APPENDIX 'A'

GEOTECHNICAL REPORT

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

February 26, 2024

Project/File: 123316892

Caleb Olfert
Dillon Consulting Ltd.
1558 Willson Place
Winnipeg, MB R3T 0Y4

Good day Caleb,

Reference: 24-R-06 Geotechnical Investigation

Stantec Consulting Ltd. (Stantec) was retained to undertake a factual geotechnical investigation for the Local Streets Package 24-R-06 in Winnipeg, Manitoba. Use of this report is subject to the Statement of General Conditions provided in **Appendix A**.

The subsurface coring and drilling sampling program was conducted from January 10, 2024, to January 25, 2024. Pavement coring was performed by our geotechnical field personnel, and drilling services were provided by Maple Leaf Drilling under the supervision of our personnel. The borehole locations are shown on the attached Borehole Location Plan provided in **Appendix B**. When subsurface drilling was required, the pavement cores were sampled with a 150 mm bit and boreholes were drilled with 125 mm solid stem augers. Geotechnical drilling boreholes were terminated at a depth of 2.0 m below the pavement, which resulted in borehole depths ranging from 2.07 m to 2.22 m below the surface. 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. Upon completion of drilling, the testholes were examined for evidence of sloughing and groundwater seepage. The borehole records are provided in **Appendix C**. 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).* Core photographs are provided in **Appendix D**.

Reference: **24-R-06 Geotechnical Investigation**

EXISTING PAVEMENT THICKNESS

The existing pavement thickness is provided in the following table:

Table 1 – Existing Pavement Thickness

Street	Core ID	Asphalt Thickness (mm)	Concrete Thickness (mm)	Total Pavement Thickness (mm)
[redacted]				
Lilian Ave	BH-11	110	0	110
Lilian Ave	BH-12	75	100	175
Lilian Ave	BH-13	0	220	220
Champlain St	BH-14	20	150	170
Champlain St	BH-15	0	155	155
Champlain St	BH-16	0	160	160
Champlain St	BH-17	0	165	165
Dumoulin St	BH-18	0	180	180
Dumoulin St	BH-19	0	150	150
Dumoulin St	BH-20	0	170	170
Dumoulin St	BH-21	0	180	180
Dumoulin St	BH-22	0	175	175
[redacted]				

Reference: **24-R-06 Geotechnical Investigation**

Street	Core ID	Asphalt Thickness (mm)	Concrete Thickness (mm)	Total Pavement Thickness (mm)
[redacted]				
Baywater Pl	BH-32	0	180	180
Baywater Pl	BH-33	0	200	200
Courtwood Pl	BH-34	0	160	160
Courtwood Pl	BH-35	0	100	100
[redacted]				

LABORATORY TESTING

The following laboratory tests were conducted on select soil samples:

- ASTM D2216 - *Laboratory Determination of Water (Moisture) Content of Soil by Mass*
- 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 at 95% maximum dry density under soaked conditions. Prior to testing the concrete core samples for compressive strength, the cores were conditioned in water at room temperature for 48 hours. The moisture content results are shown on the borehole records, and the laboratory test reports are provided in **Appendix E**.

Reference: **24-R-06 Geotechnical Investigation**

CLOSURE

We appreciate the opportunity to assist you on this project. Please contact the undersigned if you have any questions regarding this report.

Regards,

STANTEC CONSULTING LTD.

Guillaume Beauce P.Eng.
Geotechnical Engineer, Materials Testing Services
Phone: 204-928-7618
Mobile: 204-898-8290
guillaume.beauce@stantec.com

Jason Thompson C.E.T.
Manager, Materials Testing Services
Phone: 204-928-4004
Mobile: 204-981-8445
jason.thompson@stantec.com

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

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.

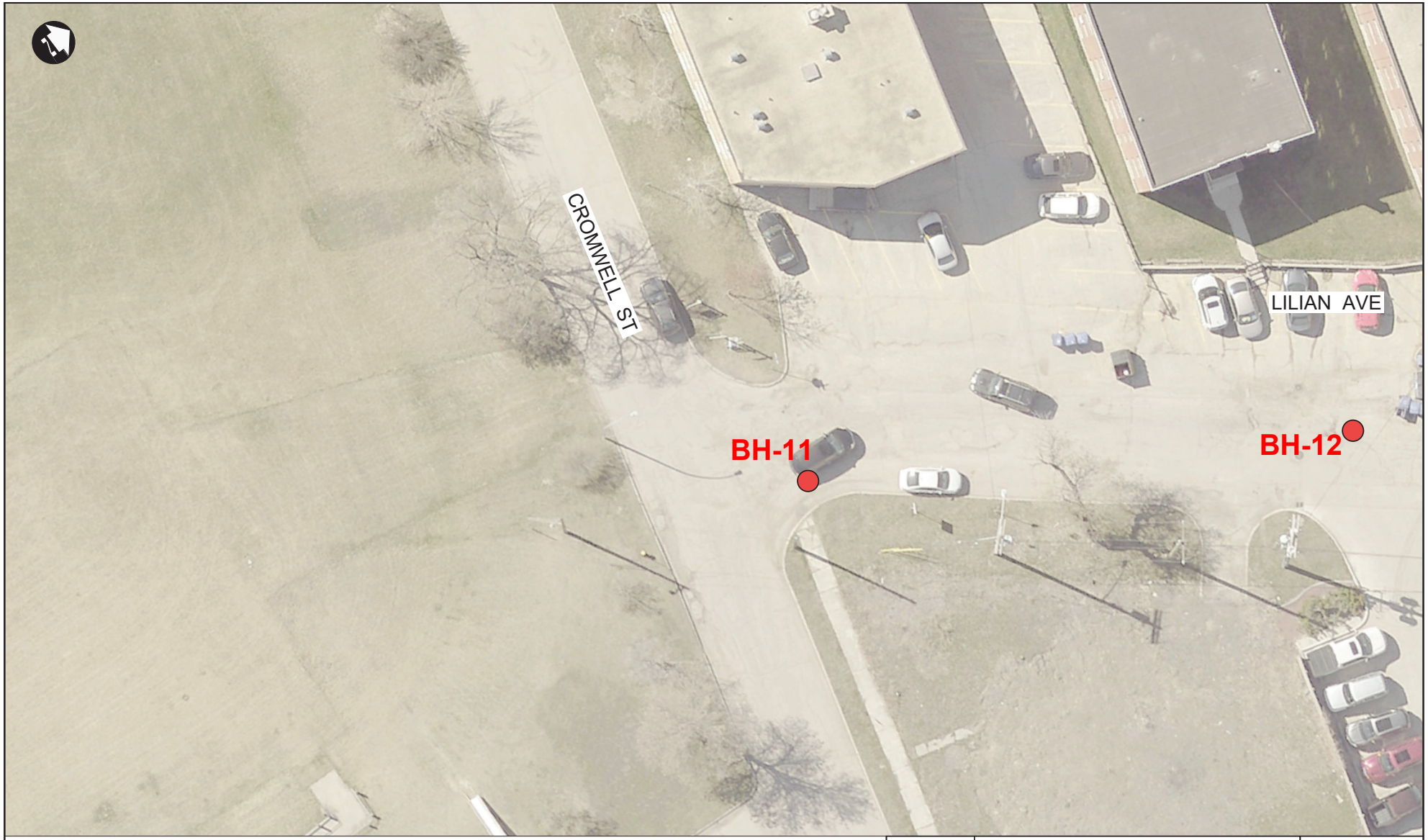
INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec at the time of the work and at the specific testing and/or sampling locations. Classifications and statements 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



DILLON CONSULTING

SCALE: 1:250

TITLE

LILIAN AVENUE

1 OF 2

PROJECT NO.

-

DRAWING NO.

-

C:\Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg

DILLON CONSULTING

SCALE: 1:250

TITLE

LILIAN AVENUE

2 OF 2

PROJECT NO.

-

DRAWING NO.

-

C:\Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg

DILLON CONSULTING

SCALE: 1:250

TITLE

CHAMPLAIN STREET

1 OF 4

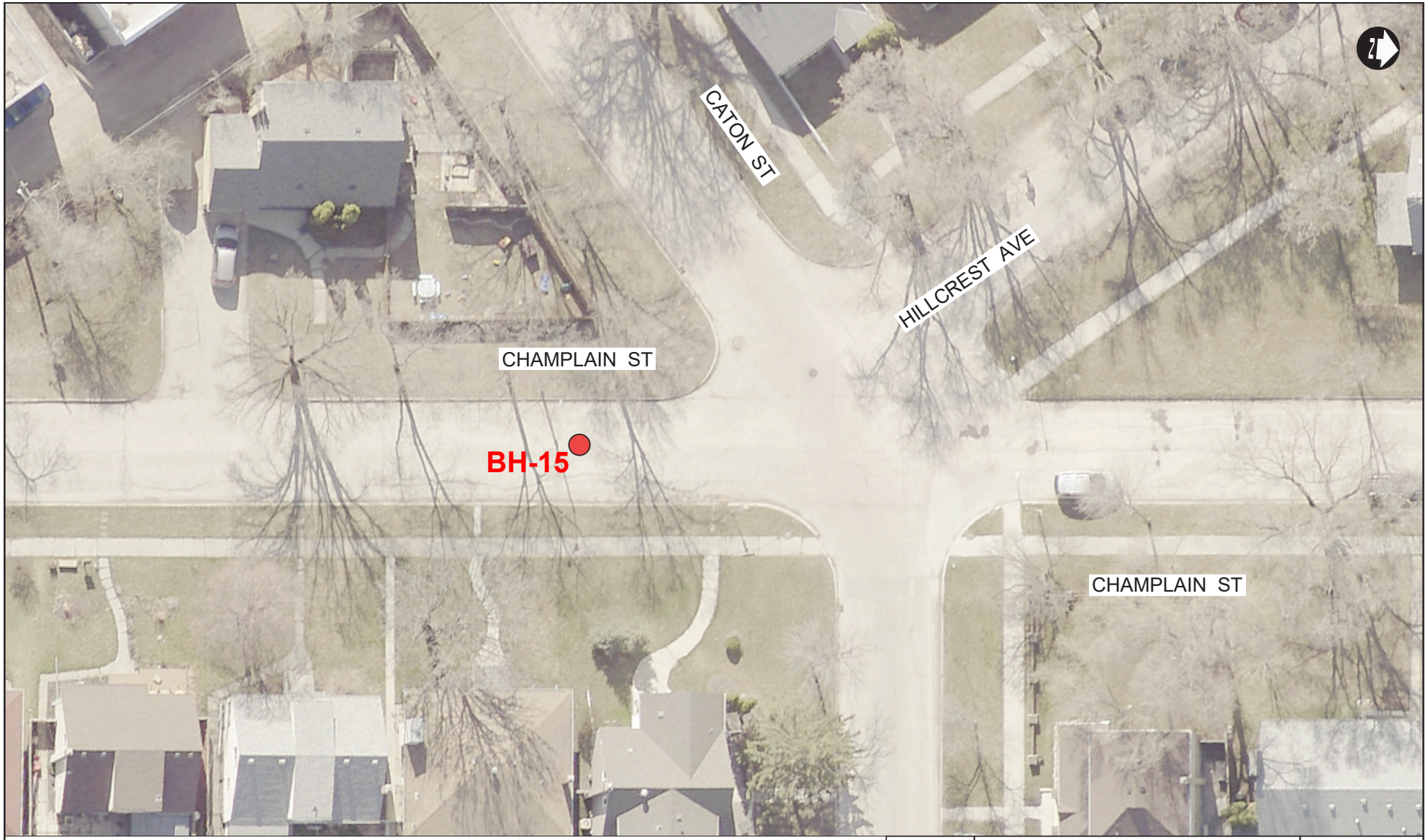
PROJECT NO.

-

DRAWING NO.

-

C: \Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg



DILLON CONSULTING

SCALE: 1:250

TITLE

CHAMPLAIN STREET

2 OF 4

PROJECT NO.

-

DRAWING NO.

-

C: \Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg

DILLON CONSULTING

SCALE: 1:250

TITLE

CHAMPLAIN STREET

3 OF 4

PROJECT NO.

-

DRAWING NO.

-

C:\Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg

DILLON CONSULTING

SCALE: 1:250

TITLE

CHAMPLAIN STREET

4 OF 4

PROJECT NO.

-

DRAWING NO.

-

C:\Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg

DILLON CONSULTING

SCALE: 1:250

TITLE

DUMOULIN STREET

1 OF 5

PROJECT NO.

-

DRAWING NO.

-

C:\Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg

DILLON CONSULTING

SCALE: 1:250

TITLE

DUMOULIN STREET

2 OF 5

PROJECT NO.

-

DRAWING NO.

-

C:\Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg

DILLON CONSULTING

SCALE: 1:250

TITLE

DUMOULIN STREET

3 OF 5

PROJECT NO.

-

DRAWING NO.

-

C: \Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg

DILLON CONSULTING

SCALE: 1:250

TITLE

DUMOULIN STREET

4 OF 5

PROJECT NO.

-

DRAWING NO.

-

C:\Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg

DILLON CONSULTING

SCALE: 1:250

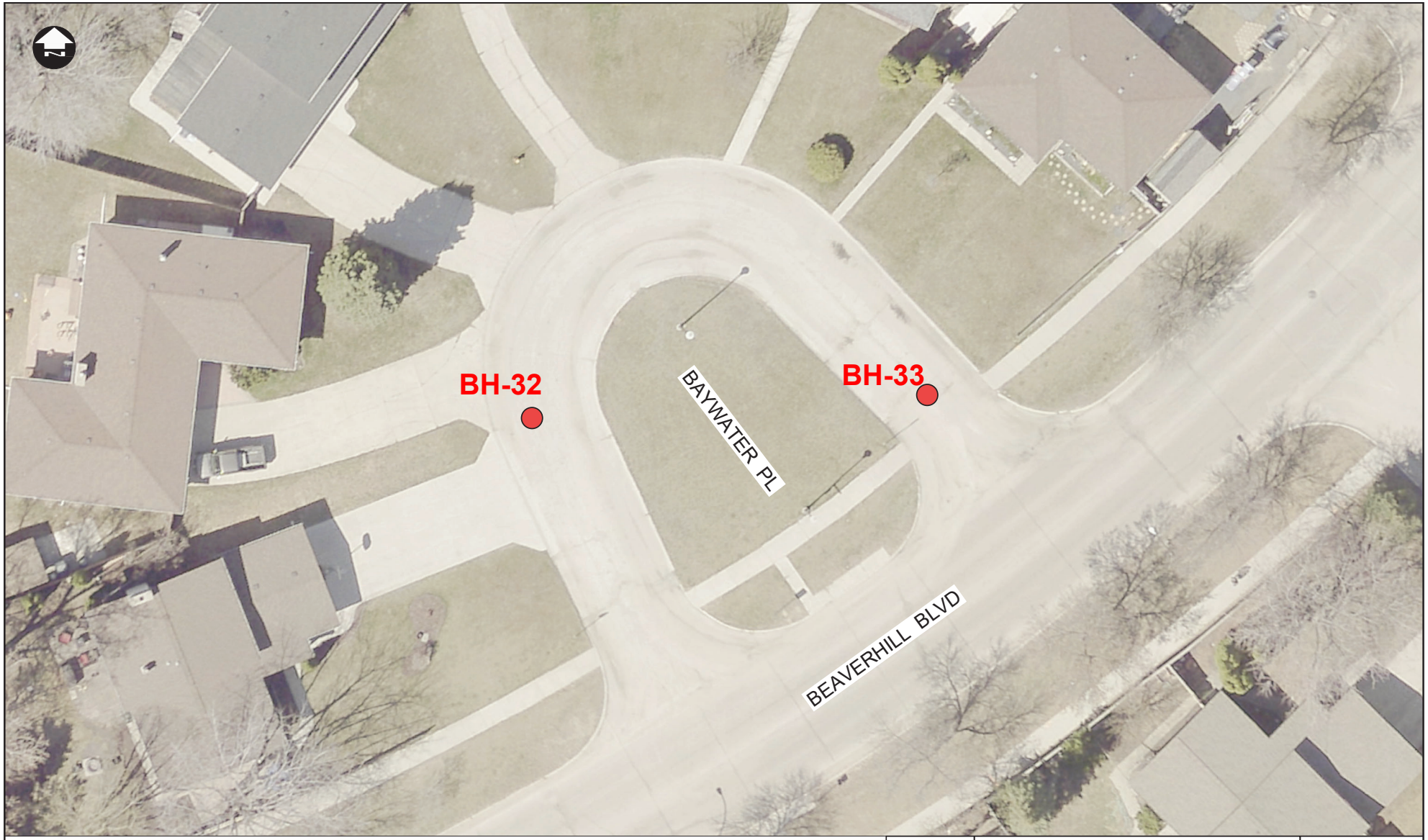
TITLE

DUMOULIN STREET
5 OF 5

PROJECT NO.
-

DRAWING NO.
-

C: \Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg



DILLON CONSULTING

SCALE: 1:250

TITLE

BAYWATER PLACE

1 OF 1

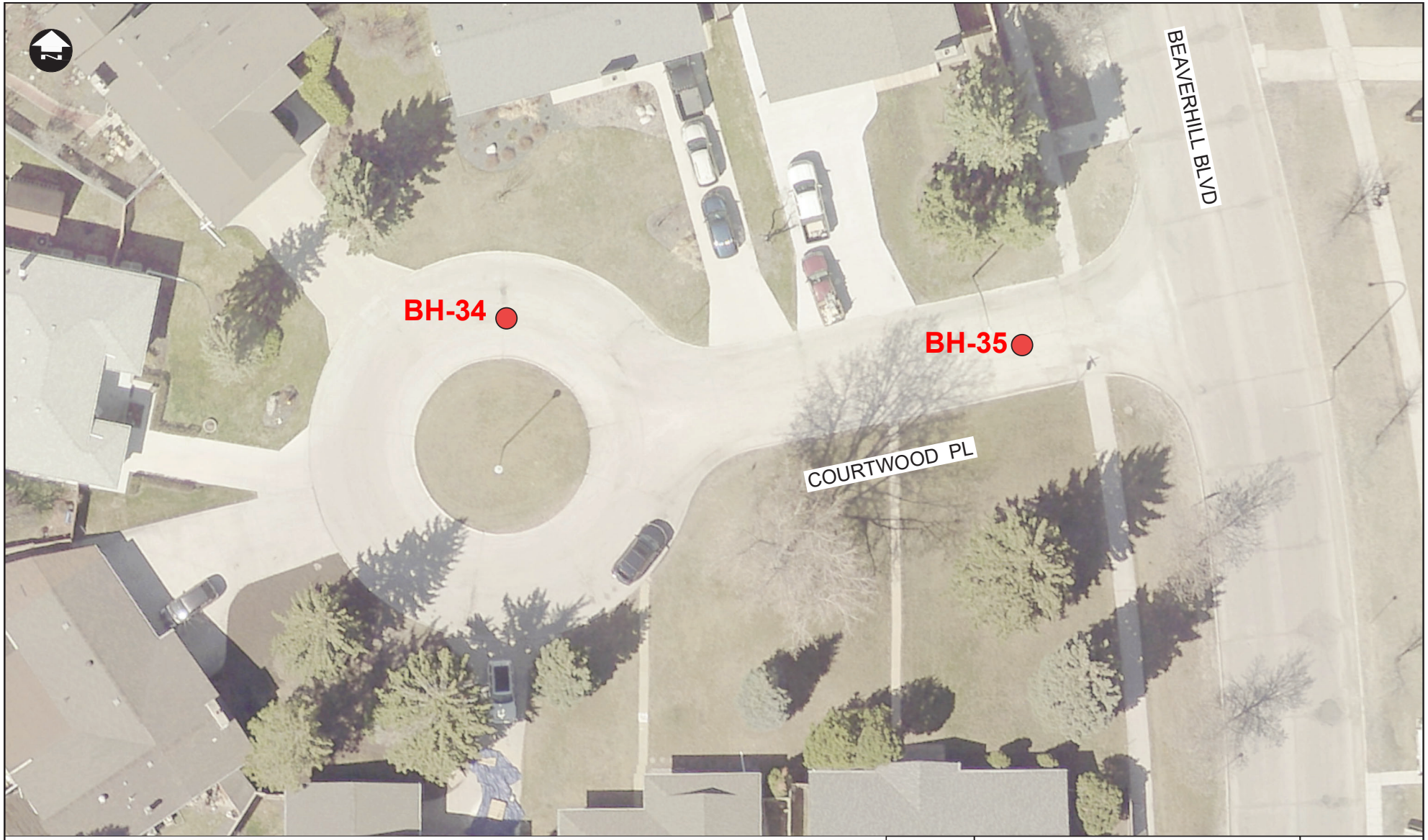
PROJECT NO.

-

DRAWING NO.

-

C:\Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg



DILLON CONSULTING

SCALE: 1:250

TITLE

COURTWOOD PL

1 OF 1

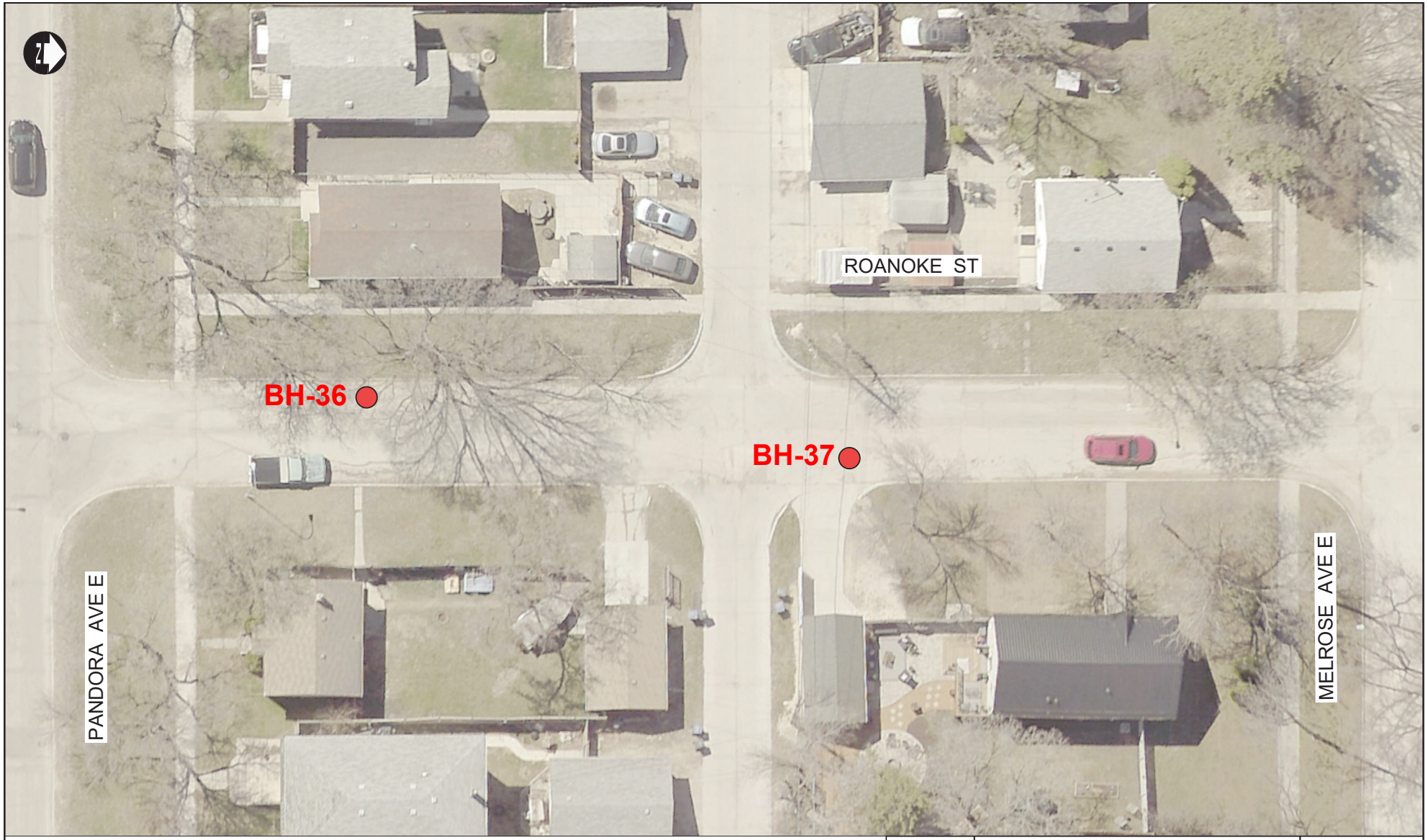
PROJECT NO.

-

DRAWING NO.

-

C: \Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg



DILLON CONSULTING

SCALE: 1:250

TITLE

Roanoke St

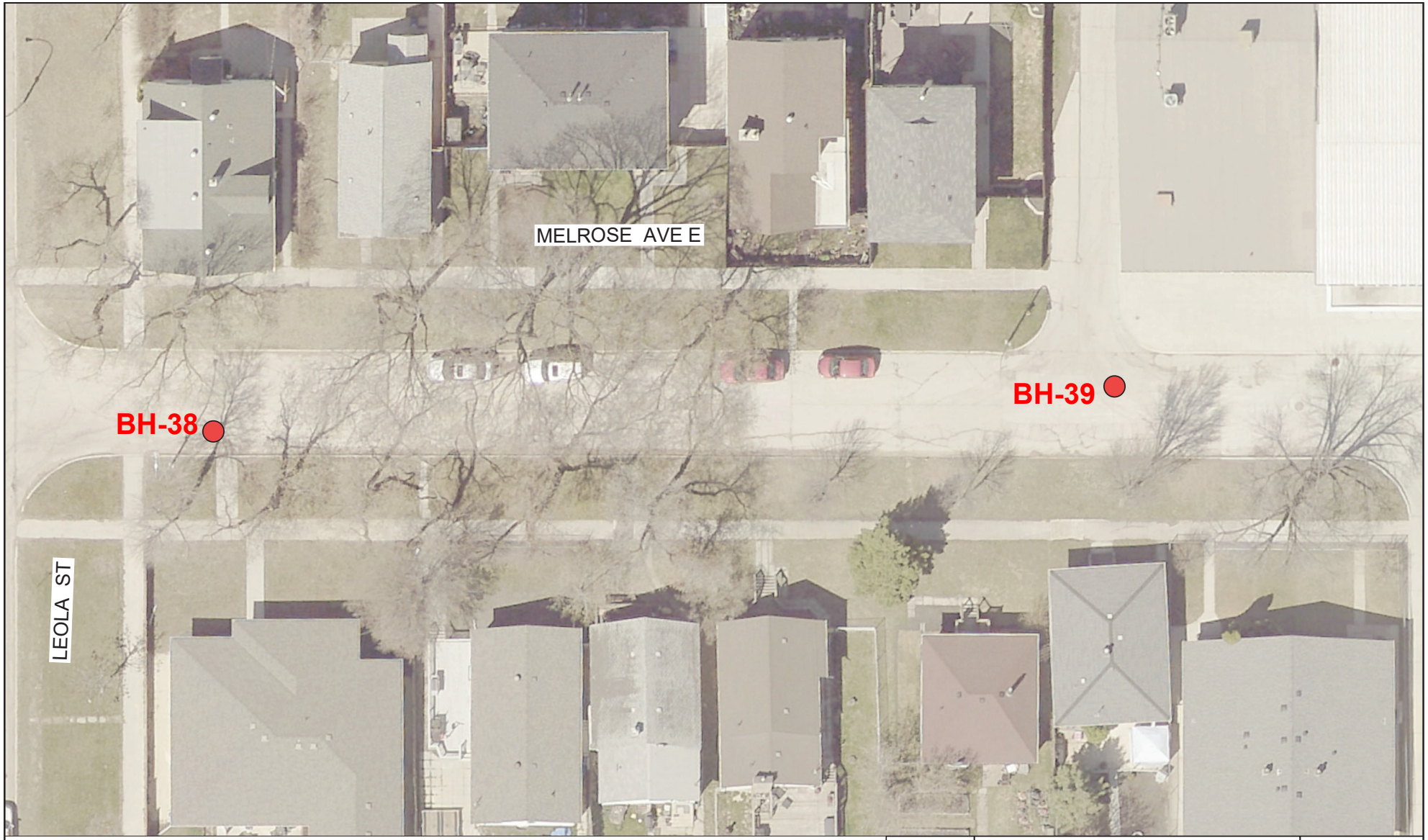
PROJECT NO.

-

DRAWING NO.

-

C:\Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg



DILLON CONSULTING

SCALE: 1:250

TITLE

Melrose Ave E

PROJECT NO.

-

DRAWING NO.

-

C:\Users\40tjh\Documents\24-R-06\24-R-06-Air-Photos.dwg

APPENDIX C

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 3. 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.

Boulders Cobbles Gravel | Sand | Silt | Clay | Organics | Asphalt | Concrete | Fill | Igneous Bedrock | Meta-morphic Bedrock | Sedi-mentary Bedrock

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
DP	Direct-Push sample (small diameter tube sampler hydraulically advanced)
PS	Piston sample
BS	Bulk sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond coring bits.

WATER LEVEL MEASUREMENT

measured in standpipe, piezometer, or well

inferred

RECOVERY

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

N-VALUE

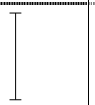
Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (63.5 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (300 mm) into the soil. In accordance with ASTM D1586, the N-Value equals 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. 50/75). 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

BOREHOLE RECORD

BH-11

CLIENT: **Dillon Consulting Ltd.**
PROJECT NO.: **123316892**
PROJECT: **24-R-06 Geotechnical Investigation**
BH ELEVATION: **N/A**
LOCATION: **Lilian Avenue**
DATUM: **N/A**
DATE BORED: **January 17 2024**
WATER LEVEL: **N/A**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (MUSCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) or TCR %	SAMPLES N-VALUE or RQD %	OTHER TESTS / REMARKS	UNDRAINED SHEAR STRENGTH, Cu (kPa) / WATER CONTENT & ATTERBERG LIMITS / SPT (N-value) BLOWS/0.3m	BACKFILL	ELEVATION (m)
0		**ASPHALT**									
		Firm brown fat **CLAY (CH)** - silty, trace sand		AS				Sieve/Hydro at 0.7 m G 0% S 9% M 53% C 38%			
1				AS							
				AS							
				AS							
2				AS							
		End of Borehole • Borehole terminated at a depth of 2.11 m. • No groundwater seepage or soil sloughing was observed during or upon completion of drilling. • Borehole backfilled with auger cuttings and bentonite chips. • Borehole surface backfilled as per City of Winnipeg Street Cuts Manual.									
3											
4											

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

Drilling Contractor: Paddock Drilling Ltd.	Logged By: RB
Drilling Method: 125 mm SSA	Reviewed By: GB
Completion Depth: 2.11 m	Page 1 of 1

Stantec

BOREHOLE RECORD

BH-12

CLIENT: **Dillon Consulting Ltd.**
PROJECT: **24-R-06 Geotechnical Investigation**
LOCATION: **Lilian Avenue**
DATE BORED: **January 17 2024**

PROJECT NO.: **123316892**
BH ELEVATION: **N/A**
DATUM: **N/A**
WATER LEVEL: **N/A**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (MUSCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) or TCR %	SAMPLES N-VALUE or RQD %	OTHER TESTS / REMARKS
0		**ASPHALT**						
		CONCRETE						
		Firm brown fat **CLAY (CH)** with sand - silty		AS				Sieve/Hydro at 0.8 m G 3% S 12% M 49% C 36%
1				AS				
				AS				
2				AS				
				AS				
3								
4								

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)

End of Borehole
- Borehole terminated at a depth of 2.17 m.
- No groundwater seepage or soil sloughing was observed during or upon completion of drilling.
- Borehole backfilled with auger cuttings and bentonite chips.
- Borehole surface backfilled as per City of Winnipeg Street Cuts Manual.

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

Drilling Contractor: Paddock Drilling Ltd.
Drilling Method: 125 mm SSA
Completion Depth: 2.17 m

Logged By: RB
Reviewed By: GB
Page 1 of 1

Printed Feb 8 2024 15:18:04 SOIL 123316892_24-R06-GEOTECHNICAL INVESTIGATION.GPJ NEW TEMPLATE TEST PROJECT.GPJ 2/8/24

Stantec

BOREHOLE RECORD

BH-13

CLIENT: **Dillon Consulting Ltd.**
PROJECT NO.: **123316892**
PROJECT: **24-R-06 Geotechnical Investigation**
BH ELEVATION: **N/A**
LOCATION: **Lilian Avenue**
DATUM: **N/A**
DATE BORED: **January 17 2024**
WATER LEVEL: **N/A**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (MUSCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) or TCR %	SAMPLES N-VALUE or RQD %	OTHER TESTS / REMARKS	BACKFILL	ELEVATION (m)
0		**CONCRETE**								
		Firm brown fat **CLAY (CH)** - silty, trace sand		AS						

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

End of Borehole
- Auger refusal at a depth of 0.51 m on suspected concrete.
- No groundwater seepage or soil sloughing was observed during or upon completion of drilling.
- Borehole surface backfilled as per City of Winnipeg Street Cuts Manual.

1 2 3 4

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

Drilling Contractor: Paddock Drilling Ltd. | Logged By: RB
Drilling Method: 125 mm SSA | Reviewed By: GB
Completion Depth: 0.51 m | Page 1 of 1

APPENDIX D

Core Photographs

[redacted]

Figure 11 – Core No. 11 (Lilian Ave)

Figure 12 – Core No. 12 (Lilian Ave)

Figure 13 – Core No. 13 (Lilian Ave)

Figure 14 – Core No. 14 (Champlain St)

Figure 15 – Core no. 15 (Champlain St)

Figure 16 – Core No. 16 (Champlain St)

Figure 17 – Core No.17 (Champlain St)

Figure 18 – Core No. 18 (Dumoulin St)

Figure 19 – Core No. 19 (Dumoulin St)

Figure 20 – Core No. 20 (Dumoulin St)

Figure 21 – Core No.21 (Dumoulin St)

Figure 22 – Core No. 22 (Dumoulin St)

[redacted]

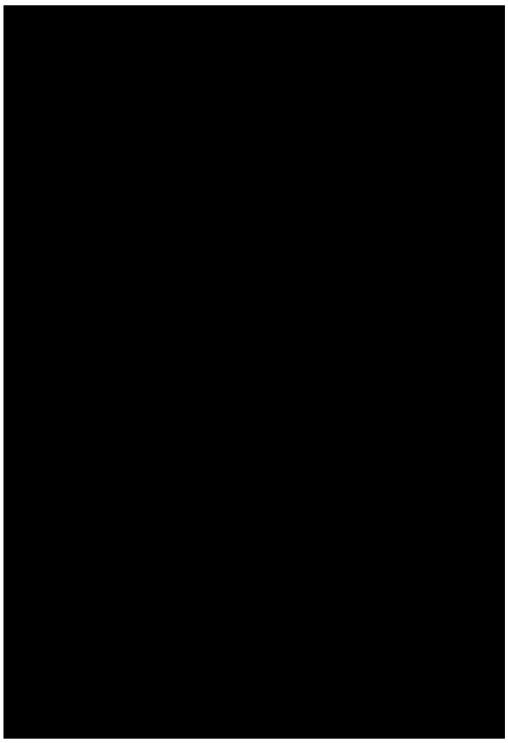
[redacted]

Figure 32 – Core No. 32 (Baywater Pl)

Figure 33 – Core No. 33 (Baywater Pl)

Figure 34 – Core No. 34 (Courtwood Pl)

Figure 35 – Core No. 35 (Courtwood Pl)



APPENDIX E

Laboratory Test Reports

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 Dillon Consulting Ltd.
300 - 100 Innovation Drive
Winnipeg, Manitoba
R3T 6A8

ATTN Caleb Olfert

PROJECT 24-R-06 - Local Street Package - Geotechnical Investigation

PROJECT NO. 123316892

REPORT NO. 8

DATE SAMPLED: 2024.Jan.17
SAMPLED BY: Stantec Consulting Ltd.

DATE RECEIVED: 2024.Jan.17
SUBMITTED BY: Stantec Consulting Ltd.

DATE TESTED: 2024.Jan.31
TESTED BY: Larry Presado

MATERIAL IDENTIFICATION

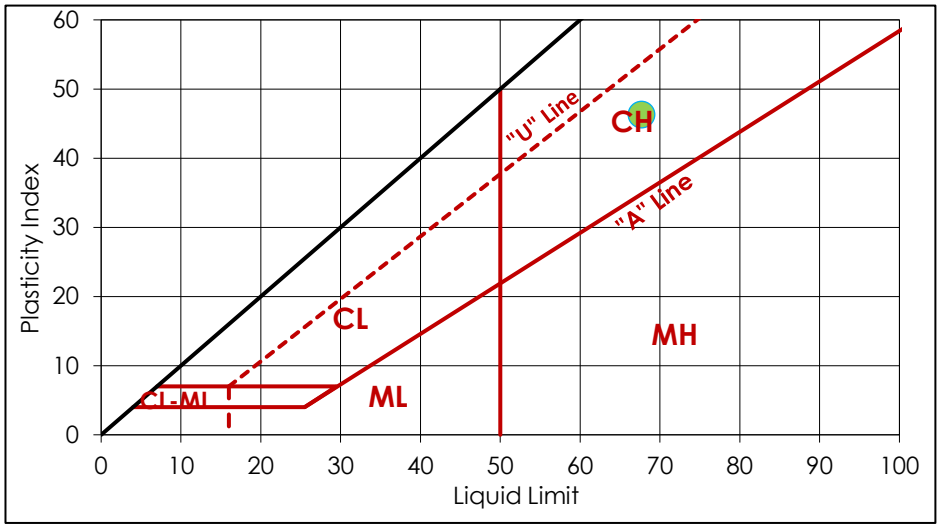
CLIENT FIELD ID BH-11, 710 mm

STANTEC SAMPLE NO. 4000

LIQUID LIMIT		
TRIAL	1	2
BLOWS	27	28
MC (%)	63	71

PLASTIC LIMIT		
TRIAL	1	2
MC (%)	22	21

LIQUID LIMIT, LL	68
PLASTIC LIMIT, PL	21
PLASTICITY INDEX, PI	46
AS REC'D MC (%)	31.60



COMMENTS
No comments.

REPORT DATE 2024.Feb.01

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 Dillon Consulting Ltd.
300 - 100 Innovation Drive
Winnipeg, Manitoba
R3T 6A8

ATTN Caleb Olfert

PROJECT 24-R-06 - Local Streets Package - Geotechnical Investigation

PROJECT NO. 123316892

REPORT NO. 8

DATE SAMPLED: 2024.Jan.17
SAMPLED BY: Stantec Consulting Ltd.

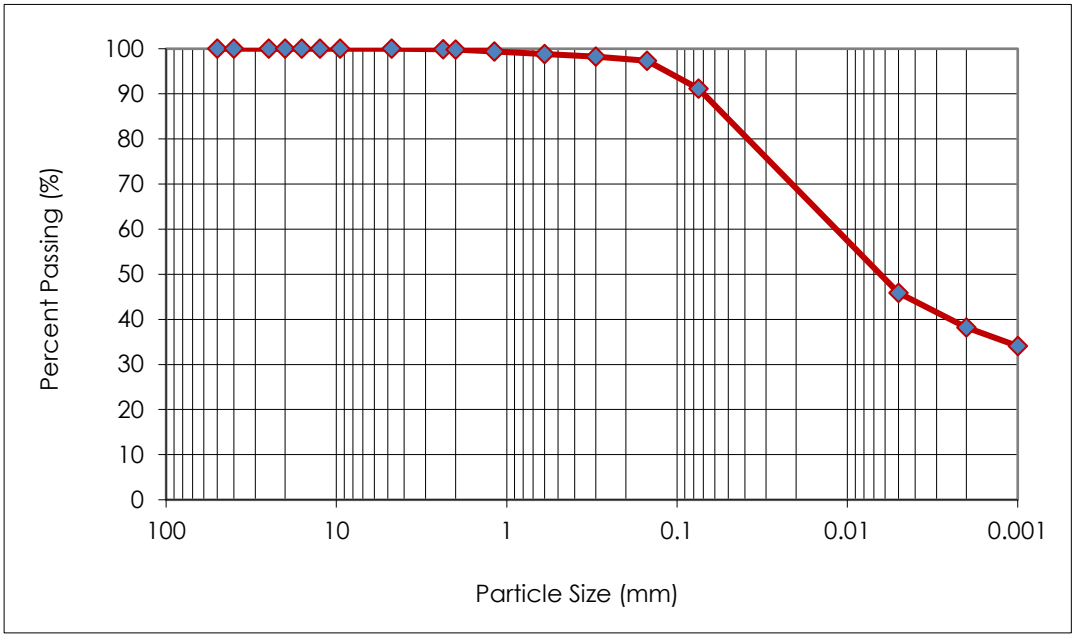
DATE RECEIVED: 2024.Jan.17
SUBMITTED BY: Stantec Consulting Ltd.

DATE TESTED: 2024.Jan.23
TESTED BY: Larry Presado

MATERIAL IDENTIFICATION

CLIENT FIELD ID BH-11, 710 mm

STANTEC SAMPLE NO. 4000



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	99.9
2.00	99.8
1.18	99.4
0.600	98.8
0.300	98.3
0.150	97.3
0.075	91.1
0.005	45.9
0.002	38.2
0.001	34.1

Gravel	Sand			Silt	Clay	Colloids
	Coarse	Medium	Fine			
0.0	0.2	1.3	7.4	52.9	38.2	34.1

COMMENTS
No comments.

REPORT DATE 2024.Jan.25

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 Dillon Consulting Ltd.
300 - 100 Innovation Drive
Winnipeg, Manitoba
R3T 6A8

ATTN Caleb Olfert

PROJECT 24-R-06 - Local Streets Package - Geotechnical Investigation

PROJECT NO. 123316892

REPORT NO. 9

DATE SAMPLED: 2024.Jan.17
SAMPLED BY: Stantec Consulting Ltd.

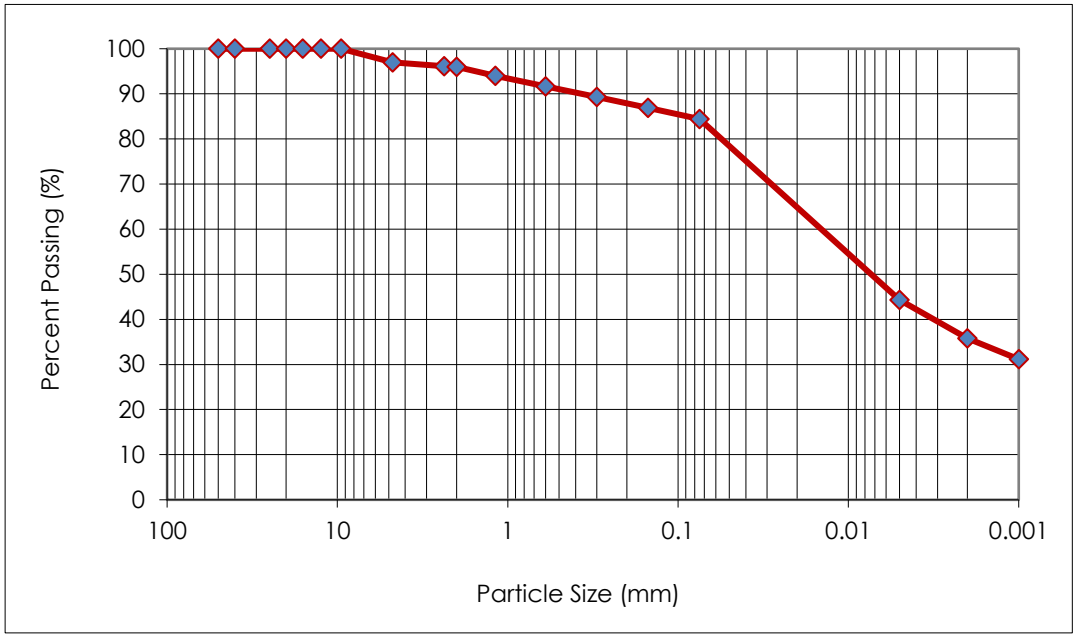
DATE RECEIVED: 2024.Jan.17
SUBMITTED BY: Stantec Consulting Ltd.

DATE TESTED: 2024.Jan.23
TESTED BY: Larry Presado

MATERIAL IDENTIFICATION

CLIENT FIELD ID BH-12, 775 mm

STANTEC SAMPLE NO. 4001



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	97.0
2.36	96.2
2.00	96.0
1.18	94.0
0.600	91.6
0.300	89.3
0.150	86.9
0.075	84.4
0.005	44.3
0.002	35.8
0.001	31.2

Gravel	Sand			Silt	Clay	Colloids
	Coarse	Medium	Fine			
3.0	1.0	5.7	5.9	48.6	35.8	31.2

COMMENTS
No comments.

REPORT DATE 2024.Jan.25

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

PROCTOR TEST REPORT

TO Dillon Consulting Ltd.
300 - 100 Innovation Dr.
Winnipeg, MB
R3T 6A8

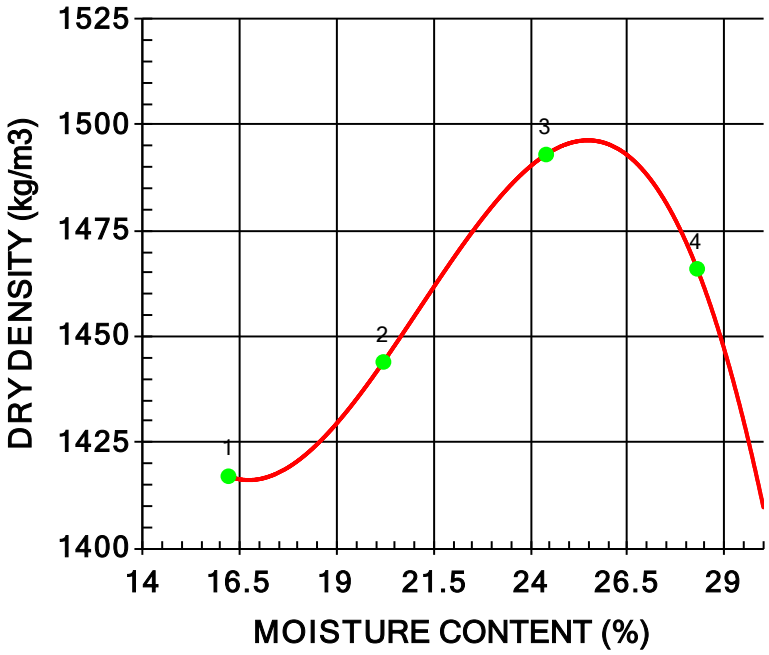
CLIENT Dillon Consulting Ltd.
C.C.

ATTN: Ali Campbell

PROJECT 24-R-06 - Local Streets Package

PROJECT NO. 123316892
PROCTOR NO. 1 DATE SAMPLED 2024.Jan.15 DATE RECEIVED 2024.Jan.15 DATE TESTED 2024.Jan.19

INSITU MOISTURE	36.7 %	COMPACTION STANDARD	Standard Proctor, ASTM D698
TESTED BY	Donald Eliazar		
MATERIAL IDENTIFICATION		COMPACTION PROCEDURE	A: 101.6mm Mold, Passing 4.75mm
MAJOR COMPONENT	Backfill		
SIZE	Fat Clay (CH)	RAMMER TYPE	Manual
DESCRIPTION		PREPARATION	Moist
SUPPLIER	Existing Materials	OVERSIZE CORRECTION METHOD	None
SOURCE	Kanata Street - BH-01, 0.740 m	RETAINED 4.75mm SCREEN	N/A %



TRIAL NUMBER	WET DENSITY (kg/m³)	DRY DENSITY (kg/m³)	MOISTURE CONTENT (%)
1	1646	1417	16.2
2	1736	1444	20.2
3	1857	1493	24.4
4	1881	1466	28.3

	MAXIMUM DRY DENSITY (kg/m³)	OPTIMUM MOISTURE CONTENT (%)
CALCULATED	1500	25.5
OVERSIZE CORRECTED		

COMMENTS

Stantec Sample No. 2967.

Page 1 of 1 2024.Jan.22 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

PROCTOR TEST REPORT

TO Dillon Consulting Ltd.
300 - 100 Innovation Dr.
Winnipeg, MB
R3T 6A8

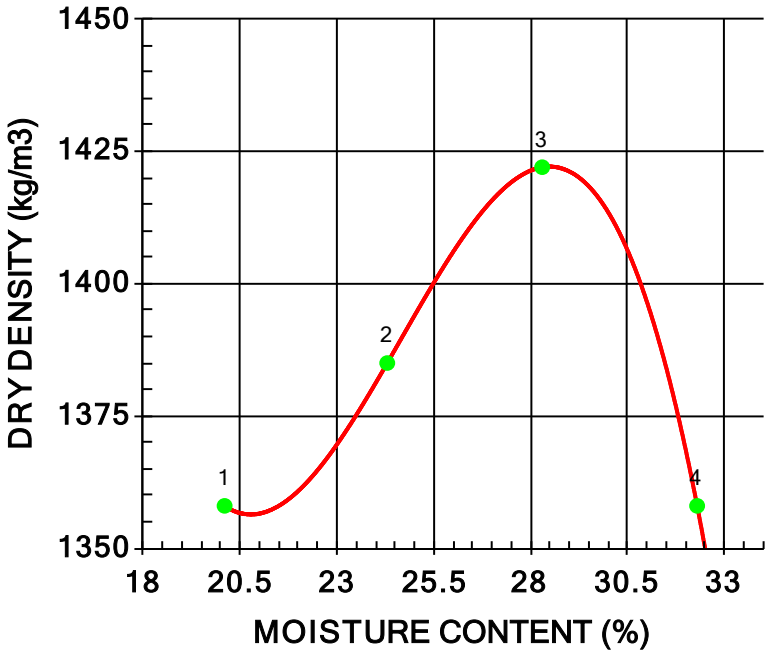
CLIENT Dillon Consulting Ltd.
C.C.

ATTN: Ali Campbell

PROJECT 24-R-06 - Local Streets Package

PROJECT NO. 123316892
PROCTOR NO. 2 DATE SAMPLED 2024.Jan.15 DATE RECEIVED 2024.Jan.15 DATE TESTED 2024.Jan.22

INSITU MOISTURE	46.2 %	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	Kanata Street - BH-02 , 0.780 m	RETAINED 4.75mm SCREEN	N/A %



TRIAL NUMBER	WET DENSITY (kg/m³)	DRY DENSITY (kg/m³)	MOISTURE CONTENT (%)
1	1631	1358	20.1
2	1722	1385	24.3
3	1824	1422	28.3
4	1796	1358	32.3

	MAXIMUM DRY DENSITY (kg/m³)	OPTIMUM MOISTURE CONTENT (%)
CALCULATED	1420	28.5
OVERSIZE CORRECTED		

COMMENTS

Stantec Sample No. 2968.

 2024.Jan.23 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

PROCTOR TEST REPORT

TO Dillon Consulting Ltd.
300 - 100 Innovation Dr.
Winnipeg, MB
R3T 6A8

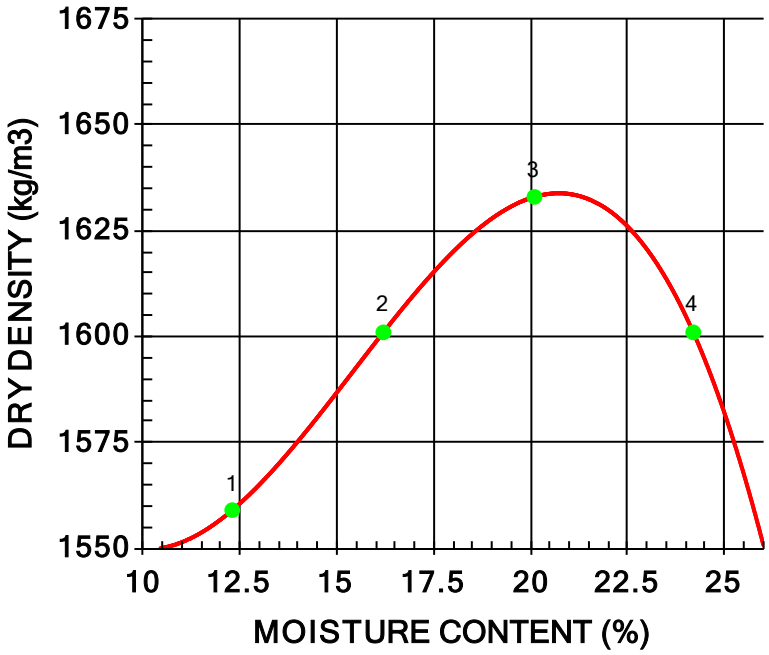
CLIENT Dillon Consulting Ltd.
C.C.

ATTN: Ali Campbell

PROJECT 24-R-06 - Local Streets Package

PROJECT NO. 123316892
PROCTOR NO. 3 DATE SAMPLED 2024.Jan.15 DATE RECEIVED 2024.Jan.15 DATE TESTED 2024.Jan.23

INSITU MOISTURE	33.5 %	COMPACTION STANDARD	Standard Proctor, ASTM D698
TESTED BY	Donald Eliazar		
MATERIAL IDENTIFICATION		COMPACTION PROCEDURE	A: 101.6mm Mold, Passing 4.75mm
MAJOR COMPONENT	Backfill		
SIZE	Fat Clay (CH)	RAMMER TYPE	Manual
DESCRIPTION		PREPARATION	Moist
SUPPLIER	Existing Materials	OVERSIZE CORRECTION METHOD	None
SOURCE	Kanata Street - BH-04, 0.780 m	RETAINED 4.75mm SCREEN	N/A %



TRIAL NUMBER	WET DENSITY (kg/m³)	DRY DENSITY (kg/m³)	MOISTURE CONTENT (%)
1	1751	1559	12.3
2	1860	1601	16.2
3	1961	1633	20.1
4	1989	1601	24.2

	MAXIMUM DRY DENSITY (kg/m³)	OPTIMUM MOISTURE CONTENT (%)
CALCULATED	1630	20.5
OVERSIZE CORRECTED		

COMMENTS

Stantec Sample No. 2969.

 2024.Jan.24 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

PROCTOR TEST REPORT

TO Dillon Consulting Ltd.
300 - 100 Innovation Dr.
Winnipeg, MB
R3T 6A8

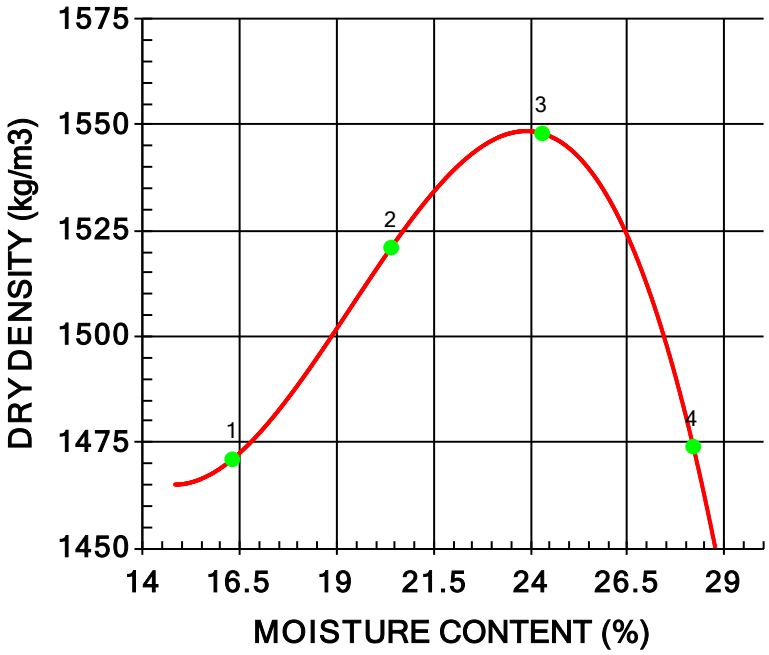
CLIENT Dillon Consulting Ltd.
C.C.

ATTN: Ali Campbell

PROJECT 24-R-06 - Local Streets Package

PROJECT NO. 123316892
PROCTOR NO. 4 DATE SAMPLED 2024.Jan.15 DATE RECEIVED 2024.Jan.15 DATE TESTED 2024.Jan.23

INSITU MOISTURE	27.9 %	COMPACTION STANDARD	Standard Proctor, ASTM D698
TESTED BY	Pervez Safdar		
MATERIAL IDENTIFICATION		COMPACTION PROCEDURE	A: 101.6mm Mold, Passing 4.75mm
MAJOR COMPONENT	Backfill		
SIZE	Fat Clay (CH)	RAMMER TYPE	Manual
DESCRIPTION		PREPARATION	Moist
SUPPLIER	Existing Materials	OVERSIZE CORRECTION METHOD	None
SOURCE	Wabasha Street - BH-05, 0.745 m	RETAINED 4.75mm SCREEN	N/A %



TRIAL NUMBER	WET DENSITY (kg/m³)	DRY DENSITY (kg/m³)	MOISTURE CONTENT (%)
1	1711	1471	16.3
2	1831	1521	20.4
3	1924	1548	24.3
4	1890	1474	28.2

	MAXIMUM DRY DENSITY (kg/m³)	OPTIMUM MOISTURE CONTENT (%)
CALCULATED	1550	24.0
OVERSIZE CORRECTED		

COMMENTS

Stantec Sample No. 2970.

 2024.Jan.24 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

PROCTOR TEST REPORT

TO Dillon Consulting Ltd.
300 - 100 Innovation Dr.
Winnipeg, MB
R3T 6A8

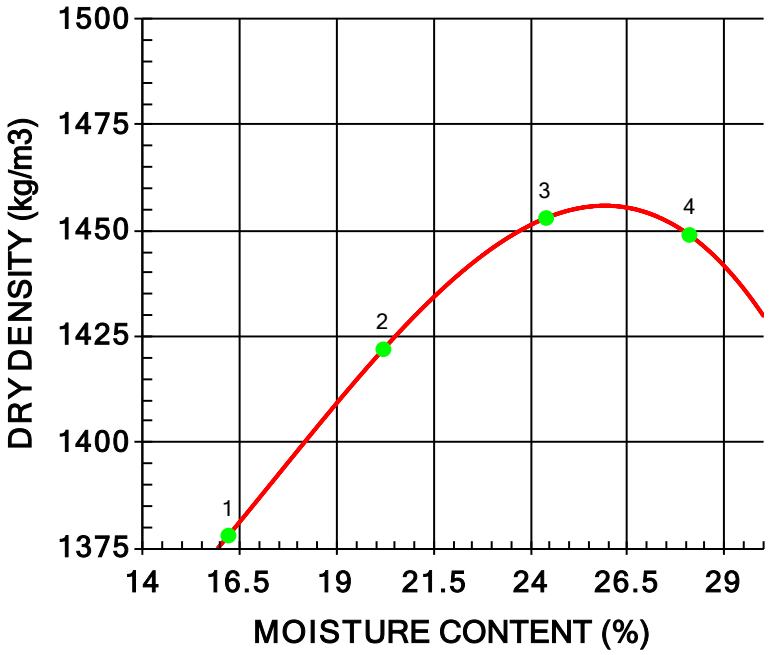
CLIENT Dillon Consulting Ltd.
C.C.

ATTN: Ali Campbell

PROJECT 24-R-06 - Local Streets Package

PROJECT NO. 123316892
PROCTOR NO. 5 DATE SAMPLED 2024.Jan.15 DATE RECEIVED 2024.Jan.15 DATE TESTED 2024.Jan.23

INSITU MOISTURE	33.9 %	COMPACTION STANDARD	Standard Proctor, ASTM D698
TESTED BY	Donald Eliazar		
MATERIAL IDENTIFICATION		COMPACTION PROCEDURE	A: 101.6mm Mold, Passing 4.75mm
MAJOR COMPONENT	Backfill		
SIZE	Fat Clay (CH)	RAMMER TYPE	Manual
DESCRIPTION		PREPARATION	Moist
SUPPLIER	Existing Materials	OVERSIZE CORRECTION METHOD	None
SOURCE	Wabasha Street - BH-07, 0.765 m	RETAINED 4.75mm SCREEN	N/A %



TRIAL NUMBER	WET DENSITY (kg/m³)	DRY DENSITY (kg/m³)	MOISTURE CONTENT (%)
1	1601	1378	16.2
2	1709	1422	20.2
3	1807	1453	24.4
4	1856	1449	28.1

	MAXIMUM DRY DENSITY (kg/m³)	OPTIMUM MOISTURE CONTENT (%)
CALCULATED	1460	26.0
OVERSIZE CORRECTED		

COMMENTS

Stantec Sample No. 2971.

 2024.Jan.24 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

PROCTOR TEST REPORT

TO Dillon Consulting Ltd.
300 - 100 Innovation Dr.
Winnipeg, MB
R3T 6A8

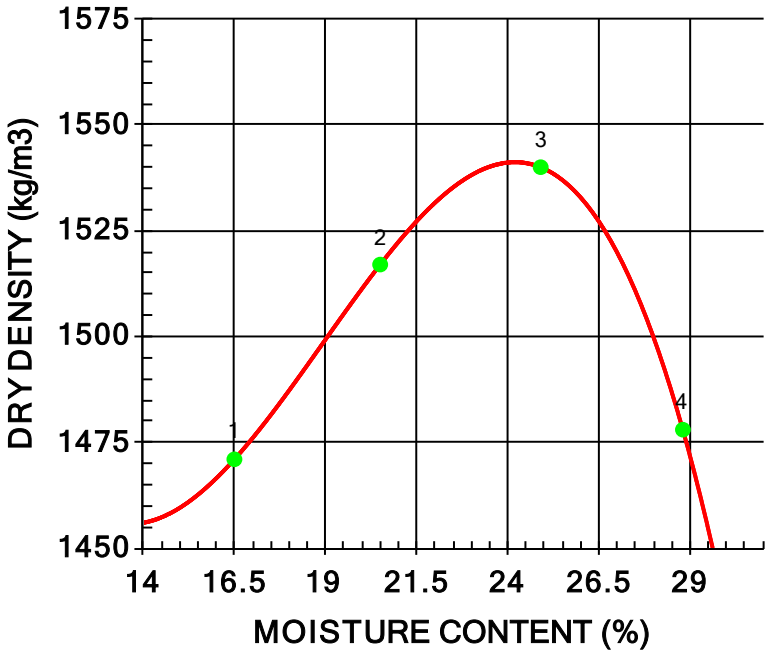
CLIENT Dillon Consulting Ltd.
C.C.

ATTN: Ali Campbell

PROJECT 24-R-06 - Local Streets Package

PROJECT NO. 123316892
PROCTOR NO. 8 DATE SAMPLED 2024.Jan.17 DATE RECEIVED 2024.Jan.17 DATE TESTED 2024.Feb.05

INSITU MOISTURE	27.8 %	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	Lilian Ave - BH-11, 0.710 m	RETAINED 4.75mm SCREEN	N/A %



TRIAL NUMBER	WET DENSITY (kg/m³)	DRY DENSITY (kg/m³)	MOISTURE CONTENT (%)
1	1714	1471	16.5
2	1828	1517	20.5
3	1923	1540	24.9
4	1904	1478	28.8

	MAXIMUM DRY DENSITY (kg/m³)	OPTIMUM MOISTURE CONTENT (%)
CALCULATED	1540	24.0
OVERSIZE CORRECTED		

COMMENTS

Stantec Sample No. 4000.

 2024.Feb.08 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

PROCTOR TEST REPORT

TO Dillon Consulting Ltd.
300 - 100 Innovation Dr.
Winnipeg, MB
R3T 6A8

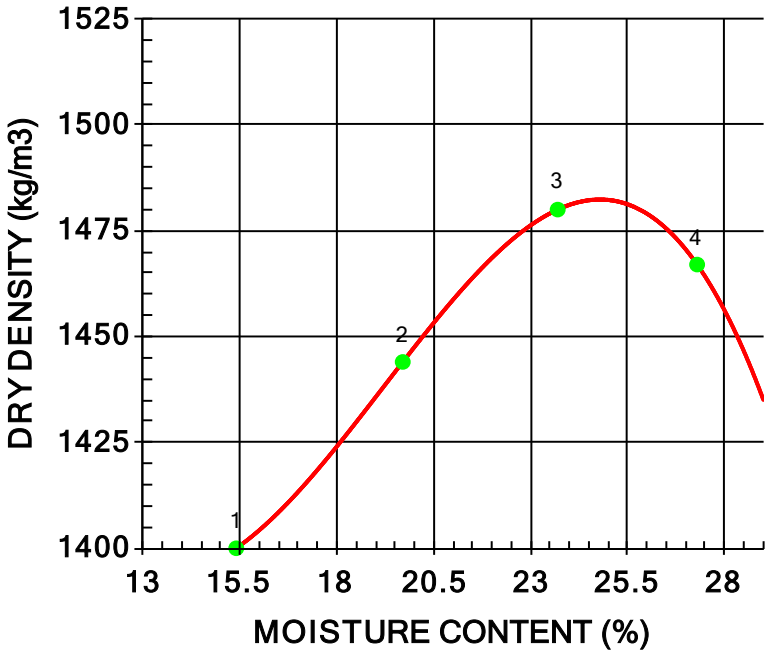
CLIENT Dillon Consulting Ltd.
C.C.

ATTN: Ali Campbell

PROJECT 24-R-06 - Local Streets Package

PROJECT NO. 123316892
PROCTOR NO. 9 DATE SAMPLED 2024.Jan.17 DATE RECEIVED 2024.Jan.17 DATE TESTED 2024.Feb.05

INSITU MOISTURE	36.6 %	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 with Sand (CH)	RAMMER TYPE	Manual
DESCRIPTION		PREPARATION	Moist
SUPPLIER	Existing Materials	OVERSIZE CORRECTION METHOD	None
SOURCE	Lilian Ave - BH-12, 0.775 m	RETAINED 4.75mm SCREEN	N/A %



TRIAL NUMBER	WET DENSITY (kg/m³)	DRY DENSITY (kg/m³)	MOISTURE CONTENT (%)
1	1616	1400	15.4
2	1729	1444	19.7
3	1831	1480	23.7
4	1867	1467	27.3

	MAXIMUM DRY DENSITY (kg/m³)	OPTIMUM MOISTURE CONTENT (%)
CALCULATED	1480	25.0
OVERSIZE CORRECTED		

COMMENTS

Stantec Sample No. 4001.

 2024.Feb.08 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 Dillon Consulting Ltd.
300 - 100 Innovation Drive
Winnipeg, Manitoba
R3T 6A8

ATTN Ali Campbell

PROJECT 24-R-06 - Local Streets Package - Geotechnical Investigation

PROJECT NO. 123316892

REPORT NO. 8

DATE SAMPLED: 2024.Jan.17
SAMPLED BY: Stantec Consulting Ltd.

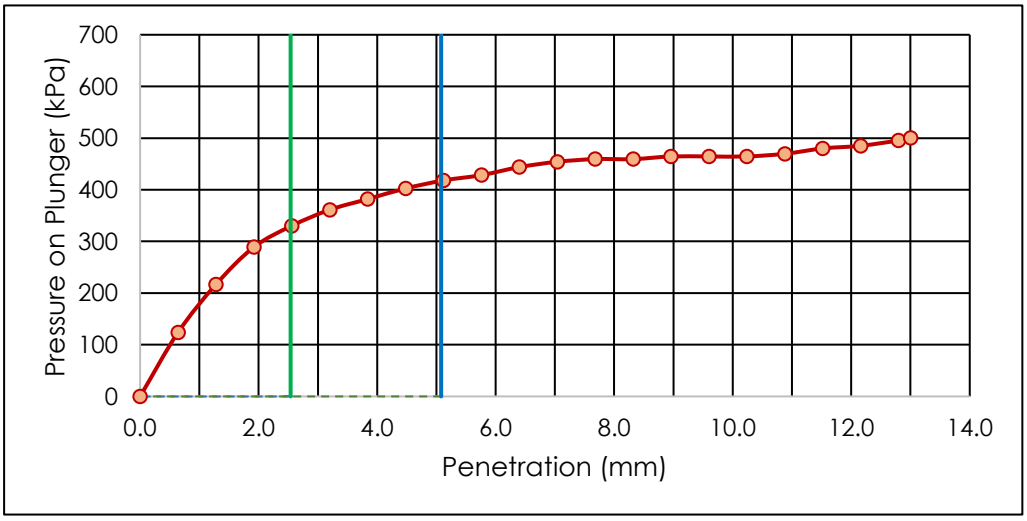
DATE RECEIVED: 2024.Jan.17
SUBMITTED BY: Stantec Consulting Ltd.

DATE TESTED: 2024.Feb.19
TESTED BY: Donald Eliazar

MATERIAL IDENTIFICATION

MATERIAL USE	Subgrade	SUPPLIER	Existing Material
MAX. NOMINAL SIZE	4.75 mm	SOURCE	Existing Material
MATERIAL TYPE	Fat Clay (CH)	SAMPLE LOCATION	BH-11, 0.710 m
SPECIFICATION ID	Not Applicable	STANTEC SAMPLE NO.	4000

IMMERSION PERIOD	96 ± 2 hr	TARGET MAX. DRY DENSITY	1540 kg/m^3
CONDITION OF SAMPLE	Soaked	TARGET OPTIMUM MOISTURE	24.0 %
SURCHARGE MASS	4.54 kg		
+19 mm OVERSIZE	0 %	AS-COMPACTED DRY DENSITY	1462 kg/m^3
SWELL OF SAMPLE	1.51 %	AS-COMPACTED MOISTURE	24.1 %
POST-TEST MOISTURE	30.4 %	AS-COMPACTED % COMPACTION	95 %



CBR VALUE AT 2.54 mm PENETRATION
4.8

CBR VALUE AT 5.08 mm PENETRATION
4.2

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

REPORT DATE 2024.Feb.26

REVIEWED BY Jason Thompson, C.E.T.
Principal - Manager of 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 Dillon Consulting Ltd.
300 - 100 Innovation Drive
Winnipeg, Manitoba
R3T 6A8

ATTN Ali Campbell

PROJECT 24-R-06 - Local Streets Package - Geotechnical Investigation

PROJECT NO. 123316892

REPORT NO. 9

DATE SAMPLED: 2024.Jan.17
SAMPLED BY: Stantec Consulting Ltd.

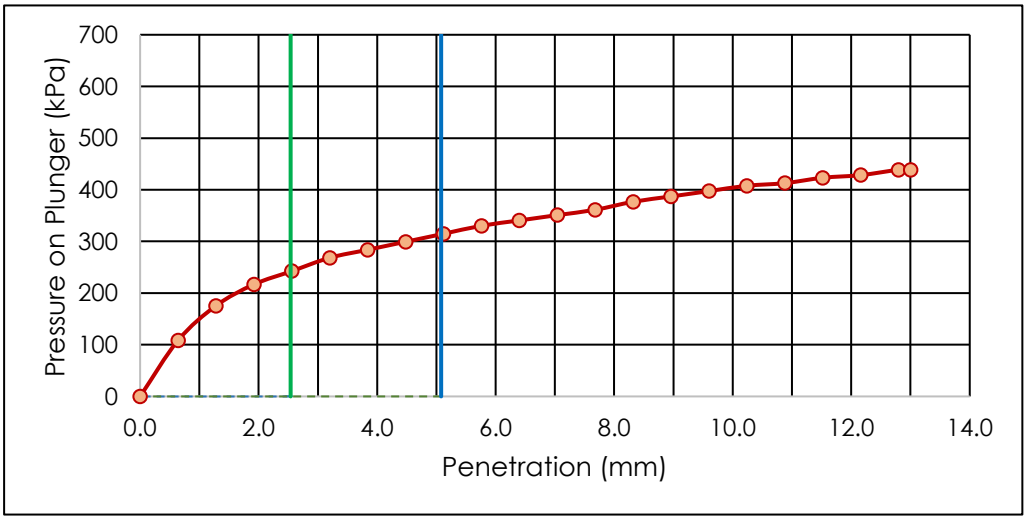
DATE RECEIVED: 2024.Jan.17
SUBMITTED BY: Stantec Consulting Ltd.

DATE TESTED: 2024.Feb.19
TESTED BY: Donald Eliazar

MATERIAL IDENTIFICATION

MATERIAL USE	Subgrade	SUPPLIER	Existing Material
MAX. NOMINAL SIZE	4.75 mm	SOURCE	Existing Material
MATERIAL TYPE	Fat CLAY with sand (CH)	SAMPLE LOCATION	BH-12, 0.775 m
SPECIFICATION ID	Not Applicable	STANTEC SAMPLE NO.	4001

IMMERSION PERIOD	96 ± 2 hr	TARGET MAX. DRY DENSITY	1480 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	1407 kg/m^3
SWELL OF SAMPLE	3.02 %	AS-COMPACTED MOISTURE	25.0 %
POST-TEST MOISTURE	37.1 %	AS-COMPACTED % COMPACTION	95 %



CBR VALUE AT 2.54 mm PENETRATION
3.5

CBR VALUE AT 5.08 mm PENETRATION
3.1

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

REPORT DATE 2024.Feb.26

REVIEWED BY Jason Thompson, C.E.T.
Principal - Manager of Materials Testing Services

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

Table 2 - Compressive Strength Test Data

Street	Core ID	Diameter (mm)	Length (mm)	L/D Ratio	Correction Factor	Peak Load (kN)	Compressive Strength (MPa)	
							Measured	Corrected
Champlain St	BH-14	75.45	150.50	1.995	0.9996	215.19	48.13	48.11
Champlain St	BH-16	75.60	171.34	2.266	1.0000	210.35	46.86	46.86
Dumoulin St	BH-19	76.09	142.27	1.870	0.9896	290.85	63.96	63.30
Dumoulin St	BH-22	87.98	176.16	2.002	1.0000	313.85	51.63	51.63
[redacted]								
Baywater Pl	BH-32	75.85	92.35	1.218	0.9223	149.23	33.03	30.46
Baywater Pl	BH-33	75.82	142.71	1.882	0.9906	133.84	29.64	29.36
Courtwood Pl	BH-34	75.79	113.32	1.495	0.9594	146.07	32.38	31.06
Courtwood Pl	BH-35	*Concrete core sample crumbled; unsuitable for testing.*						
[redacted]								