APPENDIX 'A' - GEOTECHNICAL REPORT

GEOTECHNICAL REPORT FOR:

Hastings Boulevard from Dunkirk Drive to West Limit – Asphalt Pavement Reconstruction

PAVEMENT CORES FOR:

Barrington Avenue from Pulberry Street to St Marys Road – Concrete Pavement Rehabilitation
St David Place from St David Road to St David Road – Concrete Pavement Rehabilitation
St David Road from Fermor Avenue to Havelock Avenue – Concrete Pavement Rehabilitation
Thorndale Avenue from St David Road to St Marys Road – Concrete Pavement Rehabilitation

The geotechnical report is provided to aid in the Contractor's evaluation of the existing pavement structure and/or soil conditions. The information presented is considered accurate at the locations shown on the Drawings and at the time of drilling. However, variations in pavement structure and/or soil conditions may exist between test holes and fluctuations in groundwater levels can be expected seasonally and may occur as a result of construction activities. The nature and extent of variations may not become evident until construction commences.

Stantec Consulting Ltd.
199 Henlow Bay
Winnipeg MB R3Y 1G4

February 26, 2025

Project/File: 123317463-5

Geoff Kerr
City of Winnipeg
1155 Pacific Avenue
Winnipeg, Manitoba R3E 3P1

Good day Geoff,

Reference: 2025 Local Street Renewal Program (Contract 5) - Geotechnical Investigation

Stantec Consulting Ltd. (Stantec) was retained to undertake a factual geotechnical investigation for the 2025 Local Street Renewal Program (Contract 5) in Winnipeg, Manitoba. Use of this report is subject to the Statement of General Conditions provided in Appendix A.

The coring and drilling program was conducted from January 8 to January 27, 2025. A total of 17 locations were investigated with pavement coring and/or subsurface geotechnical drilling. Pavement coring was performed by Stantec's geotechnical field technologist, and drilling services were provided by Maple Leaf Drilling Ltd. under the supervision of Stantec's technologist. A Borehole Location Plan is provided in Appendix B.

1. Pavement Coring

A total of 17 pavement core samples were recovered to determine the in-place pavement thickness. In addition, 14 concrete core samples were tested to assess the in-place compressive strength of the concrete. One (1) concrete compressive strength test was cancelled due to the core sample being inadequate for testing (crumbly/fractured condition). The existing pavement thicknesses are summarized in Table 1 below, and the core photographs are provided in Appendix C.

2. Geotechnical Drilling

Two (2) boreholes were investigated by geotechnical drilling. The boreholes were terminated at a depth of 2.0 m below the pavement, which resulted in borehole depths of 2.2 m. Soil samples were obtained directly from the auger flights at depths of 0.6 m, 0.9 m, 1.2 m, 1.6 m, and 2.0 m from the bottom of the existing pavement. The testholes were examined for evidence of sloughing and groundwater seepage upon completion of drilling.

The borehole records are provided in Appendix D. The soil classification used in the borehole records is as per ASTM D2487 – *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).*

3. Existing Pavement Thicknesses

The existing pavement thicknesses are provided in the following table:

Table 1 – Existing Pavement Thicknesses

Borehole No.	Street	Asphalt Thickness (mm)	Concrete Thickness (mm)	Total Pavement Thickness (mm)
252	Hastings Blvd	0	150	150
253	Hastings Blvd	0	150	150
254	Barrington Ave	0	135	135
255	Barrington Ave	0	130	130
256	Barrington Ave	0	140	140
257	Barrington Ave	20	140	160
258	Barrington Ave	5	155	160
259	St David Rd	0	170	170
260	St David Rd	0	205	205
261	St David Rd	0	160	160
262	St David Rd	0	170	170
263	St David Rd	0	140	140
264	St David Pl	0	155	155
265	Thorndale Ave	0	190	190
266	Thorndale Ave	0	165	165
267	Thorndale Ave	0	160	160
268	Thorndale Ave	0	150	150

4. Laboratory Testing

Laboratory determination of moisture content (ASTM D2216) was conducted on all soil samples. The results are provided on the attached borehole records.

In addition, the following laboratory tests were conducted on select samples:

- ASTM D4318 - *Liquid Limit, Plastic Limit, and Plasticity Index of Soils*
- ASTM D7928 - *Particle-Size Distribution of Fine-Grained Soils Using The Sedimentation Analysis*
- ASTM D698 - *Laboratory Compaction Characteristics of Soil Using Standard Effort*
- ASTM D1883 - *California Bearing Ratio (CBR) of Laboratory-Compacted Soils*
- CSA A23.2-14C – *Obtaining and testing drilled cores for compressive strength testing*

The CBR tests were performed on test specimens compacted to 95% of the maximum dry density under soaked conditions.

Prior to compressive strength testing, the concrete core samples were conditioned in water at room temperature for 48 hours.

The laboratory test reports are provided in Appendix E.

5. Closure

Please contact the undersigned if you have any questions regarding this report.

Regards,

Stantec Consulting Ltd.

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Attachment: Appendix A – Statement of General Conditions
Appendix B – Borehole Location Plan
Appendix C – Core Photographs
Appendix D – Borehole Records
Appendix E – Laboratory Test Reports
- Atterberg Limits Test Reports
- Particle-Size Analysis Reports
- Standard Proctor Test Reports
- CBR Test Reports
- Concrete Compressive Strength Test Results

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Appendix A

Statement of General Conditions

STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec's present understanding of the site-specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site-specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

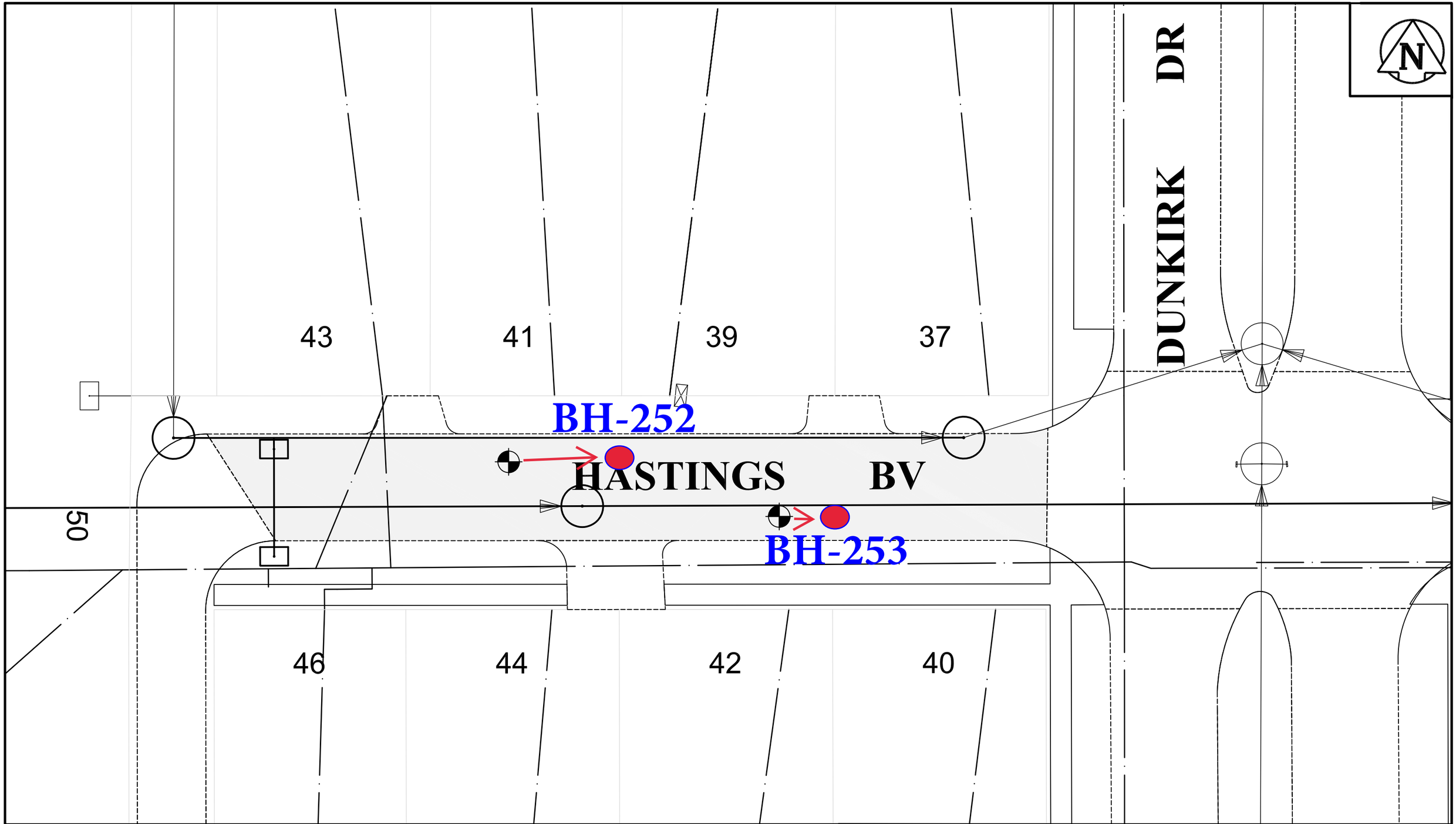
INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock, and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec will not be responsible to any party for damages incurred as a result of failing to notify Stantec that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec, sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc.), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec cannot be responsible for site work carried out without being present.

Appendix B

Borehole Location Plan



SEWER —— BOREHOLE ⊕ WATER MAIN/ WATER LINE ——·——

MANHOLE ○ CATCH BASIN □

NOTE:DRILL 2.0m BOREHOLE AS PER SITE INVESTIGATION SPECIFICATION F3.4

DATE:	DRAWING NO.:
11/14/2024	3 of 3
DRAWN BY:	SCALE:
J.W.	1:1000

2025 LOCAL STREET RENEWAL PROGRAM CORING DRAWING - **CONTRACT 5**

HASTINGS BV FROM END TO DUNKIRK DR - AC RECONSTRUCTION

THORNDALE AV

ST. MARYS RD

ST. DAVID RD

MATCHLINE B-B

BH-265

BH-266

BH-267

BH-268

BARRINGTON AV

PULBERRY ST

DUNKIRK DR

MATCHLINE C-C

BH-257

BH-258

BH-254

BH-255

BH-256

Core removed from scope of work.

SEWER —— PAVEMENT CORES ⊕

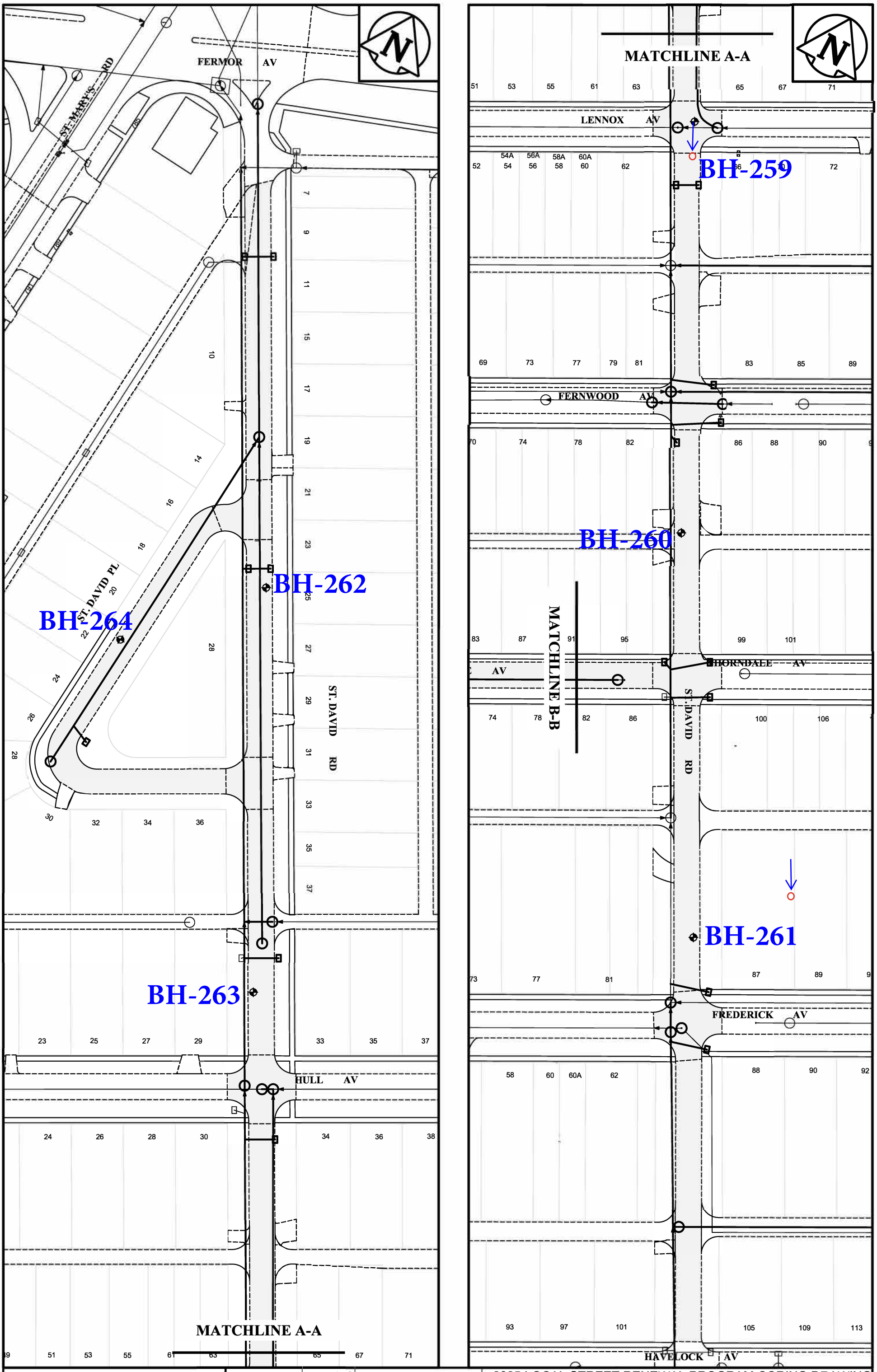
MANHOLE ○ CATCH BASIN □

NOTE:DRILL PAVEMENT CORES AS PER SITE INVESTIGATION SPECIFICATION F3.5

DATE:	DRAWING NO.:
11/13/2024	1 of 3
DRAWN BY:	SCALE:
J.W.	1:1000

2025 LOCAL STREET RENEWAL PROGRAM CORING DRAWING - **CONTRACT 5**

THORNDALE AV FROM ST MARYS RD TO ST DAVID RD - MAJOR REHABILITATION
BARRINGTON AV FROM PULBERRY ST TO ST MARYS RD - MAJOR REHABILITATION



SEWER
MANHOLE
PAVEMENT CORES
CATCH BASIN

DATE:	DRAWING NO.
11/13/2024	2 of 3
DRAWN BY: J.W.	SCALE: 1 : 1000

NOTE:DRILL PAVEMENT CORES AS PER SITE INVESTIGATION SPECIFICATION F3.5

2025 LOCAL STREET RENEWAL PROGRAM CORING DRAWING - **CONTRACT** 5

ST DAVID RD FROM FERMOR AV TO HAVELOCK AV - REHABILITATION
ST DAVID PL BY FROM ST DAVID RD TO ST DAVID RD - REHABILITATION

Appendix C

Core Photographs

Figure 1 – Core Sample No. 252 – Hastings Blvd

Figure 2 – Core Sample No. 253 – Hastings Blvd

Figure 3 – Core Sample No. 254 – Barrington Ave

Figure 4 – Core Sample No. 255 – Barrington Ave

Figure 5 – Core Sample No. 256 – Barrington Ave

Figure 6 – Core Sample No. 257 – Barrington Ave

Figure 7 – Core Sample No. 258 – Barrington Ave

Figure 8 – Core Sample No. 259 – St. David Rd

Figure 9 – Core Sample No. 260 – St. David Rd

Figure 10 – Core Sample No. 261 – St. David Rd

Figure 11 – Core Sample No. 262 – St. David Rd

Figure 12 – Core Sample No. 263 – St. David Rd

Figure 13 – Core Sample No. 264 – St. David Pl

Figure 14 – Core Sample No. 265 – Thorndale Ave

Figure 15 – Core Sample No. 266 – Thorndale Ave

Figure 16 – Core Sample No. 267 – Thorndale Ave

Core Photograph Not Available

Figure 17 – Core Sample No. 268 – Thorndale Ave

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Appendix D

Borehole Records

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis

Rootmat	vegetation, roots and moss with organic matter and topsoil typically forming a mattress at the ground surface
Topsoil	mixture of soil and humus capable of supporting vegetative growth
Peat	mixture of visible and invisible fragments of decayed organic matter
Till	unstratified glacial deposit which may range from clay to boulders
Fill	material below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure

Desiccated	having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured	having cracks, and hence a blocky structure
Varved	composed of regular alternating layers of silt and clay
Stratified	composed of alternating successions of different soil types, e.g. silt and sand
Layer	> 75 mm in thickness
Seam	2 mm to 75 mm in thickness
Parting	< 2 mm in thickness

Terminology describing soil types

The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488) which excludes particles larger than 75 mm. For particles larger than 75 mm, and for defining percent clay fraction in hydrometer results, definitions proposed by Canadian Foundation Engineering Manual, 4th Edition are used. The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris)

Terminology describing materials outside the USCS, (e.g. particles larger than 75 mm, visible organic matter, and construction debris) is based upon the proportion of these materials present:

Trace, or occasional	Less than 10%
Some	10-20%
Frequent	> 20%

Terminology describing compactness of cohesionless soils

The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test (SPT) N-Value - also known as N-Index. The SPT N-Value is described further on Page 2. A relationship between compactness condition and N-Value is shown in the following table.

Compactness Condition	SPT N-Value
Very Loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

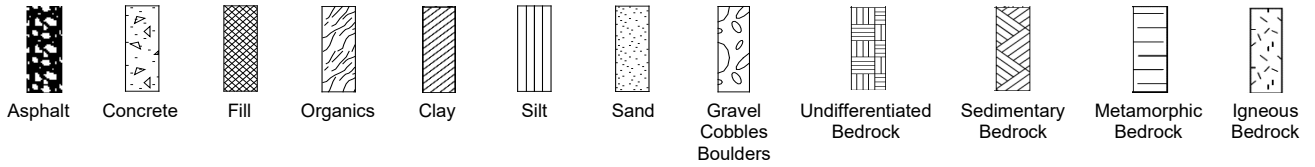
Terminology describing consistency of cohesive soils

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests. Consistency may be crudely estimated from SPT N-Value based on the correlation shown in the following table (Terzaghi and Peck, 1967). The correlation to SPT N-Value is used with caution as it is only very approximate.

Consistency	Undrained Shear Strength		Approximate SPT N-Value
	kips/sq.ft	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25 - 0.5	12.5 - 25	2-4
Firm	0.5 - 1.0	25 - 50	4-8
Stiff	1.0 - 2.0	50 – 100	8-15
Very Stiff	2.0 - 4.0	100 - 200	15-30
Hard	>4.0	>200	>30

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc. Not all bedrock strata plots are shown.



SAMPLE TYPE

AS, BS, GS		Auger sample; bulk sample; grab sample
DP		Direct-Push sample (small diameter tube sampler hydraulically advanced)
PS		Piston sample
SO		Sonic tube
SS		Split spoon sample (obtained by performing the Standard Penetration Test)
ST		Shelby Tube or thin wall tube
SV		Shear vane
RC *HQ, NQ, BQ, etc.*		Rock Core; samples obtained with the use of standard size diamond coring bits.

WATER LEVEL

Measured:
in standpipe, piezometer, or well

Inferred:
seepage noted or water level measured during or at completion of drilling

RECOVERY FOR SOIL SAMPLES

The recovery is recorded as the length of the soil sample recovered in the direct push, split spoon sampler, Shelby Tube, or sonic tube.

N-VALUE

Numbers in this column are the field results of the Standard Penetration Test (SPT): the number of blows of a 140-pound (63.5 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (300 mm) into the soil. In accordance with ASTM D1586, the N-Value equals the sum of the number of blows (N) required to drive the sampler over the interval of 6 to 18 in. (150 to 450 mm). However, when a 24 in. (610 mm) sampler is used, the number of blows (N) required to drive the sampler over the interval of 12 to 24 in. (300 to 610 mm) may be reported if this value is lower. For split spoon samples where insufficient penetration was achieved and N-Values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50 for 75 mm or 50/75 mm). Some design methods make use of N-values corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log.

DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60-degree apex cone connected to 'A' size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (300 mm) into the soil. The DCPT is used as a probe to assess soil variability.

OTHER TESTS

S	Sieve analysis
H	Hydrometer analysis
k	Laboratory permeability
γ	Unit weight
G_s	Specific gravity of soil particles
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct Shear
C	Consolidation
Q_u	Unconfined compression
I_p	Point Load Index (I_p on Borehole Record equals $I_p(50)$ in which the index is corrected to a reference diameter of 50 mm)

	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer

ROCK DESCRIPTION

Except where specified below, terminology for describing rock is as defined by the International Society for Rock Mechanics (ISRM) 2007 publication "The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006"

Total Core Recovery (TCR) denotes the sum of all measurable rock core recovered in one drill run. The value is noted as a percentage of recovered rock core based on the total length of the drill run.

Solid Core Recovery (SCR) is defined as total length of solid core divided by the total drilled length, presented as a percentage. Solid core is defined as core with one full diameter.

Rock Quality Designation (RQD) is a modified core recovery that incorporates only pieces of solid core that are equal to or greater than 10 cm (4") along the core axis. It is calculated as the total cumulative length of solid core (> 10 cm) as measured along the centerline of the core divided by the total length of borehole drilled for each drill run or geotechnical interval, presented as a percentage. RQD is determined in accordance with ASTM D6032.

Fracture Index (FI) is defined as the number of naturally occurring fractures within a given length of core. The Fracture Index is reported as a simple count of natural occurring fractures.

Terminology describing rock quality

Rock Mass Quality	Rock Quality Designation Number (RQD)	Alternate (Colloquial) Rock Mass Quality	
Very Poor Quality	0-25	*Very Severely Fractured*	*Crushed*
Poor Quality	25-50	*Severely Fractured*	*Shattered or Very Blocky*
Fair Quality	50-75	*Fractured*	*Blocky*
Good Quality	75-90	*Moderately Jointed*	*Sound*
Excellent Quality	90-100	*Intact*	*Very Sound*

Terminology describing rock strength

Strength Classification	Grade	Field Estimates of Uniaxial Compressive Strength	Unconfined Compressive Strength (MPa)
Extremely Weak	R0	Indented by thumbnail	<1
Very Weak	R1	Crumbles under firm blows of geological hammer, can be peeled with a pocketknife	1 – 5
Weak	R2	Peeled by pocketknife with difficulty, shallow indentations made by firm blow with point of geological hammer	5 – 25
Medium Strong	R3	Cannot be scraped or peeled with a pocketknife, can be fractured with single firm blow of geological hammer	25 – 50
Strong	R4	More than one blow with geological hammer to fracture	50 – 100
Very Strong	R5	Many blows with geological hammer to fracture	100 – 250
Extremely Strong	R6	Can only be chipped with geological hammer	>250

Terminology describing rock weathering

Term	Symbol	Description
Fresh	W1	No visible signs of rock weathering. Slight discoloration along major discontinuities
Slightly	W2	Discoloration indicates weathering of rock on discontinuity surfaces. All the rock material may be discolored.
Moderately	W3	Less than half the rock is decomposed and/or disintegrated into soil.
Highly	W4	More than half the rock is decomposed and/or disintegrated into soil.
Completely	W5	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.
Residual Soil	W6	All the rock converted to soil. Structure and fabric destroyed.

Terminology describing rock with respect to discontinuity and bedding spacing

Spacing (mm)	Discontinuities Spacing	Bedding
>6000	*Extremely Wide*	-
2000-6000	*Very Wide*	*Very Thick*
600-2000	*Wide*	*Thick*
200-600	*Moderate*	*Medium*
60-200	*Close*	*Thin*
20-60	*Very Close*	*Very Thin*
<20	*Extremely Close*	*Laminated*
<6	-	*Thinly Laminated*

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BOREHOLE RECORD

BH-252

CLIENT: **City of Winnipeg** PROJECT NO.: **123317463-5**

PROJECT: **2025 Local Street Renewal Program (Contract 5)** BH ELEVATION: **N/A**

LOCATION: **Hastings Blvd** DATUM: **N/A**

DATE BORED: **January 09 2025** WATER LEVEL: **N/A**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (USCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) or TCR %	SAMPLES N-VALUE or RQD %	OTHER TESTS / REMARKS
0		**CONCRETE**						
		GRAVEL: granular base, 19 mm						
		Firm black **FAT CLAY (CH)**						
		- brown below 0.8 m		BS				Sieve/Hydro at 0.8 m G 0% S 1% M 29% C 70%
				AS				
1				AS				
				AS				
				AS				
2		Soft tan **SILT (ML)** - some sand, trace clay		AS				
		End of Borehole • Borehole terminated at a depth of 2.2 m. • No groundwater seepage or soil sloughing was observed during or upon completion of drilling. • Borehole backfilled in accordance with the City of Winnipeg Street Cuts Manual.						
3								

UNDRAINED SHEAR STRENGTH, Cu (kPa)

▲ LABORATORY TEST ◆ FIELD VANE TEST

★ POCKET PENETROMETER □ POCKET SHEAR VANE

50 kPa 100 kPa 150 kPa 200 kPa

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

✖ SPT (N-value) BLOWS/0.3m

Water Content (%) and Blow Count

10 20 30 40 50 60 70 80

BACKFILL

ELEVATION (m)

BACKFILL SYMBOL: ASPHALT GROUT CONCRETE BENTONITE DRILL CUTTINGS SAND SLOUGH

Drilling Contractor: Maple Leaf Drilling Ltd.	Logged By: RB
Drilling Method: 125 mm SSA	Reviewed By: GB
Completion Depth: 2.2 m	Page 1 of 1

Printed Feb 24 2025 09:09:12 SOIL 123317463-5.GPJ 2/24/25

BOREHOLE RECORD

BH-253

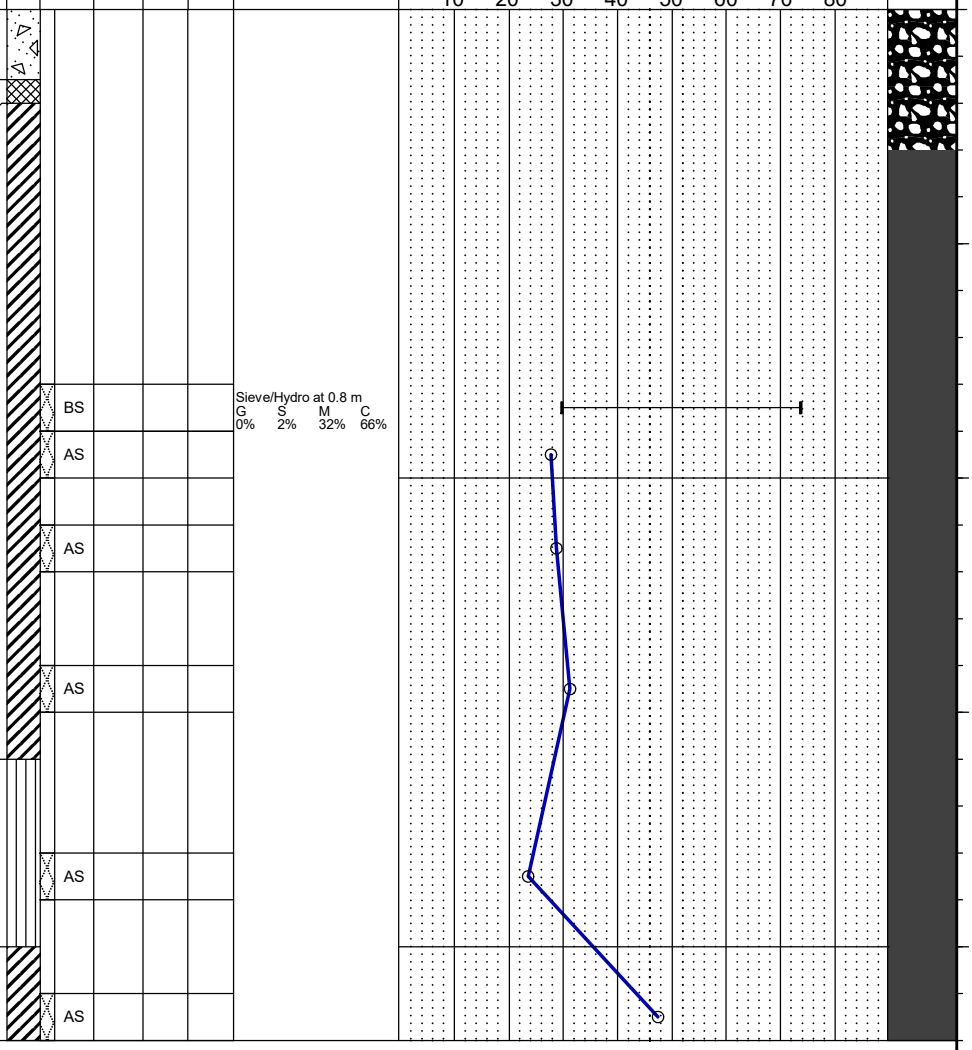
CLIENT: **City of Winnipeg**
PROJECT NO.: **123317463-5**
PROJECT: **2025 Local Street Renewal Program (Contract 5)**
BH ELEVATION: **N/A**
LOCATION: **Hastings Blvd**
DATUM: **N/A**
DATE BORED: **January 09 2025**
WATER LEVEL: **N/A**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (USCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) or TCR %	SAMPLES N-VALUE or RQD %	OTHER TESTS / REMARKS
0		**CONCRETE**						
		GRAVEL: granular base, 19 mm						
		Firm brown **FAT CLAY (CH)**		BS				Sieve/Hydro at 0.8 m G 0% S 2% M 32% C 66%
				AS				
1				AS				
				AS				
		Soft tan **SILT (ML)** - some sand, trace clay		AS				
2		Soft tan **FAT CLAY (CH)**		AS				
		End of Borehole • Borehole terminated at a depth of 2.2 m. • No groundwater seepage or soil sloughing was observed during or upon completion of drilling. • Borehole backfilled in accordance with the City of Winnipeg Street Cuts Manual.						
3								

UNDRAINED SHEAR STRENGTH, Cu (kPa)
▲ LABORATORY TEST ◆ FIELD VANE TEST
★ POCKET PENETROMETER □ POCKET SHEAR VANE
50 kPa 100 kPa 150 kPa 200 kPa

WATER CONTENT & ATTERBERG LIMITS W_P W W_L
✖ SPT (N-value) BLOWS/0.3m
Water Content (%) and Blow Count
10 20 30 40 50 60 70 80

BACKFILL



BACKFILL SYMBOL: ASPHALT, GROUT, CONCRETE, BENTONITE, DRILL CUTTINGS, SAND, SLOUGH

Drilling Contractor: Maple Leaf Drilling Ltd.	Logged By: RB
Drilling Method: 125 mm SSA	Reviewed By: GB
Completion Depth: 2.2 m	Page 1 of 1

Printed Feb 24 2025 09:09:13 SOIL 123317463-5.GPJ 2/24/25

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Appendix E

Laboratory Testing Reports

- Atterberg Limits
- Particle-Size Analysis
- Standard Proctor
- California Bearing Ratio
- Concrete Compressive Strength

Stantec Consulting Ltd.
199 Henlow Bay, Winnipeg, MB R3Y 1G4
Tel: (204) 488-6999

ASTM D4318 - LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS (LL METHOD B - ONE-POINT)

TO City of Winnipeg, Public Works Dept.
104 - 1155 Pacific Avenue
Winnipeg, Manitoba
R3E 2P1

ATTN Geoff Kerr

PROJECT 2025 Local Street Renewal Program
Contract 5

PROJECT NO. 123317463-5

REPORT NO. 1

DATE SAMPLED: 2025.Jan.09
SAMPLED BY: Stantec Consulting Ltd.

DATE RECEIVED: 2025.Jan.09
SUBMITTED BY: Stantec Consulting Ltd.

DATE TESTED: 2025.Feb.04
TESTED BY: Kailash Vaghjiyani

MATERIAL IDENTIFICATION

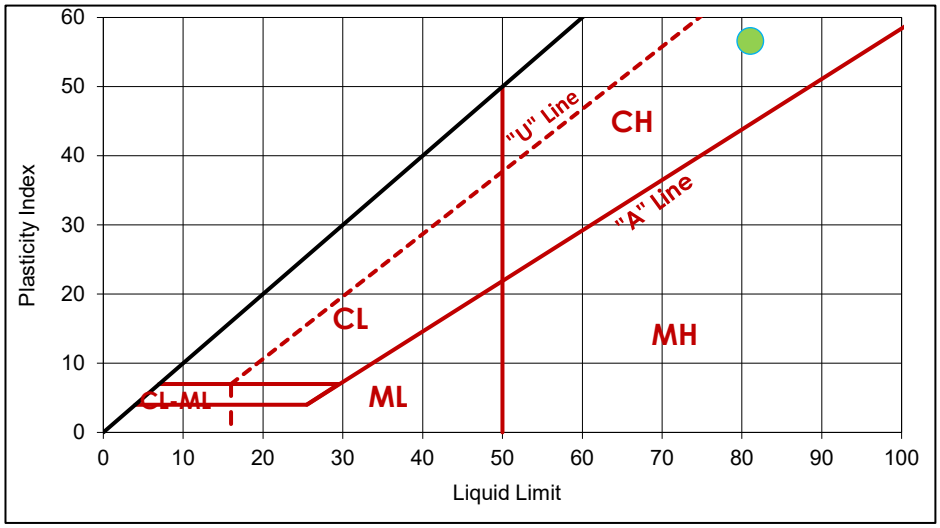
CLIENT FIELD ID BH-252, 0.8 m, Hastings Blvd.

STANTEC SAMPLE NO. 5633

LIQUID LIMIT		
TRIAL	1	2
BLOWS	25	24
MC (%)	81	81

PLASTIC LIMIT		
TRIAL	1	2
MC (%)	24	25

LIQUID LIMIT, LL	81
PLASTIC LIMIT, PL	24
PLASTICITY INDEX, PI	57
AS REC'D MC (%)	34.1



COMMENTS
No comments.

REPORT DATE 2025.Feb.06

REVIEWED BY Guillaume Beauce, P.Eng.
Geotechnical Engineer - Materials Testing Services

Stantec Consulting Ltd.
199 Henlow Bay, Winnipeg, MB R3Y 1G4
Tel: (204) 488-6999

ASTM D4318 - LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS (LL METHOD B - ONE-POINT)

TO City of Winnipeg, Public Works Dept.
104 - 1155 Pacific Avenue
Winnipeg, Manitoba
R3E 2P1

ATTN Geoff Kerr

PROJECT 2025 Local Street Renewal Program
Contract 5

PROJECT NO. 123317463-5

REPORT NO. 2

DATE SAMPLED: 2025.Jan.09
SAMPLED BY: Stantec Consulting Ltd.

DATE RECEIVED: 2025.Jan.09
SUBMITTED BY: Stantec Consulting Ltd.

DATE TESTED: 2025.Feb.05
TESTED BY: Rimanshi Gorasiya

MATERIAL IDENTIFICATION

CLIENT FIELD ID BH-253, 0.8 m, Hastings Blvd.

STANTEC SAMPLE NO. 5634

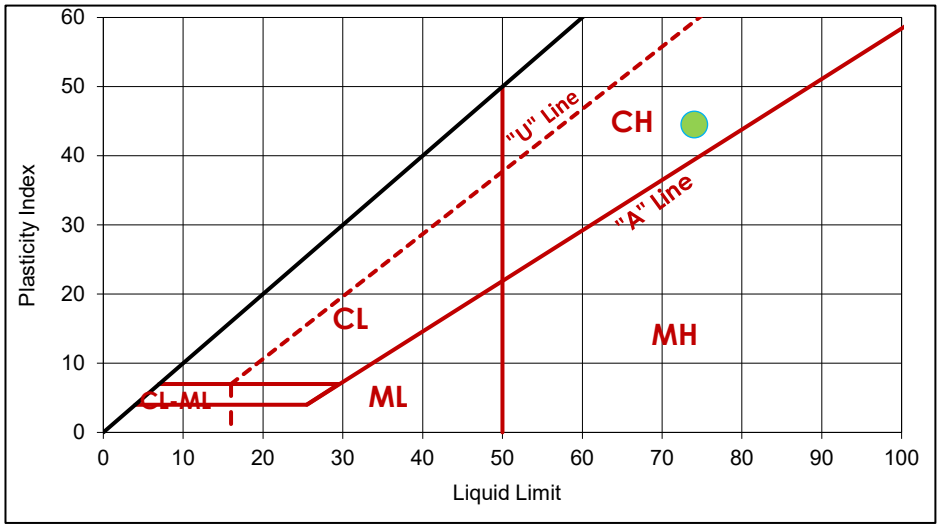
LIQUID LIMIT

TRIAL	1	2
BLOWS	24	25
MC (%)	74	74

PLASTIC LIMIT

TRIAL	1	2
MC (%)	30	30

LIQUID LIMIT, LL	74
PLASTIC LIMIT, PL	30
PLASTICITY INDEX, PI	45
AS REC'D MC (%)	28.3



COMMENTS
No comments.

REPORT DATE 2025.Feb.06

REVIEWED BY Guillaume Beauce, P.Eng.
Geotechnical Engineer - Materials Testing Services

Stantec Consulting Ltd.
199 Henlow Bay, Winnipeg, MB R3Y 1G4
Tel: (204) 488-6999

ASTM D7928 - PARTICLE-SIZE DISTRIBUTION OF FINE-GRAINED SOILS USING THE SEDIMENTATION ANALYSIS

TO City of Winnipeg, Public Works Dept.
104 - 1155 Pacific Avenue
Winnipeg, Manitoba
R3E 2P1

ATTN Geoff Kerr

PROJECT 2025 Local Street Renewal Program
Contract 5

PROJECT NO. 123317463-5

REPORT NO. 1

DATE SAMPLED: 2025.Jan.09
SAMPLED BY: Stantec Consulting Ltd.

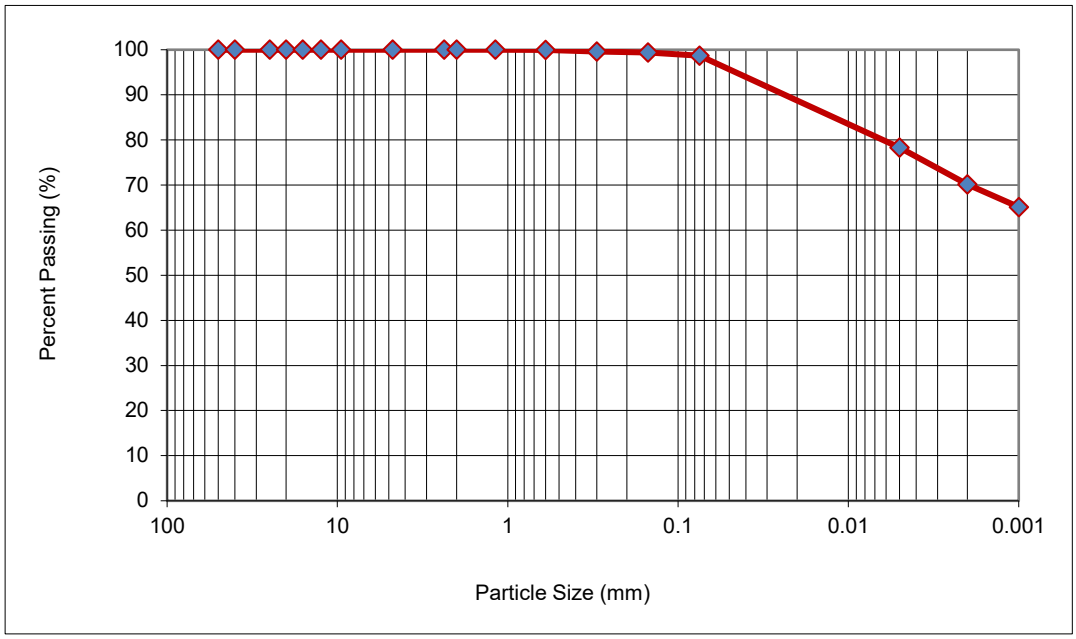
DATE RECEIVED: 2025.Jan.09
SUBMITTED BY: Stantec Consulting Ltd.

DATE TESTED: 2025.Jan.24
TESTED BY: Rimanshi Gorasiya

MATERIAL IDENTIFICATION

CLIENT FIELD ID BH-252. 0.8 m, Hastings Blvd.

STANTEC SAMPLE NO. 5633



Sieve Size (mm)	% Passing
50.0	100.0
40.0	100.0
25.0	100.0
20.0	100.0
16.0	100.0
12.5	100.0
9.5	100.0
4.75	100.0
2.36	100.0
2.00	100.0
1.18	100.0
0.600	99.9
0.300	99.6
0.150	99.4
0.075	98.7
0.005	78.3
0.002	70.1
0.001	65.1

Gravel	Sand			Silt	Clay	Colloids
	Coarse	Medium	Fine			
0.0	0.0	0.2	1.1	28.6	70.1	65.1

COMMENTS
No comments.

REPORT DATE 2025.Feb.06

REVIEWED BY Guillaume Beauce, P.Eng.
Geotechnical Engineer - Materials Testing Services

Stantec Consulting Ltd.
199 Henlow Bay, Winnipeg, MB R3Y 1G4
Tel: (204) 488-6999

ASTM D7928 - PARTICLE-SIZE DISTRIBUTION OF FINE-GRAINED SOILS USING THE SEDIMENTATION ANALYSIS

TO City of Winnipeg, Public Works Dept.
104 - 1155 Pacific Avenue
Winnipeg, Manitoba
R3E 2P1

ATTN Geoff Kerr

PROJECT 2025 Local Street Renewal Program
Contract 5

PROJECT NO. 123317463-5

REPORT NO. 2

DATE SAMPLED: 2025.Jan.09
SAMPLED BY: Stantec Consulting Ltd.

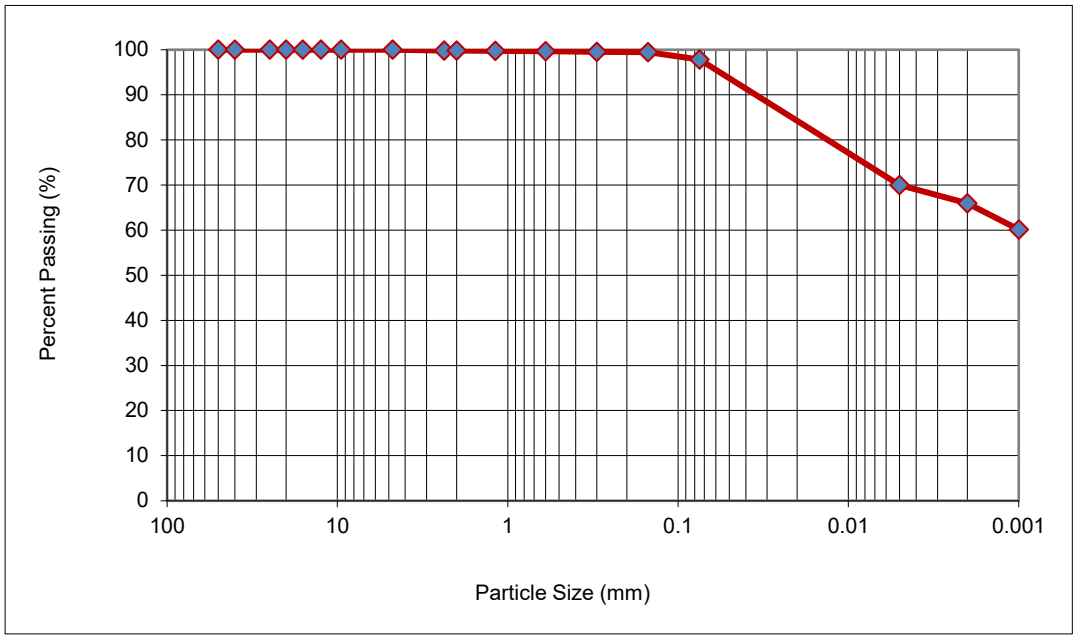
DATE RECEIVED: 2025.Jan.09
SUBMITTED BY: Stantec Consulting Ltd.

DATE TESTED: 2025.Jan.24
TESTED BY: Rimanshi Gorasiya

MATERIAL IDENTIFICATION

CLIENT FIELD ID BH-253. 0.8 m, Hastings Blvd.

STANTEC SAMPLE NO. 5634



Sieve Size (mm)	% Passing
50.0	100.0
40.0	100.0
25.0	100.0
20.0	100.0
16.0	100.0
12.5	100.0
9.5	100.0
4.75	100.0
2.36	99.8
2.00	99.8
1.18	99.8
0.600	99.7
0.300	99.5
0.150	99.4
0.075	97.8
0.005	70.0
0.002	65.9
0.001	60.1

Gravel	Sand			Silt	Clay	Colloids
	Coarse	Medium	Fine			
0.0	0.2	0.2	1.8	31.9	65.9	60.1

COMMENTS
No comments.

REPORT DATE 2025.Feb.06

REVIEWED BY Guillaume Beauce, P.Eng.
Geotechnical Engineer - Materials Testing Services

Stantec
199 Henlow Bay
Winnipeg, MB
R3Y 1G4
Email: jason.thompson@stantec.com

CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

PROCTOR TEST REPORT

TO City of Winnipeg
104 - 1155 Pacific Ave.
Winnipeg, MB
R3E 2P1

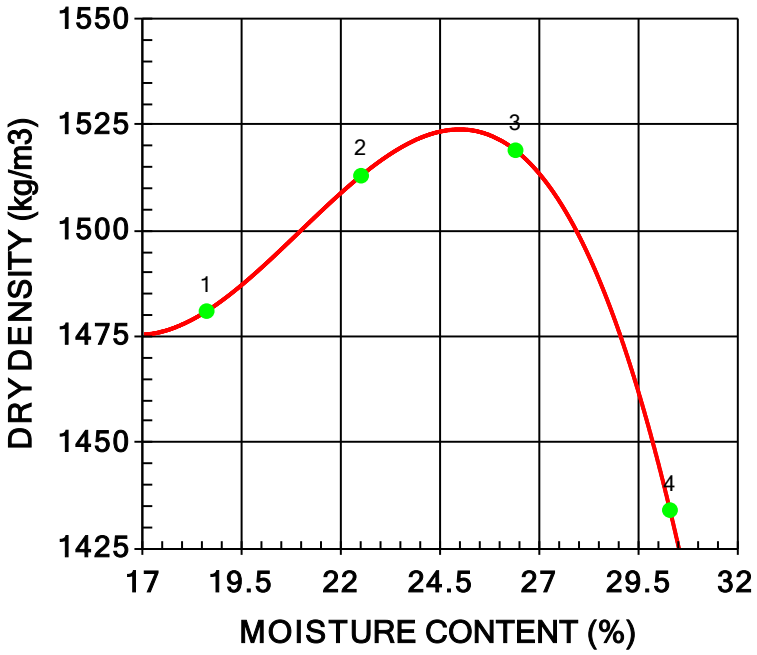
CLIENT City of Winnipeg
C.C.

ATTN: Geoff Kerr

PROJECT 2025 Local Street Renewal Program

PROJECT NO. 123317463-5 - Contract 5
PROCTOR NO. 1 DATE SAMPLED 2025.Jan.09 DATE RECEIVED 2025.Jan.09 DATE TESTED 2025.Feb.07

INSITU MOISTURE	34.1 %	COMPACTION STANDARD	Standard Proctor, ASTM D698
TESTED BY	Donald Eliazar		
MATERIAL IDENTIFICATION		COMPACTION PROCEDURE	A: 101.6mm Mold, Passing 4.75mm
MAJOR COMPONENT	Subgrade		
SIZE	Fat Clay (CH)	RAMMER TYPE	Manual
DESCRIPTION		PREPARATION	Moist
SUPPLIER	Existing Materials	OVERSIZE CORRECTION METHOD	None
SOURCE	BH-252, 0.8 m (Hastings Blvd)	RETAINED 4.75mm SCREEN	N/A %



TRIAL NUMBER	WET DENSITY (kg/m³)	DRY DENSITY (kg/m³)	MOISTURE CONTENT (%)
1	1756	1481	18.6
2	1854	1513	22.5
3	1920	1519	26.4
4	1869	1434	30.3

	MAXIMUM DRY DENSITY (kg/m³)	OPTIMUM MOISTURE CONTENT (%)
CALCULATED	1520	25.0
OVERSIZE CORRECTED		

COMMENTS

Stantec Sample No. 5633.

Page 1 of 1 2025.Feb.10 Stantec Consulting Ltd. REVIEWED BY: Jason Thompson, C.E.T.

Stantec
199 Henlow Bay
Winnipeg, MB
R3Y 1G4
Email: jason.thompson@stantec.com

CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

PROCTOR TEST REPORT

TO City of Winnipeg
104 - 1155 Pacific Ave.
Winnipeg, MB
R3E 2P1

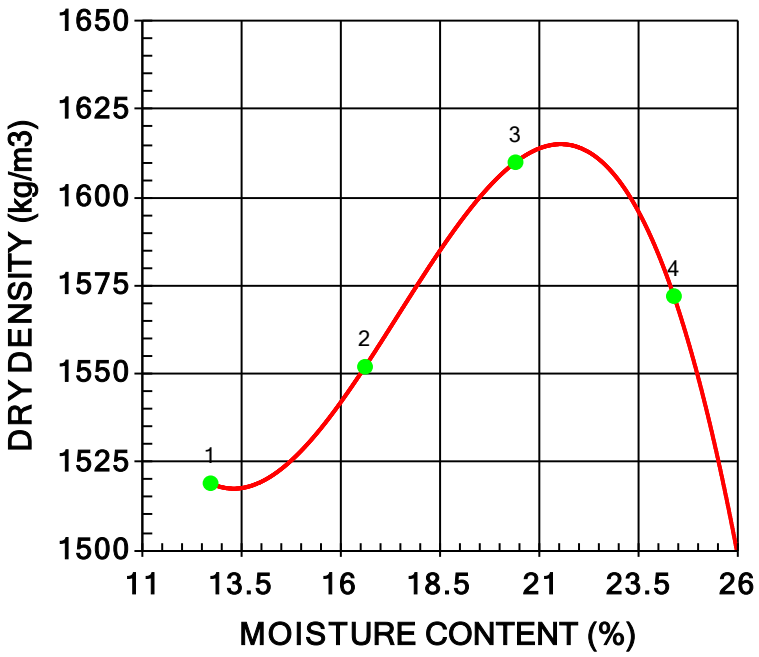
CLIENT City of Winnipeg
C.C.

ATTN: Geoff Kerr

PROJECT 2025 Local Street Renewal Program

PROJECT NO. 123317463-5 - Contract 5
PROCTOR NO. 2 DATE SAMPLED 2025.Jan.09 DATE RECEIVED 2025.Jan.09 DATE TESTED 2025.Feb.06

INSITU MOISTURE	28.3 %	COMPACTION STANDARD	Standard Proctor, ASTM D698
TESTED BY	Donald Eliazar		
MATERIAL IDENTIFICATION		COMPACTION PROCEDURE	A: 101.6mm Mold, Passing 4.75mm
MAJOR COMPONENT	Subgrade		
SIZE	Fat Clay (CH)	RAMMER TYPE	Manual
DESCRIPTION		PREPARATION	Moist
SUPPLIER	Existing Materials	OVERSIZE CORRECTION METHOD	None
SOURCE	BH-253, 0.8 m (Hastings Blvd)	RETAINED 4.75mm SCREEN	N/A %



TRIAL NUMBER	WET DENSITY (kg/m³)	DRY DENSITY (kg/m³)	MOISTURE CONTENT (%)
1	1712	1519	12.7
2	1810	1552	16.6
3	1938	1610	20.4
4	1956	1572	24.4

	MAXIMUM DRY DENSITY (kg/m³)	OPTIMUM MOISTURE CONTENT (%)
CALCULATED	1620	21.5
OVERSIZE CORRECTED		

COMMENTS

Stantec Sample No. 5634.

 2025.Feb.07 Stantec Consulting Ltd. REVIEWED BY: Jason Thompson, C.E.T.

Stantec Consulting Ltd.
199 Henlow Bay, Winnipeg, MB R3Y 1G4
Tel: (204) 488-6999

ASTM D1883 - CALIFORNIA BEARING RATIO (CBR) OF LABORATORY-COMPACTED SOILS

TO City of Winnipeg, Public Works Dept.
104 - 1155 Pacific Avenue
Winnipeg, Manitoba
R3E 3P1

ATTN Geoff Kerr

PROJECT 2025 Local Street Renewals Program
Contract 5

PROJECT NO. 123317463-5

REPORT NO. 1

DATE SAMPLED: 2025.Jan.09
SAMPLED BY: Larry Presado

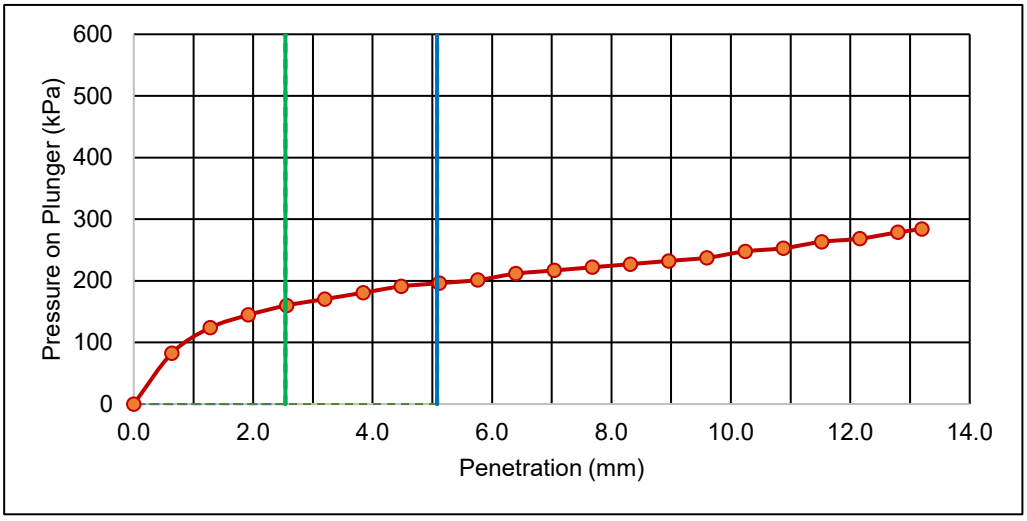
DATE RECEIVED: 2025.Jan.09
SUBMITTED BY: Larry Presado

DATE TESTED: 2025.Feb.15
TESTED BY: Donald Eliazar

MATERIAL IDENTIFICATION

MATERIAL USE	Subgrade	SUPPLIER	Existing Material
MAX. NOMINAL SIZE	< 4.75 mm	SOURCE	In Situ
MATERIAL TYPE	Clay	SAMPLE LOCATION	BH-252, 0.8 m - Hastings Blvd.
SPECIFICATION ID	Not Applicable	STANTEC SAMPLE NO.	5633

IMMERSION PERIOD	96 ± 2 hr	TARGET MAX. DRY DENSITY	1520 kg/m^3
CONDITION OF SAMPLE	Soaked	TARGET OPTIMUM MOISTURE	25.0 %
SURCHARGE MASS	4.54 kg		
+19 mm OVERSIZE	0 %	AS-COMPACTED DRY DENSITY	1444 kg/m^3
SWELL OF SAMPLE	4.15 %	AS-COMPACTED MOISTURE	25.1 %
POST-TEST MOISTURE	38.0 %	AS-COMPACTED % COMPACTION	95 %



CBR VALUE AT 2.54 mm PENETRATION
2.3

CBR VALUE AT 5.08 mm PENETRATION
2.0

COMMENTS
Sample prepared to 95% of the maximum dry density at the optimum moisture content as determined from ASTM D698.

REPORT DATE 2025.Feb.20

REVIEWED BY Guillaume Beauce, P.Eng.
Geotechnical Engineer - Materials Testing Services

Stantec Consulting Ltd.
199 Henlow Bay, Winnipeg, MB R3Y 1G4
Tel: (204) 488-6999

ASTM D1883 - CALIFORNIA BEARING RATIO (CBR) OF LABORATORY-COMPACTED SOILS

TO City of Winnipeg, Public Works Dept.
104 - 1155 Pacific Avenue
Winnipeg, Manitoba
R3E 3P1

ATTN Geoff Kerr

PROJECT 2025 Local Street Renewals Program
Contract 5

PROJECT NO. 123317463-5

REPORT NO. 2

DATE SAMPLED: 2025.Jan.09
SAMPLED BY: Larry Presado

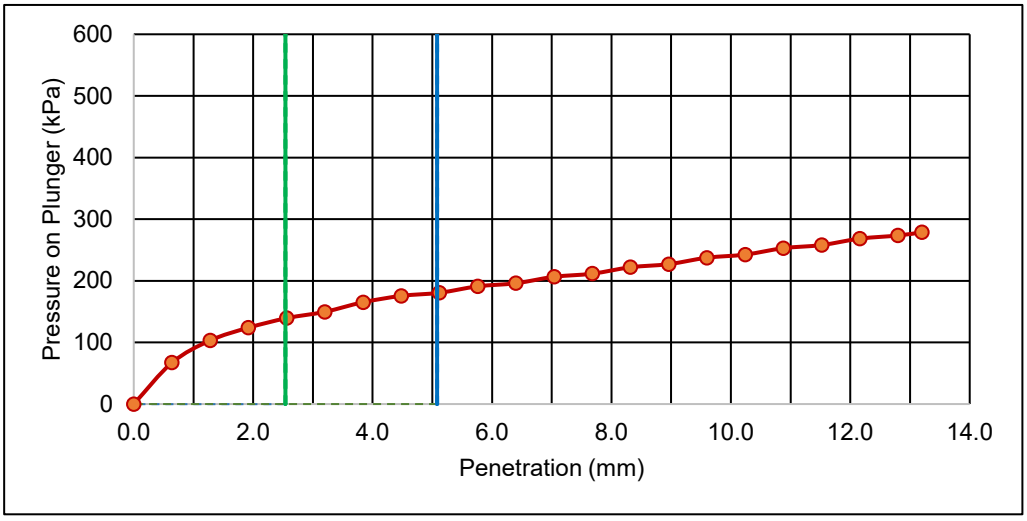
DATE RECEIVED: 2025.Jan.09
SUBMITTED BY: Larry Presado

DATE TESTED: 2025.Feb.15
TESTED BY: Donald Eliazar

MATERIAL IDENTIFICATION

MATERIAL USE	Subgrade	SUPPLIER	Existing Material
MAX. NOMINAL SIZE	< 4.75 mm	SOURCE	In Situ
MATERIAL TYPE	Clay	SAMPLE LOCATION	BH-253, 0.8 m - Hastings Blvd.
SPECIFICATION ID	Not Applicable	STANTEC SAMPLE NO.	5634

IMMERSION PERIOD	96 ± 2 hr	TARGET MAX. DRY DENSITY	1620 kg/m^3
CONDITION OF SAMPLE	Soaked	TARGET OPTIMUM MOISTURE	21.5 %
SURCHARGE MASS	4.54 kg		
+19 mm OVERSIZE	0 %	AS-COMPACTED DRY DENSITY	1540 kg/m^3
SWELL OF SAMPLE	4.75 %	AS-COMPACTED MOISTURE	21.5 %
POST-TEST MOISTURE	35.0 %	AS-COMPACTED % COMPACTION	95 %



CBR VALUE AT 2.54 mm PENETRATION
2.0

CBR VALUE AT 5.08 mm PENETRATION
1.8

COMMENTS
Sample prepared to 95% of the maximum dry density at the optimum moisture content as determined from ASTM D698.

REPORT DATE 2025.Feb.20

REVIEWED BY Guillaume Beauce, P.Eng.
Geotechnical Engineer - Materials Testing Services

Stantec

Core No.	Street	Diameter (mm)	Length (mm)	L/D Ratio	Correction Factor	Peak Load (kN)	Compressive Strength (MPa)	
							Measured	Corrected
254	Barrington Ave	76.25	139.39	1.828	0.9862	212.35	46.50	45.86
255	Barrington Ave	76.31	130.47	1.710	0.9768	254.56	55.66	54.37
256	Barrington Ave	76.29	141.60	1.856	0.9885	191.98	42.00	41.52
257	Barrington Ave	*Crumbly/fractured core; test cancelled*						
258	Barrington Ave	76.30	142.27	1.865	0.9892	204.39	44.70	44.22
259	St. David Rd	88.80	156.46	1.762	0.9810	259.41	41.89	41.09
260	St. David Rd	88.65	177.35	2.001	1.0000	351.26	56.91	56.91
261	St. David Rd	88.75	168.77	1.902	0.9922	327.60	52.96	52.54
262	St. David Rd	88.79	155.79	1.755	0.9804	309.89	50.05	49.07
263	St. David Rd	88.60	137.76	1.555	0.9644	267.19	43.34	41.79
264	St. David Place	88.62	154.28	1.741	0.9793	464.55	75.31	73.76
265	Thorndale	75.56	177.26	2.346	1.0000	253.80	56.60	56.60
266	Thorndale	75.64	158.71	2.098	1.0000	252.17	56.12	56.12
267	Thorndale	75.65	153.14	2.024	1.0000	121.30	26.99	26.99
268	Thorndale	76.80	144.16	1.877	0.9902	262.25	56.61	56.06