, environmental or geotechnical conditions, is not responsible for any variability in such conditions, geographically or over time.

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AECOM: 2015-01-06

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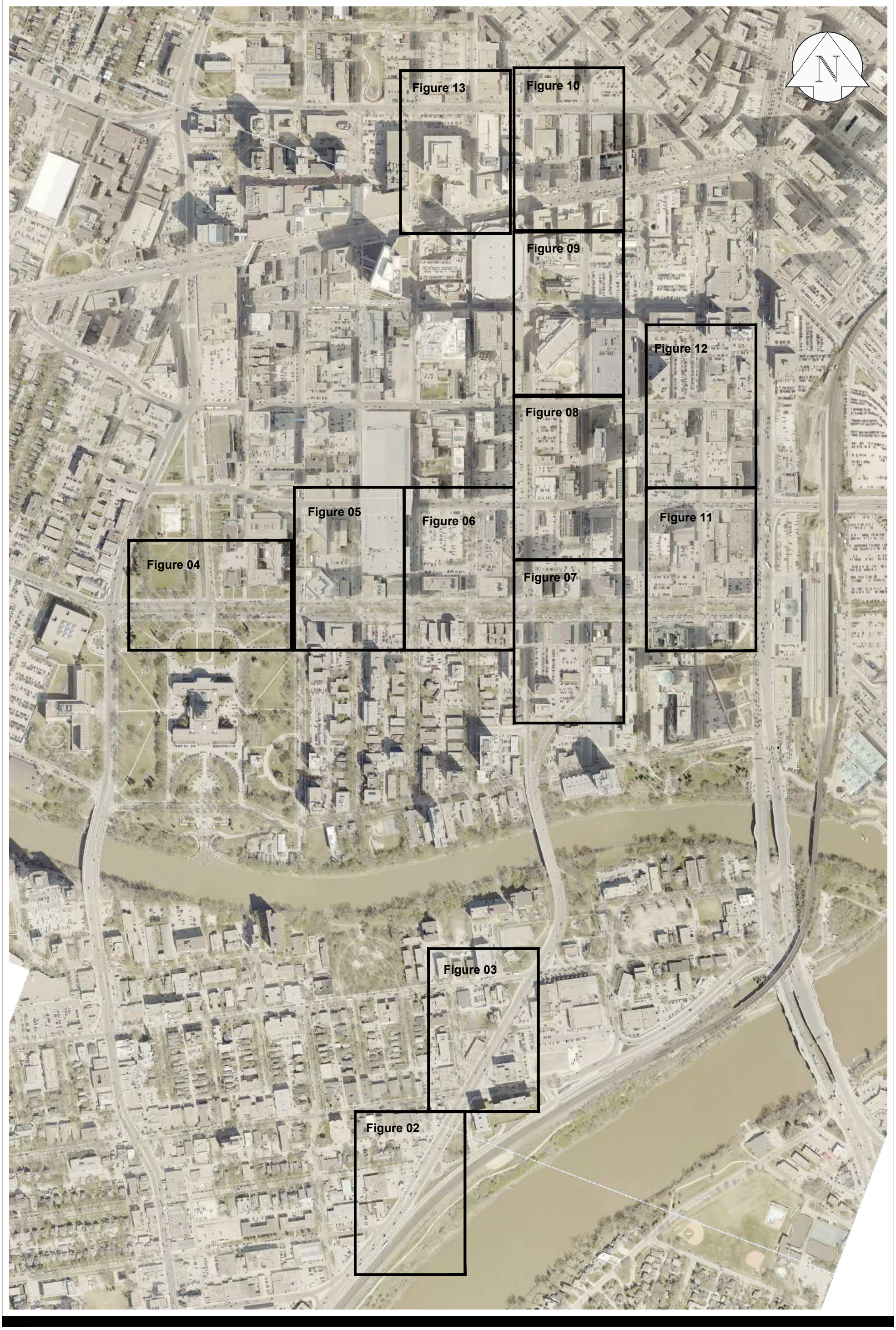
Project Management Initials: Designer: _____ Checked: _____ Approved: _____ ANSI B 279.4mm x 431.8mm



2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

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

AECOM

Figure: 01

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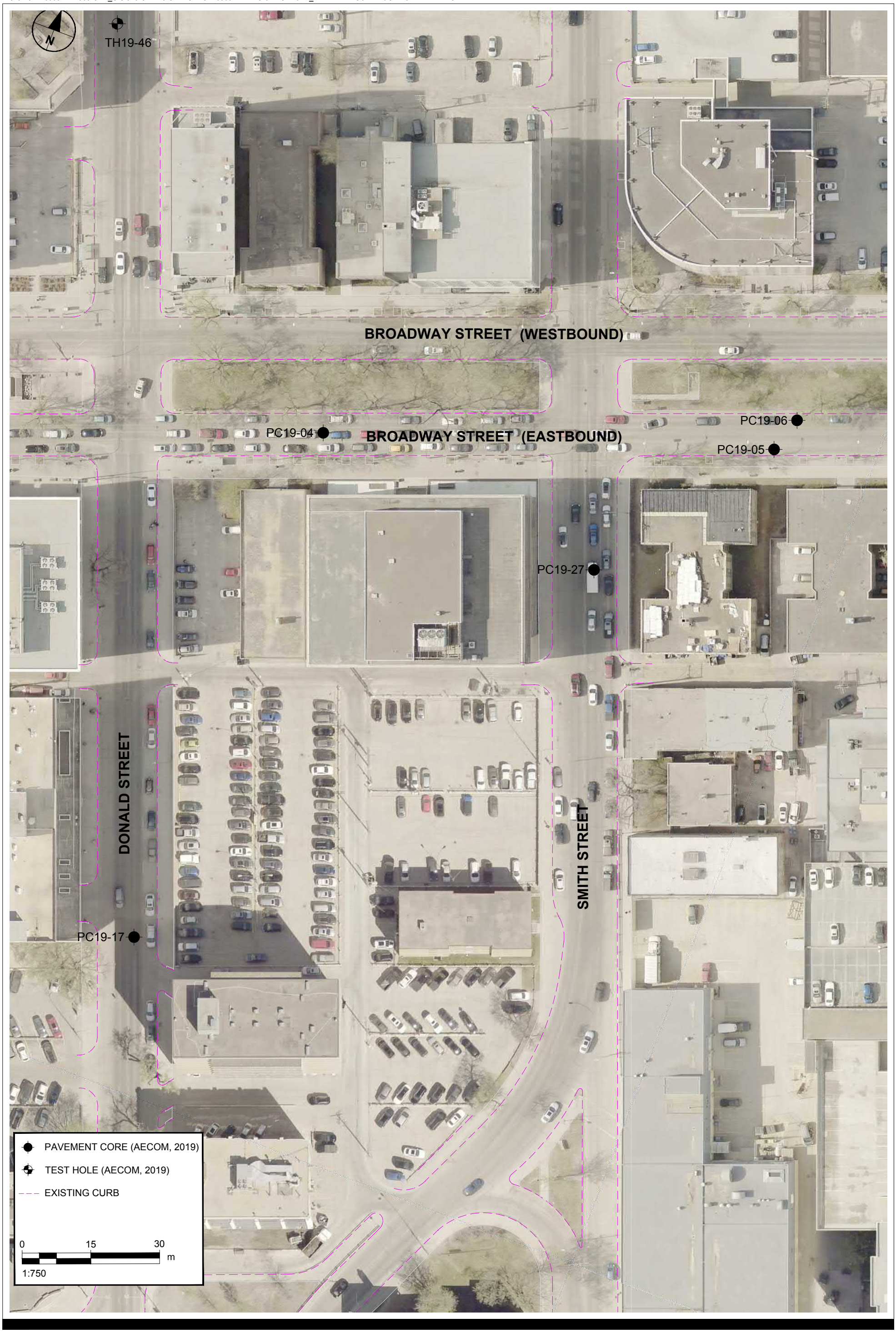

2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

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

AECOM

Figure: 07

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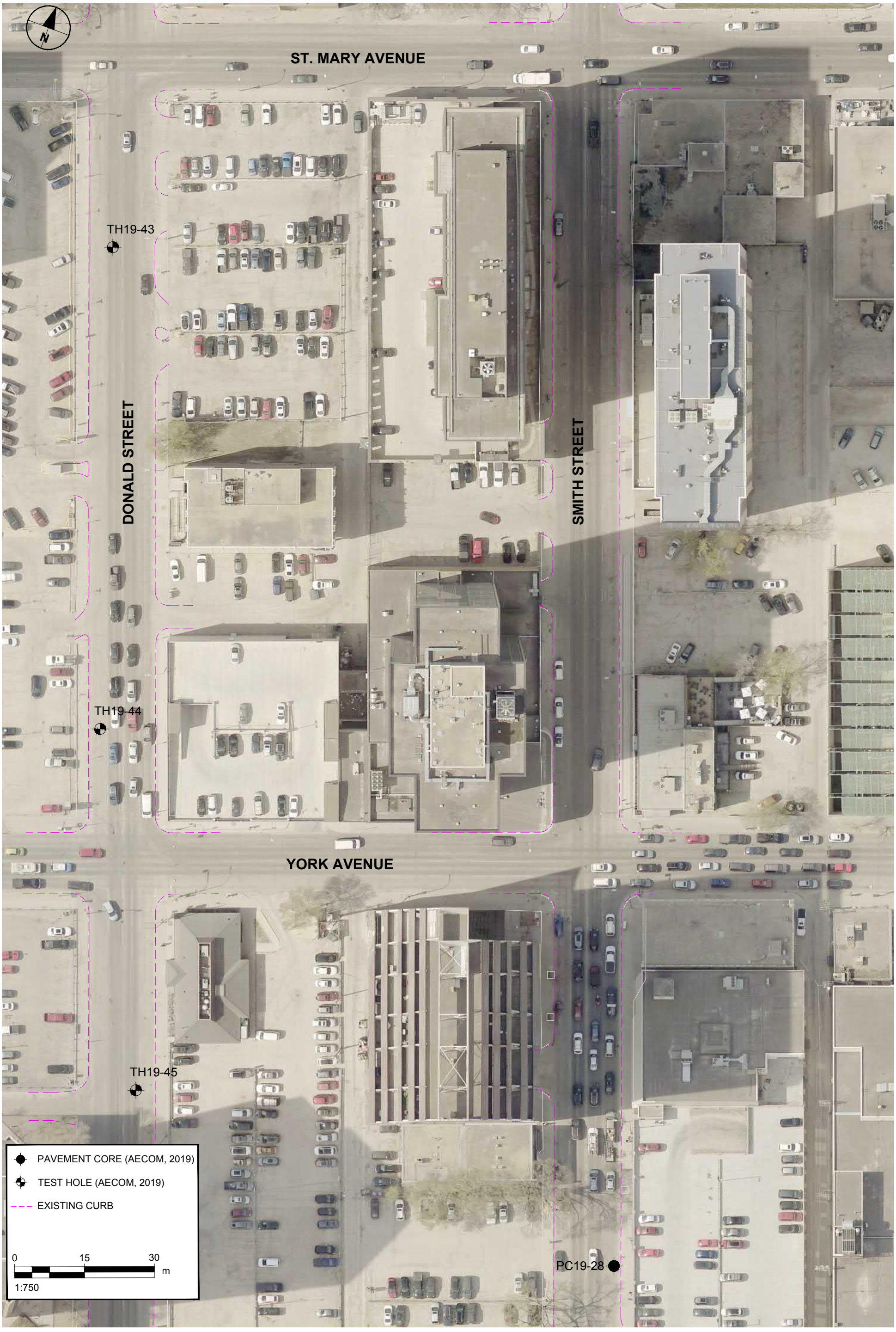

2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

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

AECOM

Figure: 08

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

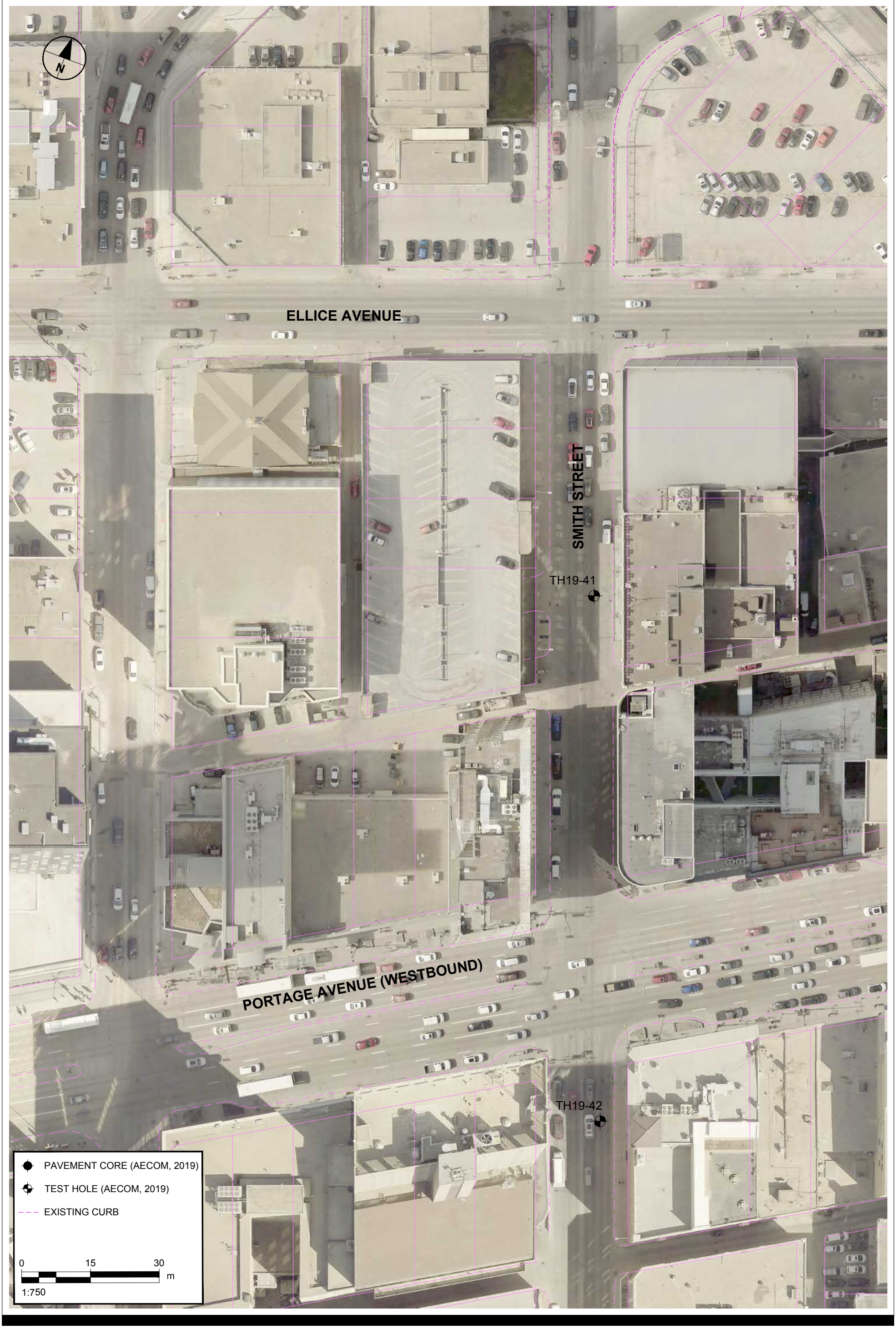
2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

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

AECOM

Figure: 09



2019 - 2023 DOWNTOWN STREET RENEWALS

Pavement Core/Test Hole Location Plan

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

AECOM

Figure: 10

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)

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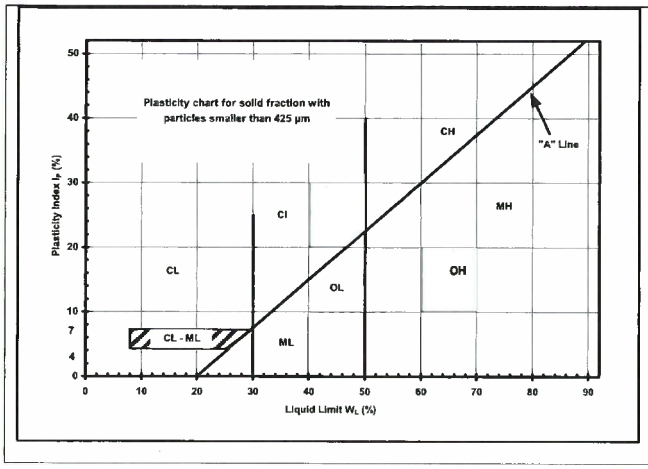


FRACTION		SEIVE SIZE (mm)		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
		Passing	Retained	Percent	Identifier
Gravel	Coarse	76	19	35-50	and
	Fine	19	4.75		
Sand	Coarse	4.75	2.00	20-35	"y" or "ey" *
	Medium	2.00	0.425		
	Fine	0.425	0.075	10-20	some
Silt (non-plastic) or Clay (plastic)		< 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: TH19-39
LOCATION: Smith Street, Graham to Portage - 2nd lane from West, 25 m N of Graham, 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

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

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (115 mm)				
		CONCRETE (215 mm)				
		- layer of crushed concrete (50 mm thick)				
		CLAY - trace sand - dark brown, moist, firm - high plasticity		G51		
				G52		
1				G53	(G53): Gravel: 0.0%, Sand: 3.6%, Silt: 27.6%, Clay: 68.7%	1
		- brown below 1.2 m		G54		
				G55		
		SILT - clayey, sandy - light brown, moist, soft - intermediate plasticity		G56		
2				G57		2
		END OF TEST HOLE AT 2.13 m IN SILT 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: 8/9/19
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: TH19-40
LOCATION: Smith Street, Graham to Portage - West curb lane, 10 m N of Graham, 2.0 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

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

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (140 mm)				
		CONCRETE (165 mm)				
		SAND and GRAVEL		G58		
		CLAY - trace sand, trace gravel - brown, moist, firm - high plasticity		G59		
1				G60		1
				G61		
				G62		
				G63		
2				G64		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: 8/9/19
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: TH19-41
LOCATION: Smith Street, Portage to Ellice - 2nd lane from East, 67 m N of Portage, 4.0 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) 0 20 40 60 80 100 | Total Unit Wt (kN/m³) 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

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (215 mm)				
		CONCRETE (125 mm)				
		SAND and GRAVEL		G65		
		CLAY - silty, some sand, trace gravel - brown, moist, firm - high plasticity		G66		
		SILT - clayey, trace to some sand, trace gravel - brown, moist, soft to firm - intermediate plasticity		G67	(G67): Gravel: 0.0%, Sand: 7.1%, Silt: 54.8%, Clay: 38.1%	1
				G68		
				G69	(G67): Gravel: 0.2%, Sand: 12.9%, Silt: 56.7%, Clay: 30.3%	
				G70		
2				G71		2
		END OF TEST HOLE AT 2.13 m IN SILT 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: 8/9/19
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: TH19-42
LOCATION: Smith Street, Portage to Graham - East curb lane, 19 m S of Portage, 3.0 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) 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

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (220 mm)				
		CONCRETE (100 mm)				
		CLAY - silty, trace sand - dark brown, moist, firm to stiff - high plasticity		G72		
				G73		
1				G74	(G74): Gravel: 0.0%, Sand: 9.4%, Silt: 30.6%, Clay: 60.0%	1
				G75		
		SILT - clayey, some sand, trace gravel - light brown, moist, soft - intermediate plasticity		G76		
				G77		
2				G78		2
		END OF TEST HOLE AT 2.13 m IN SILT 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: 8/9/19
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 – Smith Street (Notre Dame Avenue to Midtown Bridge)

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 (%)
TH19-39	Smith Street - 2nd lane from W, 25 m N of Graham, 5.0 m E of W curb	Asphalt	115	CLAY (CH)	0.4	34.7							
				CLAY (CH)	0.7								
				CLAY (CH)	1	32.3	0.0	3.6	27.6	68.7	73	28	45
		Concrete	215	CLAY (CH)	1.3								
				CLAY (CH)	1.4	29.9							
				CLAYEY SILT (MI)	1.9								
				CLAYEY SILT (MI)	2.1								
TH19-40	Smith Street - W curb lane, 10 m N of Graham, 2.0 m E of W curb	Asphalt	140	SAND AND GRAVEL	0.4	28.3							
				CLAY (CH)	0.7								
				CLAY (CH)	1	31.7							
		Concrete	165	CLAY (CH)	1.3								
				CLAY (CH)	1.4	31.9							
				CLAY (CH)	1.9								
				CLAY (CH)	2.1	34.4							
TH19-41	Smith Street - 2nd lane from E, 67 m N of Portage, 4.0 m W of E curb	Asphalt	215	SAND AND GRAVEL	0.4								
				SILTY CLAY (CH)	0.7	24.9							
				CLAYEY SILT (MI)	1	27.7	0.0	7.1	54.8	38.1	34	15	19
		Concrete	125	CLAYEY SILT (MI)	1.3								
				CLAYEY SILT (MI)	1.4	27.1	0.2	12.9	56.7	30.3	32	12	20
				CLAYEY SILT (MI)	1.9								
				CLAYEY SILT (MI)	2.1								
TH19-42	Smith Street - E curb lane, 19 m S of Portage, 3.0 m W of E curb	Asphalt	50	SILTY CLAY (CH)	0.4	31.3							
				SILTY CLAY (CH)	0.7								
				SILTY CLAY (CH)	1	38.3	0.0	9.4	30.6	60.0	72	24	48
		Concrete	180	SILTY CLAY (CH)	1.3								
				CLAYEY SILT (MI)	1.4	33.2							
				CLAYEY SILT (MI)	1.9	24.7							
				CLAYEY SILT (MI)	2.1	39.3							
PC19-27	Smith Street – 25 m S of Broadway, 5.0 m W of E curb	Asphalt	65										
		Concrete	205										

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

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 (%)
PC19-28	Smith Street – 80 m S of York, 1.5 m W of E curb	Asphalt	100										
		Concrete	255										
PC19-29	Smith Street – 80 m S of Graham, 1.4 m E of W curb	Asphalt	125										
		Concrete	205										

* 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		

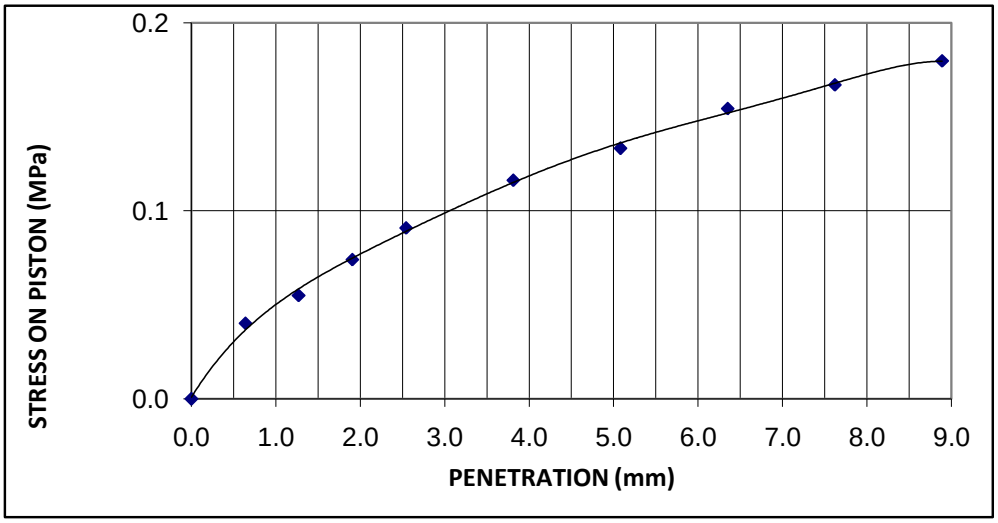
SAMPLE DATA			
Sample Type:	**CLAY**		
Source:	N/P		
Sampled by:	Client		
Optimum Moisture Content:	**19.1%**		
Maximum Dry Density:	**1618 kg/m^3**		
Method of Compaction:	Standard Proctor		
Tested by:	IA	Date Tested:	01-Nov-19

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		

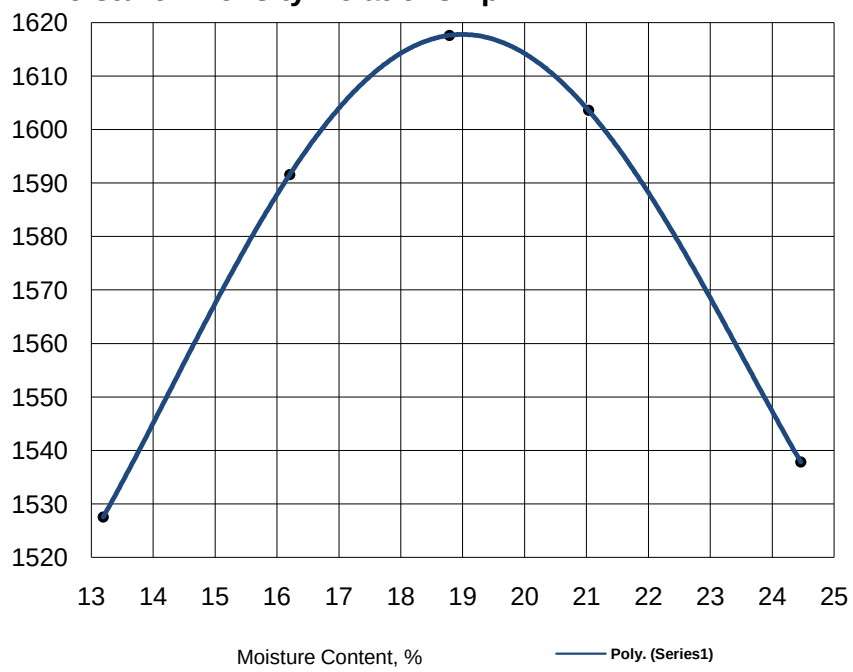
Date Sampled:	unknown	Date Received:	30-Oct-19
Sampled By:	Client	Date Tested:	01-Nov-19

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
Smith Street
TH19-39

2019 - 2023 Downtown Streets Renewal
Smith Street
TH19-40

2019 - 2023 Downtown Streets Renewal
Smith Street
TH19-41

2019 - 2023 Downtown Streets Renewal
Smith Street
TH19-42

2019 - 2023 Downtown Streets Renewal
Smith Street
PC19-27

2019 - 2023 Downtown Streets Renewal
Smith Street
PC19-28

2019 - 2023 Downtown Streets Renewal
Smith Street
PC19-29