

# **APPENDIX 'A'**

# **GEOTECHNICAL REPORT**

## **APPENDIX 'A' – GEOTECHNICAL REPORT**

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.

Mr. Ryan Cunningham  
AECOM Canada Ltd.  
99 Commerce Drive  
Winnipeg, MB R3P 0Y7

March 23, 2022

**Project #**  
60672138

Dear Mr. Cunningham:

**Subject: City of Winnipeg 2022 Local and Industrial Street and Alley Renewal Program, Package 476-2021.8 (22-RI-02): Dundas Street, Midland Street, Milt Stegall Drive, Murray Park Road, Saskatchewan Avenue, Yukon Avenue - Geotechnical Data Report**

This geotechnical data report provides the results of a geotechnical investigation performed by AECOM Canada Ltd. (AECOM) for the proposed rehabilitation of Dundas Street from Sargent Avenue to Yukon Avenue, Eastbound (EB) Murray Park Road from Cree Crescent to Saulteaux Crescent, Westbound (WB) Murray Park Road from Saulteaux Crescent to Cree Crescent, Saskatchewan Avenue from Midland Street to Empress Street, Yukon Avenue from Milt Stegall Drive to Empress Street, Yukon Avenue from St. James Street to Milt Stegall Drive, and the proposed reconstruction of Midland Street from Notre Dame Avenue to Saskatchewan Avenue, Milt Stegall Drive from Sargent Avenue to Yukon Avenue, Murray Park Road from Cree Crescent to Sturgeon Road, Saskatchewan Avenue from King Edward Street to Century Street, Saskatchewan Avenue from Sherwin Road to King Edward Street, and Saskatchewan Avenue from St. James Street to Border Street as part of the City of Winnipeg's 2022 Local and Industrial Street and Alley Renewal Program. The main objective of the geotechnical investigation was to determine the thickness of the existing pavement structure for the reconstruction and rehabilitation streets, and to determine the subsurface conditions below the existing pavement structure for the reconstruction streets.

The following test holes and/or core holes were completed along each roadway section:

- Six (6) pavement core holes (CH21-01A to CH21-06A) on Dundas Street
- Five (5) test holes (TH21-01B to TH21-05B) on Midland Street
- Three (3) test holes (TH21-01C to TH21-03C) on Milt Stegall Drive
- Five (5) test holes (TH21-01D to TH21-05D) on Murray Park Road (Sturgeon Rd. to Cree Cre.)
- Six (6) pavement core holes (CH21-01E to CH21-06E) on EB Murray Park Road (Cree Cre. to Saulteaux Cre.)
- Four (4) pavement core holes (CH21-01F to CH21-04F) on WB Murray Park Road (Saulteaux Cre. to Cree Cre.)
- Four (4) test holes (TH21-01G to TH21-04G) on Saskatchewan Avenue (King Edward St. to Century St.)
- Four (4) pavement core holes (CH21-01H to CH21-04H) on Saskatchewan Avenue (Midland St. to Empress St.)
- Four (4) test holes (TH21-01I to TH21-04I) on Saskatchewan Avenue (Sherwin Rd. to King Edward St.)
- Three (3) test holes (TH21-01J to TH21-03J) on Saskatchewan Avenue (St. James St. to Border St.)

- Eight (8) pavement core holes (CH21-01K to CH21-08K) on Yukon Avenue (Milt Stegall Dr. to Empress St.)
- Seven (7) pavement core holes (CH21-01L to CH21-07L) on Yukon Avenue (St. James St. to Milt Stegall Dr.)

Locations of the test holes and pavement core holes are as shown on the Contract Drawings. Soil logs providing detailed descriptions of subsurface conditions encountered at the test hole locations are presented in **Appendix A**.

Pavement core holes were completed by AECOM using a 50 mm diameter diamond core drill bit and pavement thicknesses were logged on-site. Test hole drilling was completed by Paddock Drilling Ltd. and Maple Leaf Drilling Ltd. using truck-mounted rigs equipped with solid stem augers (SSA), and pavement thicknesses were measured within the augered hole. A summary of the pavement thicknesses encountered in pavement core holes and test holes is provided in **Table 01** to **Table 12** in **Appendix B**, and photos of the cores recovered from the pavement core hole locations are provided in **Appendix C**.

Test holes were drilled to a depth of approximately 2.6 m below the existing road surface. During the drilling, AECOM personnel observed subsurface conditions and visually classified the collected soil samples. Other pertinent information such as groundwater and drilling conditions were also recorded. Disturbed soil samples collected during the site investigation were transported to AECOM's Materials Laboratory in Winnipeg, Manitoba and H. Manalo Consulting Ltd's Materials Laboratory in Winnipeg, Manitoba for further testing and classification.

The laboratory soil testing consisted of determination of moisture contents, Atterberg Limits (ASTM D4318), grain size distribution (ASTM D7928), Standard Proctor (ASTM D698), and California Bearing Ratio (ASTM D1883). Laboratory soil test results are shown on the test hole logs in **Appendix A**, summarized in **Appendix B**, and attached in **Appendix D**.

Sincerely,  
**AECOM Canada Ltd.**

Prepared by

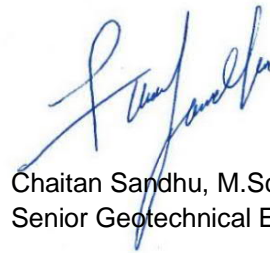


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Reviewed by:



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# Appendix A

## Test Hole Logs

# **AECOM Canada Ltd.**

## **GENERAL STATEMENT**

### **NORMAL VARIABILITY OF SUBSURFACE CONDITIONS**

The scope of the investigation presented herein is limited to an investigation of the subsurface conditions as to suitability for the proposed project. This report has been prepared to aid in the evaluation of the site and to assist the engineer in the design of the facilities. Our description of the project represents our understanding of the significant aspects of the project relevant to the design and construction of earth work, foundations and similar. In the event of any changes in the basic design or location of the structures as outlined in this report or plan, we should be given the opportunity to review the changes and to modify or reaffirm in writing the conclusions and recommendations of this report.

The analysis and recommendations presented in this report are based on the data obtained from the borings and test pit excavations made at the locations indicated on the site plans and from other information discussed herein. This report is based on the assumption that the subsurface conditions everywhere are not significantly different from those disclosed by the borings and excavations. However, variations in soil conditions may exist between the excavations and, also, general groundwater levels and conditions may fluctuate from time to time. The nature and extent of the variations may not become evident until construction. If subsurface conditions differ from those encountered in the exploratory borings and excavations, are observed or encountered during construction, or appear to be present beneath or beyond excavations, we should be advised at once so that we can observe and review these conditions and reconsider our recommendations where necessary.

Since it is possible for conditions to vary from those assumed in the analysis and upon which our conclusions and recommendations are based, a contingency fund should be included in the construction budget to allow for the possibility of variations which may result in modification of the design and construction procedures.

In order to observe compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated, we recommend that all construction operations dealing with earth work and the foundations be observed by an experienced soils engineer. We can be retained to provide these services for you during construction. In addition, we can be retained to review the plans and specifications that have been prepared to check for substantial conformance with the conclusions and recommendations contained in our report.

# EXPLANATION OF FIELD & LABORATORY TEST DATA

The field and laboratory test results, as shown for each hole, are described below.

## 1. NATURAL MOISTURE CONTENT

The relationship between the natural moisture content and depth is significant in determining the subsurface moisture conditions. The Atterberg Limits for a sample should be compared to its natural moisture content and plotted on the Plasticity Chart in order to determine the soil classification.

## 2. SOIL PROFILE AND DESCRIPTION

Each soil stratum is classified and described noting any special conditions. The Modified Unified Classification System (MUCS) is used. The soil profile refers to the existing ground level at the time the hole was done. Where available, the ground elevation is shown. The soil symbols used are shown in detail on the soil classification chart.

## 3. TESTS ON SOIL SAMPLES

Laboratory and field tests are identified by the following and are on the logs:

- N - Standard Penetration Test (SPT) Blow Count. The SPT is conducted in the field to assess the in-situ consistency of cohesive soils and the relative density of non-cohesive soils. The N value recorded is the number of blows from a 63.5 kg hammer dropped 760 mm which is required to drive a 51 mm split spoon sampler 300 mm into the soil.
  
- SO<sub>4</sub> - Water Soluble Sulphate Content. Expressed in percent. Conducted primarily to determine requirements for the use of sulphate resistant cement. Further details on the water-soluble sulphate content are given in Section 6.
  
- $\gamma_D$  - Dry Unit Weight. Usually expressed in kN/m<sup>3</sup>.
  
- $\gamma_T$  - Total Unit Weight. Usually expressed in kN/m<sup>3</sup>.
  
- Q<sub>u</sub> - Unconfined Compressive Strength. Usually expressed in kPa and may be used in determining allowable bearing capacity of the soil.



- C<sub>u</sub> - Undrained Shear Strength. Usually expressed in kPa. This value is determined by either a direct shear test or by an unconfined compression test and may also be used in determining the allowable bearing capacity of the soil.
  
- C<sub>PEN</sub> - Pocket Penetrometer Reading. Usually expressed in kPa. Estimate of the undrained shear strength as determined by a pocket penetrometer.

The following tests may also be performed on selected soil samples and the results are given on separate sheets enclosed with the logs:

- Grain Size Analysis
- Standard or Modified Proctor Compaction Test
- California Bearing Ratio Test
- Direct Shear Test
- Permeability Test
- Consolidation Test
- Triaxial Test

#### 4. SOIL DENSITY AND CONSISTENCY

The SPT test described above may be used to estimate the consistency of cohesive soils and the density of cohesionless soils. These approximate relationships are summarized in the following tables:

**Table 1 Cohesive Soils**

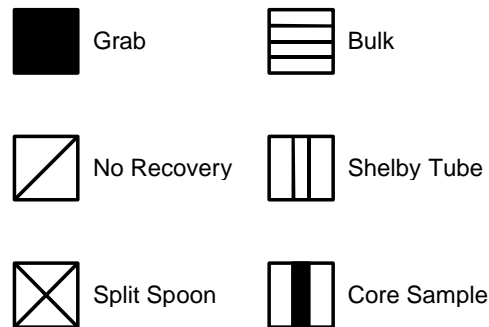
N	Consistency	C <sub>u</sub> (kPa) approx.
0 - 1	Very Soft	<10
1 - 4	Soft	10 - 25
4 - 8	Firm	25 - 50
8 - 15	Stiff	50 - 100
15 - 30	Very Stiff	100 - 200
30 - 60	Hard	200 - 300
>60	Very Hard	>300

**Table 2 Cohesionless Soils**

N	Density
0 - 5	Very Loose
5 - 10	Loose
10 - 30	Compact
30 - 50	Dense
>50	Very Dense

## 5. SAMPLE CONDITION AND TYPE

The depth, type, and condition of samples are indicated on the logs by the following symbols:



## 6. WATER SOLUBLE SULPHATE CONCENTRATION

The following table, from CSA Standard A23.1-14, indicates the requirements for concrete subjected to sulphate attack based upon the percentage of water-soluble sulphate as presented on the logs. CSA Standard A23.1-14 should be read in conjunction with the table.

**Table 3 Requirements for Concrete Subjected to Sulphate Attack\***

Class of exposure	Degree of exposure	Water-soluble sulphate (SO <sub>4</sub> ) <sup>†</sup> in soil sample, %	Sulphate (SO <sub>4</sub> ) in groundwater samples, mg/L <sup>‡</sup>	Water soluble sulphate (SO <sub>4</sub> ) in recycled aggregate sample, %	Cementing materials to be used <sup>§††</sup>	Performance requirements <sup>§,§§</sup>		
						Maximum expansion when tested using CSA A3004-C8 Procedure A at 23 °C, %		Maximum expansion when tested using CSA A3004-C8 Procedure B at 5 °C, % <sup>†††</sup>
						At 6 months	At 12 months <sup>††</sup>	At 18 months <sup>‡‡</sup>
S-1	Very severe	> 2.0	> 10 000	> 2.0	HS <sup>**</sup> , HSb, HSLb <sup>***</sup> or HSe	0.05	0.10	0.10
S-2	Severe	0.20–2.0	1500–10 000	0.60–2.0	HS <sup>**</sup> , HSb, HSLb <sup>***</sup> or HSe	0.05	0.10	0.10
S-3	Moderate (including seawater exposure*)	0.10–0.20	150–1500	0.20–0.60	MS, MSb, MSe, MSLb <sup>***</sup> , LH, LHb, HS <sup>**</sup> , HSb, HSLb <sup>***</sup> or HSe	0.10		0.10

\*For sea water exposure, also see Clause 4.1.1.5.

<sup>†</sup>In accordance with CSA A23.2-3B.

<sup>‡</sup>In accordance with CSA A23.2-2B.

<sup>§</sup>Where combinations of supplementary cementing materials and portland or blended hydraulic cements are to be used in the concrete mix design instead of the cementing materials listed, and provided they meet the performance requirements demonstrating equivalent performance against sulphate exposure, they shall be designated as MS equivalent (MSe) or HS equivalent (HSe) in the relevant sulphate exposures (see Clauses 4.1.1.6.2, 4.2.1.1, and 4.2.1.3, and 4.2.1.4).

<sup>\*\*</sup>Type HS cement shall not be used in reinforced concrete exposed to both chlorides and sulphates, including seawater. See Clause 4.1.1.6.3.

††The requirement for testing at 5 °C does not apply to MS, HS, MSb, HSb, and MSe and HSe combinations made without portland limestone cement.

‡‡ If the increase in expansion between 12 and 18 months exceeds 0.03%, the sulphate expansion at 24 months shall not exceed 0.10% in order for the cement to be deemed to have passed the sulphate resistance requirement.

§§For demonstrating equivalent performance, use the testing frequency in Table 1 of CSA A3004-A1 and see the applicable notes to Table A3 in A3001 with regard to re-establishing compliance if the composition of the cementing materials used to establish compliance changes.

\*\*\*Where MSLb or HSLb cements are proposed for use, or where MSe or HSe combinations include Portland-limestone cement, they must also contain a minimum of 25% Type F fly ash or 40% slag or 15% metakaolin (meeting Type N pozzolan requirements) or a combination of 5% Type SF silica fume with 25% slag or a combination of 5% Type SF silica fume with 20% Type F fly ash. For some proposed MSLb, HSLb, and MSe or HSe combinations that include Portland-limestone cement, higher SCM replacement levels may be required to meet the A3004-C8 Procedure B expansion limits. Due to the 18-month test period, SCM replacements higher than the identified minimum levels should also be tested. In addition, sulphate resistance testing shall be run on MSLb and HSLb cement and MSe or HSe combinations that include Portland-limestone cement at both 23 °C and 5 °C as specified in the table.

†††If the expansion is greater than 0.05% at 6 months but less than 0.10% at 1 year, the cementing materials combination under test shall be considered to have passed.

## 7. SOIL CORROSIVITY

The following table, from the Handbook of Corrosion Engineering (Roberge, 1999) indicates the corrosivity rating can be obtained from the soil resistivity, presented on the logs.

**Table 4 Corrosivity Ratings Based on Soil Resistivity**

Soil Resistivity (ohm-cm)	Corrosivity Rating
>20,000	Essentially non-corrosive
10,000 – 20,000	Mildly corrosive
5,000 – 10,000	Moderately corrosive
3,000 – 5,000	Corrosive
1,000 – 3,000	Highly corrosive
<1,000	Extremely corrosive

## 8. GROUNDWATER TABLE

The groundwater table is indicated by the equilibrium level of water in a standpipe installed in a testhole or test pit. This level is generally taken at least 24 hours after installation of the standpipe. The groundwater level is subject to seasonal variations and is usually highest in the spring. The symbol on the logs indicating the groundwater level is an inverted solid triangle (▼).

**TABLE 1 Soil Classification Chart**

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup>				Soil Classification	
				Group Symbol	Group Name <sup>B</sup>
COARSE-GRAINED SOILS	Gravels (More than 50 % of coarse fraction retained on No. 4 sieve)	Clean Gravels (Less than 5 % fines <sup>C</sup> )	Cu ≥ 4.0 and 1 ≤ Cc ≤ 3.0 <sup>D</sup>	GW	Well-graded gravel <sup>E</sup>
			Cu < 4.0 and/or [Cc < 1 or Cc > 3.0] <sup>D</sup>	GP	Poorly graded gravel <sup>E</sup>
		Gravels with Fines (More than 12 % fines <sup>C</sup> )	Fines classify as ML or MH	GM	Silty gravel <sup>E,F,G</sup>
			Fines classify as CL or CH	GC	Clayey gravel <sup>E,F,G</sup>
More than 50 % retained on No. 200 sieve	Sands (50 % or more of coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5 % fines <sup>H</sup> )	Cu ≥ 6.0 and 1.0 ≤ Cc ≤ 3.0 <sup>D</sup>	SW	Well-graded sand <sup>I</sup>
			Cu < 6.0 and/or [Cc < 1.0 or Cc > 3.0] <sup>D</sup>	SP	Poorly graded sand <sup>I</sup>
		Sands with Fines (More than 12 % fines <sup>H</sup> )	Fines classify as ML or MH	SM	Silty sand <sup>F,G,I</sup>
			Fines classify as CL or CH	SC	Clayey sand <sup>F,G,I</sup>
FINE-GRAINED SOILS	Silts and Clays	inorganic	PI > 7 and plots on or above "A" line <sup>J</sup>	CL	Lean clay <sup>K,L,M</sup>
			PI < 4 or plots below "A" line <sup>J</sup>	ML	Silt <sup>K,L,M</sup>
		organic	$\frac{\text{Liquid limit} - \text{oven dried}}{\text{Liquid limit} - \text{not dried}} < 0.75$	OL	Organic clay <sup>K,L,M,N</sup> Organic silt <sup>K,L,M,O</sup>
			PI plots on or above "A" line	CH	Fat clay <sup>K,L,M</sup>
50 % or more passes the No. 200 sieve	Silts and Clays	inorganic	PI plots below "A" line	MH	Elastic silt <sup>K,L,M</sup>
			$\frac{\text{Liquid limit} - \text{oven dried}}{\text{Liquid limit} - \text{not dried}} < 0.75$	OH	Organic clay <sup>K,L,M,P</sup> Organic silt <sup>K,L,M,Q</sup>
		organic	PI plots on or above "A" line	PT	Peat
			PI plots below "A" line		
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor		PT	Peat	

<sup>A</sup>Based on the material passing the 3-in. (75-mm) sieve.

<sup>B</sup>If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup>Gravels with 5 to 12 % fines require dual symbols:

- GW-GM well-graded gravel with silt
- GW-GC well-graded gravel with clay
- GP-GM poorly graded gravel with silt
- GP-GC poorly graded gravel with clay

$${}^D C_u = D_{60}/D_{10} \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

<sup>E</sup>If soil contains ≥15 % sand, add "with sand" to group name.

<sup>F</sup>If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>G</sup>If fines are organic, add "with organic fines" to group name.

<sup>H</sup>Sands with 5 to 12 % fines require dual symbols:

- SW-SM well-graded sand with silt
- SW-SC well-graded sand with clay
- SP-SM poorly graded sand with silt
- SP-SC poorly graded sand with clay

<sup>I</sup>If soil contains ≥15 % gravel, add "with gravel" to group name.

<sup>J</sup>If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

<sup>K</sup>If soil contains 15 to <30 % plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup>If soil contains ≥30 % plus No. 200, predominantly sand, add "sandy" to group name.

<sup>M</sup>If soil contains ≥30 % plus No. 200, predominantly gravel, add "gravelly" to group name.

<sup>N</sup>PI ≥ 4 and plots on or above "A" line.

<sup>O</sup>PI < 4 or plots below "A" line.

<sup>P</sup>PI plots on or above "A" line.

<sup>Q</sup>PI plots below "A" line.

[C136 Test Method for Sieve Analysis of Fine and Coarse Aggregates](#)

[C702 Practice for Reducing Samples of Aggregate to Testing Size](#)

[D653 Terminology Relating to Soil, Rock, and Contained Fluids](#)

[D1140 Test Methods for Determining the Amount of Material Finer than 75-µm \(No. 200\) Sieve in Soils by Washing](#)

[D2216 Test Methods for Laboratory Determination of Water \(Moisture\) Content of Soil and Rock by Mass](#)

[D2488 Practice for Description and Identification of Soils \(Visual-Manual Procedures\)](#)

[D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction](#)

[D4083 Practice for Description of Frozen Soils \(Visual-Manual Procedure\)](#)

[D4318 Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils](#)

[D4427 Classification of Peat Samples by Laboratory Testing](#)

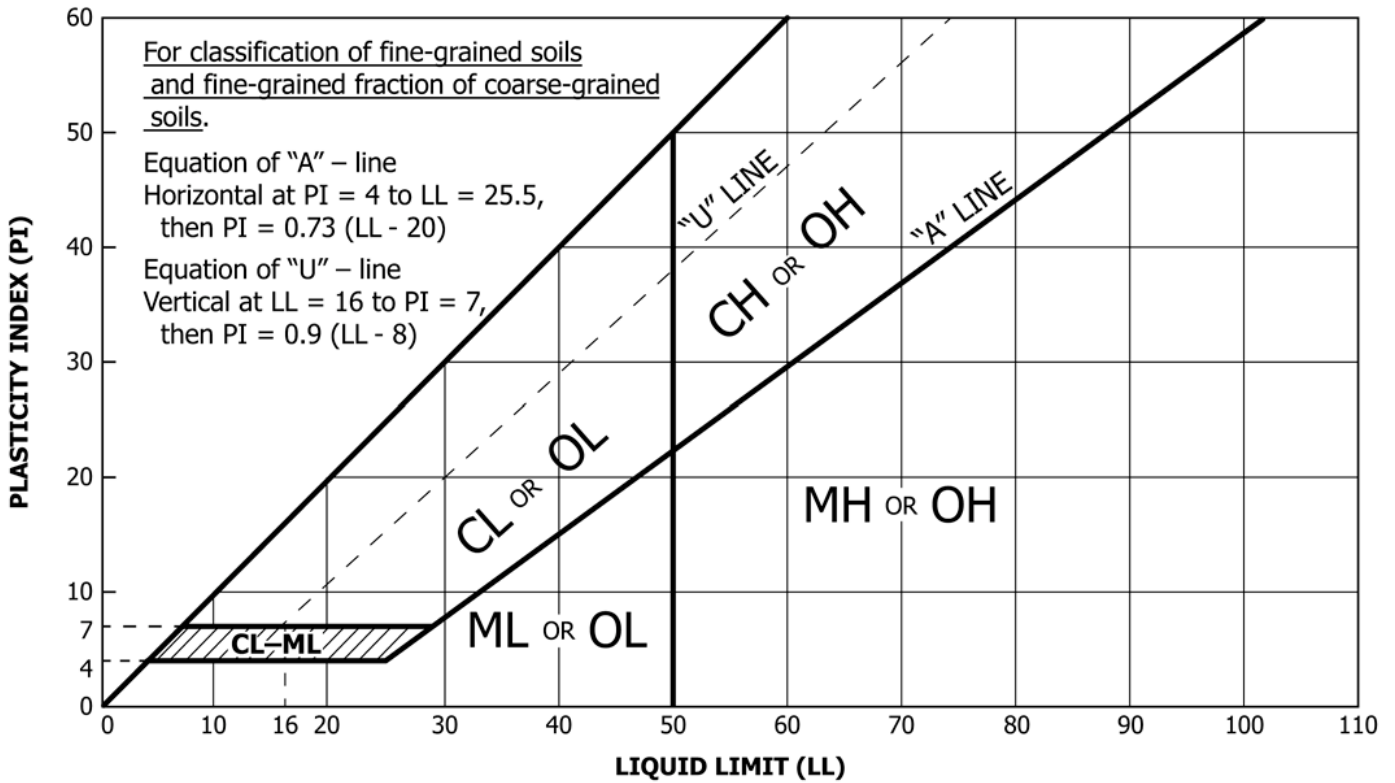
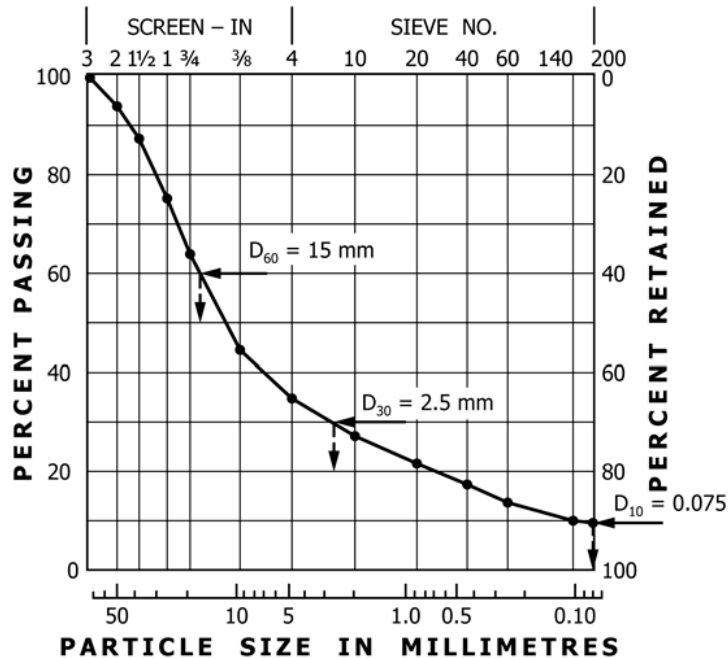


FIG. 4 Plasticity Chart

**SIEVE ANALYSIS**



$$Cu = \frac{D_{60}}{D_{10}} = \frac{15}{0.075} = 200 \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}} = \frac{(2.5)^2}{0.075 \times 15} = 5.6$$

FIG. 5 Cumulative Particle-Size Plot

## Site Investigation Requirements for Public Works Street Projects

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### General

This guideline provides basic principles and requirements for site investigations and testing with which to guide the designer in the preparation of proposals and completion of their investigations. Irrespective of the requirements listed in this document, it is important that the Engineer clearly outlines what assumptions were made in estimating the effort and resources necessary to complete the scope of work. A proposal should be submitted for approval to the City’s Project Manager.

When using this guideline, the designer remains responsible for the proposed plan in accordance to good engineering standards that address the specific needs and site conditions of the project. Without limiting that broad and general obligation, this guideline should be the minimum requirement.

Boreholes and pavement core spacing, and material testing guidelines presented in this guide are only applicable to pavement investigations. Site investigation and testing may also be conducted as per common industry practice for other road elements such as sidewalks, boulevards, and medians. The City’s Project Manager should be notified of any unusual conditions or difficulties encountered, and any changes made in the investigation program.

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### New Construction and Reconstruction Projects

The number of boreholes can be calculated using Table 1.

Table 1 : Number of Boreholes and Depths

Lanes/Locals	Industrials and Collectors	Arterials
Number of boreholes = $0.1 \times (\text{Street area (m}^2\text{)})^{0.45}$	Number of boreholes = $0.1 \times (\text{Street area (m}^2\text{)})^{0.46}$	Number of boreholes = $0.1 \times (\text{Street area (m}^2\text{)})^{0.48}$
A minimum of two boreholes, 2 m ± 150 mm depth from the bottom of the proposed or the existing pavement per project location.	A minimum of three boreholes, 2.5 m ± 150 mm depth from the bottom of the proposed or the existing pavement per project location.	A minimum of three boreholes, 2.5 m ± 150 mm depth from the bottom of the proposed or the existing pavement per project location.

<sup>1</sup>If previous soil information is available and relevant, the number of boreholes can be reduced - confirm with the City’s Project Manager.

<sup>2</sup>Additional boreholes should be undertaken where adverse soil conditions are expected or encountered during the course of field drilling.

Offset the boreholes as appropriate to provide coverage across the full width of the proposed construction. Boreholes should not be advanced on utility cut patching. The locations of the boreholes should be shown clearly on a scaled plan map of the site under investigation.

The following factors should be considered while selecting borehole locations:

- Visual sub-grade variability;
- Significant pavement failures (rutting, fatigue cracking, settlement and faulting) which are often associated with sub-grade issues to diagnose the cause of these conditions; and,
- Exiting buried infrastructure.

Information regarding the sampler type, date and time of sampling, sample type and color, sample depth, ground water elevations, boreholes location, etc. should be shown in log form using notations and a graphical system. The log form should distinguish between visual evaluations of soil samples in the field versus a more precise laboratory evaluation supported by tests. Detailed boring logs including the results of laboratory tests should be included in the geotechnical report.

Measure and identify pavement materials (thickness and types of pavement structure materials). Photograph core samples recovered from the pavement surface (concrete, asphalt or composite).

Visual identification of the soil must be reported at the following depths from the bottom of the proposed or the existing pavement – 0.6 m, 0.9 m, 1.2 m, 1.6 m, 2.0 m, and 2.5 m (if required). Ensure that each soil type encountered in the boreholes is identified. The visual identification should describe the existing pavement structure, if any, including the materials encountered and the layer thicknesses.

Backfill boreholes with granular fill. Patch pavement surface with an approved cold patch asphalt or rapid set cementitious product to match the surface pavement type.

Where significant embankments are proposed along the roadway, specific testing and recommendations for the fill materials and placement should be made including expected settlements, load compensation requirements, and potential buoyancy of the embankment. The size, complexity and extent of the testing program will depend primarily on the type, height and size of embankment as well as the expected imported soil conditions – confirm with the City's Project Manager.

For embankments less than 100 m in length, a minimum of two boreholes are required. For embankments more than 100 m in length, the spacing between boreholes along the length of the embankment should not exceed 75 m with a minimum of two (2) boreholes. Extend the boreholes depths to a minimum of 2 m ± 150 mm below the proposed sub-grade level. At critical locations and where embankment heights exceed 1.0 m, a minimum of two (2) boreholes are required in the transverse direction to define the existing geological conditions for stability analyses.

Laboratory Testing Program

Determine the moisture content of the soils encountered in every borehole in accordance with ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass, at the following depths from the bottom of the proposed or existing pavement – 0.6 m, 0.9 m, 1.2 m, 1.6 m, 2.0 m, and 2.5 m (if required).

Classify and test the anticipated sub-grade soil in accordance with Table 2. The sub-grade soil is the material on which the pavement structure will be built; 0.6 m, 0.9 m, and 1.2 m may be used for locals, collectors, and arterials, respectively – confirm with the City’s Project Manager.

Table 2: Boreholes Testing Frequency

Lanes/Locals	Collectors	Arterials
Number of boreholes = $0.1 \times (\text{Street area (m}^2\text{)})^{0.4}$	Number of boreholes = $0.1 \times (\text{Street area (m}^2\text{)})^{0.41}$	Number of boreholes = $0.1 \times (\text{Street area (m}^2\text{)})^{0.42}$
A minimum of two boreholes should be tested per project location.	A minimum of three boreholes should be tested per project location.	A minimum of three boreholes should be tested per project location.

The testing program should include:

- Particle Size Analysis – ASTM D6913 Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis and ASTM D7928 Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis;
- Atterberg Limits – ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; and,
- California Bearing Ratio (CBR) – ASTM D1883 Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils. CBR test shall be performed at 95 % maximum dry density and optimum water content. All samples shall be soaked prior to testing.

The sub-grade classification should be in accordance with:

- ASTM D3282 - Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes; and,
- ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes.



The designer should consider the site specific factors listed above for borehole locations while selecting testing location and frequency.

More advanced testing may be required depending upon site conditions including direct shear tests, triaxial tests, unconfined compressive tests, permeability tests, consolidation tests, point load tests, slaking tests, pinhole dispersion tests or other tests as deemed appropriate and justified by the designer – confirm with the City’s Project Manager.

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## **Rehabilitation Projects**

For any rehabilitation projects (Concrete, Asphalt or Composite), measure and identify pavement materials (thickness and types of pavement structure materials). Photograph core samples recovered from the pavement.

For concrete rehabilitation projects, 150 mm-diameter cores shall be taken at joints to identify proper rehabilitation strategies (i.e. mill/fill, partial depth repair, full depth repair). The number and location of cores will be determined by the designer after visiting the site – confirm with the City’s Project Manager. A minimum of two (2) cores shall be collected mid-slab to determine the existing pavement thickness and concrete strength in accordance with CSA A23.2-14C – wet condition.

Factors that should be considered while selecting pavement core locations include but are not limited to:

- Significant variation in joint condition;
- Pumping slabs, cracks or distress and perceived moisture issues from side slopes/edge cracking; and,
- Significant changes in pavement structure thickness.

Non-destructive testing (i.e. Falling Weight Deflectometer and Ground Penetrating Radar) can be used to identify layer thicknesses and structural adequacy, load transfer at joints, and appropriate rehabilitation strategies, including partial depth repairs, full depth repairs, slab replacement, and overlays – confirm with the City’s Project Manager.

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-01B  
 LOCATION: Midland Street - 6 m S of train tracks, 1.2 m E of W curb      PROJECT NO.: 60672138  
 CONTRACTOR: Maple Leaf Drilling      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS	UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0	ASPH		ASPHALT (150 mm)							
	FILL		GRANULAR FILL (150 mm) - sandy, gravelly - brown, moist		G1					
	FILL		CLAY (Fill) - grey, firm, moist - high plasticity		G2					
1					G3					
			CLAY - light brown, soft to firm, moist - low plasticity		B1				(G2): Gravel 0.0%, Sand 12.9%, Silt 32.0%, Clay 55.1%	1
					G4				(B1) Soaked CBR: 3.9%, SPMDD: 1530 kg/m3, OMC: 25.4%	
					G5					
2	CL				G6					
			- wet below 2.4 m							
3			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.							

LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 11/23/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1



LOG OF TEST HOLE 2022-01-10-MIDLAND.GPJ UMA WINN.GDT 3/21/22

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-02B  
 LOCATION: Midland Street - 45 m N of train tracks, 2.5 m W of E curb      PROJECT NO.: 60672138  
 CONTRACTOR: Maple Leaf Drilling      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE      GRAB      SHELBY TUBE      SPLIT SPOON      BULK      NO RECOVERY      CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS	UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0	ASPH CONC FILL	ASPHALT (50 mm) CONCRETE (100 mm) GRANULAR FILL (100 mm) - sandy, gravelly - brown, moist			G1	~45				
	FILL	CLAY (Fill) - some organics - grey, firm, moist - high plasticity			G2	~55				
1	CH	CLAY - brown, firm, moist - high plasticity			G3 B2 G4	~65 ~65 ~65			(B2) Soaked CBR: 4.1%, SPMDD: 1565 kg/m3, OMC: 24.8%	1
2	CL	CLAY - light brown, soft to firm, moist - low plasticity			G5	~75				2
3			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.		G6	~85				3

LOG OF TEST HOLE 2022-01-10-MIDLAND.GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 11/23/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-03B  
 LOCATION: 30 Midland Street - 2.9 m E of W curb      PROJECT NO.: 60672138  
 CONTRACTOR: Maple Leaf Drilling      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS	UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0	ASPH		ASPHALT (75 mm)							
	CONC		CONCRETE (100 mm)							
	FILL		GRANULAR FILL (130 mm) - sandy, gravelly - brown, moist		G1					
	CH		CLAY - dark grey, firm, moist - high plasticity		G2					
1					G3				(G3): Gravel 0.7%, Sand 8.7%, Silt 32.3%, Clay 58.3%	1
	CL		CLAY - light brown, firm, moist - low plasticity		G4					
					G5					
2	CH		CLAY - brown, firm, moist - high plasticity		G6					
3			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.							

LOG OF TEST HOLE 2022-01-10-MIDLAND.GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 11/23/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-04B  
 LOCATION: Midland Street - 9 m S of entrance to 1424 Midland Street, 3.6 m W of E curb      PROJECT NO.: 60672138  
 CONTRACTOR: Maple Leaf Drilling      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)			
0	ASPH	■	ASPHALT (75 mm)								
	CONC	■	CONCRETE (75 mm)								
	FILL	▨	GRANULAR FILL (150 mm) - sandy, gravelly - brown, moist								
	FILL	▨	CLAY (Fill) - dark grey, firm, moist - high plasticity		G1	~45					
		▨	CLAY - dark grey, firm, moist - high plasticity - brown below 0.8 m		G2	~55					
1		▨			G3	~65					1
		▨			G4	~75					
	CH	▨			G5	~85					
2		▨			G6	~95					2
3			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.								3

LOG OF TEST HOLE 2022-01-10-MIDLAND.GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 11/23/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-05B  
 LOCATION: 135 Midland Street - 2.4 m W of E curb      PROJECT NO.: 60672138  
 CONTRACTOR: Maple Leaf Drilling      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)				
0	ASPH CONC FILL		ASPHALT (75 mm) CONCRETE (75 mm) GRANULAR FILL (150 mm) - sandy, gravelly - brown, moist									
	CH		CLAY - dark grey, firm, moist - high plasticity		G1	●						
					G2	●						
1	CL		CLAY - light brown, soft to firm, moist - low plasticity		G3 B1	●						
					G4	●					(G4): Gravel 0.3%, Sand 12.8%, Silt 72.8%, Clay 14.1%	
	CH		CLAY - brown, firm, moist - high plasticity		G5	●						
2					G6	●						
3			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.									

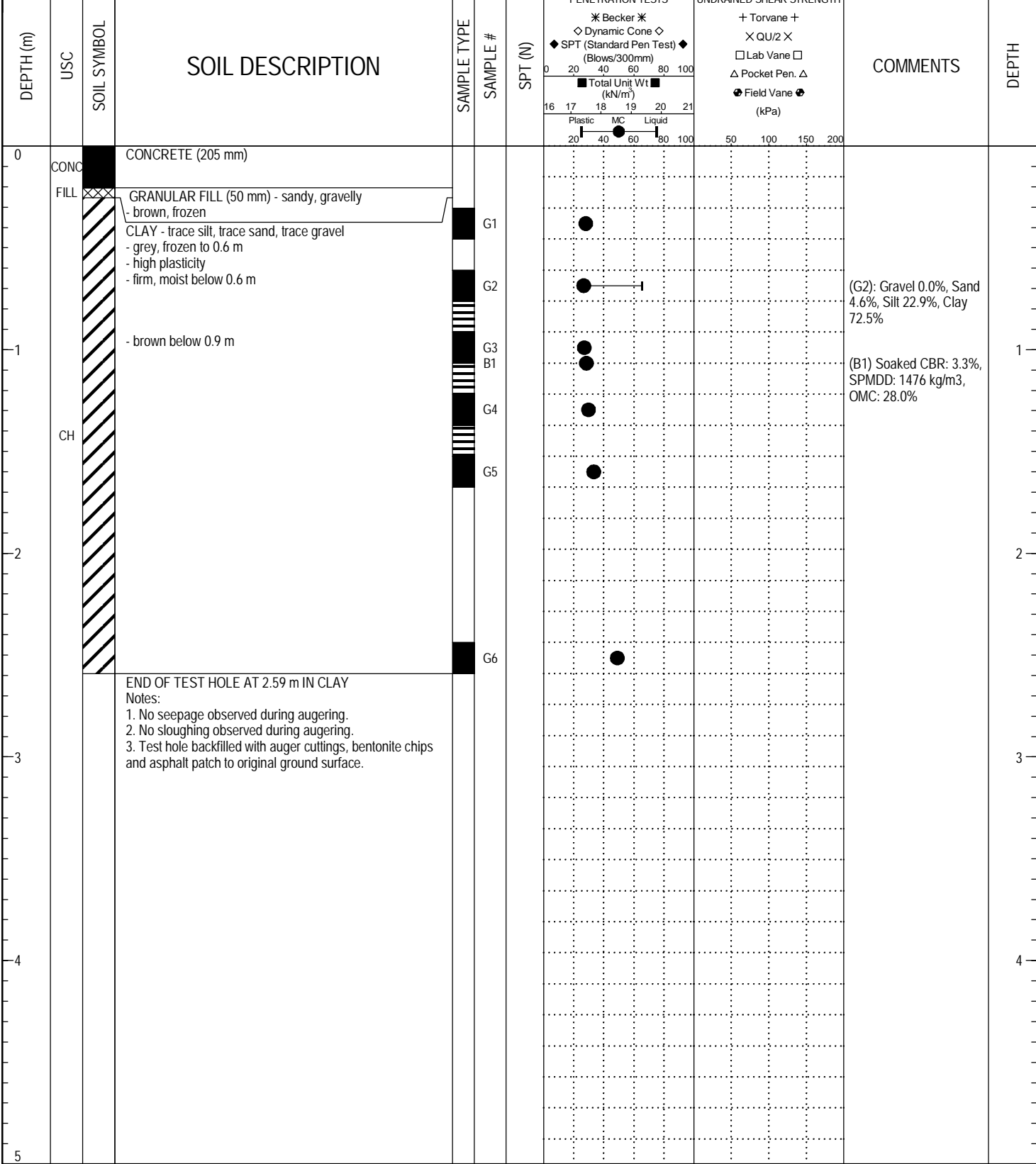
LOG OF TEST HOLE 2022-01-10-MIDLAND.GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 11/23/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-01C  
 LOCATION: Milt Stegall Drive - 23 m N of Yukon Ave, 5.1 m E of W curb      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE       GRAB       SHELBY TUBE       SPLIT SPOON       BULK       NO RECOVERY       CORE



LOG OF TEST HOLE 2022-01-20-MILT\_STEGALL.GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/21/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-02C  
 LOCATION: 1090 Milt Stegall Drive - 1.7 m W of E curb      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS	UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0	CONC		CONCRETE (230 mm)							
0.6			CLAY - grey, frozen to 0.6 m - high plasticity  - firm, moist below 0.6 m		G1	~45				
					G2	~45				
1					G3	~45				
	CH				G4	~45	MC		(G4): Gravel 0.0%, Sand 2.4%, Silt 18.9%, Clay 78.7%	
					G5	~45				
2			- brown below 1.8 m		G6	~45				
2.59			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.							

LOG OF TEST HOLE 2022-01-20-MILT\_STEGALL.GPJ UMA WINN.GDT 3/21/22

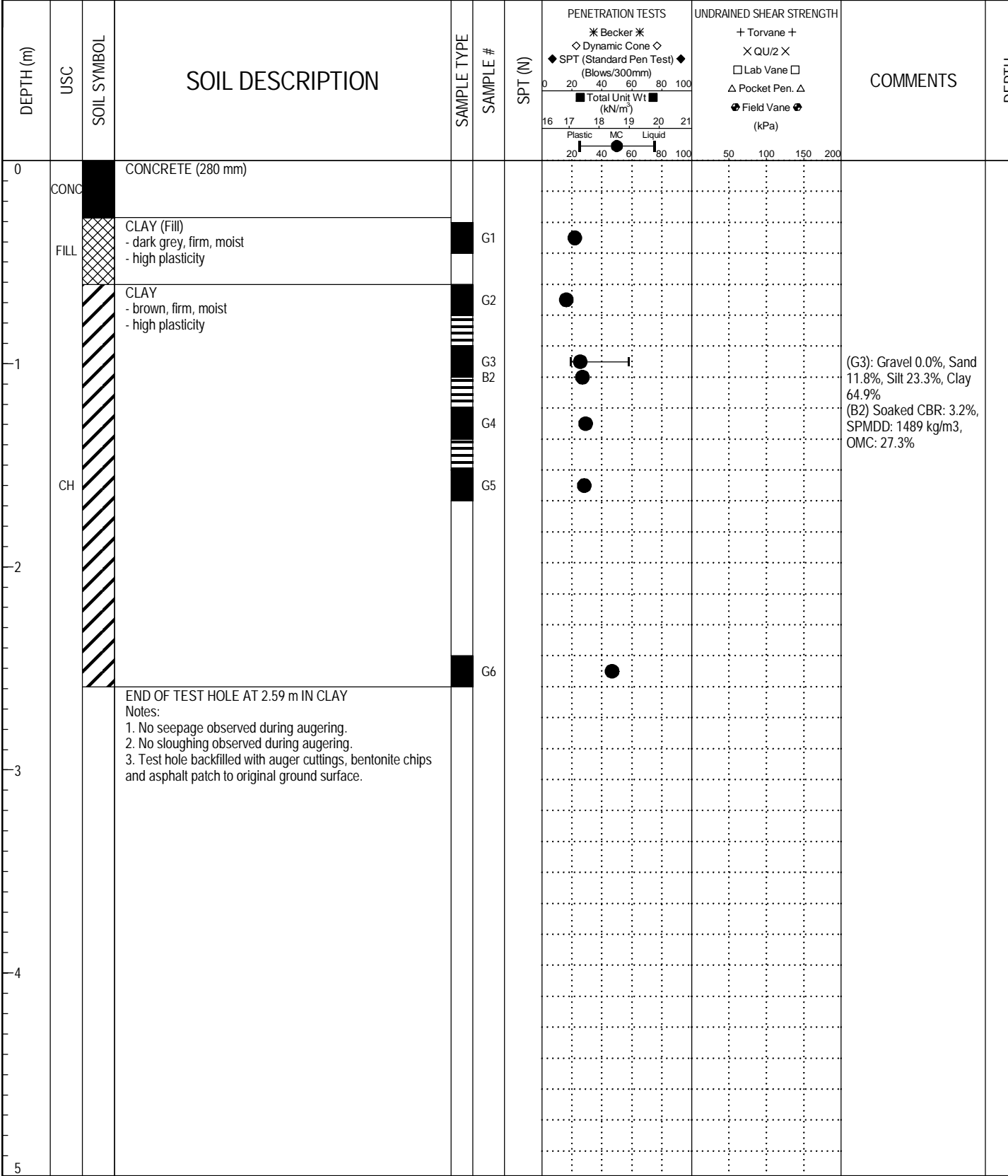


LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/21/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1



PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-03C  
 LOCATION: 1100 Milt Stegall Drive - 1.5 m E of W curb      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE       GRAB       SHELBY TUBE       SPLIT SPOON       BULK       NO RECOVERY       CORE



LOG OF TEST HOLE 2022-01-20-MILT STEGALL.GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/21/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-01D  
 LOCATION: Murray Park Road (EB) - 2.5 m S of Yellow Divider Line, 170 m E of Sturgeon Rd.      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS	UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0	ASPH		ASPHALT (300 mm)							
	FILL		GRANULAR FILL (760 mm) - sandy, gravelly - brown, moist							
	ML		SILT (Till) - sandy - light brown, dry to moist - low plasticity		B1 G4 G5 G6		* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³) Plastic MC Liquid 20 40 60 80 100	+ Torvane + X QU/2 X □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa) 50 100 150 200	(B1) Soaked CBR: 3.3%, SPMDD: 1823 kg/m3, OMC: 15.7% (G4): Gravel 2.4%, Sand 39.9%, Silt 38.2%, Clay 19.5%	
3			END OF TEST HOLE AT 2.59 m IN SILT (Till) Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.							

LOG OF TEST HOLE 2022-01-20-MURRAY PARK RD.GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/21/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-02D  
 LOCATION: Murray Park Road (WB) - 2.2 m N of Yellow Divider Line, 209 m E of Sturgeon Rd.      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE       GRAB       SHELBY TUBE       SPLIT SPOON       BULK       NO RECOVERY       CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS	UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0	ASPH		ASPHALT (265 mm)							
	FILL		GRANULAR FILL (190 mm) - sandy, gravelly - brown, moist							
	CH		CLAY - brown, soft to firm, moist - high plasticity							
	ML		SILT (Till) - sandy - light brown, dry to moist - low plasticity		G2					
					G3					
					B2				(B2) Soaked CBR: 3.5%, SPMDD: 1848 kg/m3, OMC: 14.3%	1
					G4					
					G5					
					G6					
			END OF TEST HOLE AT 2.59 m IN SILT (Till) Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.							

LOG OF TEST HOLE 2022-01-20-MURRAY PARK RD.GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/21/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-03D  
 LOCATION: Murray Park Road - 8.8 m N of parking entrance to 300 Cree Cre., 80 m W of Cree Cre.      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH	
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + X QU/2 X □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)				
0	ASPH		ASPHALT (250 mm)									
		CH	CLAY - grey, frozen to 0.6 m - high plasticity  - firm, moist below 0.6 m		G1	●						
					G2	●						
1					G3	●	—				(G3): Gravel 0.0%, Sand 6.8%, Silt 22.1%, Clay 71.1%	1
					G4	●						
					G5	●						
					G6	●						
3			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.								3	

LOG OF TEST HOLE 2022-01-20-MURRAY PARK RD.GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/21/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-04D  
 LOCATION: Murray Park Road (EB) - 7.0 m N of S curb, 38 m W of Cree Crescent      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):  
 SAMPLE TYPE       GRAB       SHELBY TUBE       SPLIT SPOON       BULK       NO RECOVERY       CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)			
0	ASPH		ASPHALT (205 mm)								
	FILL		CLAY (Fill) - grey, frozen	<input checked="" type="checkbox"/>	G1						
	CH		CLAY - brown, firm, moist - high plasticity	<input checked="" type="checkbox"/>	G2						
1				<input checked="" type="checkbox"/>	G3						1
				<input checked="" type="checkbox"/>	G4						
				<input checked="" type="checkbox"/>	G5						
2	ML		SILT (Till) - sandy - light brown, dry to moist - low plasticity	<input checked="" type="checkbox"/>	G6						2
				<input checked="" type="checkbox"/>							
3			END OF TEST HOLE AT 2.59 m IN SILT (Till) Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.								3
4											4
5											5

LOG OF TEST HOLE 2022-01-20-MURRAY PARK RD.GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/21/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-05D  
 LOCATION: Murray Park Road - WB Turning Lane - 10.5 m N of S curb, 14 m W of Cree Crescent      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS	UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0	ASPH		ASPHALT (75 mm)							
	CONC		CONCRETE (190 mm)							
	CL		CLAY - with sand - light brown, firm, moist - low plasticity		G1					
					G2				(G2): Gravel 2.4%, Sand 22.5%, Silt 35.4%, Clay 39.7%	
1			SILT (Till) - sandy - light brown, dry to moist - low plasticity		G3					1
					G4					
	ML				G5					
					G6					
2.59			END OF TEST HOLE AT 2.59 m IN SILT (Till)							
3			Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.							3
4										4
5										5

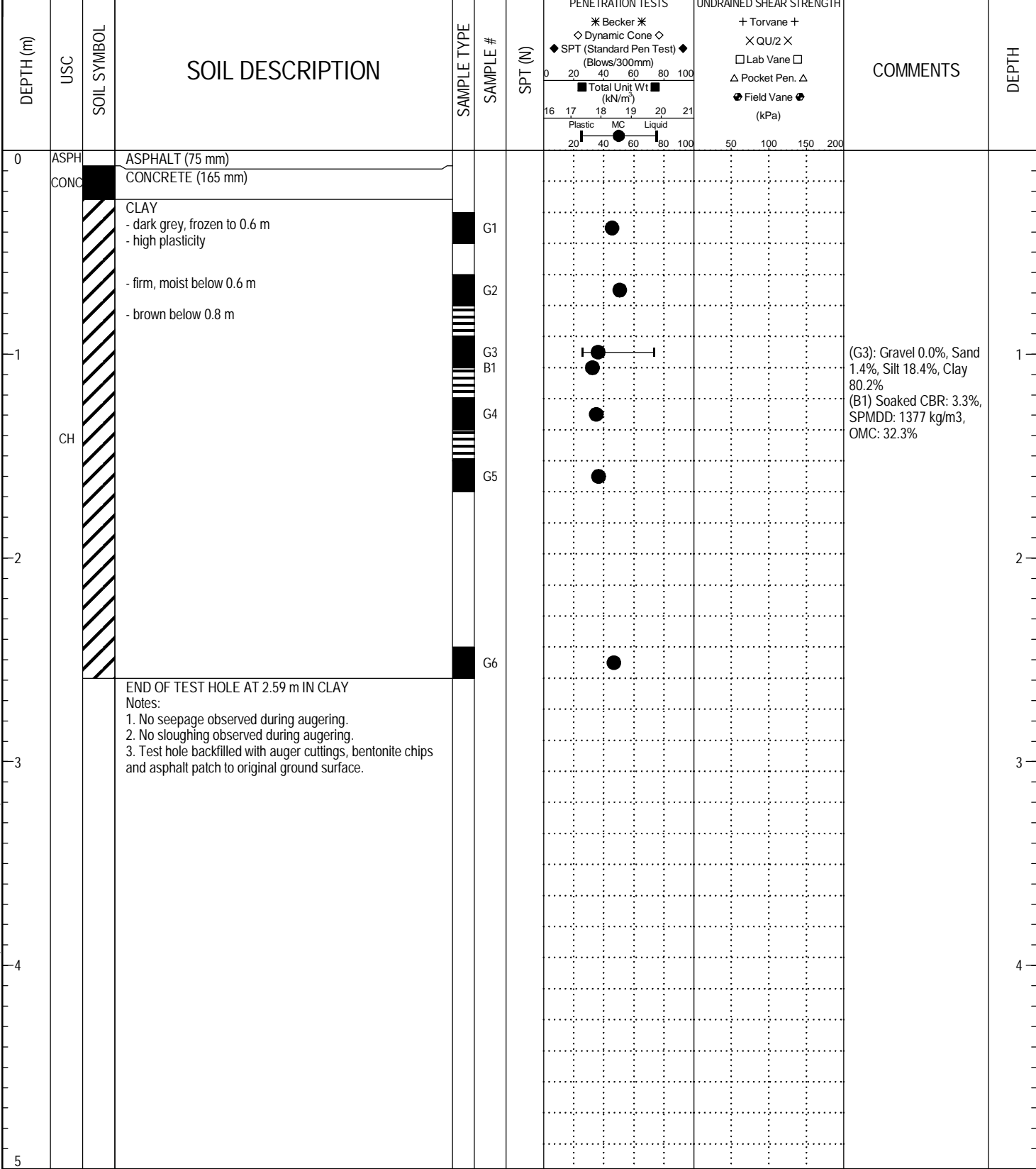
LOG OF TEST HOLE 2022-01-20-MURRAY PARK RD.GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/21/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-01G  
 LOCATION: 1540 Saskatchewan Avenue - 4.3 m N of S curb      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE



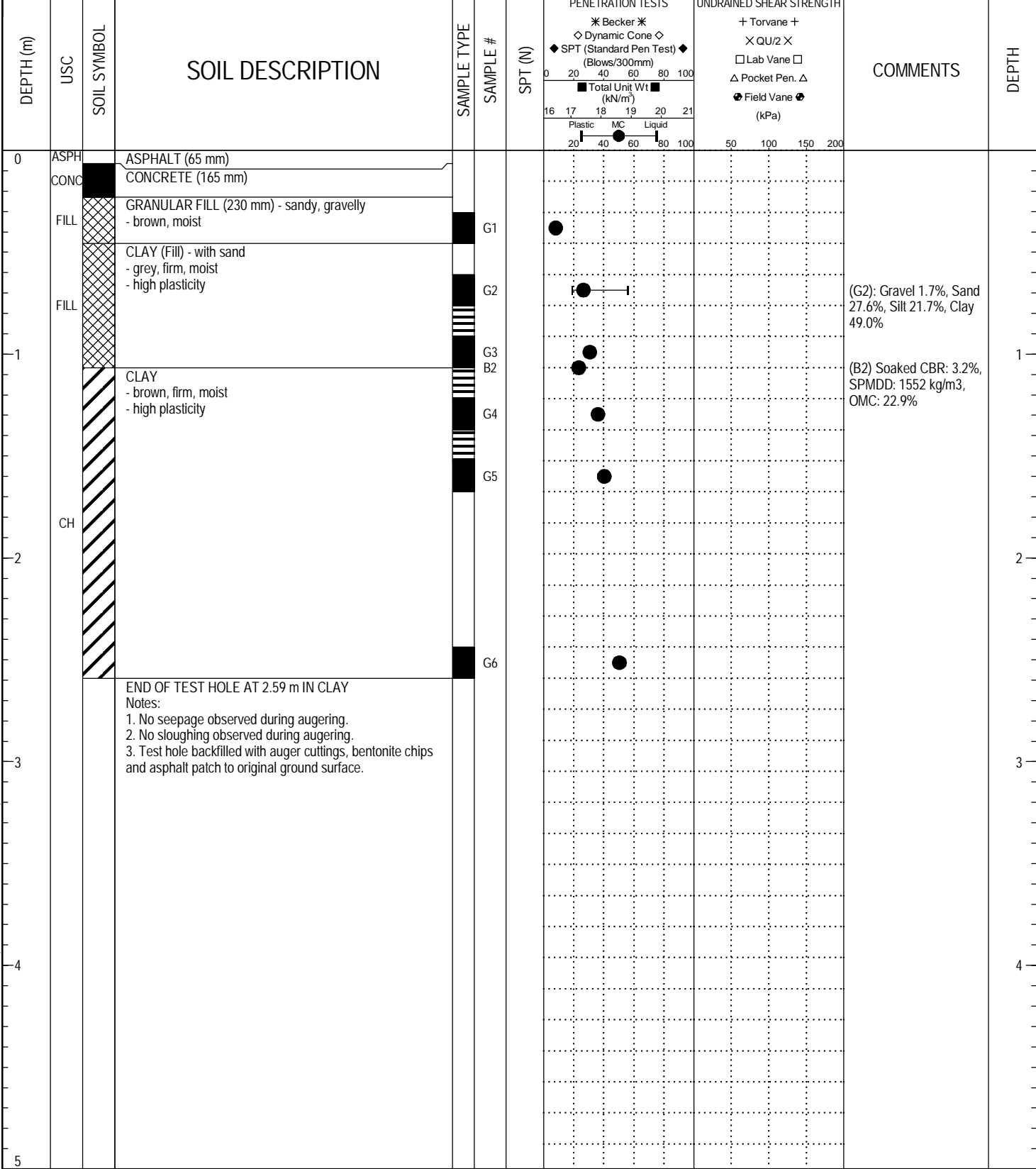
LOG OF TEST HOLE 2022-01-24-SASKATCHEWAN (KING EDWARD - CENTURY).GPJ\_UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/20/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-02G  
 LOCATION: Saskatchewan Avenue - 5.3 m N of S curb, 18 m E of Bradford St.      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE      GRAB      SHELBY TUBE      SPLIT SPOON      BULK      NO RECOVERY      CORE



LOG OF TEST HOLE 2022-01-24-SASKATCHEWAN (KING EDWARD - CENTURY).GPJ\_UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/20/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1



PROJECT: 2022 Local Streets Package No. 22-RI-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH21-03G
LOCATION: 950 Saskatchewan Avenue - 4.0 m N of S curb		PROJECT NO.: 60672138
CONTRACTOR: Paddock Drilling Ltd.	METHOD: Track Rig - 125 mm SSA	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + X QU/2 X □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ●	(kPa)			
0	ASPH CONC		ASPHALT (75 mm) CONCRETE (150 mm)									
	CH		CLAY - dark grey, frozen		G1							
					G2							
1	CL		CLAY - light brown, firm, moist - low plasticity		G3							1
					G4							
			- wet below 1.5 m		G5							
2	CH		CLAY - brown, firm, moist - high plasticity		G6							2
3			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.									3
4												4
5												5

LOG OF TEST HOLE 2022-01-24-SASKATCHEWAN (KING EDWARD - CENTURY).GPJ\_UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao	COMPLETION DEPTH: 2.59 m
REVIEWED BY: Ryan Harras	COMPLETION DATE: 12/20/21
PROJECT ENGINEER: Ryan C.	Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-04G  
 LOCATION: Saskatchewan Avenue - 2.4 m N of S curb, 33 m E of King Edward St.      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)			
0	ASPH		ASPHALT (65 mm)								
	CONC		CONCRETE (215 mm)								
	FILL		GRANULAR FILL (360 mm) - sandy, gravelly - brown, moist		G1	~45					
	FILL		CLAY (Fill) - with gravel - dark grey, firm, moist - intermediate plasticity		G2	~55					
1	FILL		SAND (Fill) - silty, clayey, with gravel - brown, moist - low plasticity		G3	~65					
	FILL				G4	~75				(G4): Gravel 16.3%, Sand 49.5%, Silt 17.7%, Clay 16.5%	
	FILL				G5	~85					
	FILL				G6	~95					
3			END OF TEST HOLE AT 2.59 m IN SAND (Fill) Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.								

LOG OF TEST HOLE 2022-01-24-SASKATCHEWAN (KING EDWARD - CENTURY).GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/20/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-011  
 LOCATION: Saskatchewan Avenue - 4.1 m N of S Curb, 54 m W of King Edward St.      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS	UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0	ASPH		ASPHALT (90 mm)							
	CONC		CONCRETE (190 mm)							
			CLAY - dark grey, frozen to 0.6 m - high plasticity  - firm, moist below 0.6 m	<input checked="" type="checkbox"/>	G1					
				<input checked="" type="checkbox"/>	G2				(G2): Gravel 0.0%, Sand 5.4%, Silt 25.9%, Clay 68.7%	
1				<input checked="" type="checkbox"/>	G3					1
				<input checked="" type="checkbox"/>	G4					
	CH		- brown below 1.5 m	<input checked="" type="checkbox"/>	G5					
2				<input checked="" type="checkbox"/>	G6					2
			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.							
3										3
4										4
5										5

LOG OF TEST HOLE 2022-01-24-SASKATCHEWAN (SHERWIN - KING EDWARD).GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/20/21  
 PROJECT ENGINEER: Ryan C      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-021  
 LOCATION: Saskatchewan Avenue - 1.7 m N of S curb, 27 m W of Berry St.      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS	UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0	ASPH		ASPHALT (90 mm)							
	CONC		CONCRETE (150 mm)							
			CLAY - dark grey, frozen to 0.6 m - high plasticity  - firm, moist below 0.6 m		G1					
					G2					
1					G3				(G3): Gravel 0.0%, Sand 2.4%, Silt 13.5%, Clay 84.1% (B1) Soaked CBR: 2.7%, SPMDD: 1393 kg/m3, OMC: 32.2%	1
					B1					
					G4					
	CH		- brown below 1.2 m		G5					
2					G6					2
3			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.							3
4										4
5										5

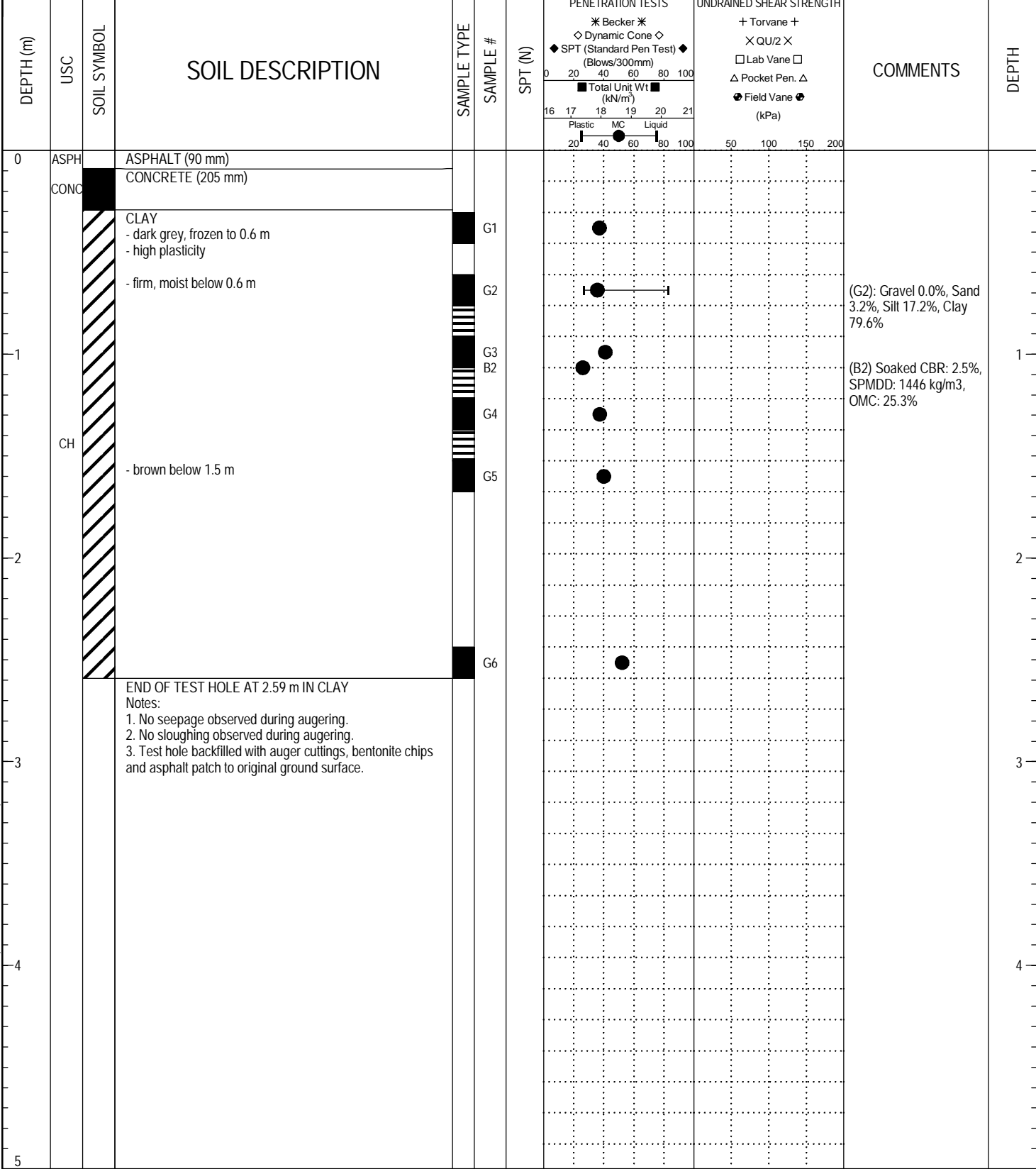
LOG OF TEST HOLE 2022-01-24-SASKATCHEWAN (SHERWIN - KING EDWARD).GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/20/21  
 PROJECT ENGINEER: Ryan C      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-031  
 LOCATION: 820 Saskatchewan Avenue - 2.8 m S of N curb      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE



LOG OF TEST HOLE 2022-01-24-SASKATCHEWAN (SHERWIN - KING EDWARD).GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/20/21  
 PROJECT ENGINEER: Ryan C      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-041  
 LOCATION: Saskatchewan Avenue - 1.1 m N of S curb, 30 m W of Sherwin Rd.      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE       GRAB       SHELBY TUBE       SPLIT SPOON       BULK       NO RECOVERY       CORE

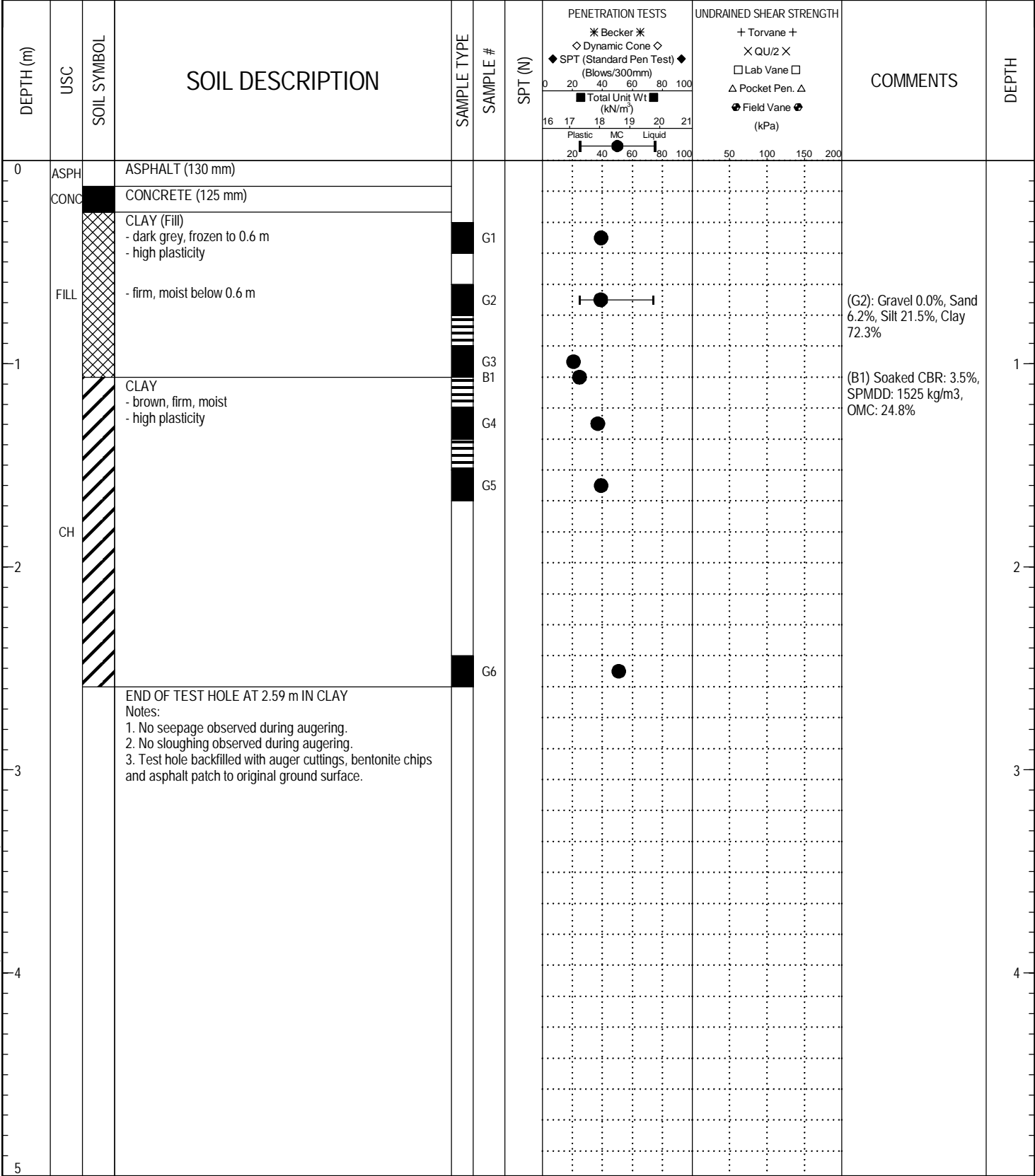
DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)			
0	ASPH		ASPHALT (90 mm)								
	CONC		CONCRETE (180 mm)								
			CLAY - grey, frozen to 0.6 m - high plasticity		G1						
	CH				G2						
1					G3						1
			CLAY - light brown, firm, moist - low plasticity		G4						
	CL				G5						
2			CLAY - brown, firm, moist - high plasticity								2
	CH				G6						
3			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.								3
4											4
5											5

LOG OF TEST HOLE 2022-01-24-SASKATCHEWAN (SHERWIN - KING EDWARD).GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/20/21  
 PROJECT ENGINEER: Ryan C      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH21-01J
LOCATION: Saskatchewan Avenue - 1.1 m N of S curb, 41 m W of St. James St.		PROJECT NO.: 60672138
CONTRACTOR: Paddock Drilling Ltd.	METHOD: Track Rig - 125 mm SSA	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

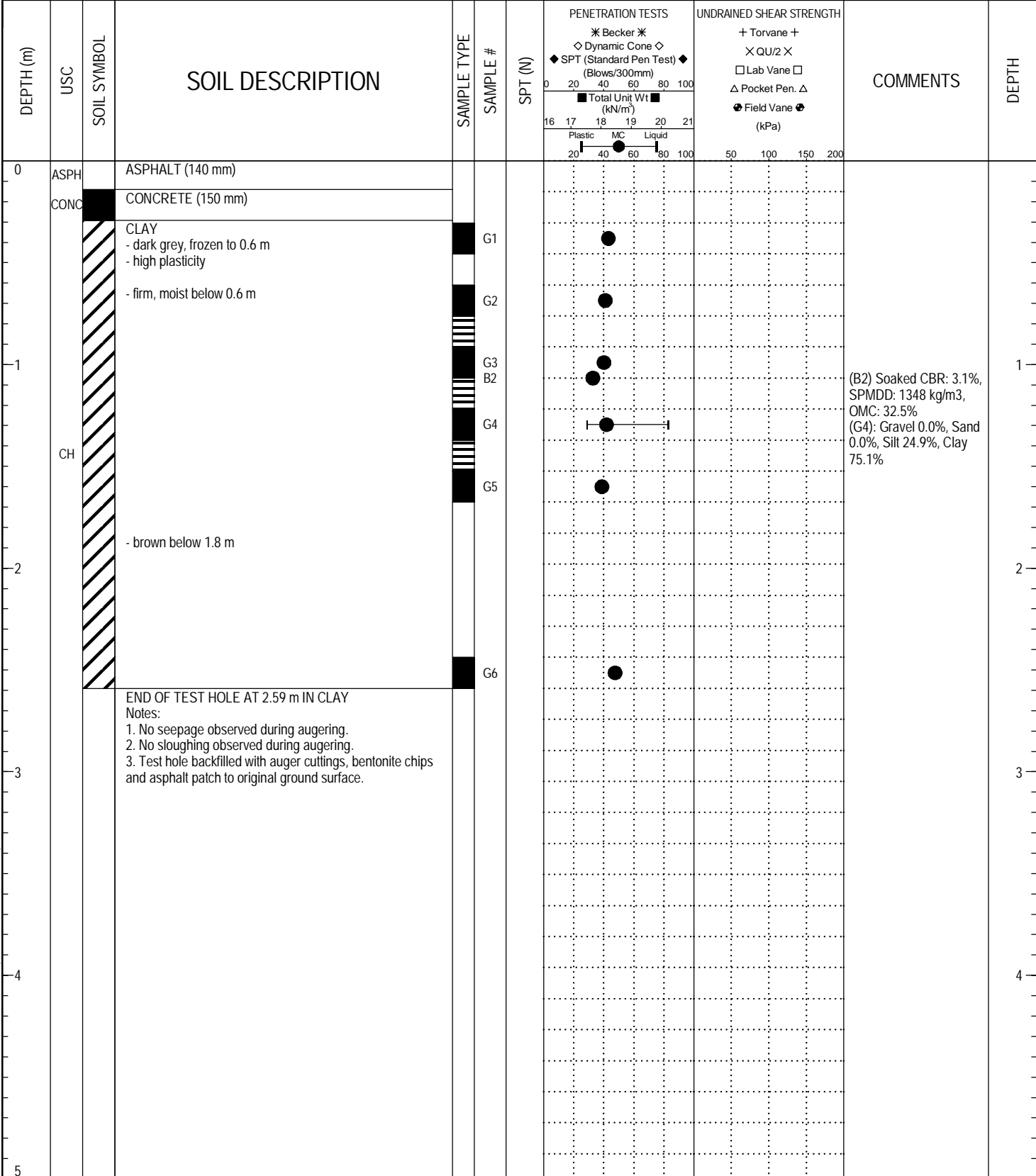


LOG OF TEST HOLE 2022-01-20-SASKATCHEWAN (ST. JAMES-BORDER).GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao	COMPLETION DEPTH: 2.59 m
REVIEWED BY: Ryan Harras	COMPLETION DATE: 12/21/21
PROJECT ENGINEER: Ryan C.	Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH21-02J
LOCATION: Saskatchewan Avenue - 1.9 m S of N curb, 88 m W of St. James St.		PROJECT NO.: 60672138
CONTRACTOR: Paddock Drilling Ltd.	METHOD: Track Rig - 125 mm SSA	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	



LOGGED BY: Enrico Manimbao	COMPLETION DEPTH: 2.59 m
REVIEWED BY: Ryan Harras	COMPLETION DATE: 12/21/21
PROJECT ENGINEER: Ryan C.	Page 1 of 1



LOG OF TEST HOLE 2022-01-20-SASKATCHEWAN (ST. JAMES-BORDER).GPJ UMA WINN.GDT 3/21/22



PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH21-03J  
 LOCATION: Saskatchewan Avenue - 2.1 m S of N curb, 34 m E of Border St.      PROJECT NO.: 60672138  
 CONTRACTOR: Paddock Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						SPT (N)	Total Unit Wt (kN/m <sup>3</sup> )			
0	ASPH		ASPHALT (130 mm)							
	CONC		CONCRETE (75 mm)							
			CLAY - dark grey, frozen to 0.6 m - high plasticity  - brown below 0.6 m		G1					
					G2					
1					G3	18	20		(G3): Gravel 0.0%, Sand 1.2%, Silt 9.6%, Clay 89.2%	1
					G4					
	CH				G5					
					G6					
3			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings, bentonite chips and asphalt patch to original ground surface.							

LOG OF TEST HOLE 2022-01-20-SASKATCHEWAN (ST. JAMES-BORDER).GPJ UMA WINN.GDT 3/21/22



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: Ryan Harras      COMPLETION DATE: 12/21/21  
 PROJECT ENGINEER: Ryan C.      Page 1 of 1

# Appendix B

## Pavement Core Hole and Test Hole Summary

Table 01 – Core Hole Summary – Dundas Street (Sargent Avenue to Yukon Avenue)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-01A	Dundas Street – 1.9 m E of W Curb, 12 m N of Yukon Ave (Pavement Slab)	Asphalt	0											
		Concrete	220											
CH21-02A	Dundas Street – 1.7 m W of E Curb, 15 m S of NW corner of Western Marble Granite & Tile (Pavement Slab)	Asphalt	0											
		Concrete	200											
CH21-03A	Dundas Street – 4.0 m E of W Curb, Aligned w/ Transformer Bumper Post (Pavement Slab)	Asphalt	0											
		Concrete	220											
CH21-04A	Dundas Street – 3.0 m W of E Curb, 5 m N of entrance to EMCO (Pavement Joint)	Asphalt	6											
		Concrete	240	No recovery. Specimen decomposed to granular and irretrievable										
CH21-05A	Dundas Street – 4.1 m E of W Curb, 14 m N of entrance of EMCO (Pavement Joint)	Asphalt	0											
		Concrete	240	No recovery. Specimen decomposed to granular and irretrievable										
CH21-06A	Dundas Street – 3.0 m W of E Curb, 11 m S of Sargent Ave (Pavement Slab)	Asphalt	40											
		Concrete	240											

\* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

City of Winnipeg

2022 Local and Industrial Street and Alley Renewal Program (22-RI-02) - Geotechnical Investigation

Table 02 – Test Hole Summary – Midland Street (Notre Dame Avenue to Saskatchewan Avenue)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
TH21-01B	Midland Street - 6 m S of train tracks, 1.2 m E of W curb (Pavement Slab)	Asphalt	150		GRANULAR FILL	0.3	23.9							
					CLAY (FILL)	0.6	25.4							
		Concrete	0		CLAY (CL)	1.2	26.5	0.0	12.9	32.0	55.1	57.1	20.5	36.6
					CLAY (CL)	1.5	22.6							
		Granular Fill	150		CLAY (CL)	2.4	20.8							
TH21-02B	Midland Street - 45 m N of train tracks, 2.5 m W of E curb (Pavement Slab)	Asphalt	50		GRANULAR FILL	0.3	18.1							
					CLAY (FILL)	0.6	30.2							
		Concrete	100		CLAY (CH)	0.9	25.7							
					CLAY (CH)	1.2	29.5							
		Granular Fill	100		CLAY (CL)	1.5	23.7							
CLAY (CL)	2.4	23.8												
TH21-03B	30 Midland Street - 2.9 m E of W curb (Pavement Slab)	Asphalt	75		GRANULAR FILL	0.3	10.7							
					CLAY (CH)	0.6	35.0							
		Concrete	100		CLAY (CH)	0.9	31.9	0.7	8.7	32.3	58.3	59.9	20.2	39.7
					CLAY (CL)	1.2	21.8							
		Granular Fill	130		CLAY (CL)	1.5	20.9							
CLAY (CH)	2.4	45.8												
TH21-04B	Midland Street - 9 m S of entrance to 1424 Midland Street, 3.6 m W of E curb (Pavement Slab)	Asphalt	75		CLAY (FILL)	0.3	20.6							
					CLAY (CH)	0.6	29.2							
		Concrete	75		CLAY (CH)	0.9	32.7							
					CLAY (CH)	1.2	25.9							
		Granular Fill	150		CLAY (CH)	1.5	26.6							
CLAY (CH)	2.4	18.3												
TH21-05B	135 Midland Street - 2.4 m W of E curb (Pavement Slab)	Asphalt	75		CLAY (CH)	0.3	29.1							
					CLAY (CH)	0.6	27.7							
		Concrete	75		CLAY (CL)	0.9	22.7							
					CLAY (CL)	1.2	22.9	0.3	12.8	72.8	14.1	24.6	12.5	12.1
		Granular Fill	150		CLAY (CH)	1.5	21.5							
CLAY (CH)	2.4	35.4												

\* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

City of Winnipeg

2022 Local and Industrial Street and Alley Renewal Program (22-RI-02) - Geotechnical Investigation

Table 03 – Test Hole Summary – Milt Stegall Drive (Sargent Avenue to Yukon Avenue)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits			
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	
TH21-01C	Milt Stegall Drive - 23 m N of Yukon Ave, 5.1 m E of W curb (Pavement Slab)	Asphalt	0		CLAY (CH)	0.3	28.0								
					CLAY (CH)	0.6	26.6	0.0	4.6	22.9	72.5	65.4	24.3	41.1	
		Concrete	205		CLAY (CH)	0.9	27.0								
					CLAY (CH)	1.2	29.8								
		Granular Fill	50		CLAY (CH)	1.5	33.3								
					CLAY (CH)	2.4	49.0								
TH21-02C	1090 Milt Stegall Drive - 1.7 m W of E curb (Pavement Slab)	Asphalt	0		CLAY (CH)	0.3	50.6								
					CLAY (CH)	0.6	35.8								
		Concrete	230		CLAY (CH)	0.9	31.1								
					CLAY (CH)	1.2	28.6	0.0	2.4	18.9	78.7	69.9	22.4	47.5	
		Granular Fill	0		CLAY (CH)	1.5	27.1								
					CLAY (CH)	2.4	27.1								
TH21-03C	1100 Milt Stegall Drive - 1.5 m E of W curb (Pavement Slab)	Asphalt	0		CLAY (FILL)	0.3	21.9								
					CLAY (CH)	0.6	16.2								
		Concrete	280		CLAY (CH)	0.9	25.5	0.0	11.8	23.3	64.9	58.0	19.3	38.7	
					CLAY (CH)	1.2	29.1								
		Granular Fill	0		CLAY (CH)	1.5	28.2								
					CLAY (CH)	2.4	46.8								

\* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

City of Winnipeg

2022 Local and Industrial Street and Alley Renewal Program (22-RI-02) - Geotechnical Investigation

Table 04 – Test Hole Summary – Murray Park Road (Cree Crescent to Sturgeon Road)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
TH21-01D	Murray Park Road (EB) - 2.5 m S of Yellow Divider Line, 170 m E of Sturgeon Rd. (Pavement Slab)	Asphalt	300		SILT TILL (ML)	1.2	9.9	2.4	39.9	38.2	19.5	12.9	9.0	3.9
		Concrete	0		SILT TILL (ML)	1.5	10.1							
		Granular Fill	760		SILT TILL (ML)	2.4	10.0							
TH21-02D	Murray Park Road (WB) - 2.2 m N of Yellow Divider Line, 209 m E of Sturgeon Rd. (Pavement Slab)	Asphalt	265		CLAY (CH)	0.6	23.4							
		Concrete	0		SILT TILL (ML)	0.9	11.4							
					SILT TILL (ML)	1.2	9.1							
					SILT TILL (ML)	1.5	11.7							
		Granular Fill	190		SILT TILL (ML)	2.4	9.1							
TH21-03D	Murray Park Road - 8.8 m N of parking entrance to 300 Cree Cre., 80 m W of Cree Cre. (Pavement Slab)	Asphalt	250		CLAY (CH)	0.3	23.4							
					CLAY (CH)	0.6	28.3							
		Concrete	0		CLAY (CH)	0.9	28.6	0.0	6.8	22.1	71.1	68.6	21.2	47.4
					CLAY (CH)	1.2	23.2							
					CLAY (CH)	1.5	28.8							
		Granular Fill	0		CLAY (CH)	2.4	20.6							
TH21-04D	Murray Park Road (EB) - 7.0 m N of S curb, 38 m W of Cree Crescent (Pavement Slab)	Asphalt	205		CLAY (FILL)	0.3	24.6							
					CLAY (CH)	0.6	23.8							
		Concrete	0		CLAY (CH)	0.9	21.6							
					SILT TILL (ML)	1.2	16.9							
					SILT TILL (ML)	1.5	13.9							
		Granular Fill	0		SILT TILL (ML)	2.4	8.8							
TH21-05D	Murray Park Road - WB Turning Lane – 10.5 m N of S curb, 14 m W of Cree Crescent (Pavement Slab)	Asphalt	75		CLAY (CL)	0.3	25.0							
					CLAY (CL)	0.6	16.2	2.4	22.5	35.4	39.7	38.8	11.7	27.1
		Concrete	190		SILT TILL (ML)	0.9	12.7							
					SILT TILL (ML)	1.2	12.9							
					SILT TILL (ML)	1.5	9.8							
		Granular Fill	0		SILT TILL (ML)	2.4	7.0							

\* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

City of Winnipeg

2022 Local and Industrial Street and Alley Renewal Program (22-RI-02) - Geotechnical Investigation

Table 05 – Core Hole Summary – Murray Park Road Eastbound (Cree Crescent to Saulteaux Crescent)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-01E	170 Murray Park Road (EB) - 5.5 m N of S curb, 7 m E of 170 Murray Park Road W Entrance (Pavement Slab)	Asphalt	0	Partial recovery. Specimen decomposed to granular and irretrievable										
		Concrete	80											
CH21-02E	158 Murray Park Road (EB) – 1.5 m N of S curb, 12 m E of 170 Murray Park Rd E Entrance (Pavement Slab)	Asphalt	0											
		Concrete	200											
CH21-03E	Murray Park Road (EB) - 2.0 m N of S curb, 62 m E of entrance to 158 Murray Park Road (Pavement Joint)	Asphalt	0	Partial recovery. Specimen decomposed to granular and irretrievable										
		Concrete	80											
CH21-04E	Murray Park Road (EB) - 5.0 m N of S curb, 80 m W of entrance of 122 Murray Park Road (Pavement Slab)	Asphalt	0											
		Concrete	180											
CH21-05E	Murray Park Road (EB) – 2.0 m N of S curb, 29 m W of entrance of 122 Murray Park Road (Pavement Slab)	Asphalt	0											
		Concrete	190											
CH21-06E	Murray Park Road (EB) – 5.2 m N of S curb, 11 m W of train tracks (Pavement Joint)	Asphalt	0											
		Concrete	190											

\* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

City of Winnipeg

2022 Local and Industrial Street and Alley Renewal Program (22-RI-02) - Geotechnical Investigation

Table 06 – Core Hole Summary – Murray Park Road Westbound (Saulteaux Crescent to Cree Crescent)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-01F	Murray Park Road (WB) – 3.5 m S of N curb, 39 m W of Saulteaux Crescent (Pavement Slab)	Asphalt	0											
		Concrete	210											
CH21-02F	61 Murray Park Road (WB) – 2.0 m N of S curb, 14 m E of Boeing East Entrance (Pavement Slab)	Asphalt	0											
		Concrete	200											
CH21-03F	99 Murray Park Road (WB) – 1.8 m S of N curb, 12 m E of Boeing Main Entrance (Pavement Slab)	Asphalt	0											
		Concrete	210											
CH21-04F	170 Murray Park Road (WB) – 2.1 m N of S curb, 100 m E of Cree Cre. (Pavement Slab)	Asphalt	0											
		Concrete	190											

\* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)



City of Winnipeg

2022 Local and Industrial Street and Alley Renewal Program (22-RI-02) - Geotechnical Investigation

Table 07 – Test Hole Summary – Saskatchewan Avenue (King Edward Street to Century Street)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
TH21-01G	1540 Saskatchewan Avenue - 4.3 m N of S curb (Pavement Slab)	Asphalt	75		CLAY (CH)	0.3	45.5							
					CLAY (CH)	0.6	50.6							
		Concrete	165		CLAY (CH)	0.9	36.2	0.0	1.4	18.4	80.2	73.5	25.6	47.9
					CLAY (CH)	1.2	35.0							
		Granular Fill	0		CLAY (CH)	1.5	36.5							
					CLAY (CH)	2.4	46.7							
TH21-02G	Saskatchewan Avenue - 5.3 m N of S curb, 18 m E of Bradford St. (Pavement Slab)	Asphalt	65		GRANULAR FILL	0.3	8.0							
					CLAY (FILL)	0.6	26.4	1.7	27.6	21.7	49.0	55.8	18.7	37.1
		Concrete	165		CLAY (FILL)	0.9	30.7							
					CLAY (CH)	1.2	36.1							
		Granular Fill	230		CLAY (CH)	1.5	40.3							
					CLAY (CH)	2.4	50.4							
TH21-03G	950 Saskatchewan Avenue - 4.0 m N of S curb (Pavement Slab)	Asphalt	75		CLAY (CH)	0.3	39.3							
					CLAY (CH)	0.6	34.0							
		Concrete	150		CLAY (CL)	0.9	25.2							
					CLAY (CL)	1.2	21.0							
		Granular Fill	0		CLAY (CL)	1.5	21.4							
					CLAY (CH)	2.4	29.5							
TH21-04G	Saskatchewan Avenue - 2.4 m N of S curb, 33 m E of King Edward St. (Pavement Slab)	Asphalt	65		GRANULAR FILL	0.3	9.1							
					CLAY FILL	0.6	24.0							
		Concrete	215		SAND FILL	0.9	7.9							
					SAND FILL	1.2	11.1	16.3	49.5	17.7	16.5	29.4	11.5	17.9
		Granular Fill	360		SAND FILL	1.5	14.0							
					SAND FILL	2.4	14.1							

\* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

Table 08 – Core Hole Summary – Saskatchewan Avenue (Midland Street to Empress Street)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-01H	Saskatchewan Avenue - 2.9 m S of N Curb, 46 m W of Midland St W Curb (Pavement Joint)	Asphalt	250	No recovery. Specimen decomposed to granular and irretrievable. Approximate measurement taken from core barrel penetration depth.										
		Concrete												
CH21-02H	Saskatchewan Avenue - 2.2 m N of S Curb, 38 m E of E entrance into Ancast Industries (Pavement Slab)	Asphalt	75	No recovery. Specimen decomposed to granular and irretrievable										
		Concrete	0											
CH21-03H	Saskatchewan Avenue - 3.3 m S of N Curb, 31 m W of E entrance into Ancast Industries (Pavement Slab)	Asphalt	40											
		Concrete	185											
CH21-04H	Saskatchewan Avenue - 1.4 m N of S Curb, 41 m E of W entrance into Ancast Industries (Pavement Joint)	Asphalt	250	No recovery. Specimen decomposed to granular and irretrievable. Approximate measurement taken from core barrel penetration depth.										
		Concrete												

\* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

Table 09 – Test Hole Summary – Saskatchewan Avenue (Sherwin Road to King Edward Street)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits			
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	
TH21-01I	Saskatchewan Avenue - 4.1 m N of S Curb, 54 m W of King Edward St. (Pavement Slab)	Asphalt	90		CLAY (CH)	0.3	33.6								
					CLAY (CH)	0.6	33.9	0.0	5.4	25.9	68.7	75.0	23.8	51.2	
		Concrete	190		CLAY (CH)	0.9	31.6								
					CLAY (CH)	1.2	33.8								
					CLAY (CH)	1.5	38.4								
Granular Fill	0		CLAY (CH)	2.4	44.9										
TH21-02I	Saskatchewan Avenue - 1.7 m N of S curb, 27 m W of Berry St. (Pavement Slab)	Asphalt	90		CLAY (CH)	0.3	44.6								
					CLAY (CH)	0.6	44.7								
		Concrete	150		CLAY (CH)	0.9	35.5	0.0	2.4	13.5	84.1	81.8	25.2	56.6	
					CLAY (CH)	1.2	35.5								
					CLAY (CH)	1.5	37.8								
Granular Fill	0		CLAY (CH)	2.4	51.9										
TH21-03I	820 Saskatchewan Avenue - 2.8 m S of N curb (Pavement Slab)	Asphalt	90		CLAY (CH)	0.3	37.1								
					CLAY (CH)	0.6	35.7	0.0	3.2	17.2	79.6	83.0	26.7	56.3	
		Concrete	205		CLAY (CH)	0.9	41.0								
					CLAY (CH)	1.2	37.3								
					CLAY (CH)	1.5	40.0								
Granular Fill	0		CLAY (CH)	2.4	52.2										
TH21-04I	Saskatchewan Avenue - 1.1 m N of S curb, 30 m W of Sherwin Rd. (Pavement Slab)	Asphalt	90		CLAY (CH)	0.3	35.1								
					CLAY (CH)	0.6	35.3								
		Concrete	180		CLAY (CH)	0.9	27.4								
					CLAY (CL)	1.2	28.5								
					CLAY (CL)	1.5	24.5								
Granular Fill	0		CLAY (CH)	2.4	47.1										

\* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

Table 10 – Test Hole Summary – Saskatchewan Avenue (St James Street to Border Street)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits			
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	
TH21-01J	Saskatchewan Avenue - 1.1 m N of S curb, 41 m W of St. James St. (Pavement Slab)	Asphalt	130		CLAY (FILL)	0.3	39.1								
					CLAY (FILL)	0.6	38.9	0.0	6.2	21.5	72.3	74.0	24.9	49.1	
		Concrete	125		CLAY (FILL)	0.9	20.7								
					CLAY (CH)	1.2	36.9								
					CLAY (CH)	1.5	39.1								
Granular Fill	0		CLAY (CH)	2.4	50.9										
TH21-02J	Saskatchewan Avenue - 1.9 m S of N curb, 88 m W of St. James St. (Pavement Slab)	Asphalt	140		CLAY (CH)	0.3	43.1								
					CLAY (CH)	0.6	41.0								
		Concrete	150		CLAY (CH)	0.9	40.1								
					CLAY (CH)	1.2	41.8	0.0	0.0	24.9	75.1	82.6	28.7	53.9	
					CLAY (CH)	1.5	38.7								
Granular Fill	0		CLAY (CH)	2.4	47.5										
TH21-03J	Saskatchewan Avenue - 2.1 m S of N curb, 34 m E of Border St. (Pavement Slab)	Asphalt	130		CLAY (CH)	0.3	38.3								
					CLAY (CH)	0.6	36.7								
		Concrete	75		CLAY (CH)	0.9	38.3	0.0	1.2	9.6	89.2	81.1	25.7	55.4	
					CLAY (CH)	1.2	36.9								
					CLAY (CH)	1.5	43.1								
Granular Fill	0		CLAY (CH)	2.4	52.6										

\* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

Table 11 – Core Hole Summary – Yukon Avenue (Milt Stegall Drive to Empress Street)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-01K	Yukon Avenue – 2.0 m N of S Curb, 18 m E of Milt Stegall Dr. (Pavement Joint)	Asphalt	0	No recovery. Specimen decomposed to granular and irretrievable										
		Concrete	150											
CH21-02K	Yukon Avenue – 1.6 m S of N Curb, 42 m E of Milt Stegall Dr. (Pavement Slab)	Asphalt	0											
		Concrete	230											
CH21-03K	Yukon Avenue – 1.7 m S of N Curb, 11 m W of Dundas St. (Pavement Slab)	Asphalt	0											
		Concrete	200											
CH21-04K	Yukon Avenue – 1.6 m S of N Curb, 2 m W of Dundas St. (Pavement Joint)	Asphalt	0	Partial recovery. Specimen decomposed to granular and irretrievable										
		Concrete	160											
CH21-05K	Yukon Avenue – 2.2 m S of N Curb, 16 m E of Dundas St. (Pavement Joint)	Asphalt	0	No recovery. Specimen decomposed to granular and irretrievable										
		Concrete	0											
CH21-06K	Yukon Avenue – 2.2 m N of S Curb, 10 m W of Empress St. (Pavement Slab)	Asphalt	0											
		Concrete	230											

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-07K	Yukon Avenue – 2.9 m S of N Curb, 24 m W of Empress St. (Pavement Joint)	Asphalt	0	No recovery. Specimen decomposed to granular and irretrievable										
		Concrete	0											
CH21-08K	Yukon Avenue – 5.6 m S of N Curb, 37 m W of Empress St. (Pavement Centerline Joint)	Asphalt	0	No recovery. Specimen decomposed to granular and irretrievable										
		Concrete	0											

\* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)

Table 12 – Core Hole Summary – Yukon Avenue (St James Street to Milt Stegall Drive)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CH21-01L	Yukon Avenue – 2.8 m S of N curb, 20 m E of St. James St. (Pavement Joint)	Asphalt	0	Partial recovery. Specimen decomposed to granular and irretrievable										
		Concrete	70											
CH21-02L	Yukon Avenue – 1.8 m N of S curb, 12 m E of St. James St. (Pavement Slab)	Asphalt	0											
		Concrete	210											
CH21-03L	1373 Yukon Avenue – 2.9 m S of N curb, 8 m E of SE corner of IWC (Pavement Slab)	Asphalt	0											
		Concrete	200											
CH21-04L	Yukon Avenue – 2.1 m S of N curb, 17 m W of Milt Stegall Dr. (Pavement Slab)	Asphalt	0	Partial recovery. Specimen decomposed to granular and irretrievable										
		Concrete	160											
CH21-05L	Yukon Avenue – 2.1 m N of S curb, 38 m W of Milt Stegall Dr. (Pavement Joint)	Asphalt	0	Partial recovery. Specimen decomposed to granular and irretrievable										
		Concrete	125											
CH21-06L	Yukon Avenue – 1.8 m N of S curb, 30 m W NE corner of The Brick (Pavement Slab)	Asphalt	50											
		Concrete	180											

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits			
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	
CH21-07L	1373 Yukon Avenue – 2.5 m S of N curb, 9 m E of SE corner of building (Pavement Joint)	Asphalt	50	No recovery. Specimen decomposed to granular and irretrievable											
		Concrete	150	Partial recovery. Specimen decomposed to granular and irretrievable											

\* Subgrade Description based on ASTM D2487-17 in accordance with City of Winnipeg Site Investigation Requirements for Public Works Street Projects (January 2021)



# Appendix C

## Pavement Core Photos



**Photograph 1: CH21-01A - Dundas Street (Sargent Avenue to Yukon Avenue)**



**Photograph 2: CH21-02A - Dundas Street (Sargent Avenue to Yukon Avenue)**



**Photograph 3: CH21-03A - Dundas Street (Sargent Avenue to Yukon Avenue)**



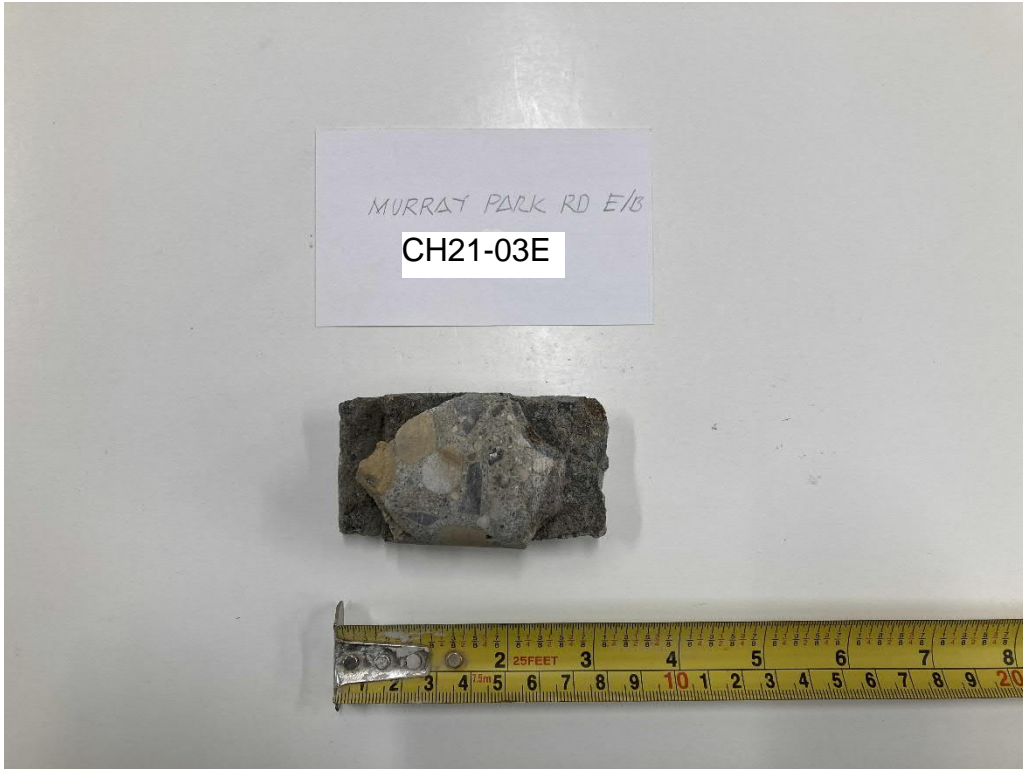
**Photograph 4: CH21-06A - Dundas Street (Sargent Avenue to Yukon Avenue)**



Photograph 5: CH21-01E - Murray Park EB (Cree Crescent to Saulteaux Crescent)



Photograph 6: CH21-02E - Murray Park EB (Cree Crescent to Saulteaux Crescent)



Photograph 7: CH21-03E - Murray Park EB (Cree Crescent to Saulteaux Crescent)



Photograph 8: CH21-04E - Murray Park EB (Cree Crescent to Saulteaux Crescent)



Photograph 9: CH21-05E - Murray Park EB (Cree Crescent to Sauleaux Crescent)



Photograph 10: CH21-06E - Murray Park EB (Cree Crescent to Sauleaux Crescent)



Photograph 11: CH21-01F - Murray Park WB (Cree Crescent to Sturgeon Road)



Photograph 12: CH21-02F - Murray Park WB (Cree Crescent to Sturgeon Road)



Photograph 13: CH21-03F - Murray Park WB (Cree Crescent to Sturgeon Road)



Photograph 14: CH21-04F - Murray Park WB (Cree Crescent to Sturgeon Road)





Photograph 15: CH21-02H - Saskatchewan Avenue (Midland Street to Empress Street)



Photograph 16: CH21-03H - Saskatchewan Avenue (Midland Street to Empress Street)



Photograph 17: CH21-02K - Yukon Avenue (Milt Stegall Drive to Empress Street)



Photograph 18: CH21-03K - Yukon Avenue (Milt Stegall Drive to Empress Street)



Photograph 19: CH21-04K - Yukon Avenue (Milt Stegall Drive to Empress Street)



Photograph 20: CH21-06K - Yukon Avenue (Milt Stegall Drive to Empress Street)



Photograph 21: CH21-01L - Yukon Avenue (St. James Street to Milt Stegall Drive)



Photograph 22: CH21-02L - Yukon Avenue (St. James Street to Milt Stegall Drive)



Photograph 23: CH21-03L - Yukon Avenue (St. James Street to Milt Stegall Drive)



Photograph 24: CH21-04L - Yukon Avenue (St. James Street to Milt Stegall Drive)



Photograph 25: CH21-05L - Yukon Avenue (St. James Street to Milt Stegall Drive)



Photograph 26: CH21-06L - Yukon Avenue (St. James Street to Milt Stegall Drive)



**Photograph 27: CH21-07L - Yukon Avenue (St. James Street to Milt Stegall Drive)**

# Appendix D

## Laboratory Test Results





AECOM Canada Ltd.  
 Winnipeg Geotechnical Laboratory  
 99 Commerce Drive  
 Winnipeg, Manitoba  
 R3P 0Y7  
 Phone: 204 477 5381



Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
 Project Number: 60672138  
 Client: City of Winnipeg  
 Sample Location: Midland, St.  
 Sample Depth: Varies  
 Sample Number: Varies

Supplier: AECOM  
 Specification: N/A  
 Field Technician: EManimbao  
 Sample Date: November 23, 2021  
 Lab Technician: EManimbao  
 Date Tested: February 9, 2022

### Moisture Content (ASTM D2216-10)

Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Location	Sample	Depth (m)	Moisture Content (%)
TH21-01B	G1	0.30 - 0.46 m	23.9%
	G2	0.61 - 0.76 m	25.4%
	B1	0.61 - 1.52 m	-
	G3	0.91 - 1.07 m	31.3%
	G4	1.22 - 1.37 m	26.5%
	G5	1.52 - 1.68 m	22.6%
	G6	2.44 - 2.59 m	20.8%
TH21-02B	G1	0.30 - 0.46 m	18.1%
	G2	0.61 - 0.76 m	30.2%
	B2	0.61 - 1.52 m	-
	G3	0.91 - 1.07 m	25.7%
	G4	1.22 - 1.37 m	29.5%
	G5	1.52 - 1.68 m	23.7%
	G6	2.44 - 2.59 m	23.8%
TH21-03B	G1	0.30 - 0.46 m	10.7%
	G2	0.61 - 0.76 m	35.0%
	G3	0.91 - 1.07 m	31.9%
	G4	1.22 - 1.37 m	21.8%
	G5	1.52 - 1.68 m	20.9%
	G6	2.44 - 2.59 m	45.8%
TH21-04B	G1	0.30 - 0.46 m	20.6%
	G2	0.61 - 0.76 m	29.2%
	G3	0.91 - 1.07 m	32.7%
	G4	1.22 - 1.37 m	25.9%
	G5	1.52 - 1.68 m	26.6%
	G6	2.44 - 2.59 m	18.3%
TH21-05B	G1	0.30 - 0.46 m	29.1%
	G2	0.61 - 0.76 m	27.7%
	G3	0.91 - 1.07 m	22.7%
	G4	1.22 - 1.37 m	22.9%
	G5	1.52 - 1.68 m	21.5%
	G6	2.44 - 2.59 m	35.4%

Location	Sample	Depth (m)	Moisture Content (%)



AECOM Canada Ltd.  
Winnipeg Geotechnical Laboratory  
99 Commerce Drive  
Winnipeg, Manitoba  
R3P 0Y7  
Phone: 204 477 5381



Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-01B (Midland St.)  
Sample Depth: 0.61 - 0.76 m  
Sample Number: G2

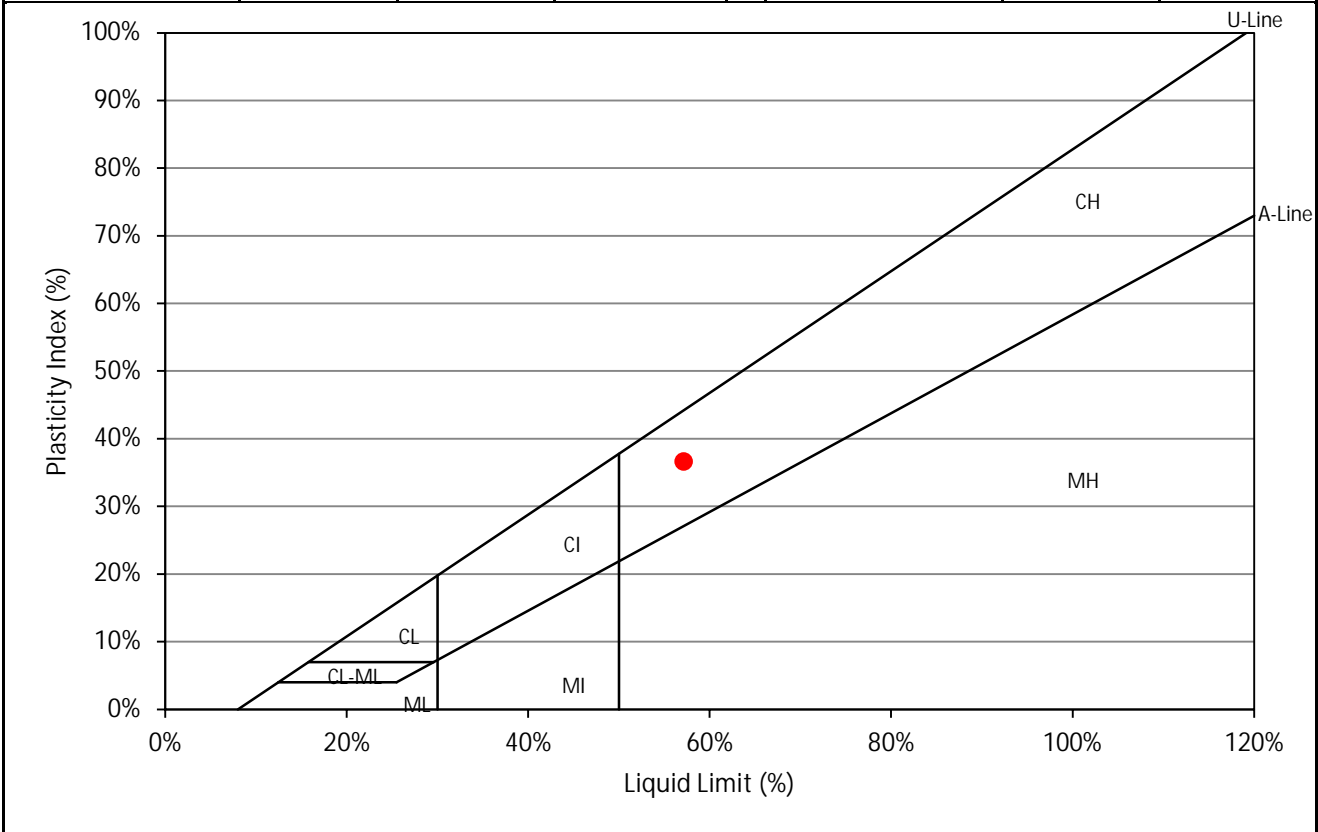
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

### Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	31	25	19
Wet Sample (g)	8.5	8.6	9.6
Dry Sample (g)	5.4	5.5	6.1
Water Content (%)	56.1%	57.0%	58.0%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.2	6.1
Dry Sample (g)	5.2	5.1
Water Content (%)	20.5%	20.4%



Liquid Limit (%): 57.1%	Plastic Limit (%): 20.5%	Plasticity Index (%): 36.6%
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Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-03B (Midland St.)  
Sample Depth: 0.91 - 1.07 m  
Sample Number: G3

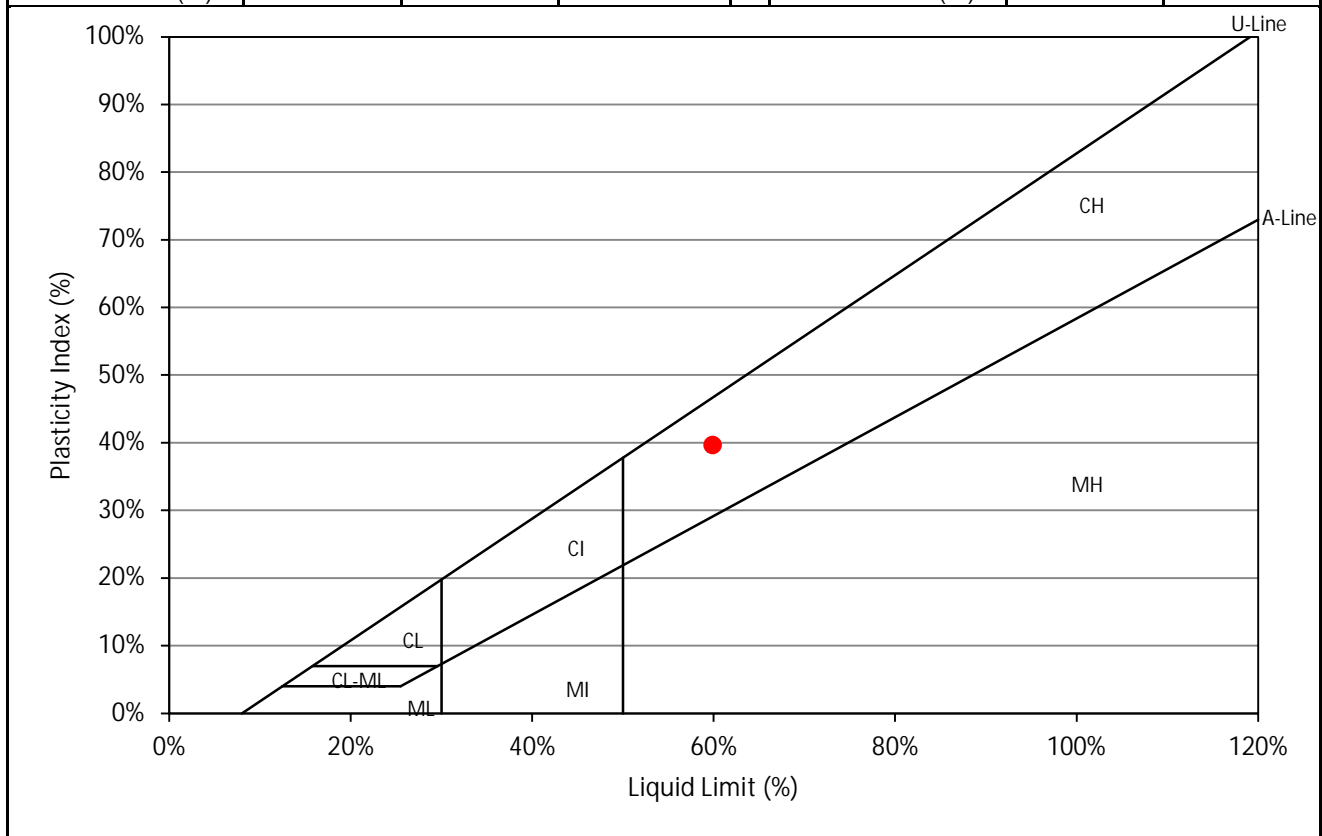
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	35	27	17
Wet Sample (g)	9.1	8.7	8.6
Dry Sample (g)	5.8	5.5	5.3
Water Content (%)	56.9%	59.1%	63.0%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.2	6.1
Dry Sample (g)	5.2	5.1
Water Content (%)	20.4%	20.1%



Liquid Limit (%): 59.9%

Plastic Limit (%): 20.2%

Plasticity Index (%): 39.6%



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Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-05B (Midland St.)  
Sample Depth: 1.22 - 1.37 m  
Sample Number: G4

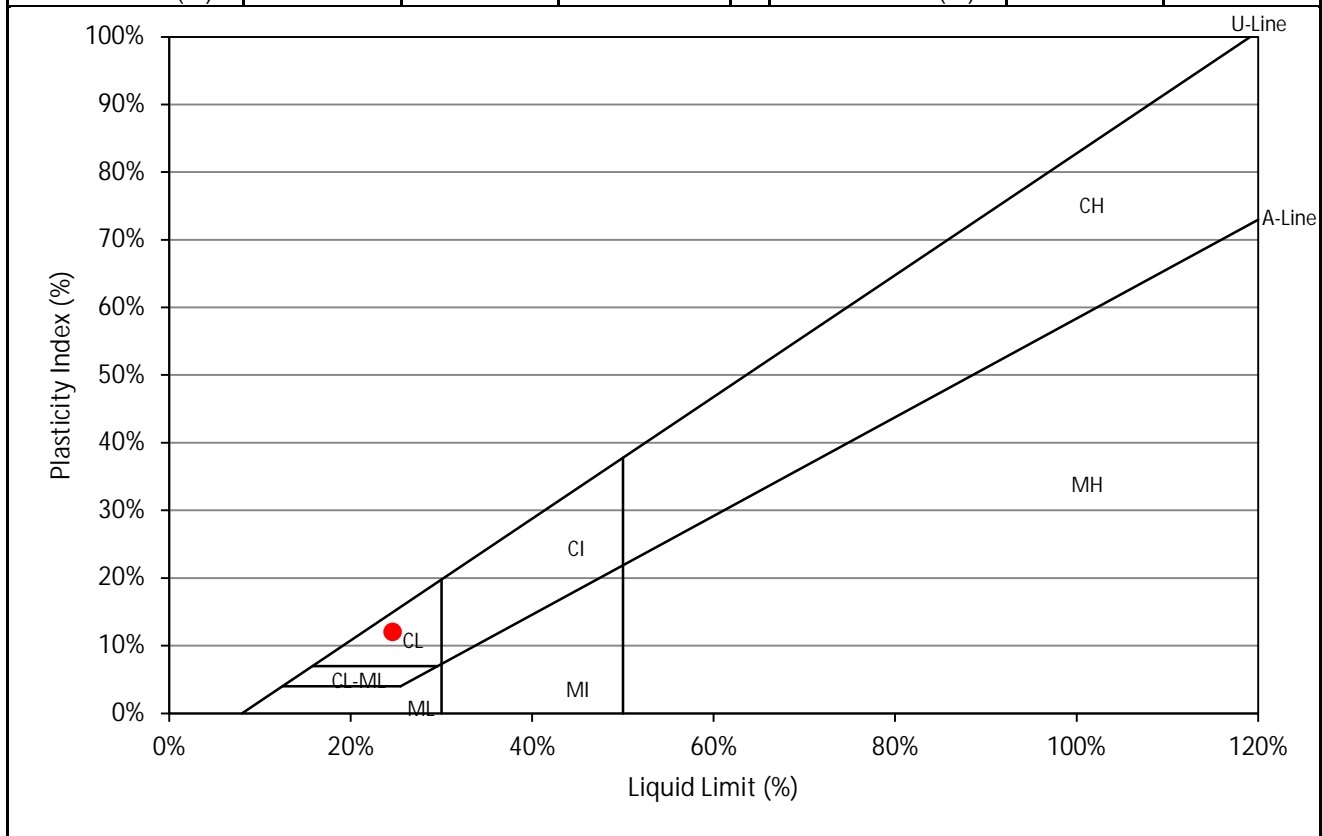
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

### Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	34	27	23
Wet Sample (g)	10.8	12.1	11.0
Dry Sample (g)	8.8	9.8	8.8
Water Content (%)	23.1%	24.2%	25.0%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.2	6.4
Dry Sample (g)	5.5	5.7
Water Content (%)	12.6%	12.5%



Liquid Limit (%): 24.6%	Plastic Limit (%): 12.5%	Plasticity Index (%): 12.0%
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**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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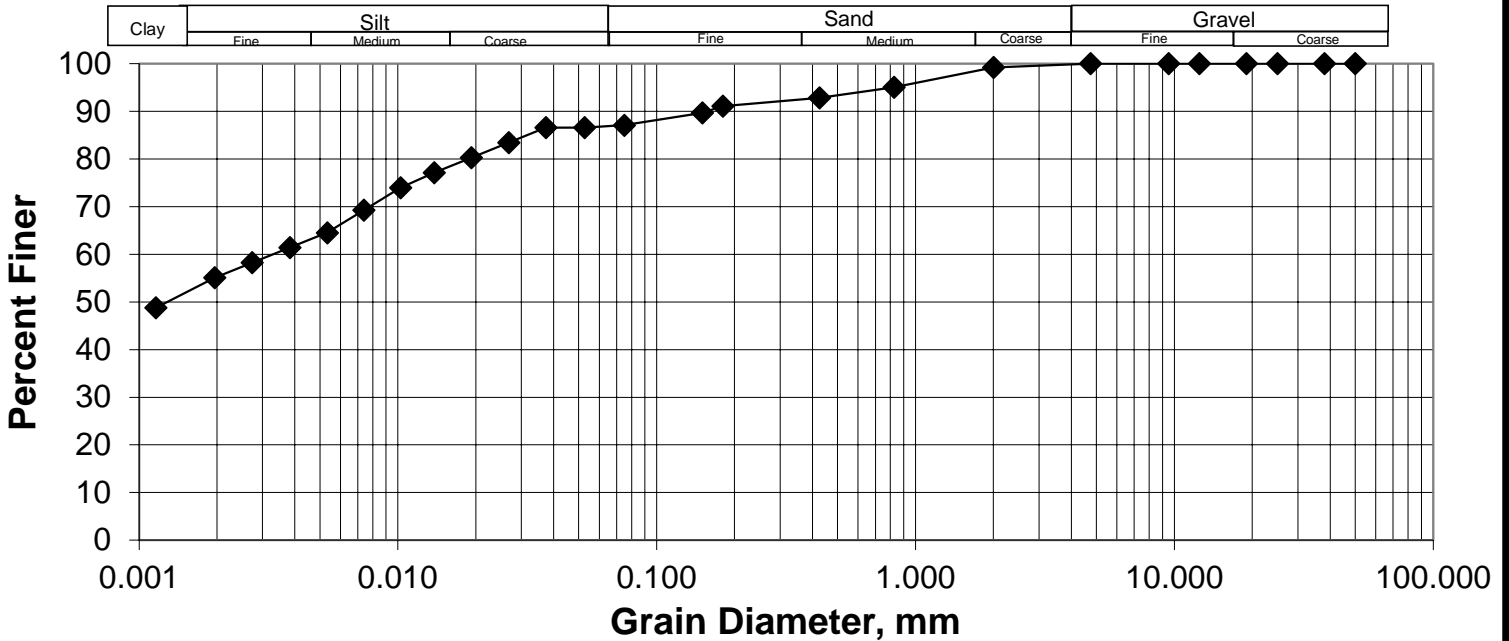


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-01B (Midland St.)  
Sample No.: G2  
Depth: 0.61 - 0.76 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	87.1
38.0	100.0	2.00	99.2	0.0527	86.6
25.0	100.0	0.825	95.0	0.0373	86.6
19.0	100.0	0.425	92.8	0.0268	83.4
12.5	100.0	0.18	91.1	0.0192	80.3
9.5	100.0	0.15	89.7	0.0138	77.1
4.75	100.0	0.075	87.1	0.0102	74.0
				0.0074	69.3
				0.0053	64.5
				0.0038	61.4
				0.0027	58.2
				0.0020	55.1
				0.0012	48.8

**GRAIN SIZE DISTRIBUTION CURVE**



Gravel	0.0%	Silt	32.0%
Sand	12.9%	Clay	55.1%

**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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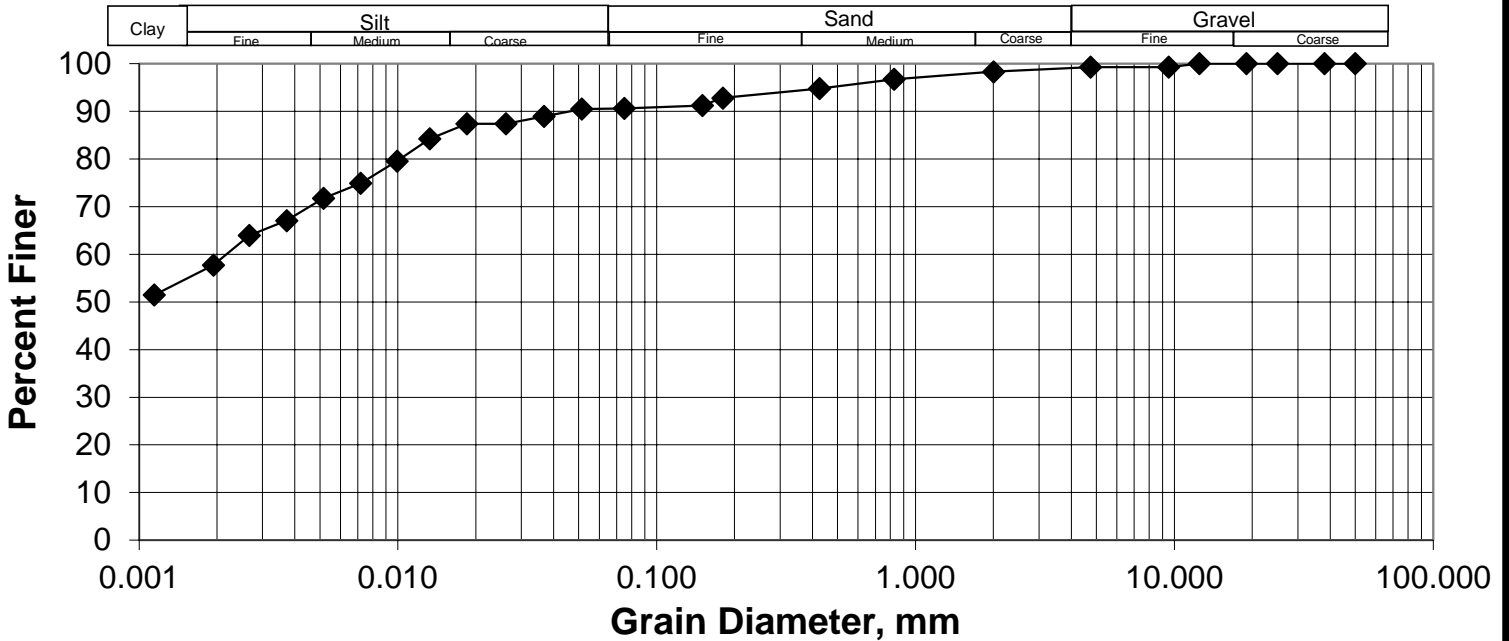


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-03B (Midland St.)  
Sample No.: G3  
Depth: 0.91 - 1.07 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	99.3	0.0750	90.6
38.0	100.0	2.00	98.3	0.0514	90.5
25.0	100.0	0.825	96.7	0.0367	88.9
19.0	100.0	0.425	94.8	0.0261	87.4
12.5	100.0	0.18	92.8	0.0185	87.4
9.5	99.3	0.15	91.2	0.0133	84.2
4.75	99.3	0.075	90.6	0.0099	79.6
				0.0072	74.9
				0.0052	71.8
				0.0037	67.1
				0.0027	63.9
				0.0019	57.7
				0.0011	51.5

**GRAIN SIZE DISTRIBUTION CURVE**



Gravel	0.7%	Silt	32.3%
Sand	8.7%	Clay	58.3%

**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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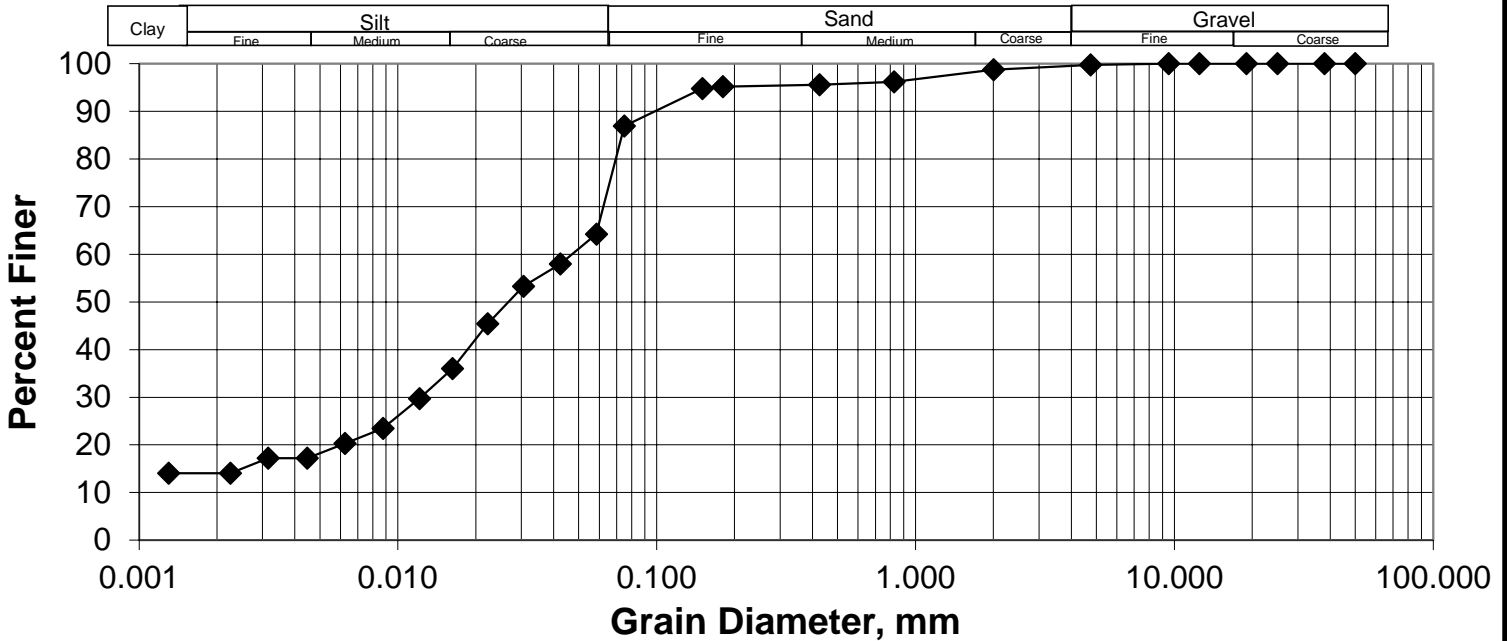


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-05B (Midland St.)  
Sample No.: G4  
Depth: 1.22 - 1.37 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	99.7	0.0750	86.9
38.0	100.0	2.00	98.7	0.0584	64.2
25.0	100.0	0.825	96.2	0.0424	58.0
19.0	100.0	0.425	95.6	0.0306	53.3
12.5	100.0	0.18	95.2	0.0223	45.4
9.5	100.0	0.15	94.8	0.0163	36.0
4.75	99.7	0.075	86.9	0.0121	29.7
				0.0088	23.5
				0.0063	20.3
				0.0045	17.2
				0.0032	17.2
				0.0023	14.1
				0.0013	14.1

**GRAIN SIZE DISTRIBUTION CURVE**



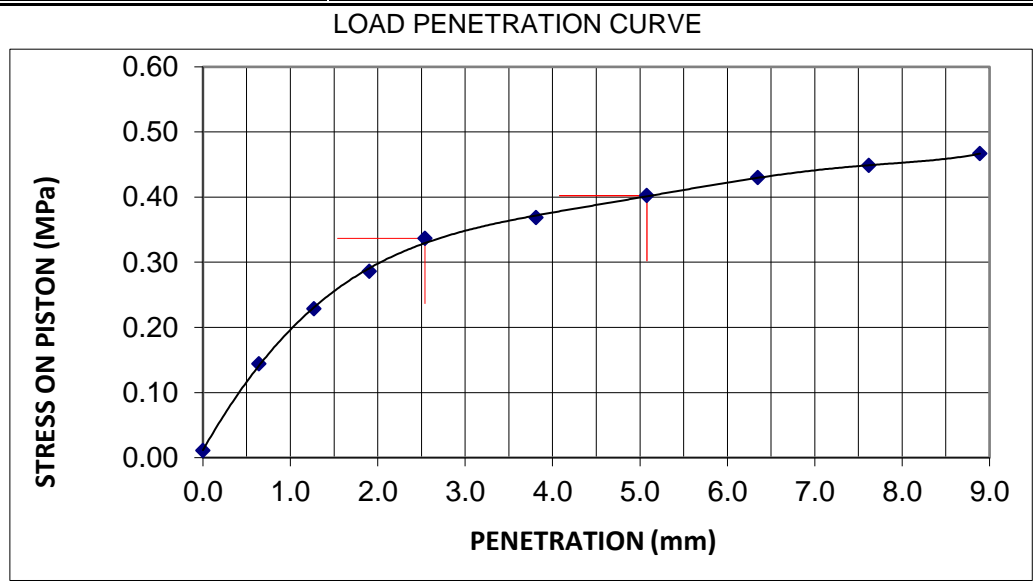
Gravel	0.3%	Silt	72.8%
Sand	12.8%	Clay	14.1%

**CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883**

Client:	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	Project No.:	112-2204
Attention:	Rico Manimbao	CBR test No.:	7
Project	Job No. 60672138	Lab No.:	HM 007
Location:	Midland - Notre Dame to Saskatchewan	Date sampled:	
		Date Received :	27-Jan-22
		Date Tested /By:	07-Feb-22 / ECS


SAMPLE DATA		SPECIMEN DATA		
Sample Type:	Clay	DESCRIPTION	Before Soaking	After Testing
Source:	TH21-01, B1 2'-5'	Moisture Content (MC), %	25.2	
Sampled by:	Client	MC of top 25mm layer, %		28.9
Optimum Moisture Content:	25.4 %	Dry Density, kg/m <sup>3</sup>	1514	
Maximum Dry Density:	1530 kg/cm <sup>3</sup>	Compaction, %	99%	
Method of Compaction:	Standard Proctor	CBR, %		4.9
Tested by:	ECS	Swell, %		1.5
	Date Tested: 01-Feb-22			

LOAD DATA	
PENETRATION mm	STRESS MPa
0	0.01
0.64	0.14
1.27	0.23
1.91	0.29
2.54	0.34
3.81	0.37
5.08	0.40
6.35	0.43
7.62	0.45
8.89	0.47



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD		BEARING RATIO (soaked)	
		ACTUAL MPa	CORRECTED MPa	at 2.5 mm penetration	at 5.1 mm penetration
2.54	6.9	0.34	0.34	4.9	-
5.08	10.3	0.40	0.40	-	3.9

Remarks: 4 days soaked

Reviewed by:   
Hermie Manalo

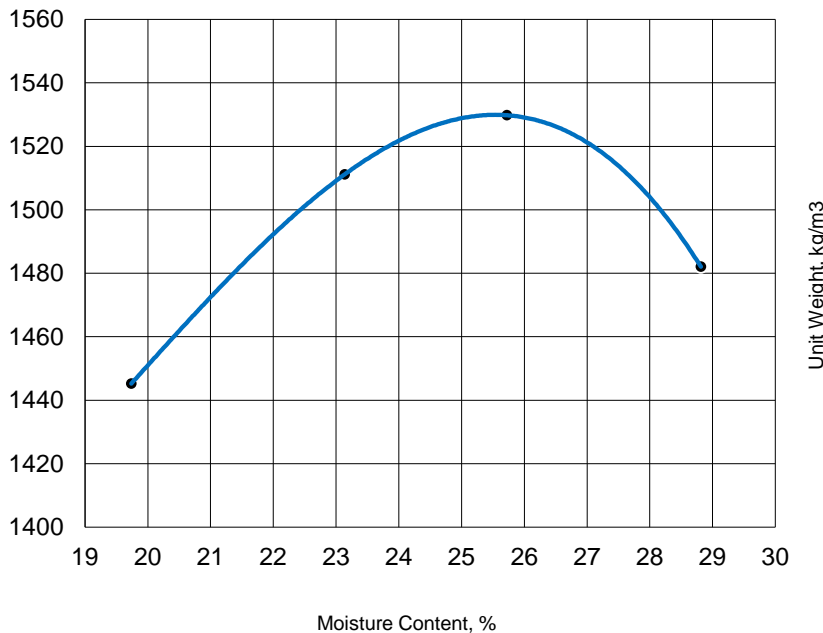


**MAXIMUM DRY DENSITY AND MOISTURE CONTENT - Proctor Method (ASTM D698)**

CLIENT	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7		PROJECT No.:	112-2204
ATTENTION:	Rico Manimbao		PROCTOR Test No.:	7
PROJECT:	Job No. 60672138 Midland - Notre Dame to Saskatchewan		LAB No.:	HM 007
Date Sampled:	N/A	Date Received:	27-Jan-22	
Sampled By:	Client	Date Tested:	01-Feb-22	
<b>MATERIAL INFORMATION</b>			PROCEDURE	A
Material Type:	Clay		PREPARATION	Dry
Material Use:	Subgrade	Material Supplier:	in-situ	
Maximum Size:	4.75 mm	Material Source:	TH21-01, B1 2'-5'	
			COMPACTION METHOD	Manual
			BLOWS PER LAYER	25
			NO. OF LAYERS	3
			MOLD SIZE	100
			MOLD VOLUME	935
			WEIGHT OF HAMMER	2.5 kg

	Test No.	1	2	3	4	
Wet Density		1730	1861	1923	1909	
Moisture Content		19.7	23.1	25.7	28.8	
Dry Density		1445	1511	1530	1482	

**Moisture - Density Relationship**



Maximum Dry Density (MDD):  
1530 kg/m<sup>3</sup>  
Optimum Moisture Content  
25.4 %

**STONE CORRECTION (ASTM D 4718)**

Retained on 4.75 mm sieve:  
\_\_\_\_\_%  
Corrected Moisture:  
25.4 %  
Corrected Maximum Dry Density:  
1530 kg/m<sup>3</sup>

Remarks:

Tested by: E. Santiago

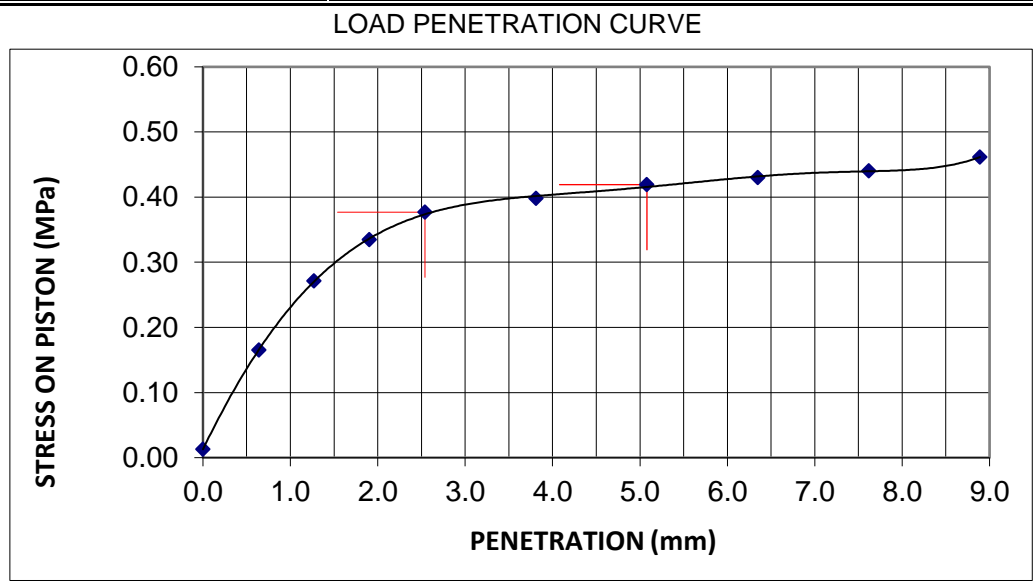
Reviewed by: Paul Bevel

**CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883**

Client:	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	Project No.:	112-2204
Attention:	Rico Manimbao	CBR test No.:	8
Project	Job No. 60672138	Lab No.:	HM 007
Location:	Midland - Notre Dame to Saskatchewan	Date sampled:	
		Date Received :	27-Jan-22
		Date Tested /By:	13-Feb-22 / ECS

SAMPLE DATA		SPECIMEN DATA		
Sample Type:	Clay	DESCRIPTION	Before Soaking	After Testing
Source:	TH21-02, B2 2'-5'	Moisture Content (MC), %	25.3	
Sampled by:	Client	MC of top 25mm layer, %		28.0
Optimum Moisture Content:	24.8 %	Dry Density, kg/m <sup>3</sup>	1525	
Maximum Dry Density:	1565 kg/cm <sup>3</sup>	Compaction, %	97%	
Method of Compaction:	Standard Proctor	CBR, %	5.5	
Tested by:	ECS	Swell, %	1.4	
	Date Tested: 07-Feb-22			

LOAD DATA	
PENETRATION mm	STRESS MPa
0	0.01
0.64	0.17
1.27	0.27
1.91	0.33
2.54	0.38
3.81	0.40
5.08	0.42
6.35	0.43
7.62	0.44
8.89	0.46



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD		BEARING RATIO (soaked)	
		ACTUAL MPa	CORRECTED MPa	at 2.5 mm penetration	at 5.1 mm penetration
2.54	6.9	0.38	0.38	5.5	-
5.08	10.3	0.42	0.42	-	4.1

Remarks: 4 days soaked

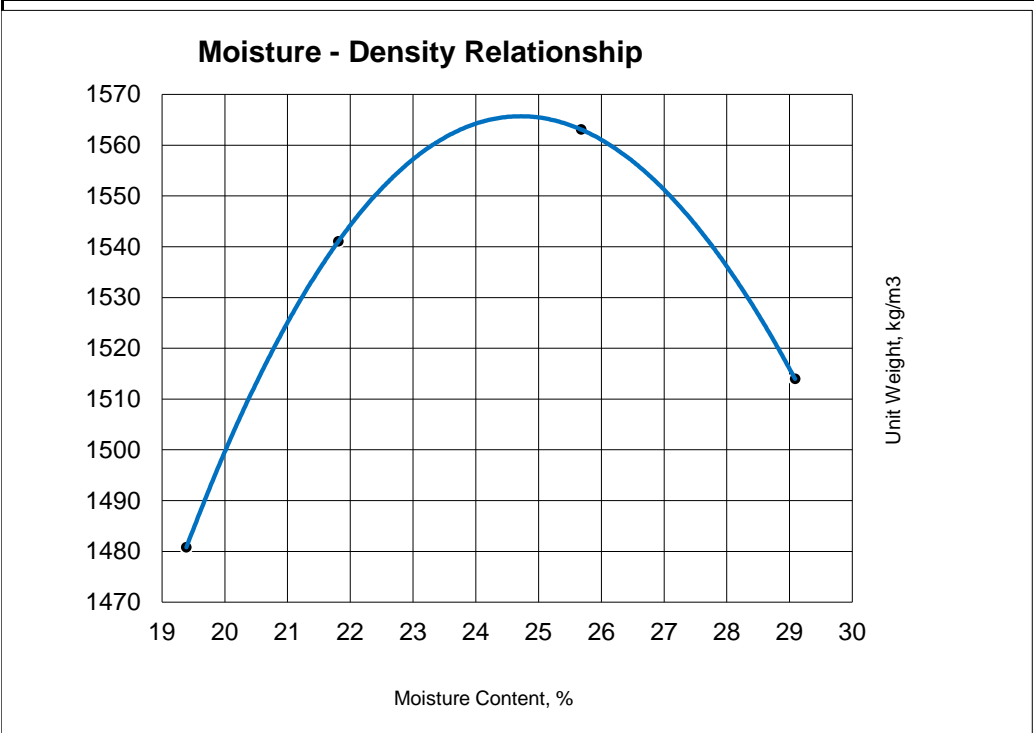
Reviewed by:   
Hermie Manalo

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

CLIENT	AECOM Canada Ltd.	PROJECT No.:	112-2204
	99 Commerce Drive	PROCTOR Test No.:	8
	Winnipeg MB R3P 0Y7	LAB No.:	HM 007
	ATTENTION: Rico Manimbao		
PROJECT:	Job No. 60672138		
	Midland - Notre Dame to Saskatchewan		

Date Sampled:	N/A	Date Received:	27-Jan-22	PROCEDURE	A
Sampled By:	Client	Date Tested:	07-Feb-22		PREPARATION
<b>MATERIAL INFORMATION</b>				COMPACTION METHOD	Manual
				BLOWS PER LAYER	25
Material Type: Clay				NO. OF LAYERS	3
Material Use:	Subgrade	Material Supplier:	in-situ	MOLD SIZE	100
Maximum Size:	4.75 mm	Material Source:	TH21-04, B2 2'-5'	MOLD VOLUME	935
				WEIGHT OF HAMMER	2.5 kg

Test No.	1	2	3	4
	Wet Density	1768	1877	1964
Moisture Content	19.4	21.8	25.7	29.1
Dry Density	1481	1541	1563	1514



Maximum Dry Density (MDD):  
1565 kg/m<sup>3</sup>  
Optimum Moisture Content  
24.8 %

STONE CORRECTION (ASTM D 4718)

Retained on 4.75 mm sieve: \_\_\_\_\_ %  
Corrected Moisture: 24.8 %  
Corrected Maximum Dry Density: 1565 kg/m<sup>3</sup>

Remarks:

*P. Bevel*

Tested by: E. Santiago

Reviewed by: Paul Bevel





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R3P 0Y7  
Phone: 204 477 5381



Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-01C (Milt Stegall Dr.)  
Sample Depth: 0.61 - 0.76 m  
Sample Number: G2

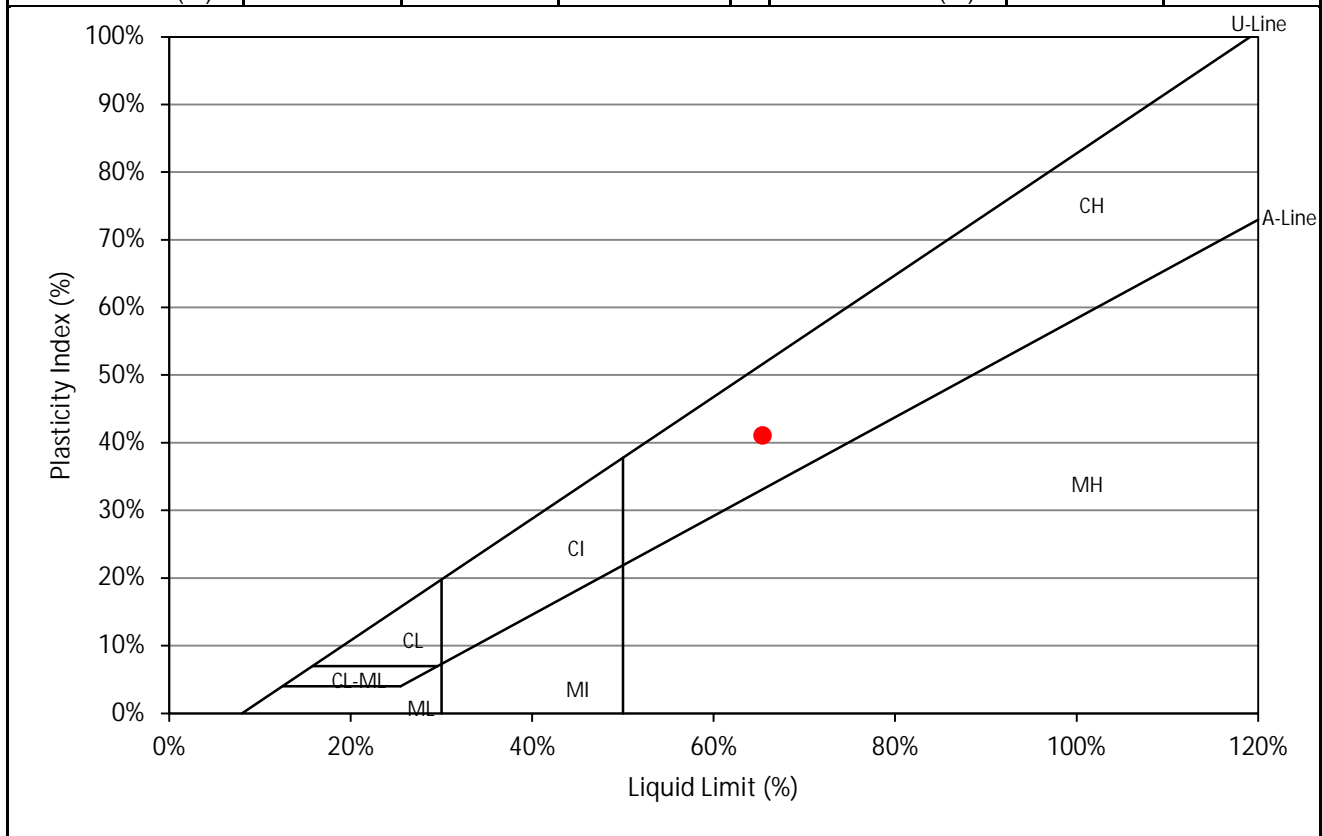
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	33	29	24
Wet Sample (g)	9.9	9.4	8.3
Dry Sample (g)	6.2	5.8	5.0
Water Content (%)	60.0%	62.1%	66.4%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.3	6.6
Dry Sample (g)	5.1	5.3
Water Content (%)	24.2%	24.4%



Liquid Limit (%): 65.4%

Plastic Limit (%): 24.3%

Plasticity Index (%): 41.1%



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Phone: 204 477 5381



Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-02C (Milt Stegall Dr.)  
Sample Depth: 1.22 - 1.37 m  
Sample Number: G4

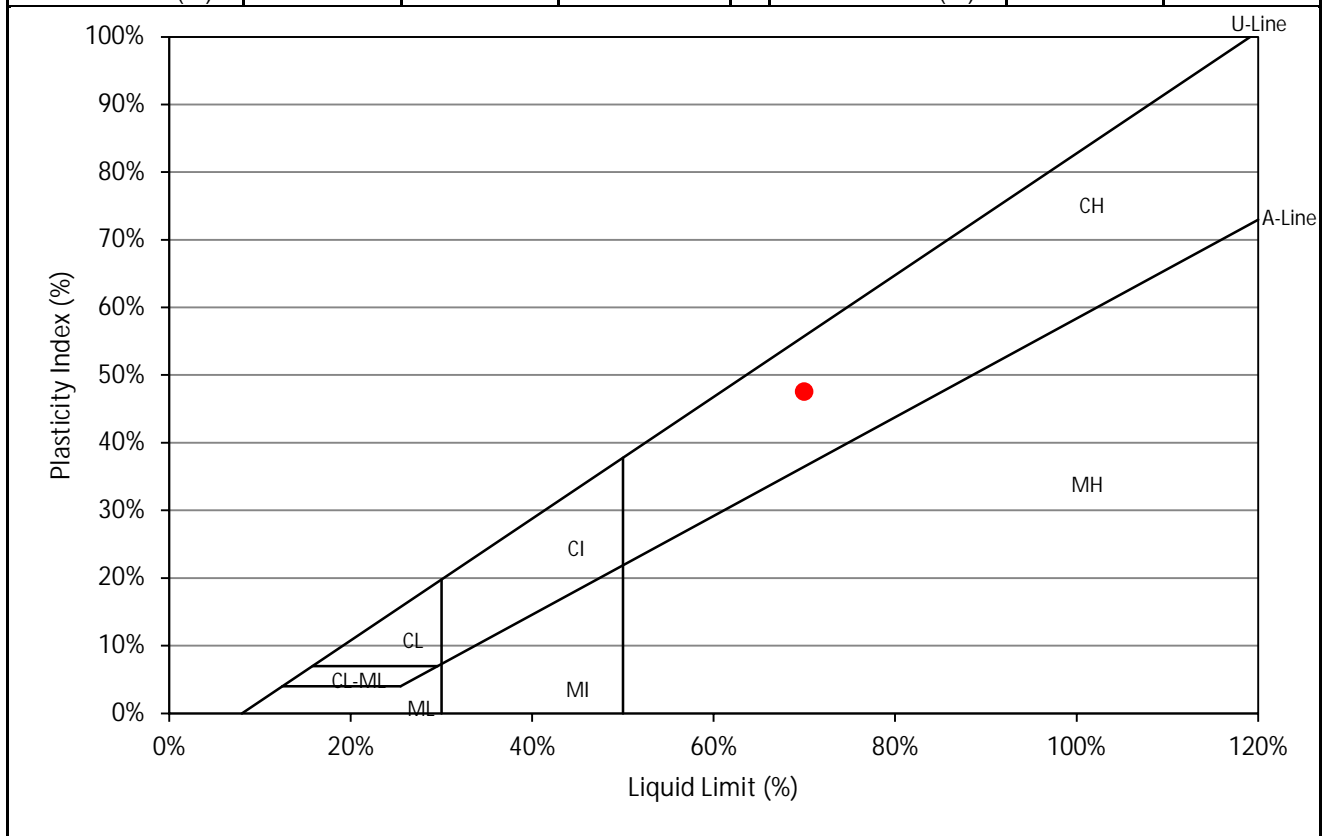
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	27	23	18
Wet Sample (g)	9.1	8.2	7.8
Dry Sample (g)	5.4	4.8	4.5
Water Content (%)	69.5%	70.7%	72.4%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.2	6.5
Dry Sample (g)	5.0	5.3
Water Content (%)	22.5%	22.2%



Liquid Limit (%): 69.9%

Plastic Limit (%): 22.4%

Plasticity Index (%): 47.6%



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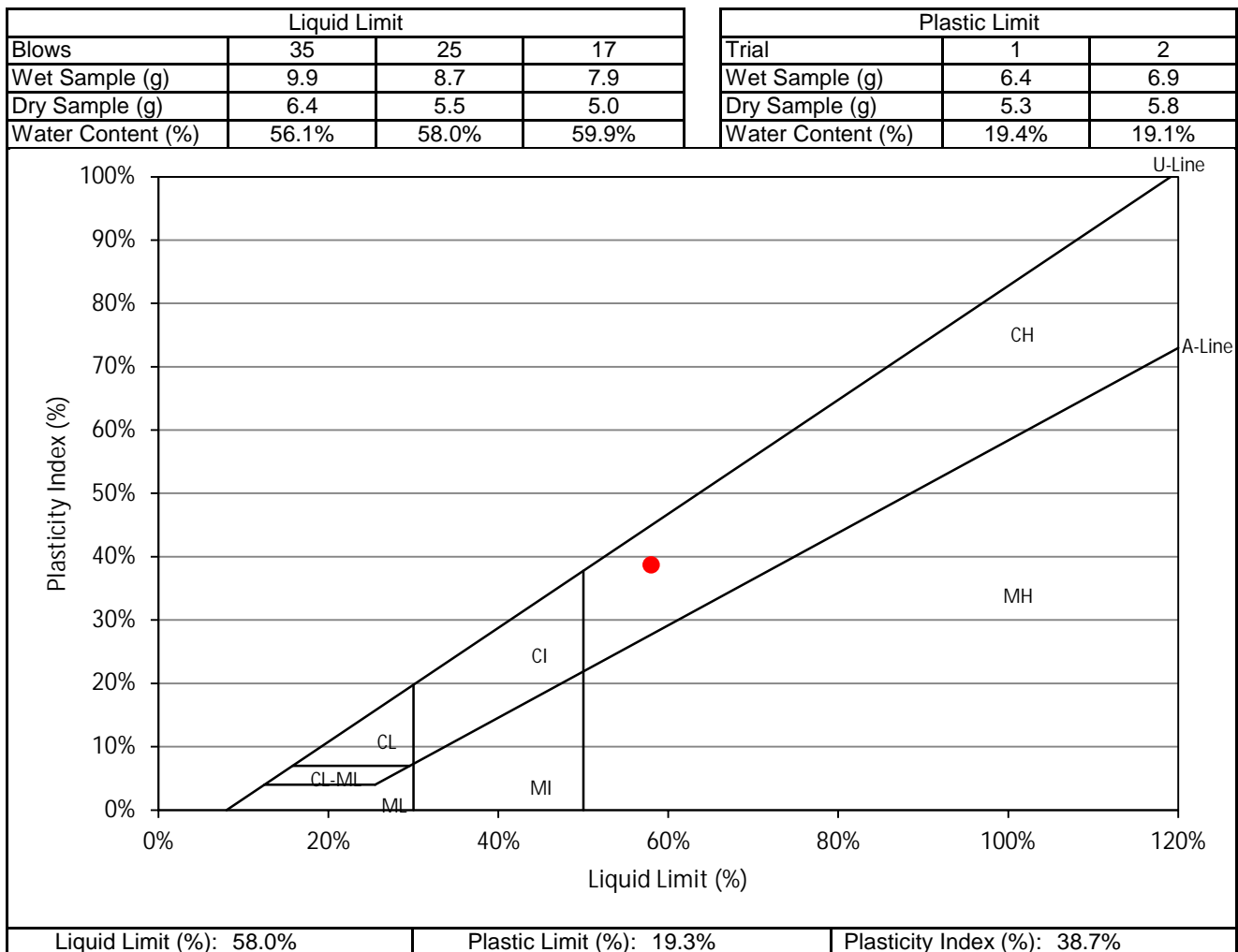
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Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-03C (Milt Stegall Dr.)  
Sample Depth: 0.91 - 1.07 m  
Sample Number: G3

Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils



**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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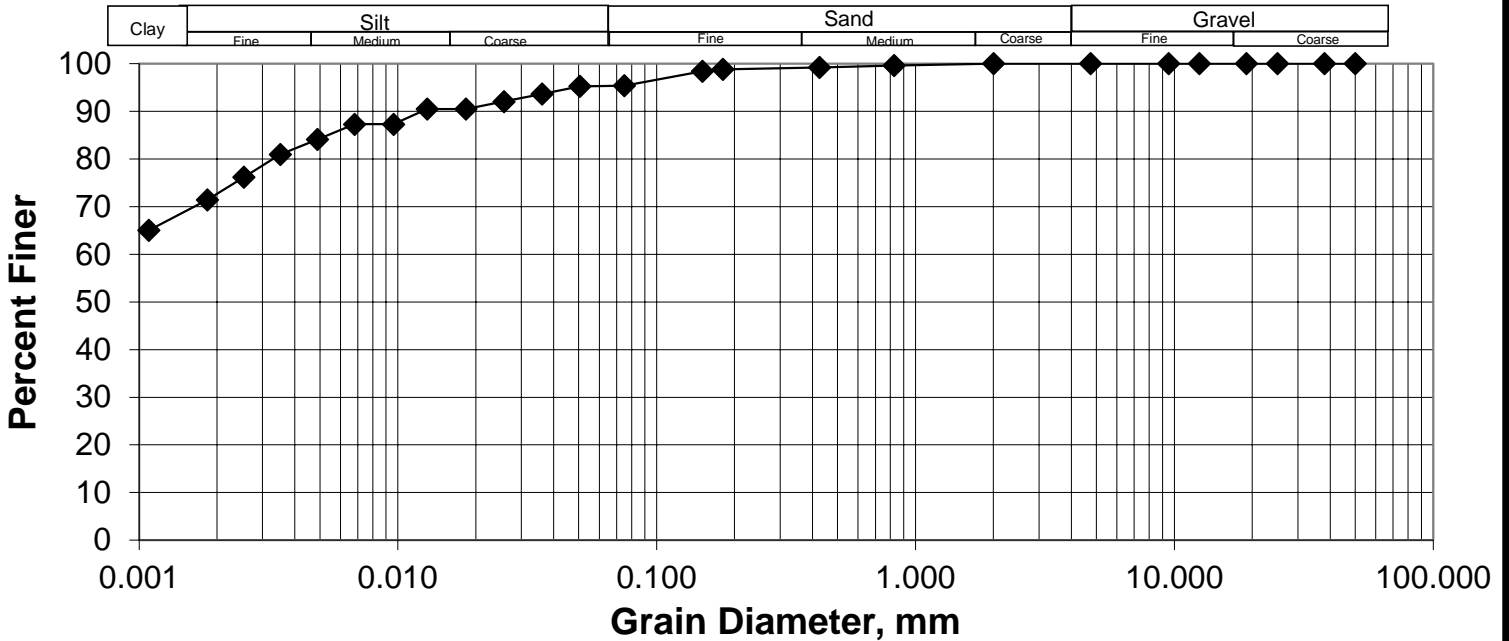


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-01C (Milt Stegall Dr.)  
Sample No.: G2  
Depth: 0.61 - 0.76 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	95.4
38.0	100.0	2.00	100.0	0.0505	95.2
25.0	100.0	0.825	99.6	0.0360	93.6
19.0	100.0	0.425	99.2	0.0257	92.1
12.5	100.0	0.18	98.8	0.0183	90.5
9.5	100.0	0.15	98.4	0.0130	90.5
4.75	100.0	0.075	95.4	0.0096	87.3
				0.0068	87.3
				0.0049	84.1
				0.0035	80.9
				0.0025	76.2
				0.0018	71.4
				0.0011	65.1

**GRAIN SIZE DISTRIBUTION CURVE**



Gravel	0.0%	Silt	22.9%
Sand	4.6%	Clay	72.5%



**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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tel (204) 477-5381 fax (431) 800-1210

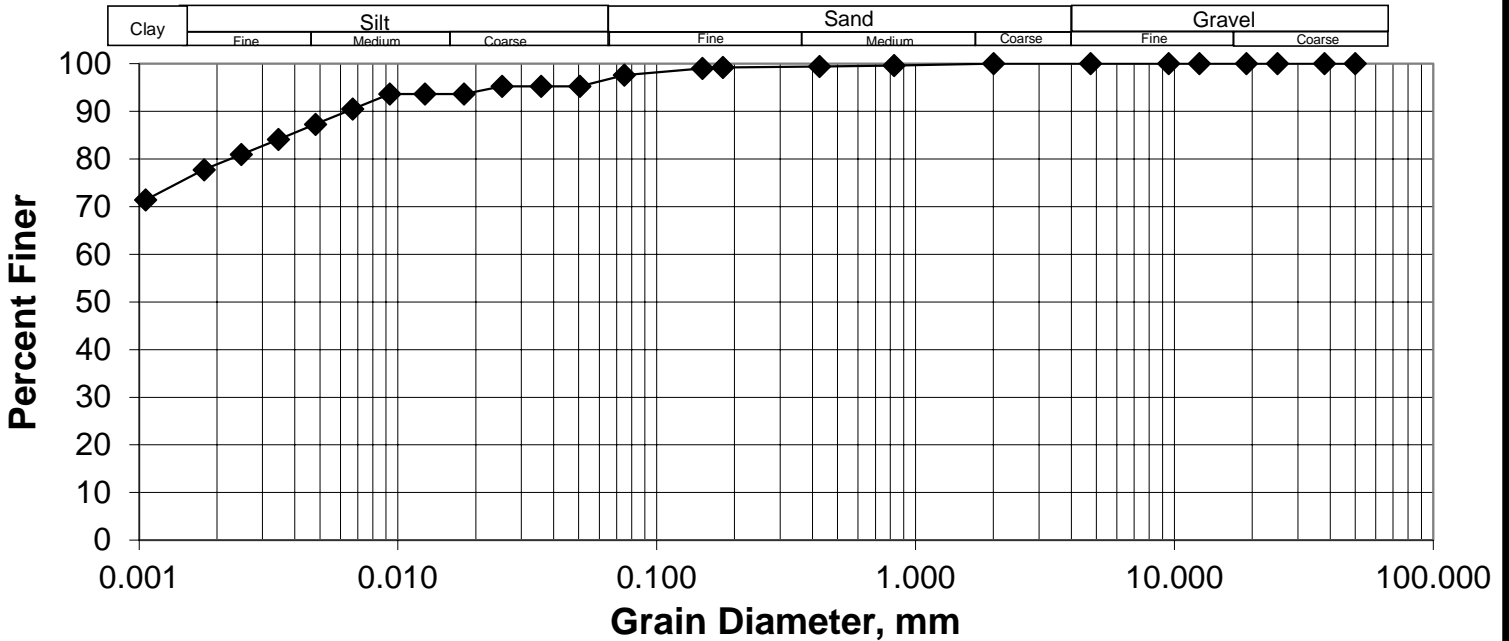


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-02C (Milt Stegall Dr.)  
Sample No.: G4  
Depth: 1.22 - 1.37 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	97.6
38.0	100.0	2.00	100.0	0.0505	95.2
25.0	100.0	0.825	99.6	0.0357	95.2
19.0	100.0	0.425	99.4	0.0253	95.2
12.5	100.0	0.18	99.2	0.0180	93.6
9.5	100.0	0.15	99.0	0.0127	93.6
4.75	100.0	0.075	97.6	0.0093	93.6
				0.0067	90.5
				0.0048	87.3
				0.0035	84.1
				0.0025	80.9
				0.0018	77.8
				0.0011	71.4

**GRAIN SIZE DISTRIBUTION CURVE**



Gravel	0.0%	Silt	18.9%
Sand	2.4%	Clay	78.7%

**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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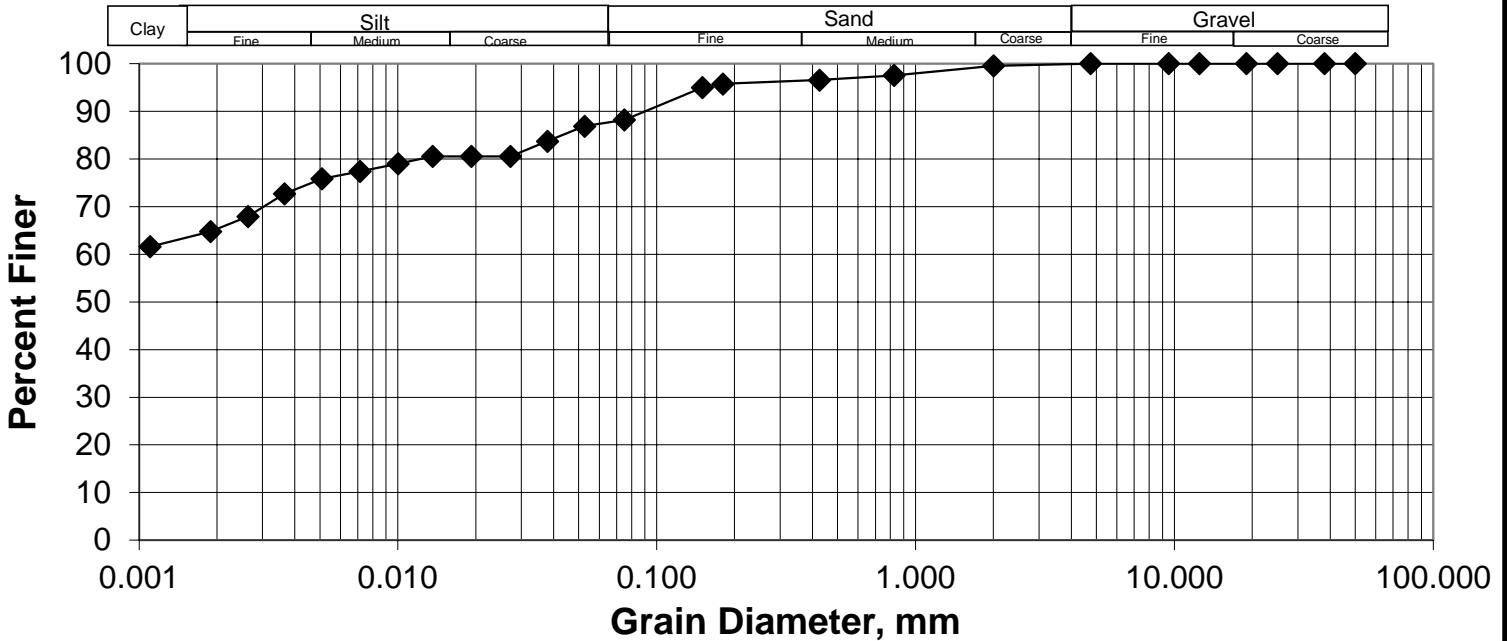


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-03C (Milt Stegall Dr.)  
Sample No.: G3  
Depth: 0.91 - 1.07 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	88.2
38.0	100.0	2.00	99.5	0.0527	86.9
25.0	100.0	0.825	97.5	0.0379	83.7
19.0	100.0	0.425	96.6	0.0272	80.6
12.5	100.0	0.18	95.8	0.0192	80.6
9.5	100.0	0.15	95.0	0.0136	80.6
4.75	100.0	0.075	88.2	0.0100	79.0
				0.0071	77.4
				0.0051	75.8
				0.0036	72.7
				0.0026	67.9
				0.0019	64.8
				0.0011	61.6

**GRAIN SIZE DISTRIBUTION CURVE**



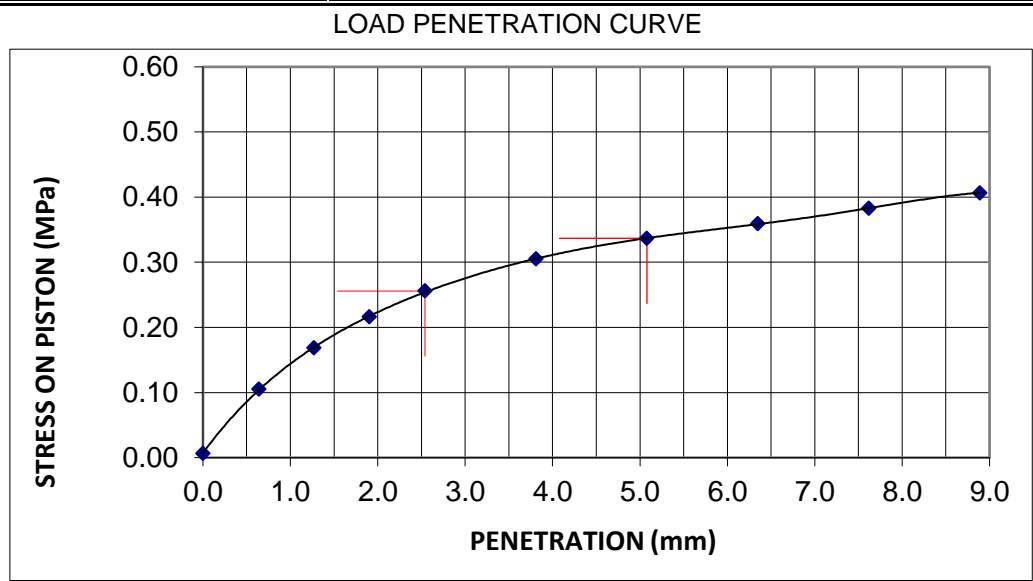
Gravel	0.0%	Silt	23.3%
Sand	11.8%	Clay	64.9%

**CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883**

Client:	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	Project No.:	112-2204
Attention:	Rico Manimbao	CBR test No.:	10
Project	Job No. 60672138	Lab No.:	HM 007
Location:	Milt Stegall - Sargent to Yukon	Date sampled:	
		Date Received :	27-Jan-22
		Date Tested /By:	08-Feb-22 / ECS

SAMPLE DATA		SPECIMEN DATA		
Sample Type:	Clay	DESCRIPTION	Before Soaking	After Testing
Source:	TH21-01, B1 2'-5'	Moisture Content (MC), %	28.4	
Sampled by:	Client	MC of top 25mm layer, %		32.6
Optimum Moisture Content:	28.0 %	Dry Density, kg/m <sup>3</sup>	1462	
Maximum Dry Density:	1476 kg/cm <sup>3</sup>	Compaction, %	99%	
Method of Compaction:	Standard Proctor	CBR, %	4.9	
Tested by:	ECS	Swell, %	1.5	
	Date Tested: 01-Feb-22			

LOAD DATA	
PENETRATION mm	STRESS MPa
0	0.01
0.64	0.11
1.27	0.17
1.91	0.22
2.54	0.26
3.81	0.31
5.08	0.34
6.35	0.36
7.62	0.38
8.89	0.41



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD		BEARING RATIO (soaked)	
		ACTUAL MPa	CORRECTED MPa	at 2.5 mm penetration	at 5.1 mm penetration
2.54	6.9	0.26	0.26	3.7	-
5.08	10.3	0.34	0.34	-	3.3

Remarks: 4 days soaked

Reviewed by:   
Hermie Manalo

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

CLIENT	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	PROJECT No.:	112-2204
ATTENTION:	Rico Manimbao	PROCTOR Test No.:	10
PROJECT:	Job No. 60672138 Milt Stegall - Sargent to Yukon	LAB No.:	HM 007

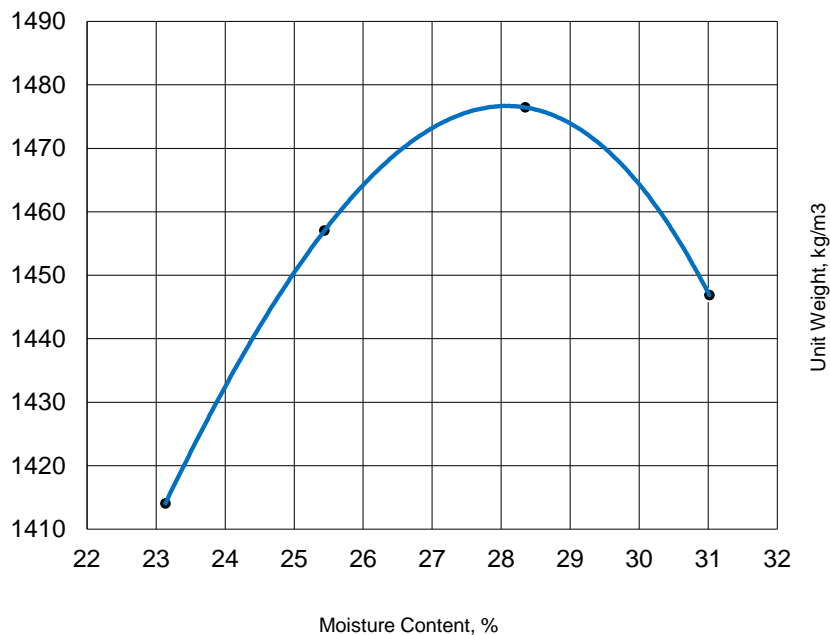
Date Sampled:	N/A	Date Received:	27-Jan-22	PROCEDURE	A
Sampled By:	Client	Date Tested:	01-Feb-22	PREPARATION	Dry
				COMPACTION METHOD	Manual

**MATERIAL INFORMATION**

Material Type:	Clay	Material Supplier:	in-situ	BLOWS PER LAYER	25
Material Use:	Subgrade	Material Source:	TH21-01, B1 2'-5'	NO. OF LAYERS	3
Maximum Size:	4.75 mm			MOLD SIZE	100
				MOLD VOLUME	935
				WEIGHT OF HAMMER	2.5 kg

	Test No.	1	2	3	4		
	Wet Density	1741	1828	1895	1896		
	Moisture Content	23.1	25.4	28.3	31.0		
	Dry Density	1414	1457	1476	1447		

**Moisture - Density Relationship**



Maximum Dry Density (MDD):  
1476 kg/m<sup>3</sup>  
Optimum Moisture Content  
28.0 %

**STONE CORRECTION (ASTM D 4718)**

Retained on 4.75 mm sieve:  
         %  
Corrected Moisture:  
28.0 %  
Corrected Maximum Dry Density:  
1476 kg/m<sup>3</sup>

Remarks:

*P. Bevel*

Tested by: E. Santiago

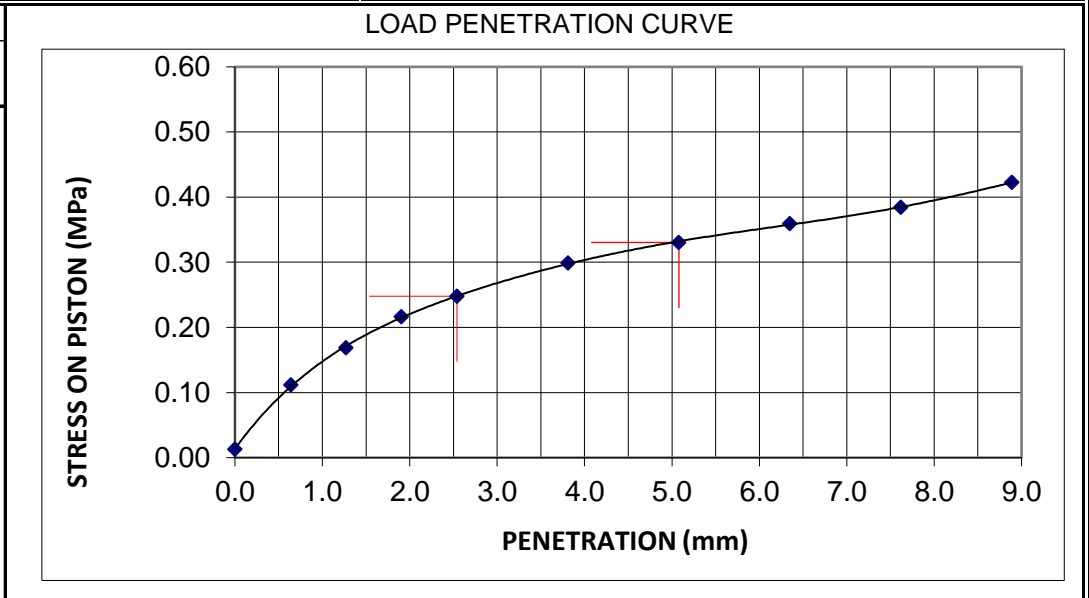
Reviewed by: Paul Bevel

**CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883**

Client:	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	Project No.:	112-2204
Attention:	Rico Manimbao	CBR test No.:	9
Project	Job No. 60672138	Lab No.:	HM 007
Location:	Milt Stegall - Sargent to Yukon	Date sampled:	
		Date Received :	27-Jan-22
		Date Tested /By:	08-Feb-22 / ECS

SAMPLE DATA		SPECIMEN DATA		
Sample Type:	Clay	DESCRIPTION	Before Soaking	After Testing
Source:	TH21-03, B2 2'-5'	Moisture Content (MC), %	27.0	
Sampled by:	Client	MC of top 25mm layer, %		33.1
Optimum Moisture Content:	27.3 %	Dry Density, kg/m <sup>3</sup>	1472	
Maximum Dry Density:	1489 kg/cm <sup>3</sup>	Compaction, %	99%	
Method of Compaction:	Standard Proctor	CBR, %	3.6	
Tested by:	ECS	Swell, %	1.7	
	Date Tested: 01-Feb-22			

LOAD DATA	
PENETRATION mm	STRESS MPa
0	0.01
0.64	0.11
1.27	0.17
1.91	0.22
2.54	0.25
3.81	0.30
5.08	0.33
6.35	0.36
7.62	0.38
8.89	0.42



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD		BEARING RATIO (soaked)	
		ACTUAL MPa	CORRECTED MPa	at 2.5 mm penetration	at 5.1 mm penetration
2.54	6.9	0.25	0.25	3.6	-
5.08	10.3	0.33	0.33	-	3.2

Remarks: 4 days soaked

Reviewed by:   
Hermie Manalo

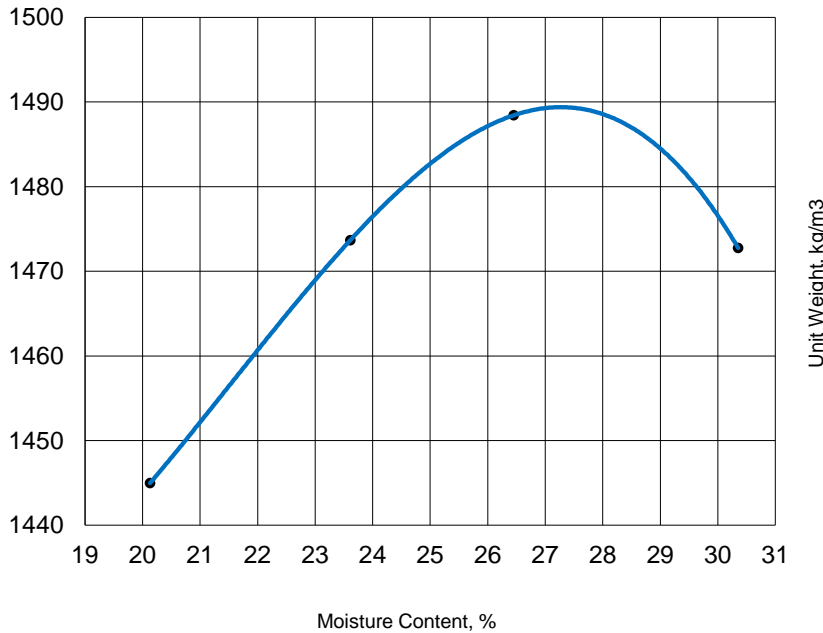
**MAXIMUM DRY DENSITY AND MOISTURE CONTENT - Proctor Method (ASTM D698)**

CLIENT	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	PROJECT No.:	112-2204
ATTENTION:	Rico Manimbao	PROCTOR Test No.:	9
PROJECT:	Job No. 60672138 Milt Stegall - Sargent to Yukon	LAB No.:	HM 007

Date Sampled:	N/A	Date Received:	27-Jan-22	PROCEDURE	A
Sampled By:	Client	Date Tested:	01-Feb-22	PREPARATION	Dry
<b>MATERIAL INFORMATION</b>				COMPACTION METHOD	Manual
Material Type:	Clay			BLOWS PER LAYER	25
Material Use:	Subgrade	Material Supplier:	in-situ	NO. OF LAYERS	3
Maximum Size:	4.75 mm	Material Source:	TH21-03, B2 2'-5'	MOLD SIZE	100
				MOLD VOLUME	935
				WEIGHT OF HAMMER	2.5 kg

	Test No.	1	2	3	4		
	Wet Density	1736	1822	1882	1920		
	Moisture Content	20.1	23.6	26.5	30.4		
	Dry Density	1445	1474	1488	1473		

**Moisture - Density Relationship**



Maximum Dry Density (MDD):  
\_\_\_\_\_ 1489 kg/m<sup>3</sup>  
Optimum Moisture Content  
\_\_\_\_\_ 27.3 %

STONE CORRECTION (ASTM D 4718)  
  
Retained on 4.75 mm sieve:  
\_\_\_\_\_ %  
Corrected Moisture:  
\_\_\_\_\_ 27.3 %  
Corrected Maximum Dry Density:  
\_\_\_\_\_ 1489 kg/m<sup>3</sup>

Remarks:

*P. Bevel*

Tested by: E. Santiago

Reviewed by: Paul Bevel



AECOM Canada Ltd.  
 Winnipeg Geotechnical Laboratory  
 99 Commerce Drive  
 Winnipeg, Manitoba  
 R3P 0Y7  
 Phone: 204 477 5381



Fax: 204 284 2040

**Project Name:** 2022 Industrial Streets (22-RI-02)  
**Project Number:** 60672138  
**Client:** City of Winnipeg  
**Sample Location:** Murray Park Rd.  
**Sample Depth:** Varies  
**Sample Number:** Varies

**Supplier:** AECOM  
**Specification:** N/A  
**Field Technician:** EManimbao  
**Sample Date:** December 21, 2021  
**Lab Technician:** EManimbao  
**Date Tested:** February 9, 2022

### Moisture Content (ASTM D2216-10)

Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Location	Sample	Depth (m)	Moisture Content (%)
TH21-01D	G1	0.30 - 0.46 m	-
	G2	0.61 - 0.76 m	-
	B1	0.91 - 1.68 m	-
	G3	0.91 - 1.07 m	-
	G4	1.22 - 1.37 m	9.9%
	G5	1.52 - 1.68 m	10.1%
TH21-02D	G6	2.44 - 2.59 m	10.0%
	G1	0.30 - 0.46 m	-
	G2	0.61 - 0.76 m	23.4%
	B2	0.61 - 1.52 m	-
	G3	0.91 - 1.07 m	11.4%
	G4	1.22 - 1.37 m	9.1%
TH21-03D	G5	1.52 - 1.68 m	11.7%
	G6	2.44 - 2.59 m	9.1%
	G1	0.30 - 0.46 m	23.4%
	G2	0.61 - 0.76 m	28.3%
	G3	0.91 - 1.07 m	28.6%
	G4	1.22 - 1.37 m	23.2%
TH21-04D	G5	1.52 - 1.68 m	28.8%
	G6	2.44 - 2.59 m	20.6%
	G1	0.30 - 0.46 m	24.6%
	G2	0.61 - 0.76 m	23.8%
	G3	0.91 - 1.07 m	21.6%
	G4	1.22 - 1.37 m	16.9%
TH21-05D	G5	1.52 - 1.68 m	13.9%
	G6	2.44 - 2.59 m	8.8%
	G1	0.30 - 0.46 m	25.0%
	G2	0.61 - 0.76 m	16.2%
	G3	0.91 - 1.07 m	12.7%
	G4	1.22 - 1.37 m	12.9%
	G5	1.52 - 1.68 m	9.8%
	G6	2.44 - 2.59 m	7.0%

Location	Sample	Depth (m)	Moisture Content (%)



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Phone: 204 477 5381



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Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-01D (Murray Park Rd.)  
Sample Depth: 1.22 - 1.37 m  
Sample Number: G4

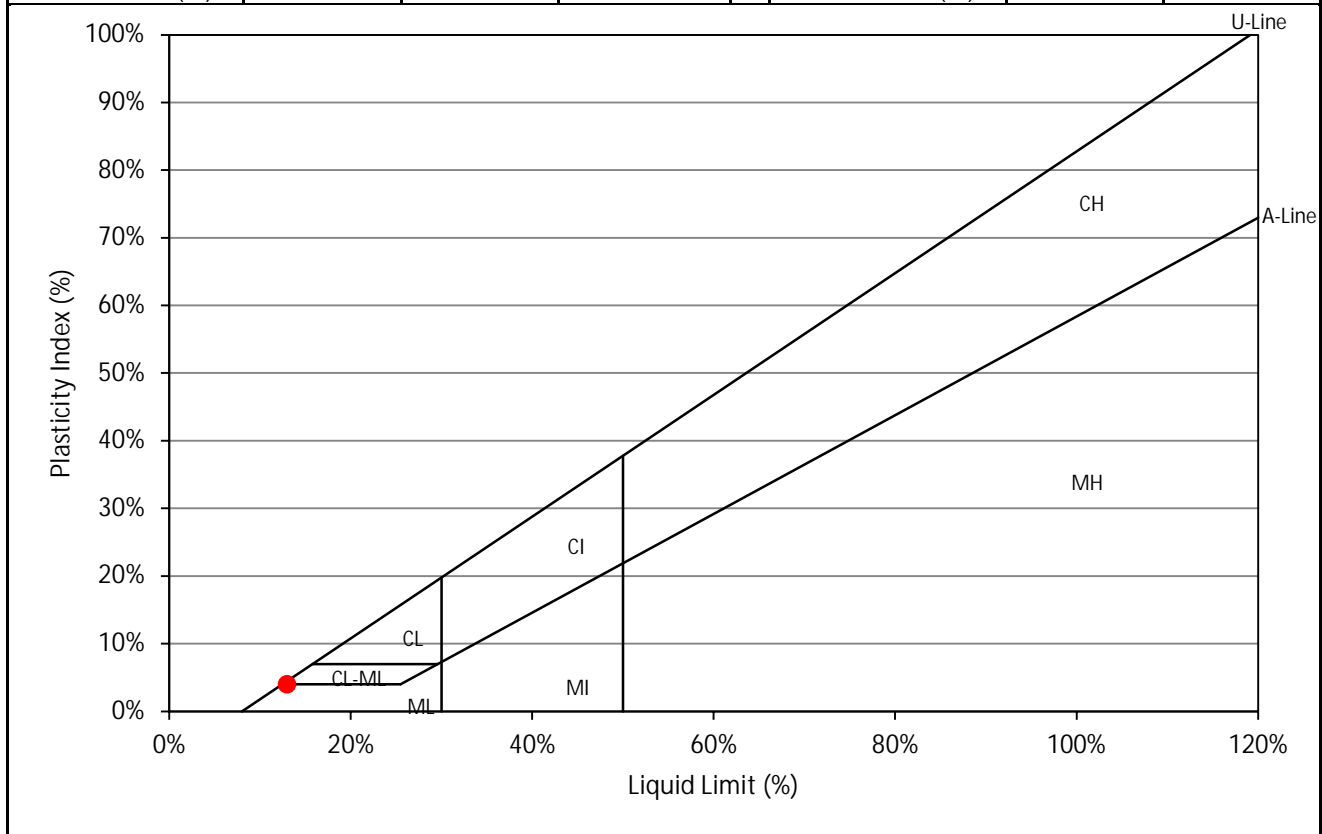
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	35	28	23
Wet Sample (g)	11.9	11.8	14.3
Dry Sample (g)	10.6	10.5	12.6
Water Content (%)	12.1%	12.7%	13.2%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.6	6.5
Dry Sample (g)	6.1	6.0
Water Content (%)	9.0%	9.0%



Liquid Limit (%): 12.9%

Plastic Limit (%): 9.0%

Plasticity Index (%): 4.0%





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Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-03D (Murray Park Rd.)  
Sample Depth: 0.91 - 1.07 m  
Sample Number: G3

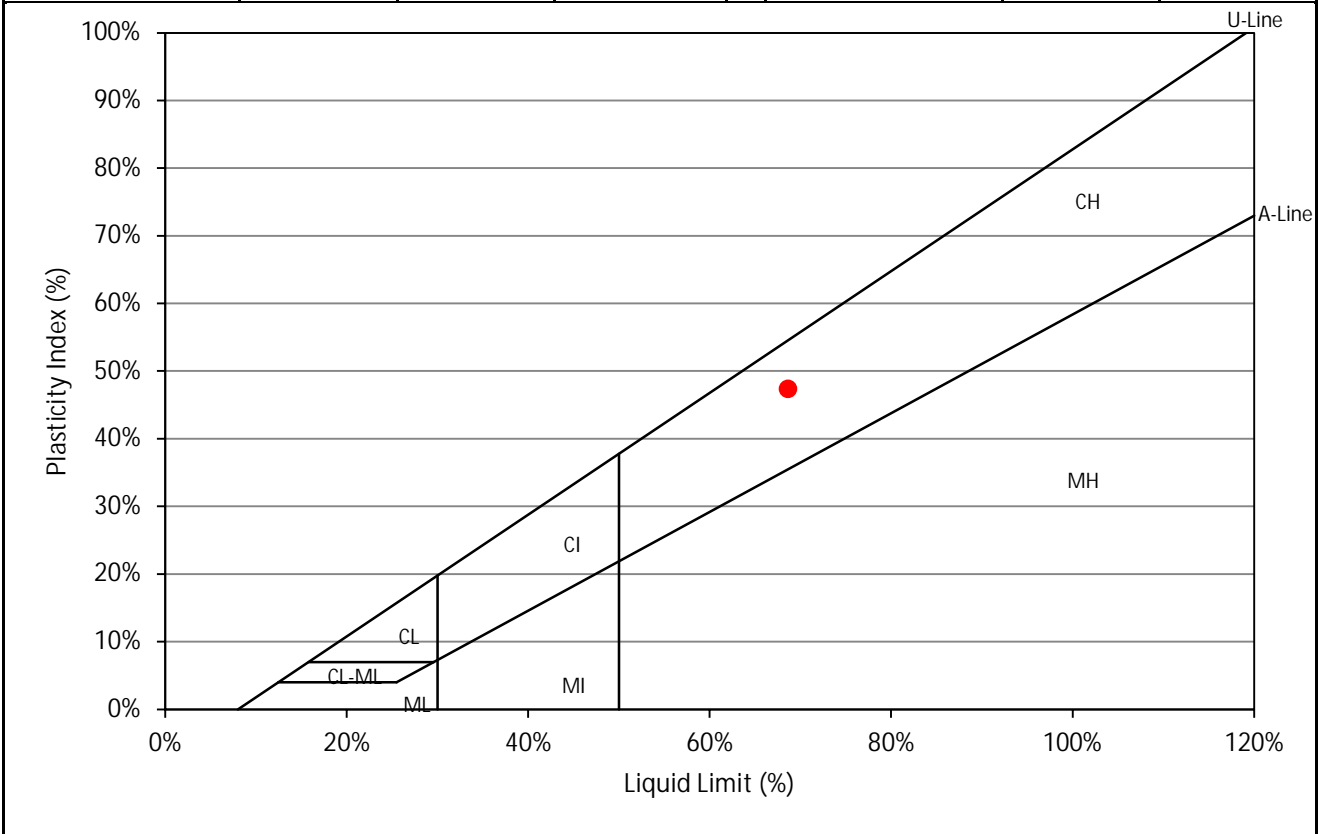
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

### Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	34	26	19
Wet Sample (g)	8.2	9.4	9.2
Dry Sample (g)	4.9	5.6	5.4
Water Content (%)	66.2%	68.1%	70.5%

Plastic Limit		
Trial	1	2
Wet Sample (g)	7.7	8.3
Dry Sample (g)	6.3	6.9
Water Content (%)	21.2%	21.3%



Liquid Limit (%): 68.6%      Plastic Limit (%): 21.2%      Plasticity Index (%): 47.4%



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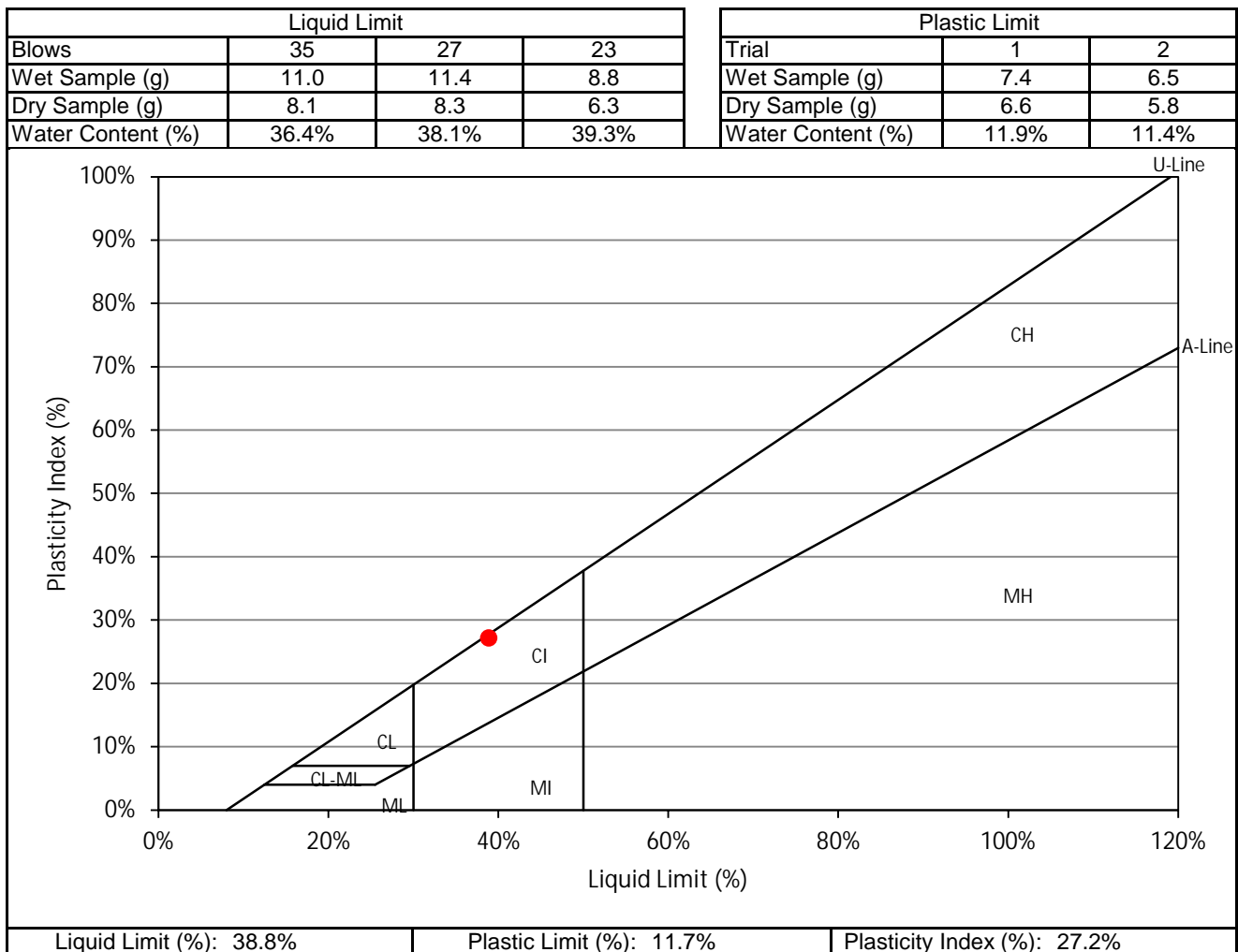
Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-05D (Murray Park Rd.)  
Sample Depth: 0.61 - 0.76 m  
Sample Number: G2

Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils



**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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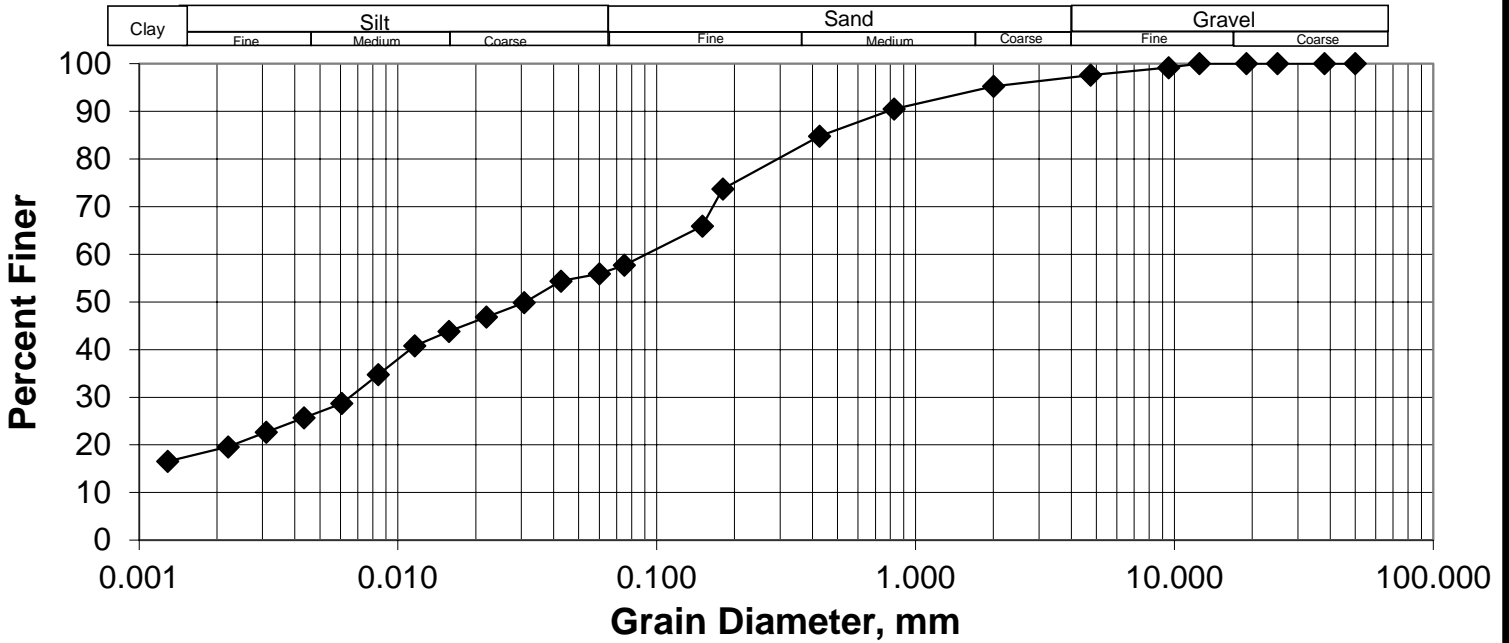


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-01D (Murray Park Rd.)  
Sample No.: G4  
Depth: 1.22 - 1.37 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	97.6	0.0750	57.7
38.0	100.0	2.00	95.2	0.0600	55.9
25.0	100.0	0.825	90.5	0.0427	54.4
19.0	100.0	0.425	84.8	0.0307	49.9
12.5	100.0	0.18	73.7	0.0220	46.8
9.5	99.2	0.15	65.9	0.0157	43.8
4.75	97.6	0.075	57.7	0.0116	40.8
				0.0084	34.7
				0.0061	28.7
				0.0043	25.7
				0.0031	22.6
				0.0022	19.6
				0.0013	16.6

**GRAIN SIZE DISTRIBUTION CURVE**



Gravel	2.4%	Silt	38.2%
Sand	39.9%	Clay	19.5%

**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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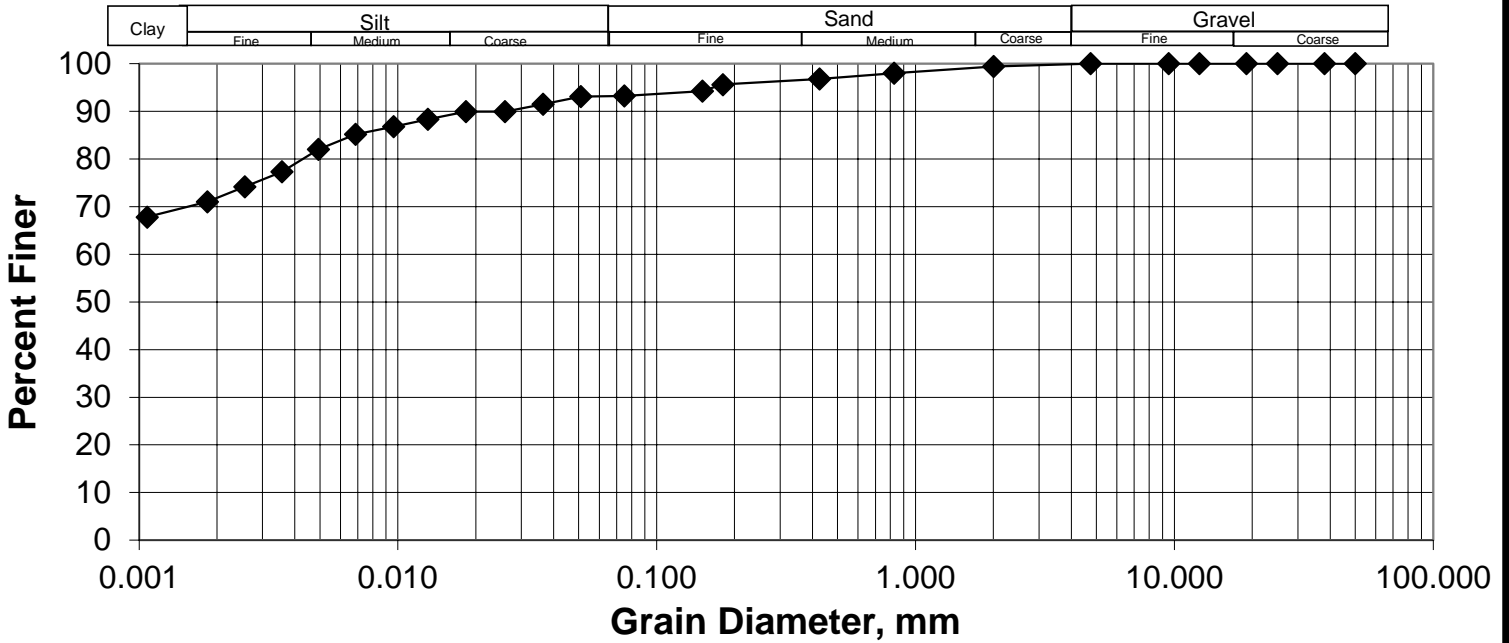


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-03D (Murray Park Rd.)  
Sample No.: G3  
Depth: 0.91 - 1.07 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	93.2
38.0	100.0	2.00	99.4	0.0510	93.1
25.0	100.0	0.825	98.0	0.0363	91.5
19.0	100.0	0.425	96.8	0.0259	89.9
12.5	100.0	0.18	95.6	0.0183	89.9
9.5	100.0	0.15	94.2	0.0131	88.3
4.75	100.0	0.075	93.2	0.0096	86.8
				0.0069	85.2
				0.0049	82.0
				0.0036	77.3
				0.0026	74.1
				0.0018	71.0
				0.0011	67.8

**GRAIN SIZE DISTRIBUTION CURVE**



Gravel	0.0%	Silt	22.1%
Sand	6.8%	Clay	71.1%

**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



WINNIPEG GEOTECHNICAL LABORATORY

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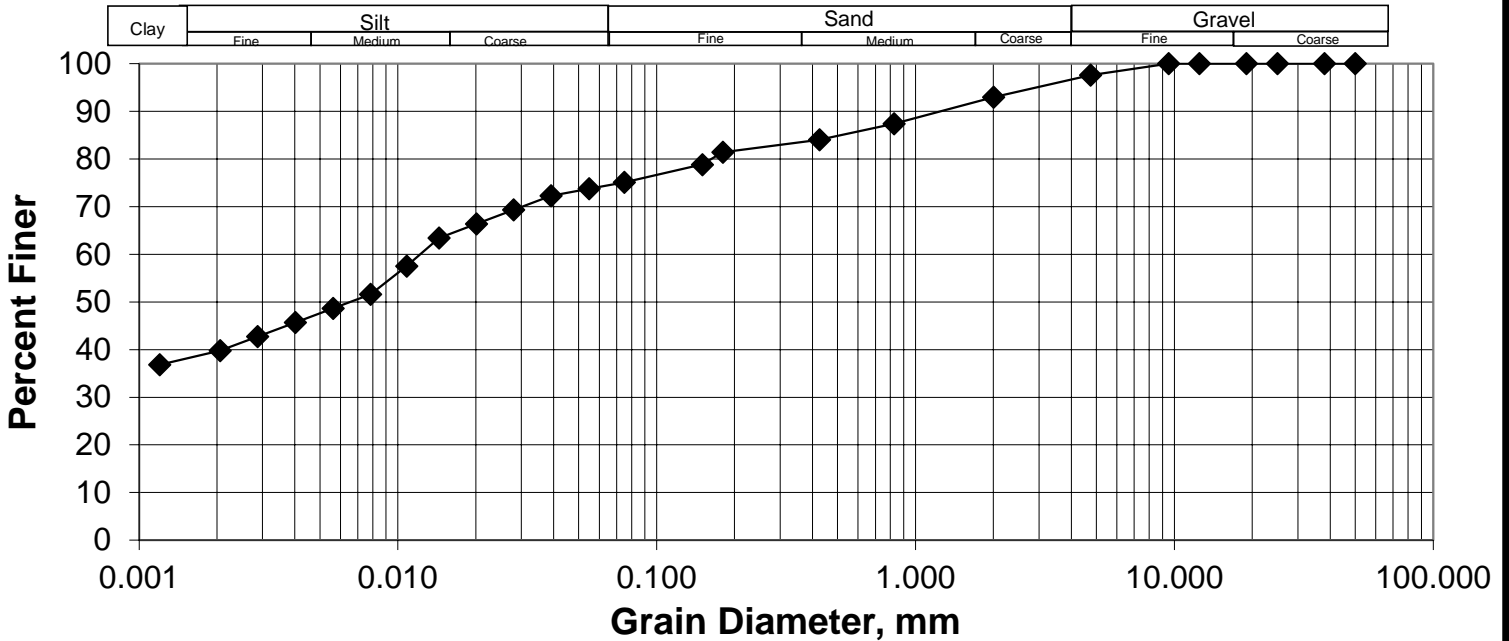


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-05D (Murray Park Rd.)  
Sample No.: G2  
Depth: 0.61 - 0.76 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	97.6	0.0750	75.1
38.0	100.0	2.00	93.0	0.0548	73.8
25.0	100.0	0.825	87.4	0.0391	72.3
19.0	100.0	0.425	84.0	0.0280	69.3
12.5	100.0	0.18	81.4	0.0201	66.4
9.5	100.0	0.15	78.8	0.0144	63.4
4.75	97.6	0.075	75.1	0.0108	57.5
				0.0078	51.6
				0.0056	48.7
				0.0040	45.7
				0.0029	42.8
				0.0021	39.8
				0.0012	36.9

**GRAIN SIZE DISTRIBUTION CURVE**



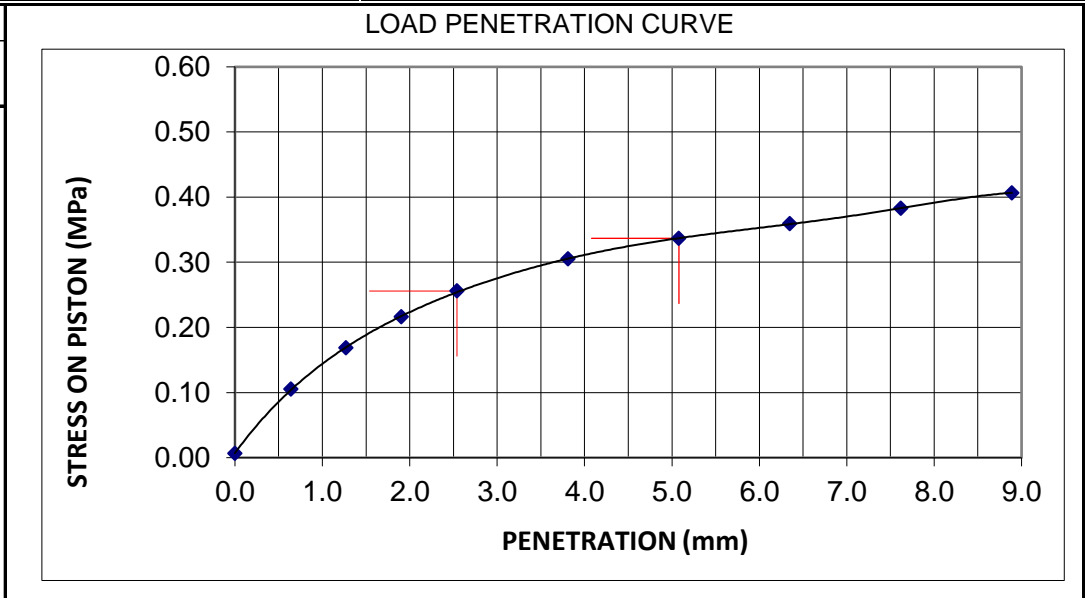
Gravel	2.4%	Silt	35.4%
Sand	22.5%	Clay	39.7%

**CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883**

Client:	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	Project No.:	112-2204
Attention:	Rico Manimbao	CBR test No.:	11
Project	Job No. 60672138	Lab No.:	HM 007
Location:	Murray Park Rd. - Sturgeon to Cree Crescent	Date sampled:	
		Date Received :	27-Jan-22
		Date Tested /By:	09-Feb-22 / ECS

SAMPLE DATA		SPECIMEN DATA	
Sample Type:	Clay till	DESCRIPTION	Before Soaking / After Testing
Source:	TH21-01, B1 2'-5'	Moisture Content (MC), %	15.6
Sampled by:	Client	MC of top 25mm layer, %	17.8
Optimum Moisture Content:	15.7 %	Dry Density, kg/m <sup>3</sup>	1795
Maximum Dry Density:	1823 kg/cm <sup>3</sup>	Compaction, %	98%
Method of Compaction:	Standard Proctor	CBR, %	3.7
Tested by:	ECS	Swell, %	1.3
	Date Tested: 04-Feb-22		

LOAD DATA	
PENETRATION mm	STRESS MPa
0	0.01
0.64	0.11
1.27	0.17
1.91	0.22
2.54	0.26
3.81	0.31
5.08	0.34
6.35	0.36
7.62	0.38
8.89	0.41



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD		BEARING RATIO (soaked)	
		ACTUAL MPa	CORRECTED MPa	at 2.5 mm penetration	at 5.1 mm penetration
2.54	6.9	0.26	0.26	3.7	-
5.08	10.3	0.34	0.34	-	3.3

Remarks: 4 days soaked

Reviewed by:

Hermie Manalo

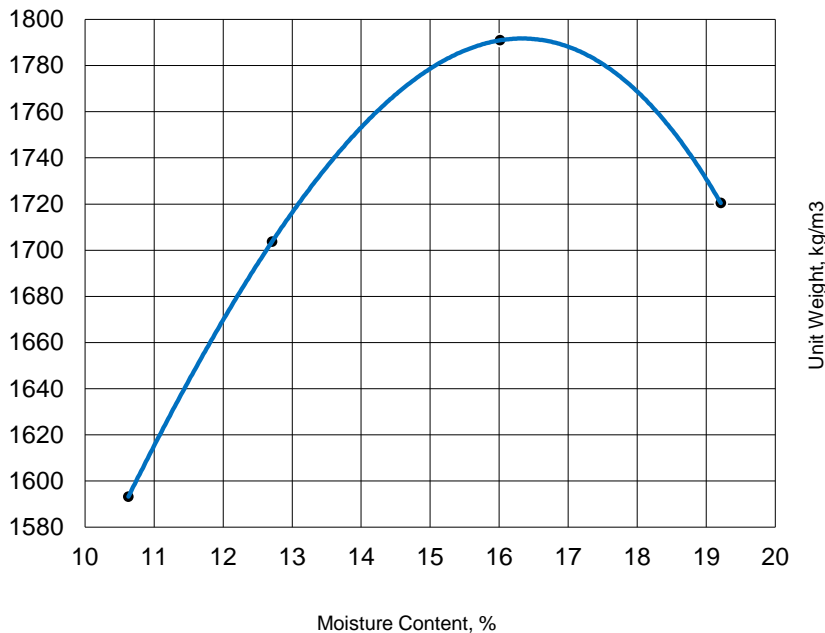
**MAXIMUM DRY DENSITY AND MOISTURE CONTENT - Proctor Method (ASTM D698)**

CLIENT	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	PROJECT No.:	112-2204
ATTENTION:	Rico Manimbao	PROCTOR Test No.:	11
PROJECT:	Job No. 60672138 Murray Park Rd. - Sturgeon to Cree Crescent	LAB No.:	HM 007

Date Sampled:	N/A	Date Received:	27-Jan-22	PROCEDURE	A
Sampled By:	Client	Date Tested:	04-Feb-22	PREPARATION	Dry
<b>MATERIAL INFORMATION</b>				COMPACTION METHOD	Manual
				BLOWS PER LAYER	25
Material Type:	Clay till	NO. OF LAYERS	3	MOLD SIZE	100
Material Use:	Subgrade	Material Supplier:	in-situ	MOLD VOLUME	935
Maximum Size:	16 mm	Material Source:	TH21-01, B1 2'-5'	WEIGHT OF HAMMER	2.5 kg

	Test No.	1	2	3	4		
	Wet Density	1763	1920	2078	2051		
	Moisture Content	10.6	12.7	16.0	19.2		
	Dry Density	1593	1704	1791	1720		

**Moisture - Density Relationship**



Maximum Dry Density (MDD):  
1791 kg/m<sup>3</sup>  
Optimum Moisture Content  
16.4 %

**STONE CORRECTION (ASTM D 4718)**

Retained on 4.75 mm sieve:  
5.4 %  
Corrected Moisture:  
15.7 %  
Corrected Maximum Dry Density:  
1823 kg/m<sup>3</sup>

Remarks:

*P. Bevel*

Tested by: E. Santiago

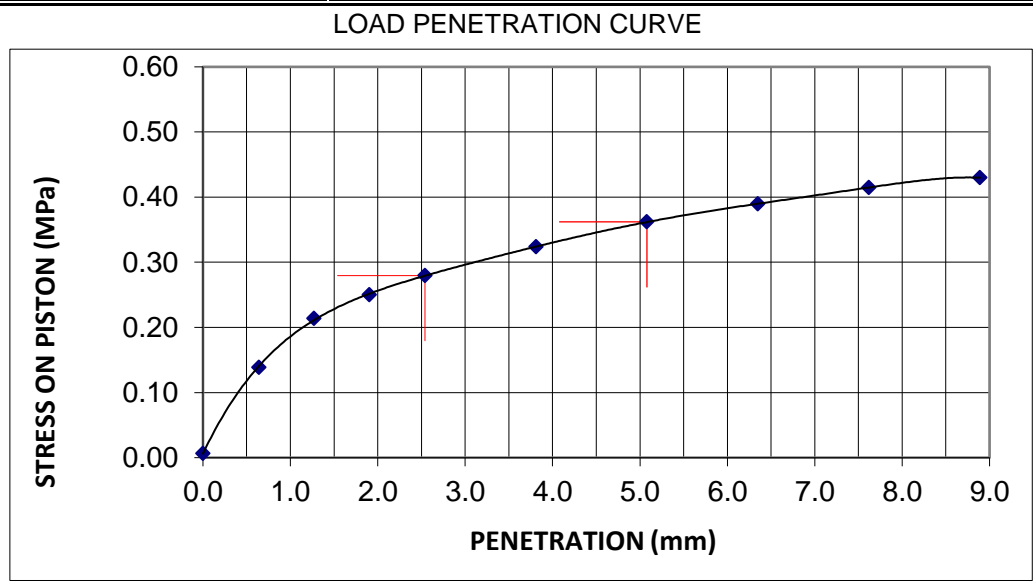
Reviewed by: Paul Bevel

**CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883**

Client:	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	Project No.:	112-2204
Attention:	Rico Manimbao	CBR test No.:	12
Project	Job No. 60672138	Lab No.:	HM 007
Location:	Murray Park Rd. - Sturgeon to Cree Crescent	Date sampled:	
		Date Received :	27-Jan-22
		Date Tested /By:	09-Feb-22 / ECS


SAMPLE DATA		SPECIMEN DATA	
Sample Type:	Clay till	DESCRIPTION	Before Soaking / After Testing
Source:	TH21-02, B2 2'-5'	Moisture Content (MC), %	14.5
Sampled by:	Client	MC of top 25mm layer, %	17.7
Optimum Moisture Content:	14.3 %	Dry Density, kg/m <sup>3</sup>	1810
Maximum Dry Density:	1848 kg/cm <sup>3</sup>	Compaction, %	98%
Method of Compaction:	Standard Proctor	CBR, %	4.1
Tested by:	ECS	Swell, %	1.4
	Date Tested: 01-Feb-22		

LOAD DATA	
PENETRATION mm	STRESS MPa
0	0.01
0.64	0.14
1.27	0.21
1.91	0.25
2.54	0.28
3.81	0.32
5.08	0.36
6.35	0.39
7.62	0.41
8.89	0.43



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD		BEARING RATIO (soaked)	
		ACTUAL MPa	CORRECTED MPa	at 2.5 mm penetration	at 5.1 mm penetration
2.54	6.9	0.28	0.28	4.1	-
5.08	10.3	0.36	0.36	-	3.5

Remarks: 4 days soaked

Reviewed by:   
Hermie Manalo



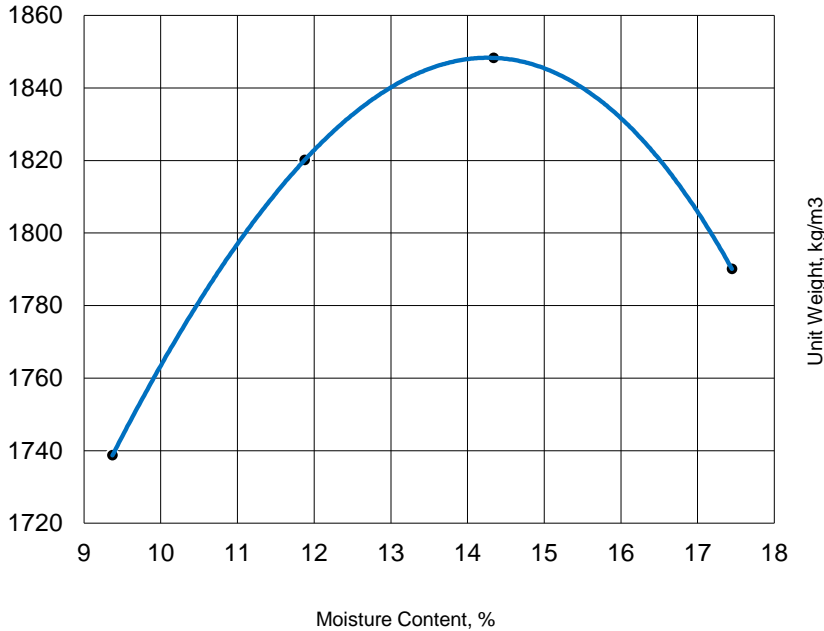
**MAXIMUM DRY DENSITY AND MOISTURE CONTENT - Proctor Method (ASTM D698)**

CLIENT	AECOM Canada Ltd.	PROJECT No.:	112-2204
	99 Commerce Drive	PROCTOR Test No.:	12
	Winnipeg MB R3P 0Y7	LAB No.:	HM 007
ATTENTION:	Rico Manimbao		
PROJECT:	Job No. 60672138		
	Murray Park Rd. - Sturgeon to Cree Crescent		

Date Sampled:	N/A	Date Received:	27-Jan-22	PROCEDURE	A
Sampled By:	Client	Date Tested:	01-Feb-22	PREPARATION	Dry
<b>MATERIAL INFORMATION</b>				COMPACTION METHOD	Manual
				BLOWS PER LAYER	25
Material Type:	Clay till	NO. OF LAYERS	3	MOLD SIZE	100
Material Use:	Subgrade	Material Supplier:	in-situ	MOLD VOLUME	935
Maximum Size:	4.75 mm	Material Source:	TH21-02, B2 2'-5'	WEIGHT OF HAMMER	2.5 kg

	Test No.	1	2	3	4		
	Wet Density	1902	2036	2113	2102		
	Moisture Content	9.4	11.9	14.3	17.4		
	Dry Density	1739	1820	1848	1790		

**Moisture - Density Relationship**



Maximum Dry Density (MDD):  
1848 kg/m<sup>3</sup>  
Optimum Moisture Content  
14.3 %

STONE CORRECTION (ASTM D 4718)

Retained on 4.75 mm sieve:  
         %  
Corrected Moisture:  
14.3 %  
Corrected Maximum Dry Density:  
1848 kg/m<sup>3</sup>

Remarks:

*P. Bevel*

Tested by: E. Santiago

Reviewed by: Paul Bevel



AECOM Canada Ltd.  
Winnipeg Geotechnical Laboratory  
99 Commerce Drive  
Winnipeg, Manitoba  
R3P 0Y7  
Phone: 204 477 5381



Fax: 204 284 2040

Project Name:	2022 Industrial Streets (22-RI-02)
Project Number:	60672138
Client:	City of Winnipeg
Sample Location:	Sask. Ave (King E - Century)
Sample Depth:	Varies
Sample Number:	Varies

Supplier:	AECOM
Specification:	N/A
Field Technician:	EManimbao
Sample Date:	December 20, 2022
Lab Technician:	EManimbao
Date Tested:	February 9, 2022

## Moisture Content (ASTM D2216-10)

Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Location	Sample	Depth (m)	Moisture Content (%)
TH21-01G	G1	0.30 - 0.46 m	45.5%
	G2	0.61 - 0.76 m	50.6%
	B1	0.61 - 1.52 m	-
	G3	0.91 - 1.07 m	36.2%
	G4	1.22 - 1.37 m	35.0%
	G5	1.52 - 1.68 m	36.5%
TH21-02G	G6	2.44 - 2.59 m	46.7%
	G1	0.30 - 0.46 m	8.0%
	G2	0.61 - 0.76 m	26.4%
	B2	0.61 - 1.52 m	-
	G3	0.91 - 1.07 m	30.7%
	G4	1.22 - 1.37 m	36.1%
TH21-03G	G5	1.52 - 1.68 m	40.3%
	G6	2.44 - 2.59 m	50.4%
	G1	0.30 - 0.46 m	39.3%
	G2	0.61 - 0.76 m	34.0%
	G3	0.91 - 1.07 m	25.2%
	G4	1.22 - 1.37 m	21.0%
TH21-04G	G5	1.52 - 1.68 m	21.4%
	G6	2.44 - 2.59 m	29.5%
	G1	0.30 - 0.46 m	9.1%
	G2	0.61 - 0.76 m	24.0%
	G3	0.91 - 1.07 m	7.9%
	G4	1.22 - 1.37 m	11.1%
G5	1.52 - 1.68 m	14.0%	
G6	2.44 - 2.59 m	14.1%	

Location	Sample	Depth (m)	Moisture Content (%)



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Phone: 204 477 5381



Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-01G (Saskatchewan-King E-Cent)  
Sample Depth: 0.91 - 1.07 m  
Sample Number: G3

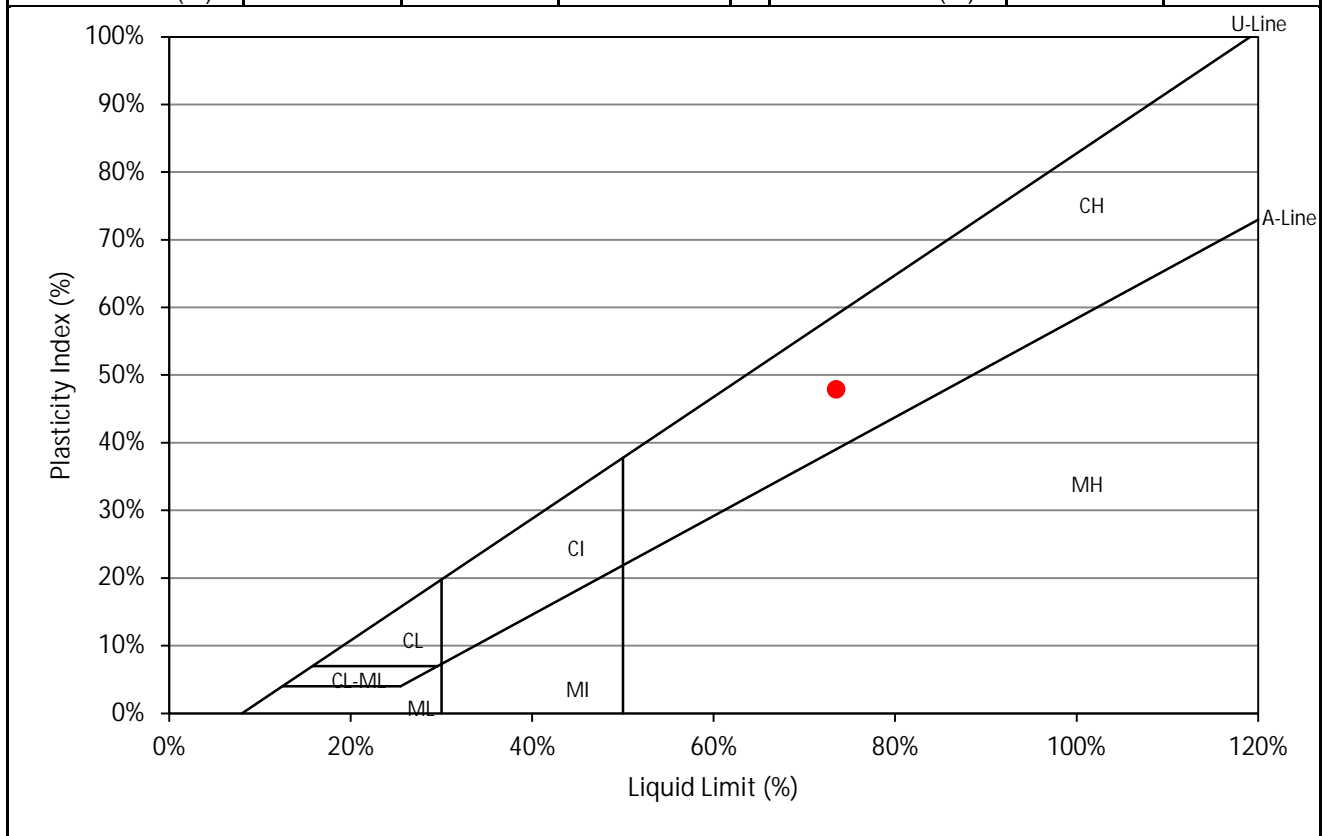
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	32	27	24
Wet Sample (g)	9.0	9.0	8.3
Dry Sample (g)	5.3	5.2	4.8
Water Content (%)	70.9%	72.7%	74.1%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.3	6.9
Dry Sample (g)	5.1	5.5
Water Content (%)	25.5%	25.7%



Liquid Limit (%): 73.5%

Plastic Limit (%): 25.6%

Plasticity Index (%): 47.9%



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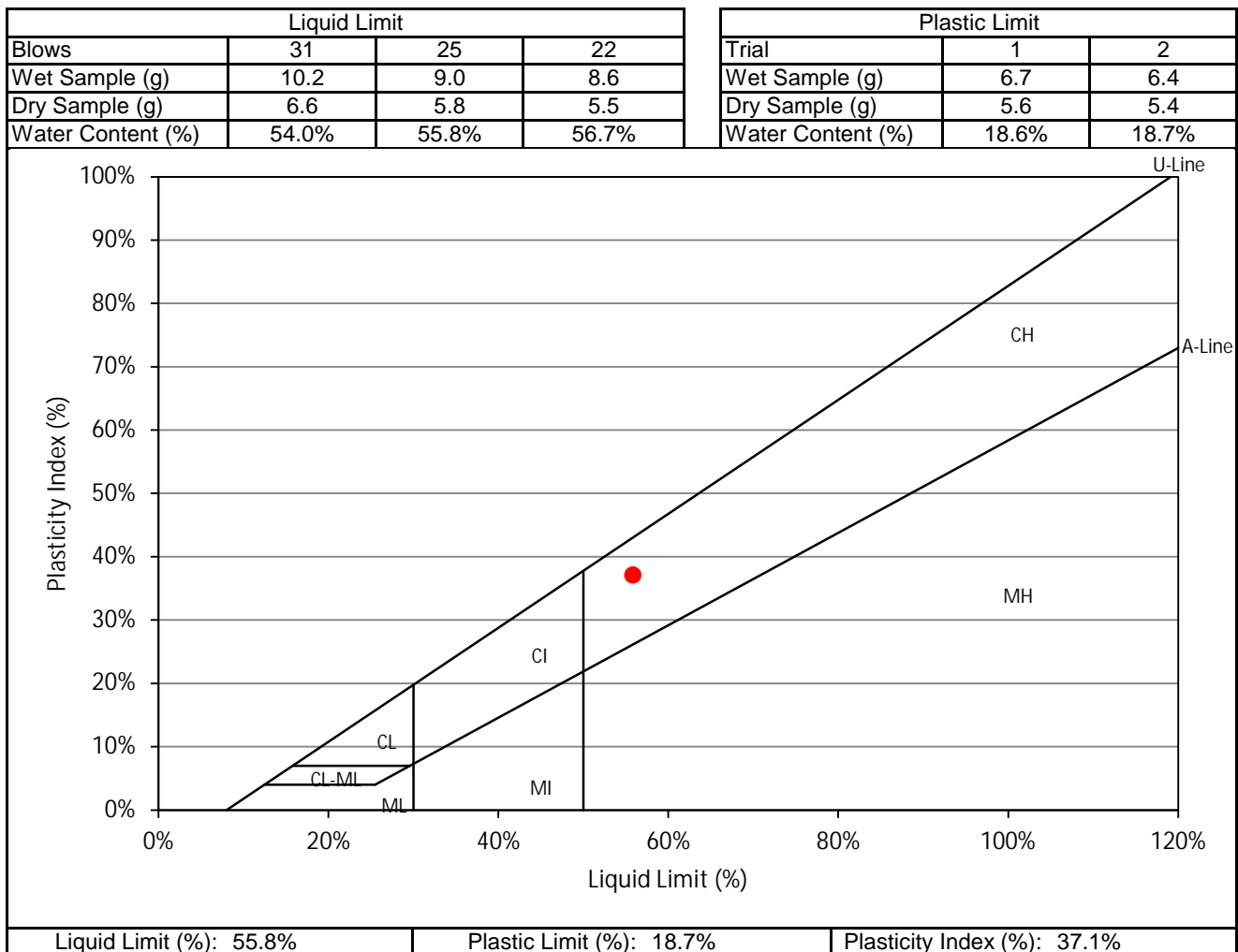
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Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-02G (Saskatchewan-King E-Cent)  
Sample Depth: 0.61 - 0.76 m  
Sample Number: G2

Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils





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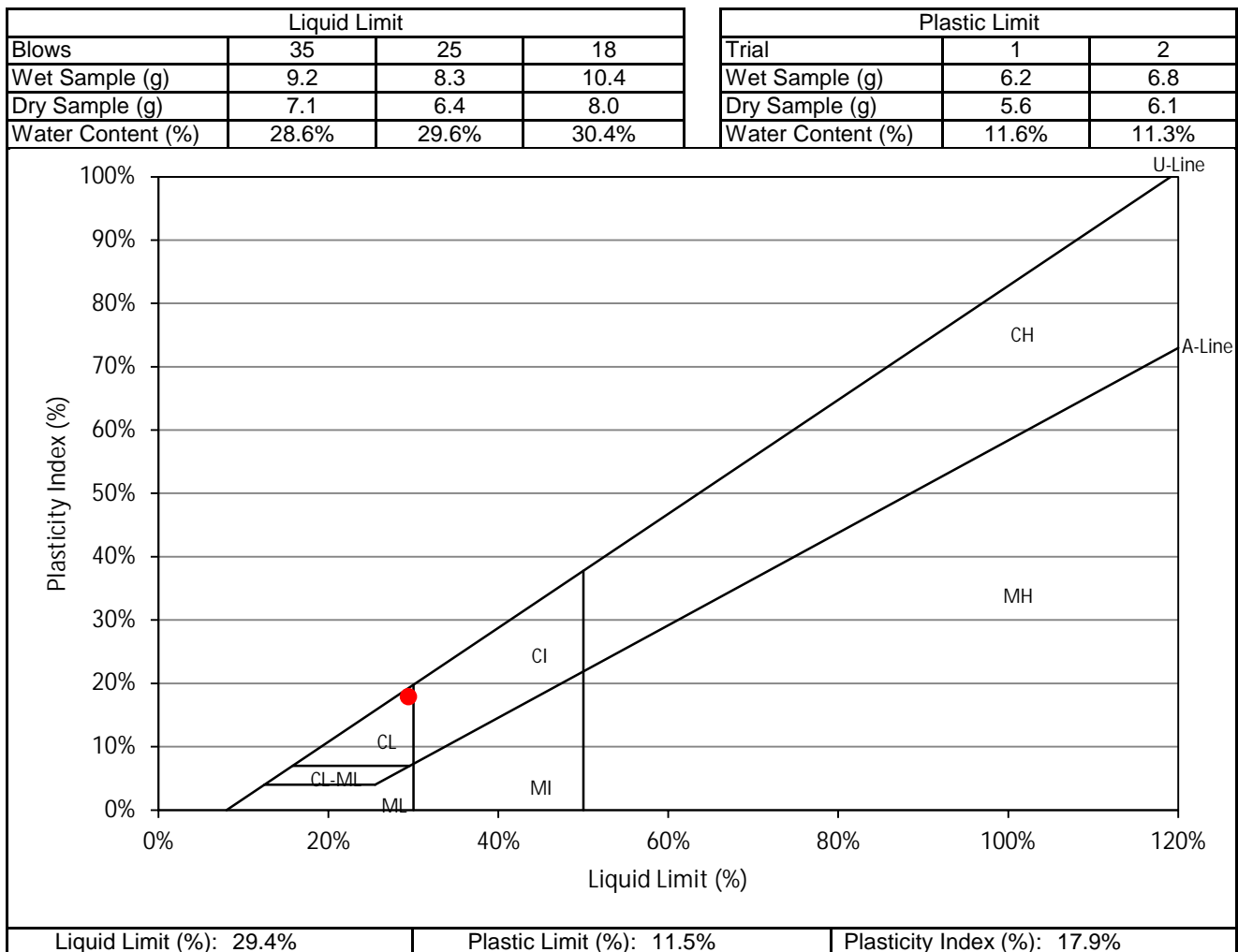
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Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-04G (Saskatchewan-King E-Cent)  
Sample Depth: 1.22 - 1.37 m  
Sample Number: G4

Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils



**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



WINNIPEG GEOTECHNICAL LABORATORY

99 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada  
tel (204) 477-5381 fax (431) 800-1210

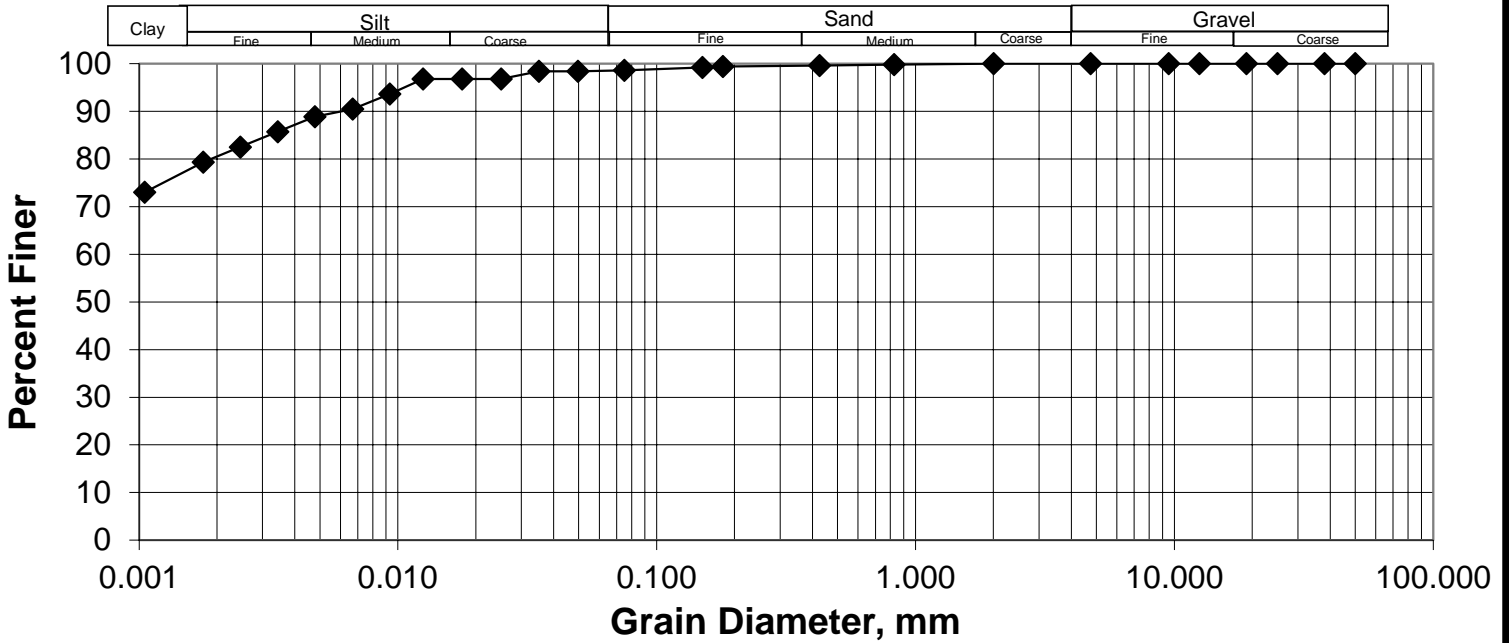


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-01G (Saskatchewan-King E-Cent)  
Sample No.: G3  
Depth: 0.91 - 1.07 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	98.6
38.0	100.0	2.00	100.0	0.0496	98.4
25.0	100.0	0.825	99.8	0.0351	98.4
19.0	100.0	0.425	99.6	0.0250	96.8
12.5	100.0	0.18	99.4	0.0177	96.8
9.5	100.0	0.15	99.2	0.0125	96.8
4.75	100.0	0.075	98.6	0.0093	93.6
				0.0067	90.5
				0.0048	88.9
				0.0034	85.7
				0.0025	82.5
				0.0018	79.3
				0.0011	73.0

**GRAIN SIZE DISTRIBUTION CURVE**



Gravel	0.0%	Silt	18.4%
Sand	1.4%	Clay	80.2%

**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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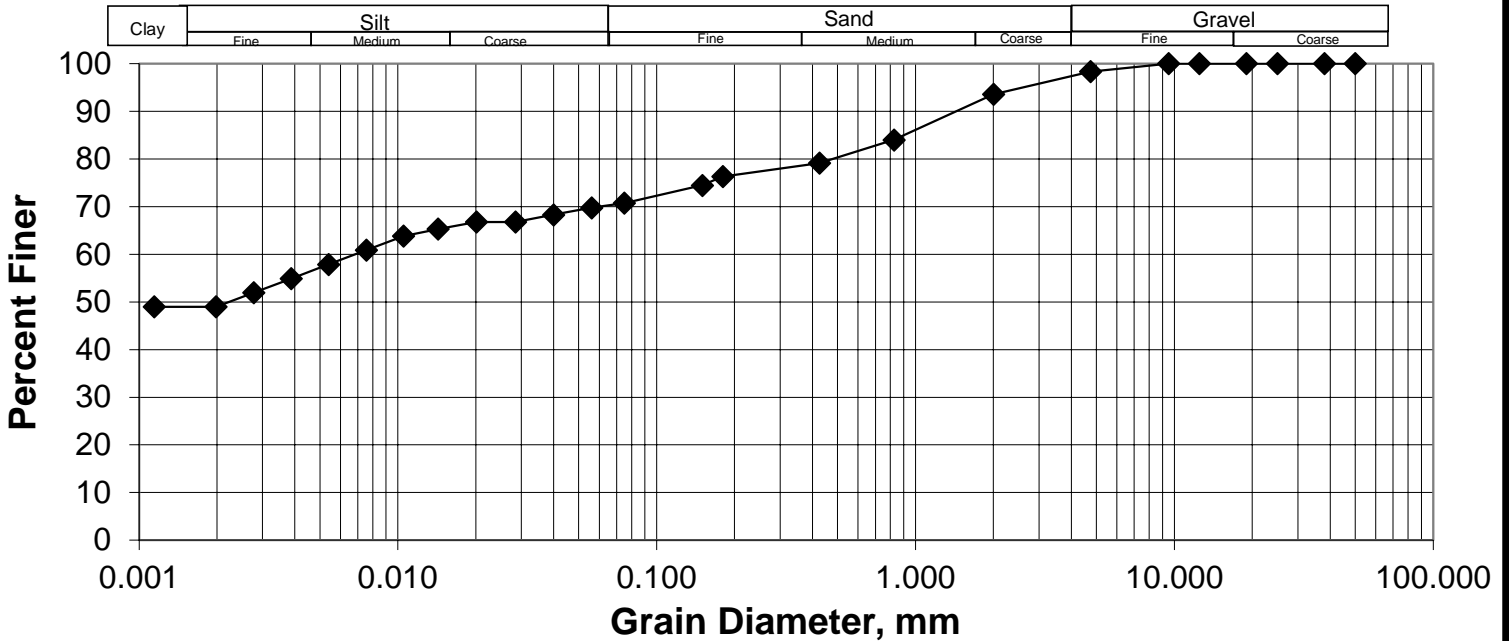


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-02G (Saskatchewan-King E- Cent)  
Sample No.: G2  
Depth: 0.61 - 0.76 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	98.3	0.0750	70.7
38.0	100.0	2.00	93.5	0.0561	69.8
25.0	100.0	0.825	84.0	0.0399	68.3
19.0	100.0	0.425	79.1	0.0284	66.8
12.5	100.0	0.18	76.3	0.0201	66.8
9.5	100.0	0.15	74.5	0.0143	65.3
4.75	98.3	0.075	70.7	0.0105	63.8
				0.0075	60.9
				0.0054	57.9
				0.0039	54.9
				0.0028	51.9
				0.0020	49.0
				0.0011	49.0

**GRAIN SIZE DISTRIBUTION CURVE**



Gravel	1.7%	Silt	21.7%
Sand	27.6%	Clay	49.0%

**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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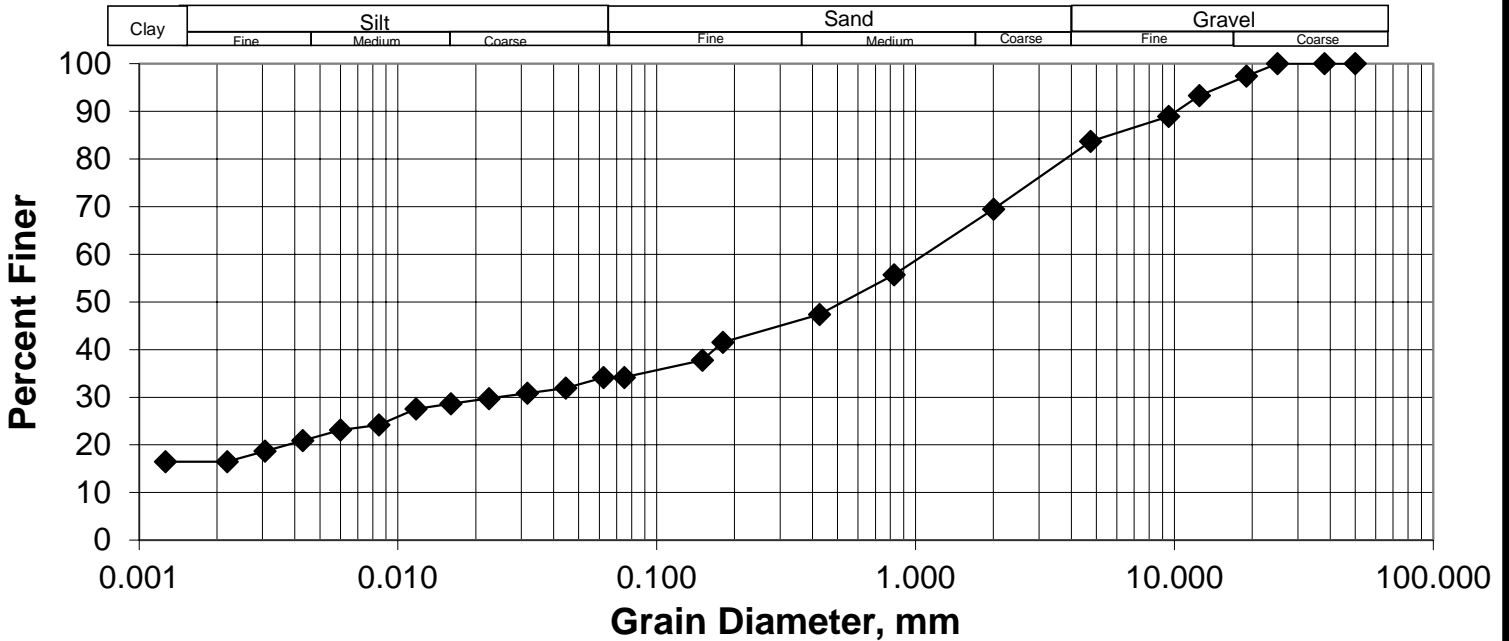


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-04G (Saskatchewan-King E- Cent)  
Sample No.: G4  
Depth: 1.22 - 1.37 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	83.7	0.0750	34.2
38.0	100.0	2.00	69.5	0.0622	34.2
25.0	100.0	0.825	55.7	0.0445	31.9
19.0	97.4	0.425	47.4	0.0317	30.8
12.5	93.3	0.18	41.5	0.0225	29.7
9.5	88.9	0.15	37.8	0.0160	28.6
4.75	83.7	0.075	34.2	0.0118	27.5
				0.0084	24.2
				0.0060	23.1
				0.0043	20.9
				0.0031	18.7
				0.0022	16.5
				0.0013	16.5

**GRAIN SIZE DISTRIBUTION CURVE**



Gravel	16.3%	Silt	17.7%
Sand	49.5%	Clay	16.5%

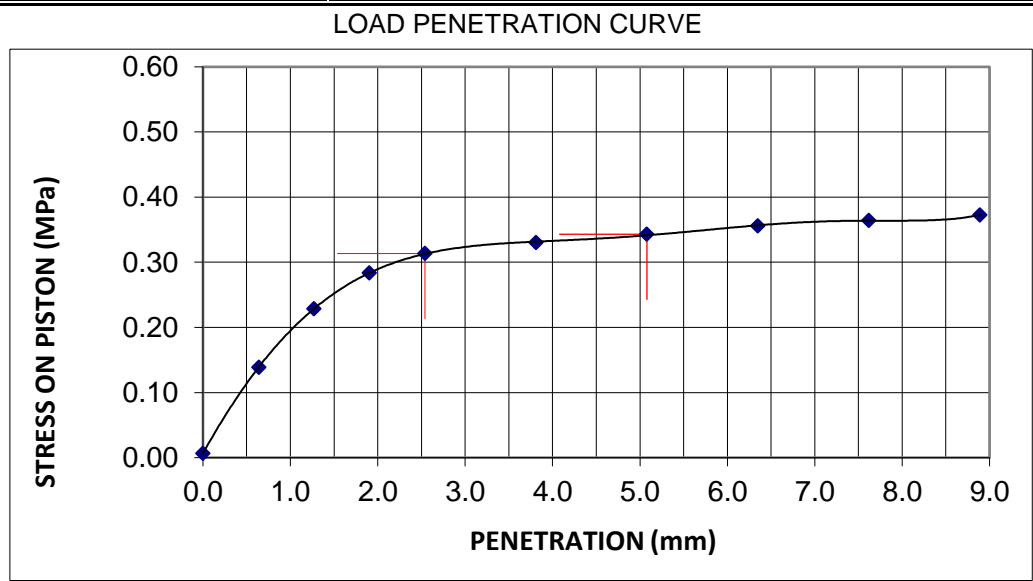


**CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883**

Client:	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	Project No.:	112-2204
Attention:	Rico Manimbao	CBR test No.:	3
Project	Job No. 60672138	Lab No.:	HM 007
Location:	Saskatchewan - Century to King Edward	Date sampled:	
		Date Received :	27-Jan-22
		Date Tested /By:	07-Feb-22 / ECS

SAMPLE DATA		SPECIMEN DATA	
Sample Type:	Clay	DESCRIPTION	Before Soaking / After Testing
Source:	TH21-01, B1 2'-5'	Moisture Content (MC), %	32.4
Sampled by:	Client	MC of top 25mm layer, %	37.1
Optimum Moisture Content:	32.3 %	Dry Density, kg/m <sup>3</sup>	1355
Maximum Dry Density:	1377 kg/cm <sup>3</sup>	Compaction, %	98%
Method of Compaction:	Standard Proctor	CBR, %	4.5
Tested by:	ECS	Swell, %	1.51
	Date Tested: 01-Feb-22		

LOAD DATA	
PENETRATION mm	STRESS MPa
0	0.01
0.64	0.14
1.27	0.23
1.91	0.28
2.54	0.31
3.81	0.33
5.08	0.34
6.35	0.36
7.62	0.36
8.89	0.37



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD		BEARING RATIO (soaked)	
		ACTUAL MPa	CORRECTED MPa	at 2.5 mm penetration	at 5.1 mm penetration
2.54	6.9	0.31	0.31	4.5	-
5.08	10.3	0.34	0.34	-	3.3

Remarks: 4 days soaked

Reviewed by:   
Hermie Manalo

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

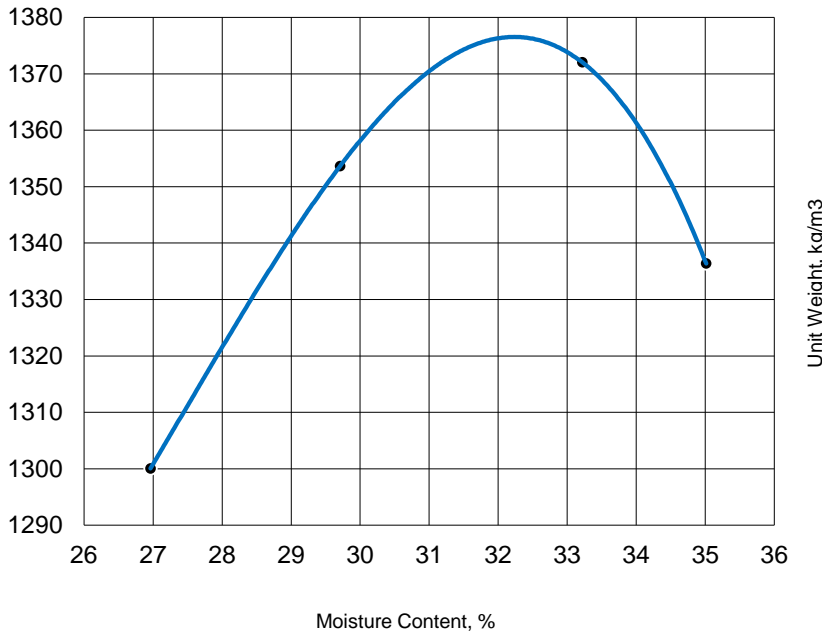
CLIENT	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	PROJECT No.:	112-2204
ATTENTION:	Rico Manimbao	PROCTOR Test No.:	3
PROJECT:	Saskatchewan - Century to King Edward Century to King Edward	LAB No.:	HM 007

Date Sampled:	N/A	Date Received:	27-Jan-22	PROCEDURE	A
Sampled By:	Client	Date Tested:	01-Feb-22	PREPARATION	Dry
				COMPACTION METHOD	Manual

MATERIAL INFORMATION				BLOWS PER LAYER	25
Material Type:	Clay			NO. OF LAYERS	3
Material Use:	Subgrade	Material Supplier:	in-situ	MOLD SIZE	100
Maximum Size:	4.75	Material Source:	TH21-01, B1 2'-5'	MOLD VOLUME	935
				WEIGHT OF HAMMER	2.5 kg

	Test No.	1	2	3	4		
	Wet Density	1651	1756	1828	1804		
	Moisture Content	27.0	29.7	33.2	35.0		
	Dry Density	1300	1354	1372	1336		

**Moisture - Density Relationship**



Maximum Dry Density (MDD):  
1377 kg/m<sup>3</sup>  
Optimum Moisture Content  
32.3 %

**STONE CORRECTION (ASTM D 4718)**

Retained on 4.75 mm sieve:  
                     %  
Corrected Moisture:  
32.3 %  
Corrected Maximum Dry Density:  
1377 kg/m<sup>3</sup>

Remarks:

*P. Bevel*

Tested by: E. Santiago

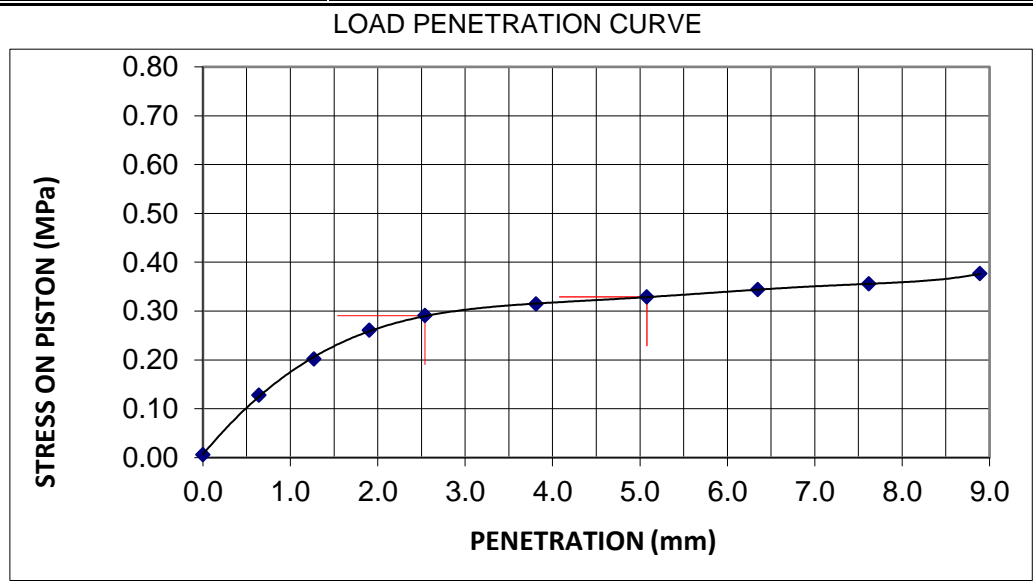
Reviewed by: Paul Bevel

**CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883**

Client:	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	Project No.:	112-2204
Attention:	Rico Manimbao	CBR test No.:	4
Project	Job No. 60672138	Lab No.:	HM 007
Location:	Saskatchewan - Century to King Edward	Date sampled:	
		Date Received :	27-Jan-22
		Date Tested /By:	07-Feb-22 / ECS

SAMPLE DATA		SPECIMEN DATA		
Sample Type:	Clay	DESCRIPTION	Before Soaking	After Testing
Source:	TH21-02, B2 2'-5'	Moisture Content (MC), %	23.3	
Sampled by:	Client	MC of top 25mm layer, %		29.9
Optimum Moisture Content:	22.9 %	Dry Density, kg/m <sup>3</sup>	1516	
Maximum Dry Density:	1552 kg/cm <sup>3</sup>	Compaction, %	98%	
Method of Compaction:	Standard Proctor	CBR, %	4.2	
Tested by:	ECS	Swell, %	1.51	
	Date Tested: 01-Feb-22			

LOAD DATA	
PENETRATION mm	STRESS MPa
0	0.01
0.64	0.13
1.27	0.20
1.91	0.26
2.54	0.29
3.81	0.31
5.08	0.33
6.35	0.34
7.62	0.36
8.89	0.38



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD		BEARING RATIO (soaked)	
		ACTUAL MPa	CORRECTED MPa	at 2.5 mm penetration	at 5.1 mm penetration
2.54	6.9	0.29	0.29	4.2	-
5.08	10.3	0.33	0.33	-	3.2

Remarks: 4 days soaked

Reviewed by:   
Hermie Manalo

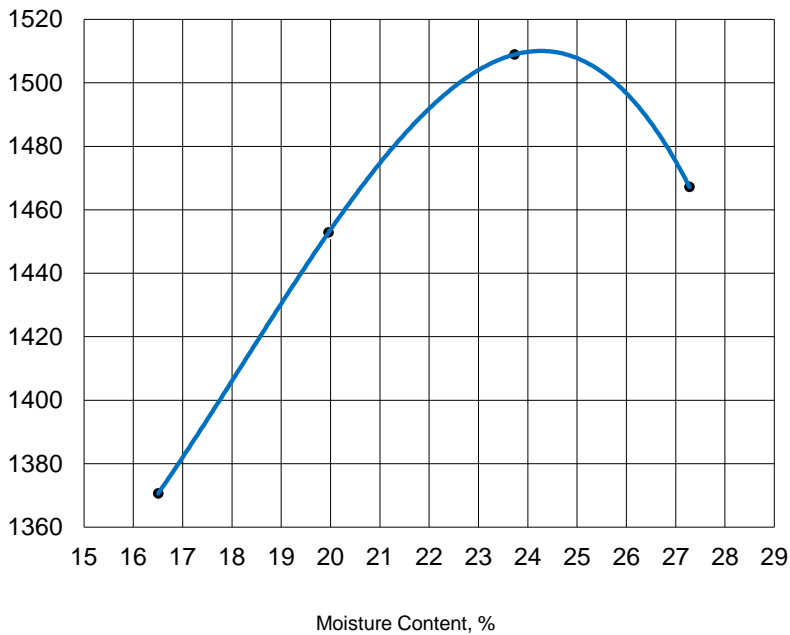
**MAXIMUM DRY DENSITY AND MOISTURE CONTENT - Proctor Method (ASTM D698)**

CLIENT	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	PROJECT No.:	112-2204
ATTENTION:	Rico Manimbao	PROCTOR Test No.:	4
PROJECT:	Job No. 60672138 Saskatchewan - Century to King Edward	LAB No.:	HM 007

Date Sampled:	Date Received:	27-Jan-22	PROCEDURE	A	
Sampled By:	Client	Date Tested:	01-Feb-22	PREPARATION	Dry
<b>MATERIAL INFORMATION</b>			COMPACTION METHOD	Manual	
Material Type:	Clay		BLOWS PER LAYER	25	
Material Use:	Subgrade	Material Supplier:	in-situ	NO. OF LAYERS	3
Maximum Size:	9.5 mm	Material Source:	TH21-02, B2 2'-5'	MOLD SIZE	100
			MOLD VOLUME	935	
			WEIGHT OF HAMMER	2.5 kg	

	Test No.	1	2	3	4		
	Wet Density	1597	1743	1867	1867		
	Moisture Content	16.5	20.0	23.7	27.3		
	Dry Density	1371	1453	1509	1467		

**Moisture - Density Relationship**



Maximum Dry Density (MDD):  
1510 kg/m³  
Optimum Moisture Content  
24.2 %

STONE CORRECTION (ASTM D 4718)

Retained on 4.75 mm sieve:  
6.3 %  
Corrected Moisture:  
22.9 %  
Corrected Maximum Dry Density:  
1552 kg/m³

Remarks:

*P. Bevel*

Tested by: E. Santiago

Reviewed by: Paul Bevel





AECOM Canada Ltd.  
Winnipeg Geotechnical Laboratory  
99 Commerce Drive  
Winnipeg, Manitoba  
R3P 0Y7  
Phone: 204 477 5381



Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-01I (Saskatchewan-King E-Sherwin)  
Sample Depth: 0.61 - 0.76 m  
Sample Number: G2

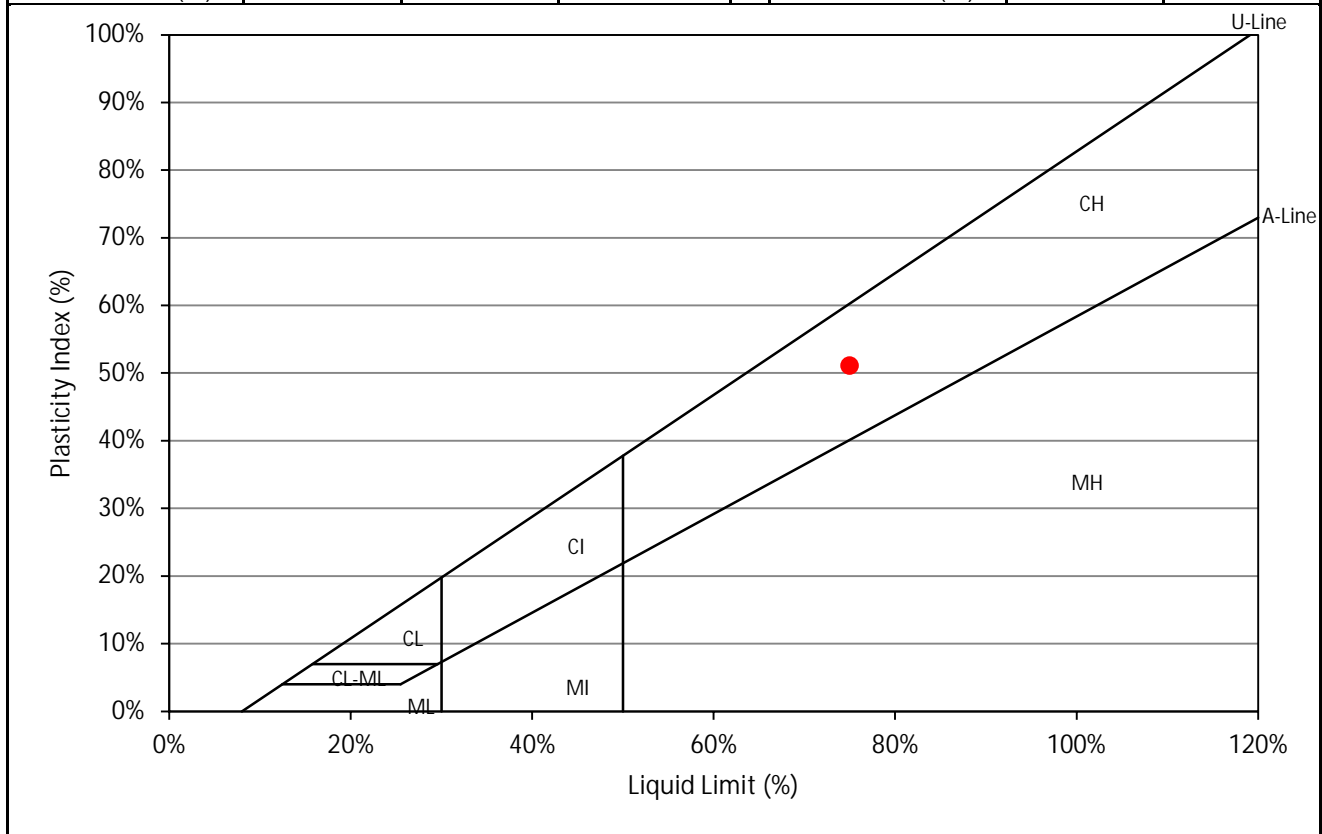
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	34	29	17
Wet Sample (g)	8.6	8.8	9.4
Dry Sample (g)	5.0	5.0	5.3
Water Content (%)	73.0%	73.9%	77.1%

Plastic Limit		
Trial	1	2
Wet Sample (g)	7.7	7.5
Dry Sample (g)	6.2	6.0
Water Content (%)	23.9%	23.8%



Liquid Limit (%): 75.0%

Plastic Limit (%): 23.8%

Plasticity Index (%): 51.1%



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Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-02I (Saskatchewan-King E-Sherwin)  
Sample Depth: 0.91 - 1.07 m  
Sample Number: G3

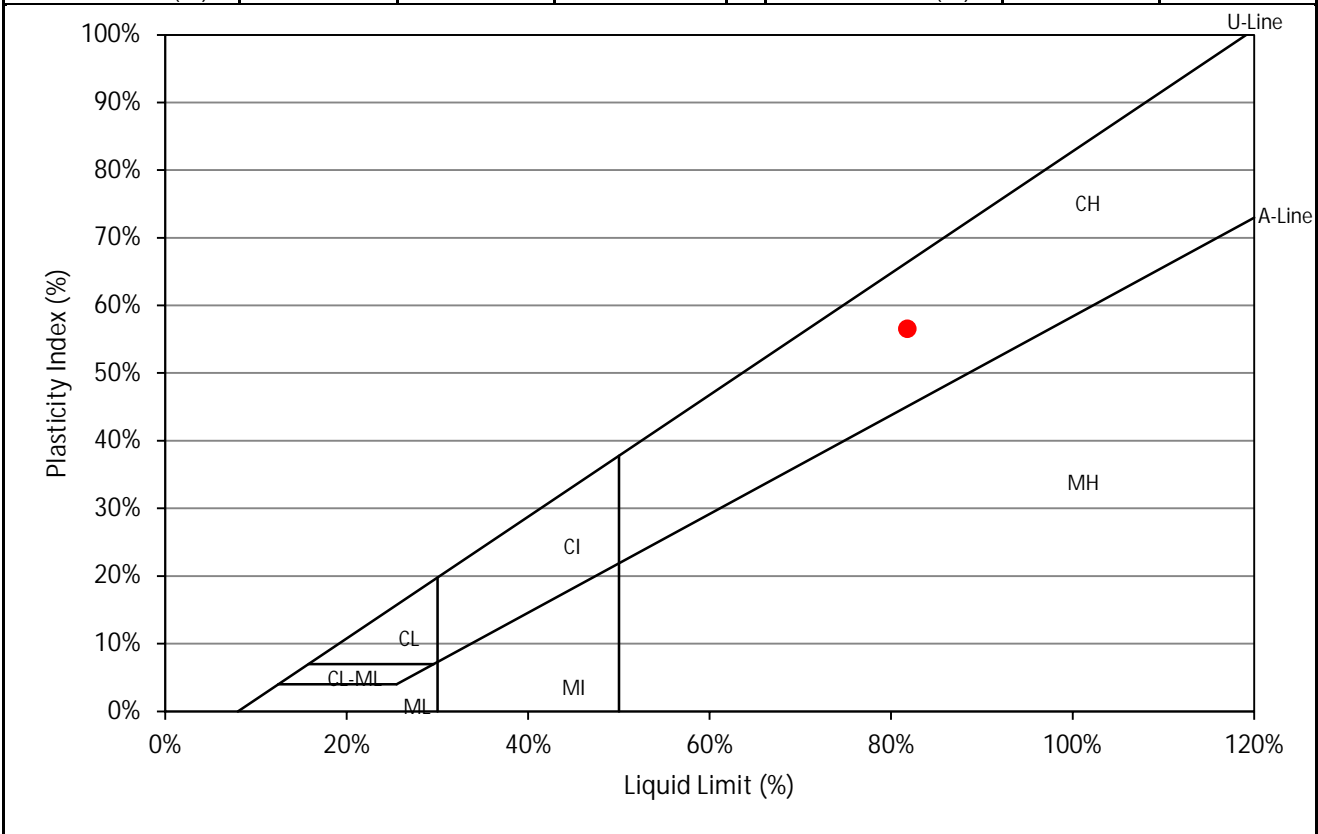
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	31	22	15
Wet Sample (g)	8.5	9.1	9.2
Dry Sample (g)	4.8	5.0	4.9
Water Content (%)	78.8%	83.5%	88.2%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.6	6.4
Dry Sample (g)	5.3	5.1
Water Content (%)	25.2%	25.2%



Liquid Limit (%): 81.8%

Plastic Limit (%): 25.2%

Plasticity Index (%): 56.5%



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Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-03I (Saskatchewan-King E-Sherwin)  
Sample Depth: 0.61 - 0.76 m  
Sample Number: G2

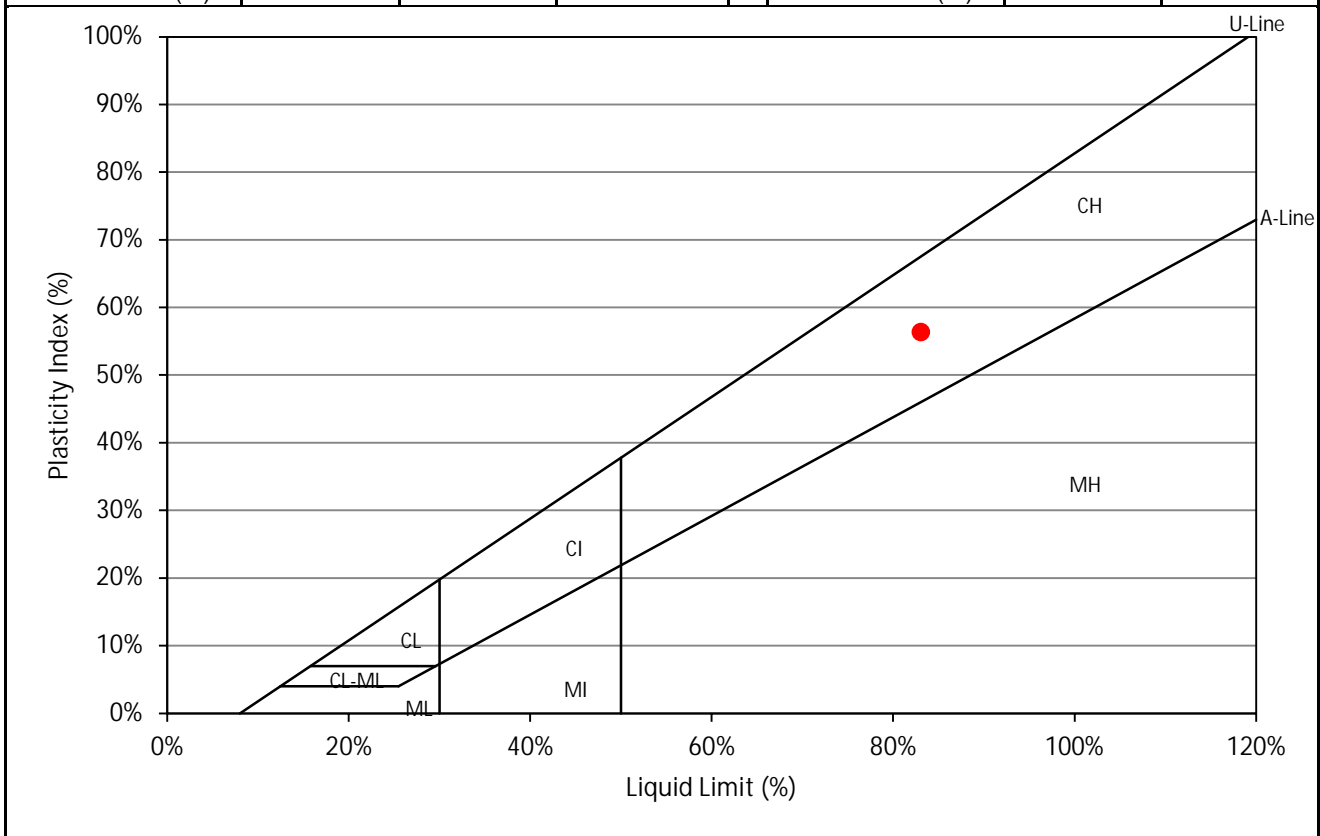
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

	Liquid Limit		
Blows	31	25	20
Wet Sample (g)	7.4	8.9	8.1
Dry Sample (g)	4.1	4.8	4.4
Water Content (%)	81.4%	82.9%	84.4%

	Plastic Limit	
Trial	1	2
Wet Sample (g)	6.9	6.3
Dry Sample (g)	5.4	5.0
Water Content (%)	26.5%	26.8%



Liquid Limit (%): 83.0%

Plastic Limit (%): 26.7%

Plasticity Index (%): 56.4%



**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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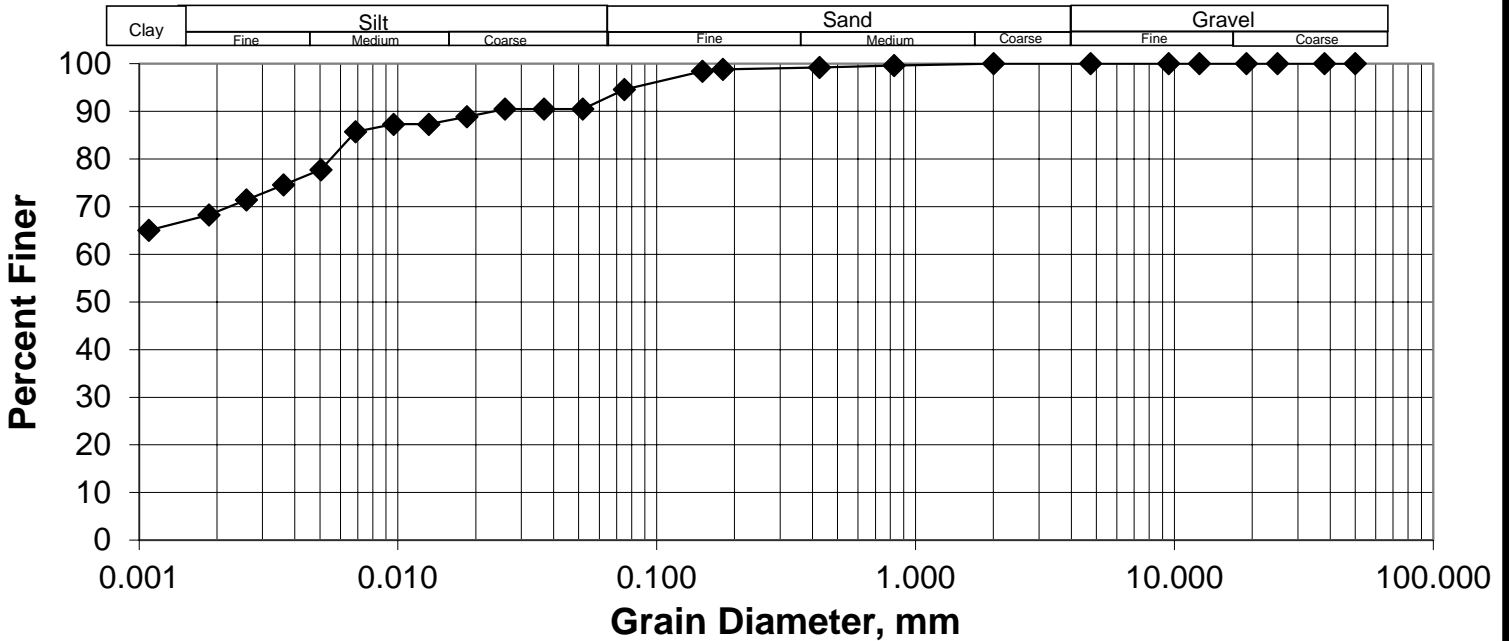


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-01I (Saskatchewan-King E-Sherwin)  
Sample No.: G2  
Depth: 0.61 - 0.76 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	94.6
38.0	100.0	2.00	100.0	0.0518	90.5
25.0	100.0	0.825	99.6	0.0367	90.5
19.0	100.0	0.425	99.2	0.0259	90.5
12.5	100.0	0.18	98.8	0.0185	88.9
9.5	100.0	0.15	98.4	0.0132	87.3
4.75	100.0	0.075	94.6	0.0096	87.3
				0.0069	85.7
				0.0050	77.8
				0.0036	74.6
				0.0026	71.4
				0.0019	68.2
				0.0011	65.1

**GRAIN SIZE DISTRIBUTION CURVE**



Gravel	0.0%	Silt	25.9%
Sand	5.4%	Clay	68.7%

**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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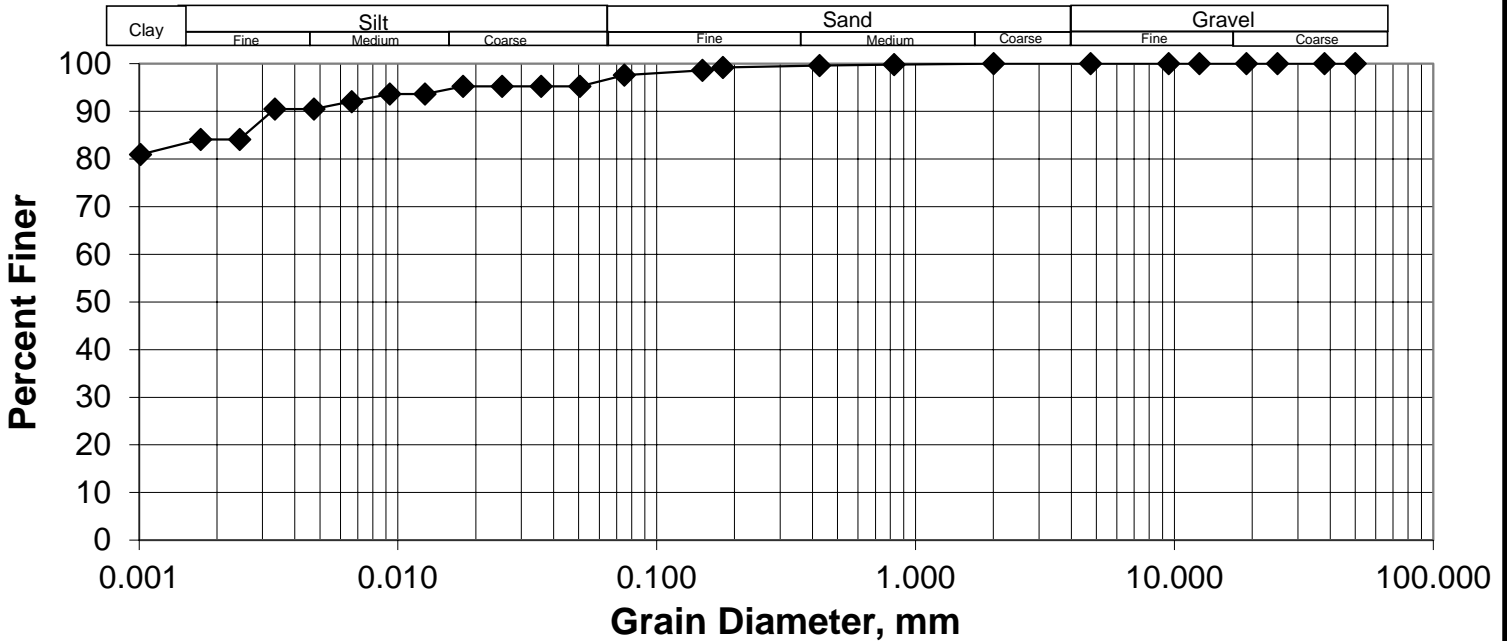


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-02I (Saskatchewan-King E-Sherwin)  
Sample No.: G3  
Depth: 0.91 - 1.07 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	97.6
38.0	100.0	2.00	100.0	0.0505	95.2
25.0	100.0	0.825	99.8	0.0357	95.2
19.0	100.0	0.425	99.6	0.0253	95.2
12.5	100.0	0.18	99.2	0.0179	95.2
9.5	100.0	0.15	98.6	0.0127	93.6
4.75	100.0	0.075	97.6	0.0093	93.6
				0.0066	92.1
				0.0047	90.5
				0.0033	90.5
				0.0024	84.1
				0.0017	84.1
				0.0010	80.9

**GRAIN SIZE DISTRIBUTION CURVE**



Gravel	0.0%	Silt	13.5%
Sand	2.4%	Clay	84.1%

**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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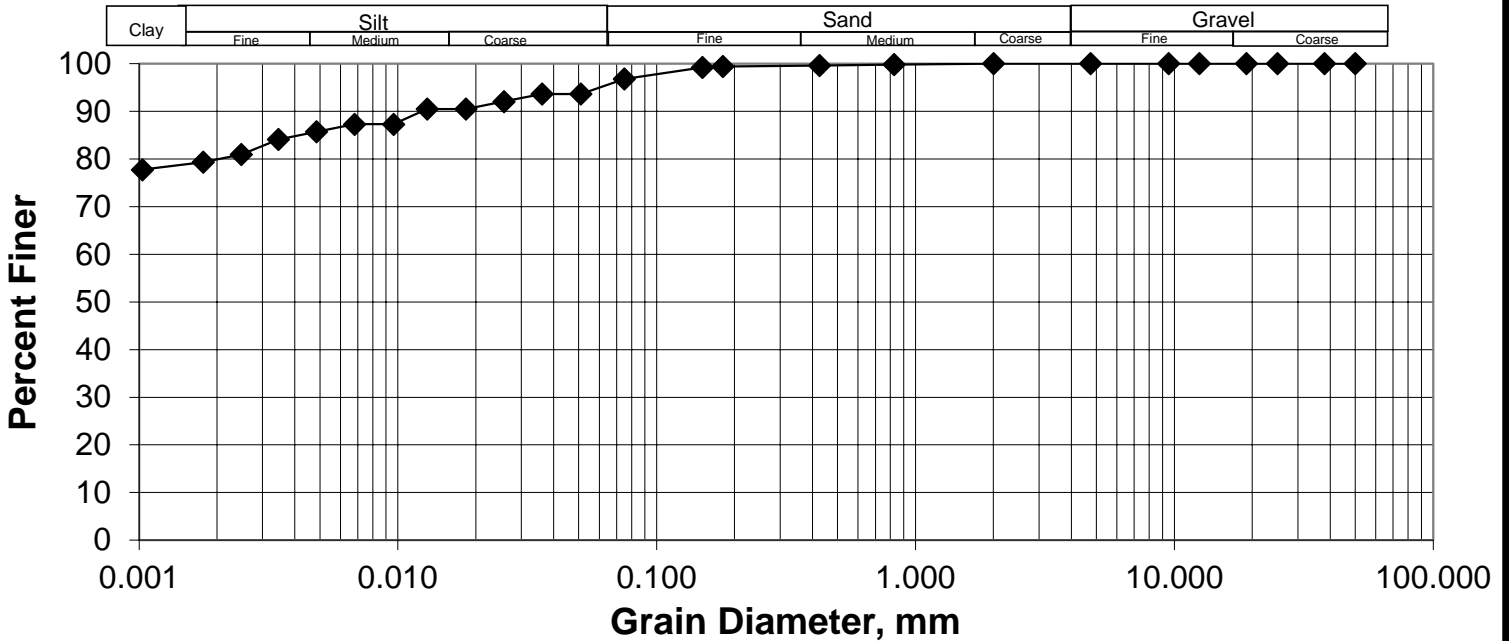


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-03I (Saskatchewan-King E-Sherwin)  
Sample No.: G2  
Depth: 0.61 - 0.76 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	96.8
38.0	100.0	2.00	100.0	0.0510	93.6
25.0	100.0	0.825	99.8	0.0360	93.6
19.0	100.0	0.425	99.6	0.0257	92.1
12.5	100.0	0.18	99.4	0.0183	90.5
9.5	100.0	0.15	99.2	0.0130	90.5
4.75	100.0	0.075	96.8	0.0096	87.3
				0.0068	87.3
				0.0049	85.7
				0.0035	84.1
				0.0025	80.9
				0.0018	79.3
				0.0010	77.8

**GRAIN SIZE DISTRIBUTION CURVE**



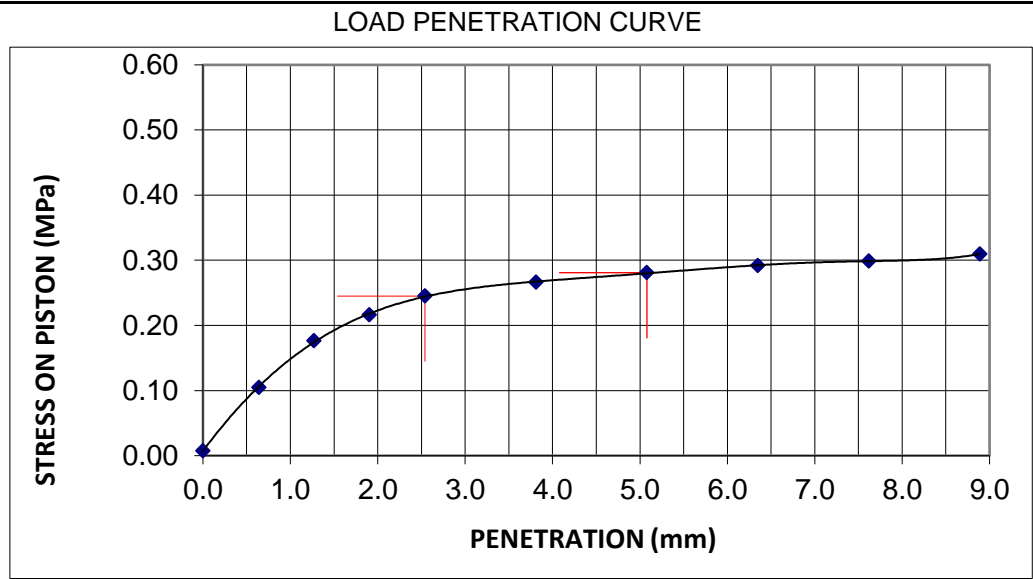
Gravel	0.0%	Silt	17.2%
Sand	3.2%	Clay	79.6%

**CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883**

Client:	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	Project No.:	112-2204
Attention:	Rico Manimbao	CBR test No.:	5
Project	Job No. 60672138	Lab No.:	HM 007
Location:	Saskatchewan - King Edward to Sherwin	Date sampled:	
		Date Received :	27-Jan-22
		Date Tested /By:	09-Feb-22 / ECS


SAMPLE DATA		SPECIMEN DATA		
Sample Type:	Clay	DESCRIPTION	Before Soaking	After Testing
Source:	TH21-02, B1 2'-5'	Moisture Content (MC), %	32.4	
Sampled by:	Client	MC of top 25mm layer, %		37.9
Optimum Moisture Content:	32.2 %	Dry Density, kg/m <sup>3</sup>	1372	
Maximum Dry Density:	1393 kg/cm <sup>3</sup>	Compaction, %	98%	
Method of Compaction:	Standard Proctor	CBR, %	3.6	
Tested by:	ECS	Swell, %	1.9	
	Date Tested: 03-Feb-22			

LOAD DATA	
PENETRATION mm	STRESS MPa
0	0.01
0.64	0.10
1.27	0.18
1.91	0.22
2.54	0.24
3.81	0.27
5.08	0.28
6.35	0.29
7.62	0.30
8.89	0.31



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD		BEARING RATIO (soaked)	
		ACTUAL MPa	CORRECTED MPa	at 2.5 mm penetration	at 5.1 mm penetration
2.54	6.9	0.24	0.24	3.6	-
5.08	10.3	0.28	0.28	-	2.7

Remarks: 4 days soaked

Reviewed by:   
Hermie Manalo

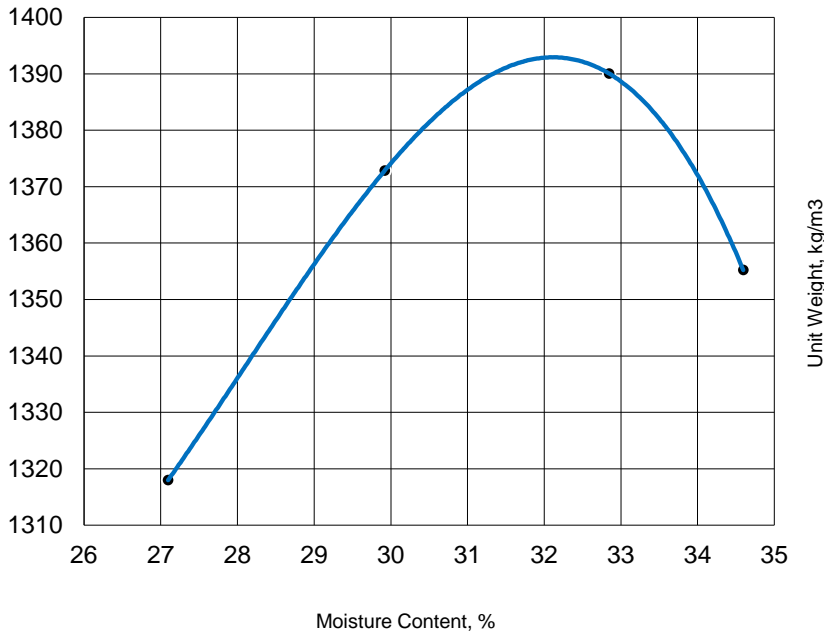
**MAXIMUM DRY DENSITY AND MOISTURE CONTENT - Proctor Method (ASTM D698)**

CLIENT	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	PROJECT No.:	112-2204
ATTENTION:	Rico Manimbao	PROCTOR Test No.:	5
PROJECT:	Job No. 60672138 Saskatchewan - King Edward to Sherwin	LAB No.:	HM 007

Date Sampled:	N/A	Date Received:	27-Jan-22	PROCEDURE	A
Sampled By:	Client	Date Tested:	03-Feb-22	PREPARATION	Dry
<b>MATERIAL INFORMATION</b>				COMPACTION METHOD	Manual
Material Type:	Clay	BLOWS PER LAYER	25	NO. OF LAYERS	3
Material Use:	Subgrade	Material Supplier:	in-situ	MOLD SIZE	100
Maximum Size:	4.75	Material Source:	TH21-02, B1 2'-5'	MOLD VOLUME	935
				WEIGHT OF HAMMER	2.5 kg

	Test No.	1	2	3	4		
Wet Density		1675	1784	1847	1824		
Moisture Content		27.1	29.9	32.8	34.6		
Dry Density		1318	1373	1390	1355		

**Moisture - Density Relationship**



Maximum Dry Density (MDD):  
1393 kg/m<sup>3</sup>  
Optimum Moisture Content  
32.2 %

**STONE CORRECTION (ASTM D 4718)**

Retained on 4.75 mm sieve: \_\_\_\_\_ %  
Corrected Moisture: 32.2 %  
Corrected Maximum Dry Density: 1393 kg/m<sup>3</sup>

Remarks:

*P. Bevel*

Tested by: E. Santiago

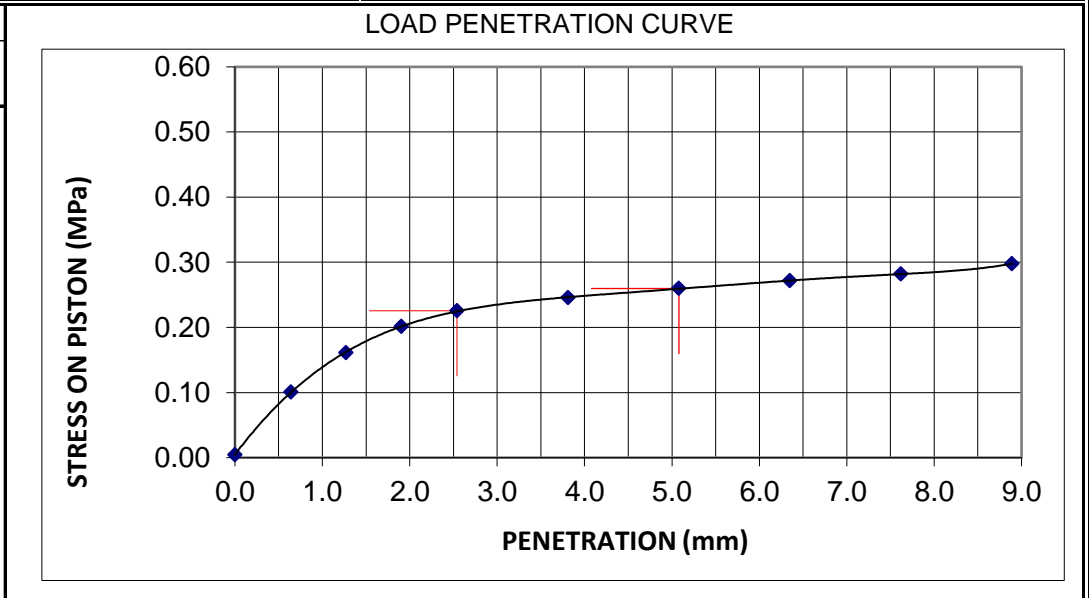
Reviewed by: Paul Bevel

**CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883**

Client:	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	Project No.:	112-2204
Attention:	Rico Manimbao	CBR test No.:	6
Project	Job No. 60672138	Lab No.:	HM 007
Location:	Saskatchewan - King Edward to Sherwin	Date sampled:	
		Date Received :	27-Jan-22
		Date Tested /By:	13-Feb-22 / ECS

SAMPLE DATA		SPECIMEN DATA		
Sample Type:	Clay	DESCRIPTION	Before Soaking	After Testing
Source:	TH21-03, B2 2'-5'	Moisture Content (MC), %	26.0	
Sampled by:	Client	MC of top 25mm layer, %		31.4
Optimum Moisture Content:	25.3 %	Dry Density, kg/m <sup>3</sup>	1431	
Maximum Dry Density:	1446 kg/cm <sup>3</sup>	Compaction, %	99%	
Method of Compaction:	Standard Proctor	CBR, %	3.3	
Tested by:	ECS	Swell, %	1.7	
	Date Tested: 07-Feb-22			

LOAD DATA	
PENETRATION mm	STRESS MPa
0	0.00
0.64	0.10
1.27	0.16
1.91	0.20
2.54	0.23
3.81	0.25
5.08	0.26
6.35	0.27
7.62	0.28
8.89	0.30



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD		BEARING RATIO (soaked)	
		ACTUAL MPa	CORRECTED MPa	at 2.5 mm penetration	at 5.1 mm penetration
2.54	6.9	0.23	0.23	3.3	-
5.08	10.3	0.26	0.26	-	2.5

Remarks: 4 days soaked

Reviewed by:

Hermie Manalo

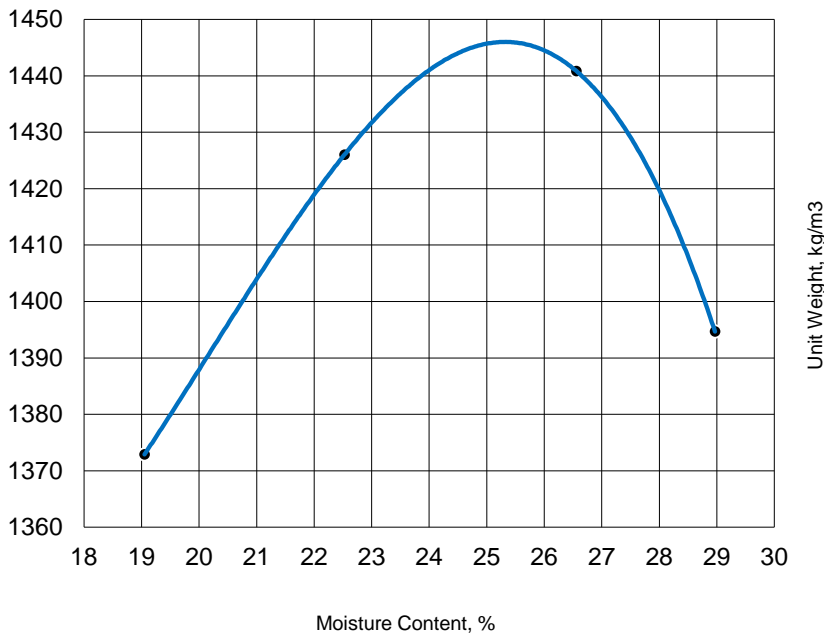
**MAXIMUM DRY DENSITY AND MOISTURE CONTENT - Proctor Method (ASTM D698)**

CLIENT	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	PROJECT No.:	112-2204
ATTENTION:	Rico Manimbao	PROCTOR Test No.:	13
PROJECT:	Job No. 60672138 Saskatchewan - King Edward to Sherwin	LAB No.:	HM 007

Date Sampled:	N/A	Date Received:	27-Jan-22	PROCEDURE	A
Sampled By:	Client	Date Tested:	07-Feb-22	PREPARATION	Dry
<b>MATERIAL INFORMATION</b>				COMPACTION METHOD	Manual
Material Type:	Clay			BLOWS PER LAYER	25
Material Use:	Subgrade	Material Supplier:	in-situ	NO. OF LAYERS	3
Maximum Size:	4.75 mm	Material Source:	TH21-03, B2 2'-5'	MOLD SIZE	100
				MOLD VOLUME	935
				WEIGHT OF HAMMER	2.5 kg

	Test No.	1	2	3	4		
	Wet Density	1634	1747	1824	1799		
	Moisture Content	19.1	22.5	26.6	29.0		
	Dry Density	1373	1426	1441	1395		

**Moisture - Density Relationship**



Maximum Dry Density (MDD):  
1446 kg/m<sup>3</sup>  
Optimum Moisture Content  
25.3 %

STONE CORRECTION (ASTM D 4718)

Retained on 4.75 mm sieve:  
         %  
Corrected Moisture:  
25.3 %  
Corrected Maximum Dry Density:  
1446 kg/m<sup>3</sup>

Remarks:

*P. Bevel*

Tested by: E. Santiago

Reviewed by: Paul Bevel



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 Winnipeg, Manitoba  
 R3P 0Y7  
 Phone: 204 477 5381



Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
 Project Number: 60672138  
 Client: City of Winnipeg  
 Sample Location: Saskatchewan Ave. (St. James-Border)  
 Sample Depth: Varies  
 Sample Number: Varies

Supplier: AECOM  
 Specification: N/A  
 Field Technician: EManimbao  
 Sample Date: December 21, 2021  
 Lab Technician: EManimbao  
 Date Tested: February 9, 2022

### Moisture Content (ASTM D2216-10)

Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Location	Sample	Depth (m)	Moisture Content (%)
TH21-01J	G1	0.30 - 0.46 m	<b>39.1%</b>
	G2	0.61 - 0.76 m	<b>38.9%</b>
	B1	0.61 - 1.52 m	-
	G3	0.91 - 1.07 m	<b>20.7%</b>
	G4	1.22 - 1.37 m	<b>36.9%</b>
	G5	1.52 - 1.68 m	<b>39.1%</b>
TH21-02J	G6	2.44 - 2.59 m	<b>50.9%</b>
	G1	0.30 - 0.46 m	<b>43.1%</b>
	G2	0.61 - 0.76 m	<b>41.0%</b>
	B2	0.61 - 1.52 m	-
	G3	0.91 - 1.07 m	<b>40.1%</b>
	G4	1.22 - 1.37 m	<b>41.8%</b>
TH21-03J	G5	1.52 - 1.68 m	<b>38.7%</b>
	G6	2.44 - 2.59 m	<b>47.5%</b>
	G1	0.30 - 0.46 m	<b>38.3%</b>
	G2	0.61 - 0.76 m	<b>36.7%</b>
	G3	0.91 - 1.07 m	<b>38.3%</b>
	G4	1.22 - 1.37 m	<b>36.9%</b>
	G5	1.52 - 1.68 m	<b>43.1%</b>
	G6	2.44 - 2.59 m	<b>52.6%</b>

Location	Sample	Depth (m)	Moisture Content (%)





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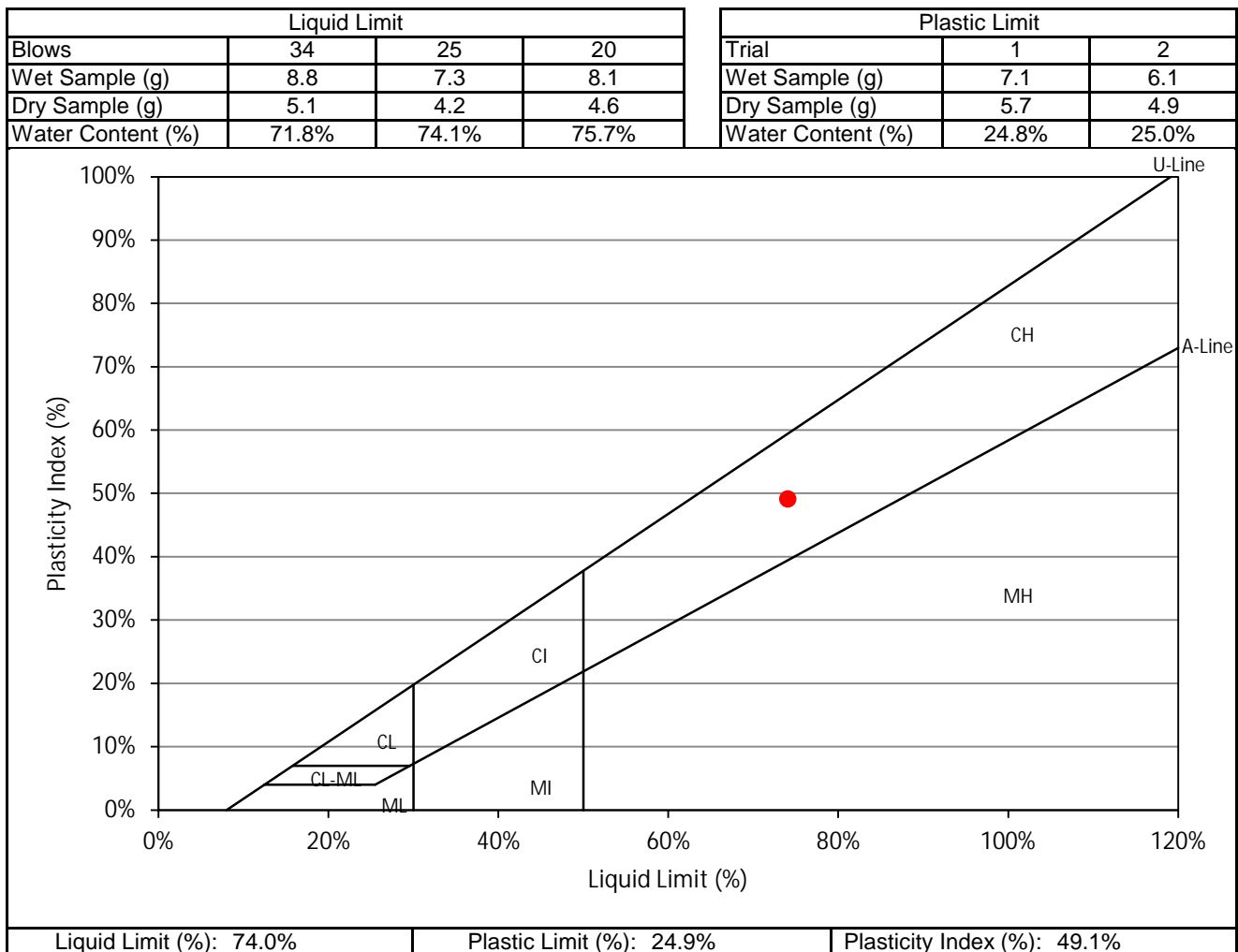
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Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-01J (Saskatchewan-St.James-Border)  
Sample Depth: 0.61 - 0.76 m  
Sample Number: G2

Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils





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Winnipeg, Manitoba  
R3P 0Y7  
Phone: 204 477 5381



Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: City of Winnipeg  
Sample Location: TH21-02J (Saskatchewan-St.James-Border)  
Sample Depth: 1.22 - 1.37 m  
Sample Number: G4

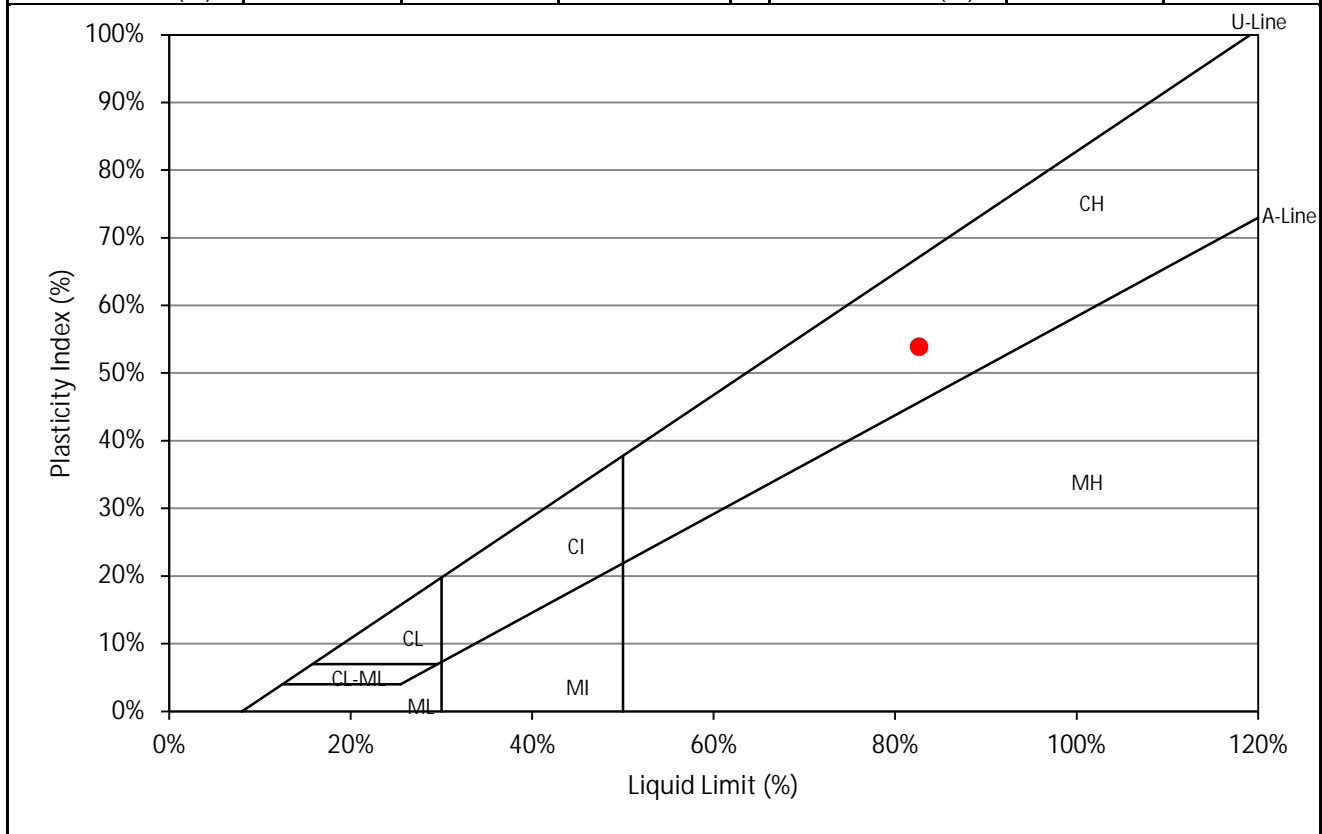
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: December 22, 2021  
Lab Technician: EManimbao  
Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	29	23	17
Wet Sample (g)	8.2	7.3	8.1
Dry Sample (g)	4.5	4.0	4.4
Water Content (%)	82.3%	82.8%	83.4%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.8	7.1
Dry Sample (g)	5.3	5.5
Water Content (%)	28.4%	29.0%



Liquid Limit (%): 82.6%

Plastic Limit (%): 28.7%

Plasticity Index (%): 53.9%



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 Winnipeg, Manitoba  
 R3P 0Y7  
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Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
 Project Number: 60672138  
 Client: City of Winnipeg  
 Sample Location: TH21-03J (Saskatchewan-St.James-Border)  
 Sample Depth: 0.91 - 1.07 m  
 Sample Number: G3

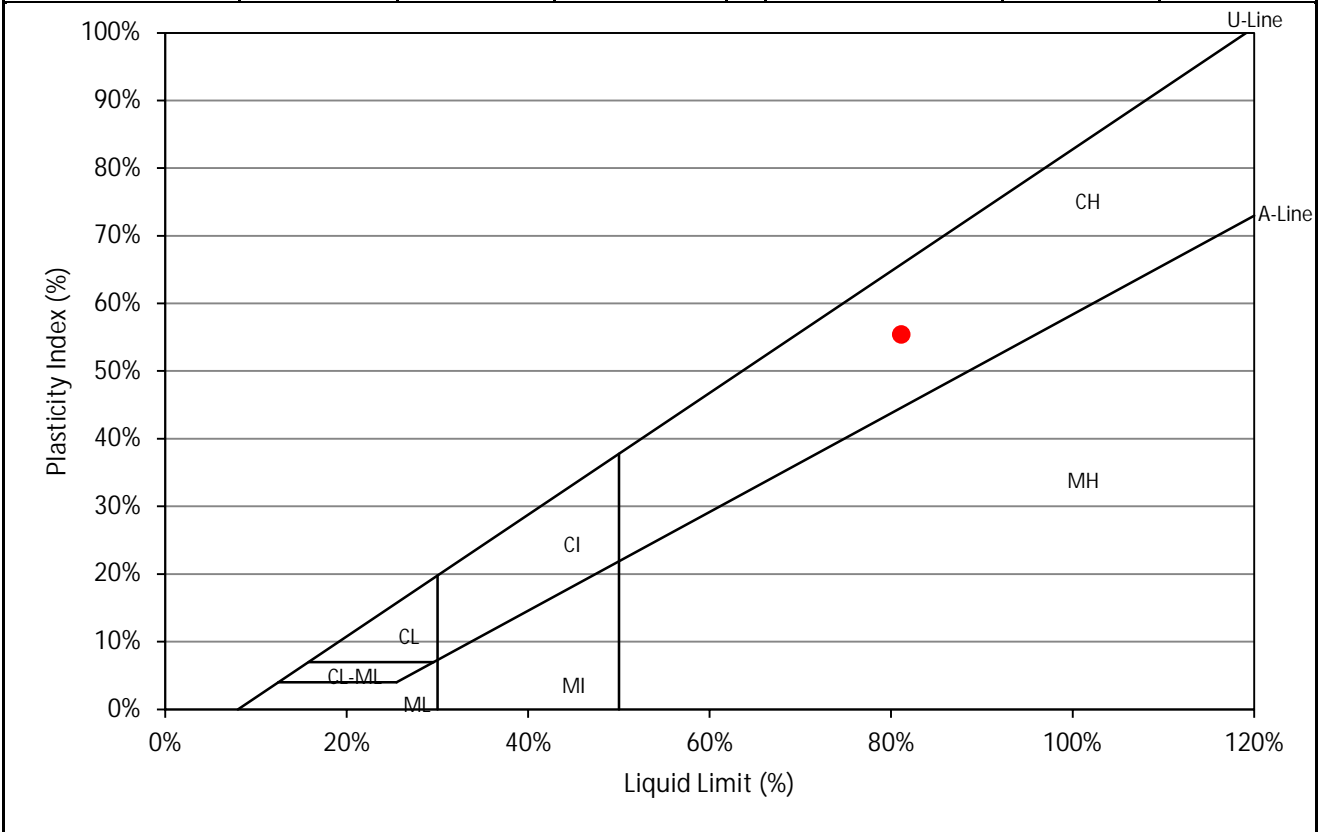
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 Specification: N/A  
 Field Technician: EManimbao  
 Sample Date: December 22, 2021  
 Lab Technician: EManimbao  
 Date Tested: March 8, 2022

## Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

	Liquid Limit		
Blows	28	25	17
Wet Sample (g)	9.1	8.5	8.8
Dry Sample (g)	5.1	4.7	4.7
Water Content (%)	79.7%	81.1%	86.1%

	Plastic Limit	
Trial	1	2
Wet Sample (g)	6.5	6.1
Dry Sample (g)	5.1	4.8
Water Content (%)	25.8%	25.6%



Liquid Limit (%): 81.1%	Plastic Limit (%): 25.7%	Plasticity Index (%): 55.4%
-------------------------	--------------------------	-----------------------------

**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



WINNIPEG GEOTECHNICAL LABORATORY

99 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada  
tel (204) 477-5381 fax (431) 800-1210

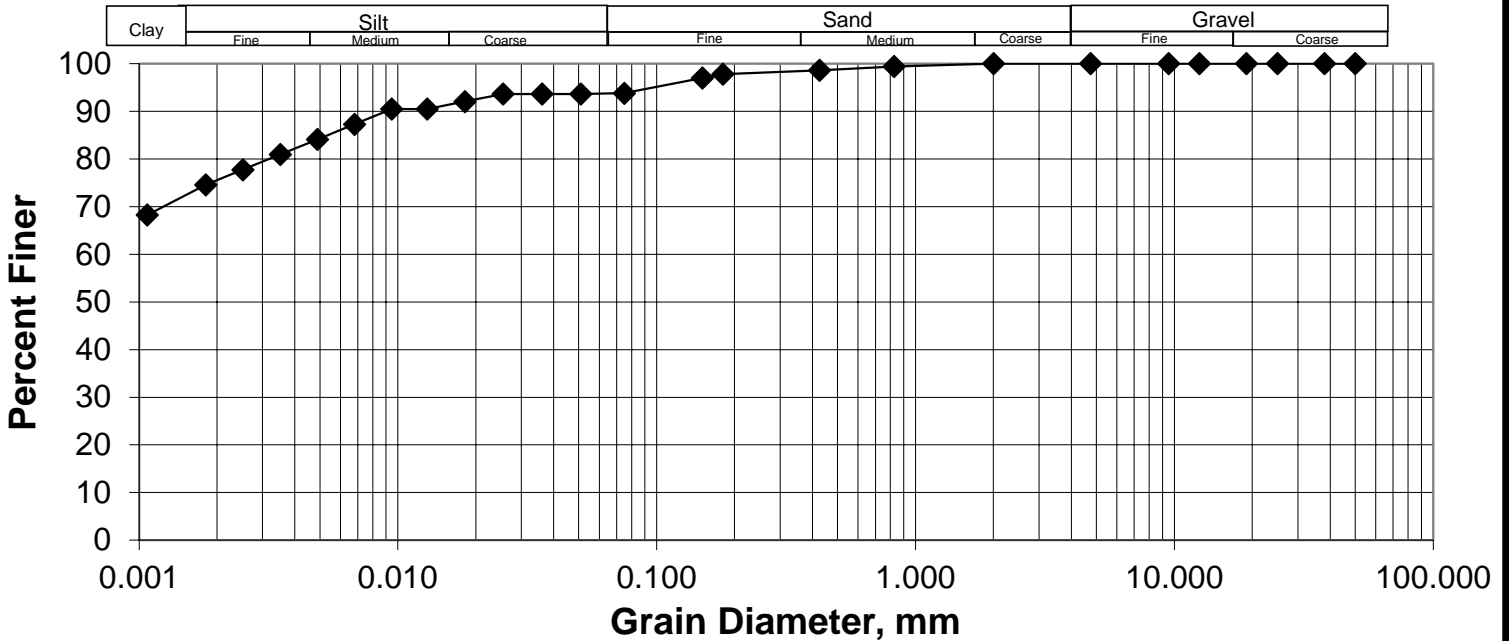


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-01J (Saskatchewan-St. James-Border)  
Sample No.: G2  
Depth: 0.61 - 0.76 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	93.8
38.0	100.0	2.00	100.0	0.0510	93.6
25.0	100.0	0.825	99.4	0.0360	93.6
19.0	100.0	0.425	98.6	0.0255	93.6
12.5	100.0	0.18	97.8	0.0182	92.1
9.5	100.0	0.15	97.0	0.0130	90.5
4.75	100.0	0.075	93.8	0.0095	90.5
				0.0068	87.3
				0.0049	84.1
				0.0035	80.9
				0.0025	77.8
				0.0018	74.6
				0.0011	68.2

**GRAIN SIZE DISTRIBUTION CURVE**



Gravel	0.0%	Silt	21.5%
Sand	6.2%	Clay	72.3%

**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



WINNIPEG GEOTECHNICAL LABORATORY

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tel (204) 477-5381 fax (431) 800-1210

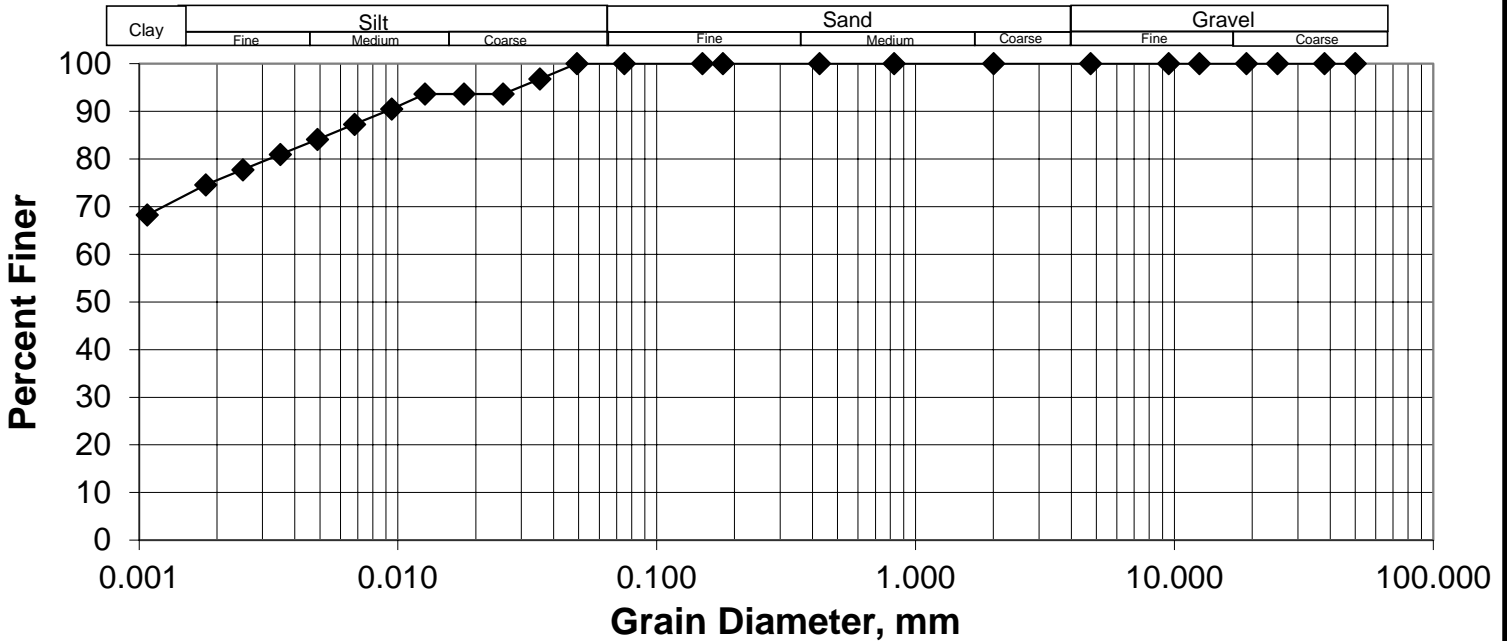


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-02J (Saskatchewan-St. James-Border)  
Sample No.: G4  
Depth: 1.22 - 1.37 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	100.0
38.0	100.0	2.00	100.0	0.0491	100.0
25.0	100.0	0.825	100.0	0.0354	96.8
19.0	100.0	0.425	100.0	0.0255	93.6
12.5	100.0	0.18	100.0	0.0180	93.6
9.5	100.0	0.15	100.0	0.0127	93.6
4.75	100.0	0.075	100.0	0.0095	90.5
				0.0068	87.3
				0.0049	84.1
				0.0035	80.9
				0.0025	77.8
				0.0018	74.6
				0.0011	68.2

**GRAIN SIZE DISTRIBUTION CURVE**



Gravel	0.0%	Silt	24.9%
Sand	0.0%	Clay	75.1%

**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



WINNIPEG GEOTECHNICAL LABORATORY

99 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada  
tel (204) 477-5381 fax (431) 800-1210

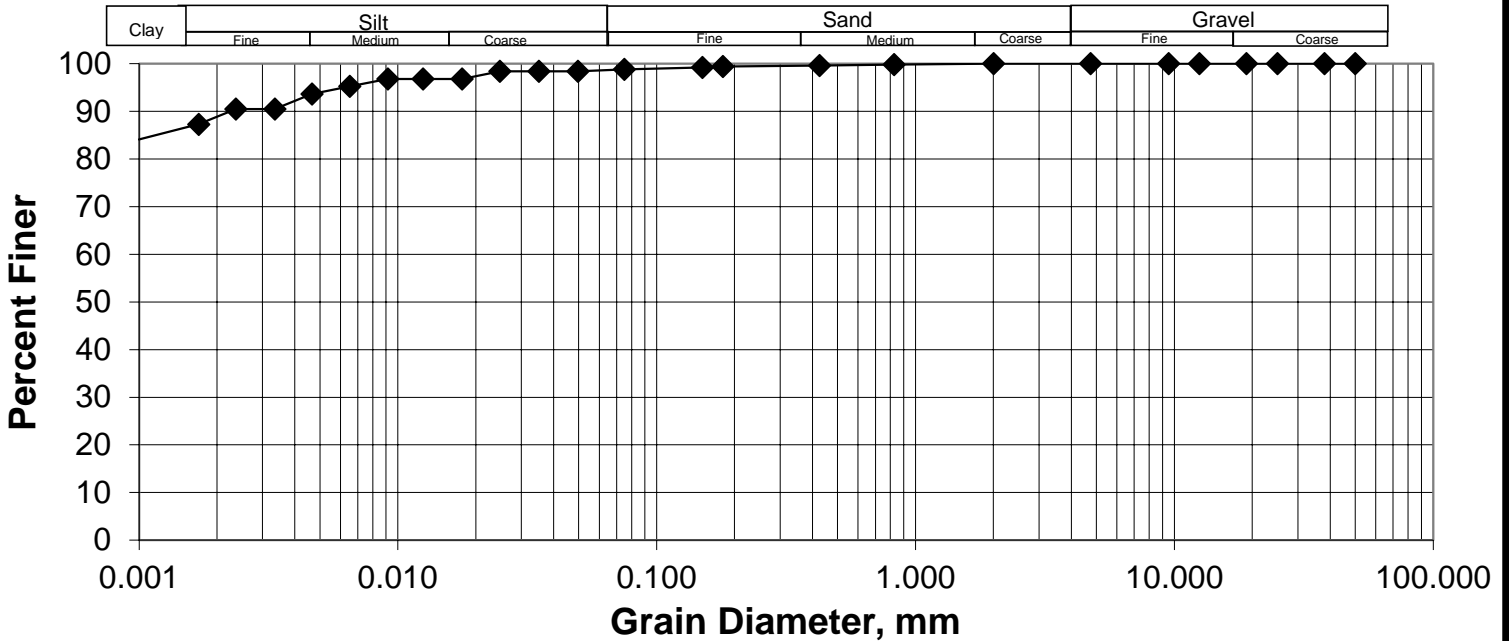


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 22-Feb-22  
Tested By: EManimbao

Hole No.: TH21-03J (Saskatchewan-St. James-Border)  
Sample No.: G3  
Depth: 0.91 - 1.07 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	98.8
38.0	100.0	2.00	100.0	0.0496	98.4
25.0	100.0	0.825	99.8	0.0351	98.4
19.0	100.0	0.425	99.6	0.0248	98.4
12.5	100.0	0.18	99.4	0.0177	96.8
9.5	100.0	0.15	99.2	0.0125	96.8
4.75	100.0	0.075	98.8	0.0091	96.8
				0.0065	95.2
				0.0047	93.6
				0.0033	90.5
				0.0024	90.5
				0.0017	87.3
				0.0010	84.1

**GRAIN SIZE DISTRIBUTION CURVE**



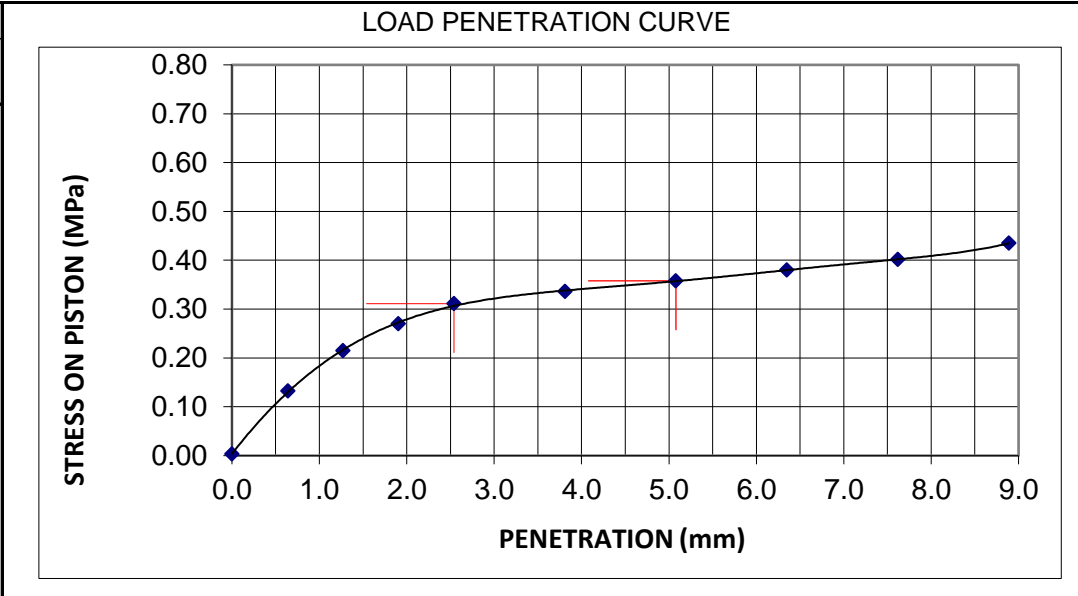
Gravel	0.0%	Silt	9.6%
Sand	1.2%	Clay	89.2%

**CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883**

Client:	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	Project No.:	112-2204
Attention:	Rico Manimbao	CBR test No.:	1
Project	Job No. 60672138	Lab No.:	HM 007
Location:	Saskatchewan - St. James to Border	Date sampled:	
		Date Received :	27-Jan-22
		Date Tested /By:	09-Feb-22 / ECS

SAMPLE DATA		SPECIMEN DATA	
Sample Type:	Clay	DESCRIPTION	Before Soaking / After Testing
Source:	TH21-01, B1 2'-5'	Moisture Content (MC), %	24.7
Sampled by:	Client	MC of top 25mm layer, %	31.3
Optimum Moisture Content:	24.8 %	Dry Density, kg/m <sup>3</sup>	1488
Maximum Dry Density:	1525 kg/cm <sup>3</sup>	Compaction, %	98%
Method of Compaction:	Standard Proctor	CBR, %	4.5
Tested by:	ECS	Swell, %	1.6
	Date Tested: 03-Feb-22		

LOAD DATA	
PENETRATION mm	STRESS MPa
0	0.00
0.64	0.13
1.27	0.21
1.91	0.27
2.54	0.31
3.81	0.34
5.08	0.36
6.35	0.38
7.62	0.40
8.89	0.43



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD		BEARING RATIO (soaked)	
		ACTUAL MPa	CORRECTED MPa	at 2.5 mm penetration	at 5.1 mm penetration
2.54	6.9	0.31	0.31	4.5	-
5.08	10.3	0.36	0.36	-	3.5

Remarks: 4 days soaked

Reviewed by:

Hermie Manalo

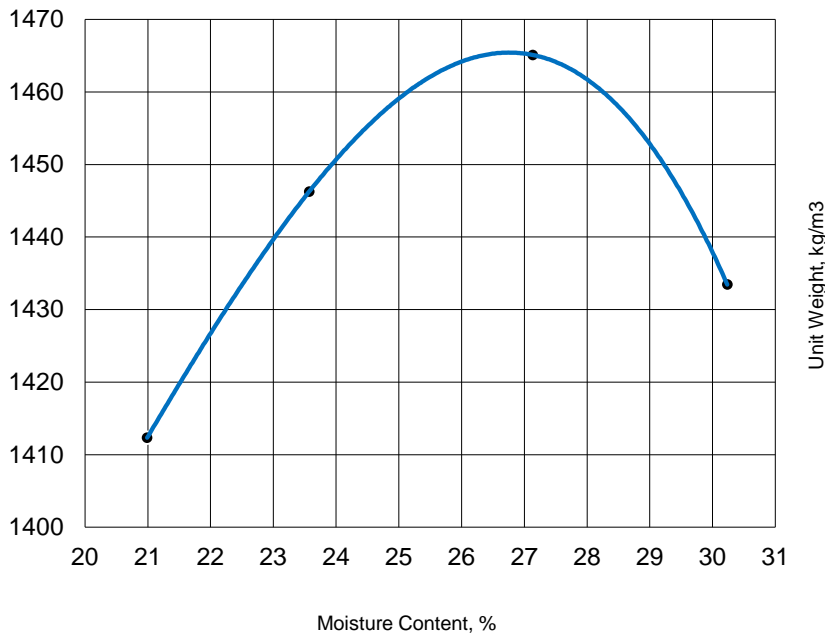
**MAXIMUM DRY DENSITY AND MOISTURE CONTENT - Proctor Method (ASTM D698)**

CLIENT	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	PROJECT No.:	112-2204
ATTENTION:	Rico Manimbao	PROCTOR Test No.:	1
PROJECT:	Job No. 60672138 Saskatchewan - St. James to Border	LAB No.:	HM 007

Date Sampled:	N/A	Date Received:	27-Jan-22	PROCEDURE	A
Sampled By:	Client	Date Tested:	03-Feb-22	PREPARATION	Dry
<b>MATERIAL INFORMATION</b>				COMPACTION METHOD	Manual
				BLOWS PER LAYER	25
Material Type:	Clay	NO. OF LAYERS	3	MOLD SIZE	100
Material Use:	Subgrade	Material Supplier:	in-situ	MOLD VOLUME	935
Maximum Size:	19 mm	Material Source:	TH21-01, B1 2'-5'	WEIGHT OF HAMMER	2.5 kg

	Test No.	1	2	3	4		
	Wet Density	1709	1787	1863	1867		
	Moisture Content	21.0	23.6	27.1	30.2		
	Dry Density	1412	1446	1465	1433		

**Moisture - Density Relationship**



Maximum Dry Density (MDD):  
1466 kg/m<sup>3</sup>  
Optimum Moisture Content  
26.8 %

STONE CORRECTION (ASTM D 4718)

Retained on 4.75 mm sieve:  
8.6 %  
Corrected Moisture:  
24.8 %  
Corrected Maximum Dry Density:  
1525 kg/m<sup>3</sup>

Remarks:

*P. Bevel*

Tested by: E. Santiago

Reviewed by: Paul Bevel

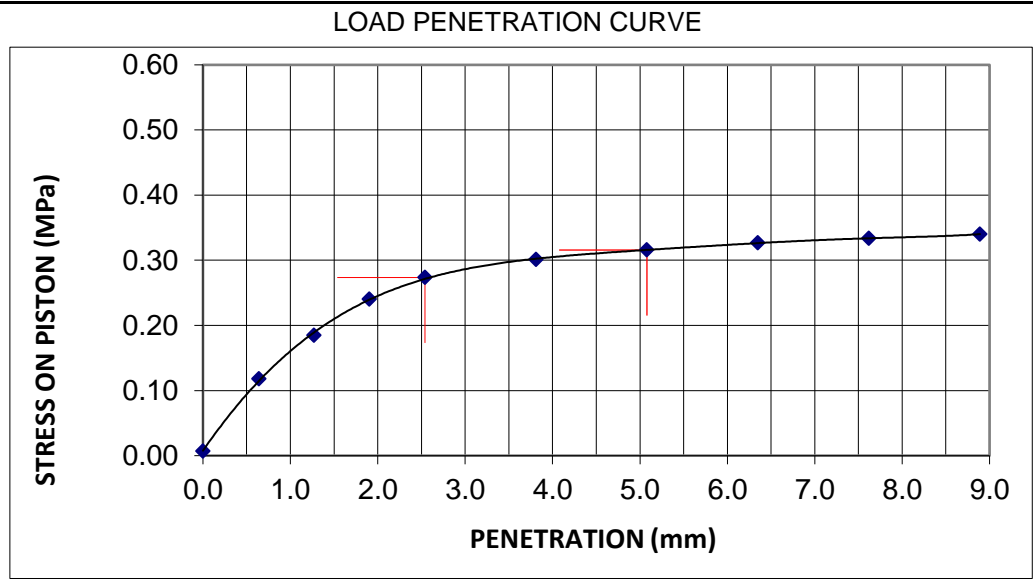


**CALIFORNIA BEARING RATIO (CBR) TEST - ASTM D 1883**

Client:	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	Project No.:	112-2204
Attention:	Rico Manimbao	CBR test No.:	2
Project	Job No. 60672138	Lab No.:	HM 007
Location:	Saskatchewan - St. James St to Border St	Date sampled:	
		Date Received :	27-Jan-22
		Date Tested /By:	18-Feb-22 / ECS


SAMPLE DATA		SPECIMEN DATA		
Sample Type:	Clay	DESCRIPTION	Before Soaking	After Testing
Source:	TH21-02, B2 2'-5'	Moisture Content (MC), %	32.7	
Sampled by:	Client	MC of top 25mm layer, %		38.6
Optimum Moisture Content:	32.5 %	Dry Density, kg/m <sup>3</sup>	1305	
Maximum Dry Density:	1348 kg/cm <sup>3</sup>	Compaction, %	97%	
Method of Compaction:	Standard Proctor	CBR, %	4	
Tested by:	ECS	Swell, %	1.8	
	Date Tested: 07-Feb-22			

LOAD DATA	
PENETRATION mm	STRESS MPa
0	0.01
0.64	0.12
1.27	0.18
1.91	0.24
2.54	0.27
3.81	0.30
5.08	0.32
6.35	0.33
7.62	0.33
8.89	0.34



PENETRATION mm	STANDARD LOAD MPa	TEST LOAD		BEARING RATIO (soaked)	
		ACTUAL MPa	CORRECTED MPa	at 2.5 mm penetration	at 5.1 mm penetration
2.54	6.9	0.27	0.27	4.0	-
5.08	10.3	0.32	0.32	-	3.1

Remarks: 4 days soaked

Reviewed by:   
Hermie Manalo

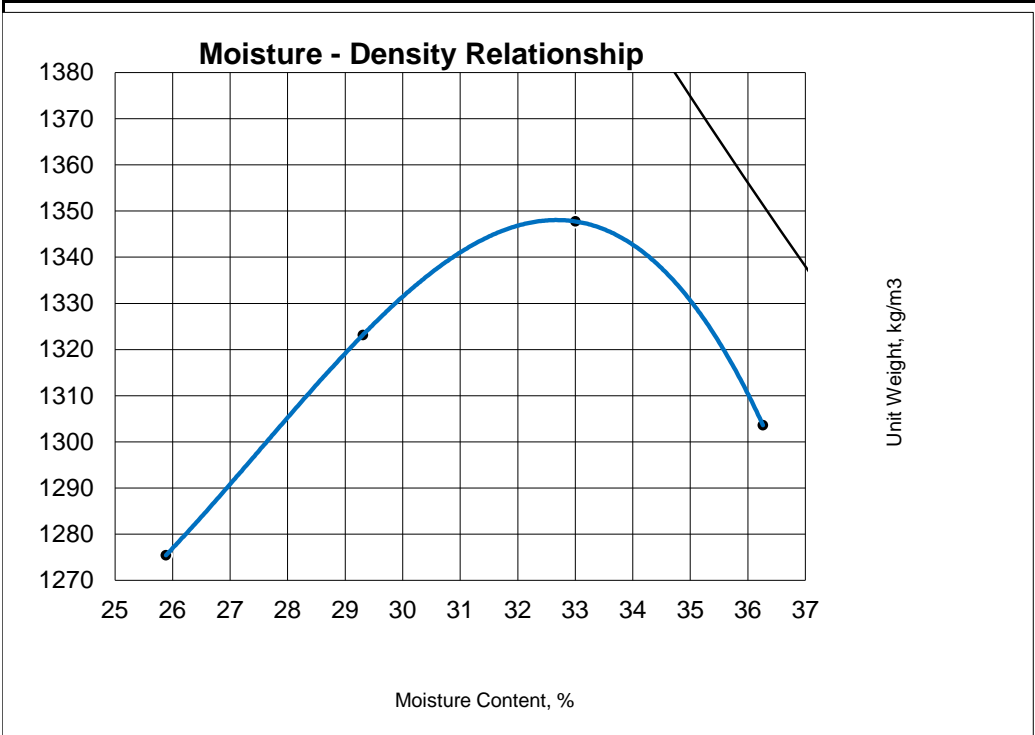
**MAXIMUM DRY DENSITY AND MOISTURE CONTENT - Proctor Method (ASTM D698)**

CLIENT	AECOM Canada Ltd. 99 Commerce Drive Winnipeg MB R3P 0Y7	PROJECT No.:	112-2204
ATTENTION:	Rico Manimbao	PROCTOR Test No.:	2
PROJECT:	Job No. 60672138 Saskatchewan - St. James St to Border St	LAB No.:	HM 007

Date Sampled:	N/A	Date Received:	27-Jan-22	PROCEDURE	A	
Sampled By:	Client	Date Tested:	07-Feb-22		PREPARATION	Dry
					COMPACTION METHOD	Manual

MATERIAL INFORMATION				BLOWS PER LAYER	25
Material Type:	Clay	Material Supplier:	in-situ	NO. OF LAYERS	3
Material Use:	Subgrade	Material Source:	TH21-02, B2 2'-5'	MOLD SIZE	100
Maximum Size:	4.75			MOLD VOLUME	935
				WEIGHT OF HAMMER	2.5 kg

	Test No.	1	2	3	4	
Wet Density		1606	1711	1793	1776	
Moisture Content		25.9	29.3	33.0	36.3	
Dry Density		1275	1323	1348	1304	



Maximum Dry Density (MDD):  
1348 kg/m<sup>3</sup>  
Optimum Moisture Content  
32.5 %

STONE CORRECTION (ASTM D 4718)

Retained on 4.75 mm sieve:  
\_\_\_\_\_%  
Corrected Moisture:  
32.5 %  
Corrected Maximum Dry Density:  
1348 kg/m<sup>3</sup>

Remarks:

*P. Bevel*

Tested by: E. Santiago

Reviewed by: Paul Bevel

Mr. Ryan Cunningham  
AECOM Canada Ltd.  
99 Commerce Drive  
Winnipeg, MB R3P 0Y7

January 9, 2023

**Project #**  
60672138

Dear Mr. Cunningham:

**Subject: City of Winnipeg 2022 Local and Industrial Street and Alley Renewal Program, Package 476-2021.8 (22-RI-02): Saskatchewan Avenue, - 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 Saskatchewan Avenue from Midland Street to Empress Street as part of the City of Winnipeg's 2022 Local and Industrial Street and Alley Renewal Program. The main objective of the geotechnical investigation was to determine the subsurface conditions below the existing pavement structure. Four (4) test holes were completed on the said roadway section.

Soil logs providing detailed descriptions of subsurface conditions encountered at the test hole locations are presented in **Appendix A**.

Test hole drilling was completed by Maple Leaf Drilling Ltd. using truck-mounted rigs equipped with solid stem augers (SSA), and pavement thicknesses were measured within the augered hole.

Test holes were drilled to a depth of approximately 2.6 m below the existing road surface. During the drilling, AECOM personnel observed subsurface conditions and visually classified the collected soil samples. Other pertinent information such as groundwater and drilling conditions were also recorded. Disturbed soil samples collected during the site investigation were transported to AECOM's Materials Laboratory in Winnipeg, Manitoba for further testing and classification.

The laboratory soil testing consisted of determination of moisture contents (ASTM D2216), Atterberg Limits (ASTM D4318), grain size distribution (ASTM D7928), Standard Proctor (ASTM D698), and California Bearing Ratio (ASTM D1883). Laboratory soil test results are shown on the test hole logs in **Appendix A**, summarized in **Appendix B**, and attached in **Appendix C**.

Sincerely,  
**AECOM Canada Ltd.**

Prepared by



Enrico Manimbao, C.E.T., E.I.T.  
Materials Testing Technologist

Reviewed by:



German Leal, M.Eng., P.Eng,  
Discipline Lead, Geotechnical

## 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.

Consultant agrees that the Report represents its professional judgement as described above and that the Information has been prepared for the specific purpose and use described in the Report and the Agreement, but Consultant makes no other representations, or any guarantees or warranties whatsoever, whether express or implied, with respect to the Report, the Information or any part thereof.

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# Appendix A

## Test Hole Logs

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH22-01  
 LOCATION: EB Saskatchewan Ave. - 2.4 m N of S curb, 63.0 m W of Midland St.      PROJECT NO.: 60672138  
 CONTRACTOR: Maple Leaf Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)				
0	ASPH		ASPHALT									
	CONC		CONCRETE									
			Clay fill - brown, moist, firm		G1							
					G2	~45						
					G3	~55						
1	FI				B1	~65					(B1) SPMD: 1736 kg/m3, OMC: 17.0%, CBR @ 95% SPMD: 4.8%	1
					G4	~75						
					G5	~85						
2			Fat CLAY - brown, moist, firm		G6	~95						
3	CH		END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings up to 0.30m bgs and asphalt patch to original ground surface.									

LOG OF TEST HOLE 2022-12-20- SASKATCHEWAN AVE. (MIDLAND ST-EMPRESS ST).GPJ UMA WINN.GDT 1/6/23



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: German Leal      COMPLETION DATE: 10/4/22  
 PROJECT ENGINEER: Ryan Cunningham      Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH22-02  
 LOCATION: EB Saskatchewan Ave. - 2.4 m N of S curb, 43.0 m E of E entrance of ANCAST.      PROJECT NO.: 60672138  
 CONTRACTOR: Maple Leaf Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)			
0	ASPH		ASPHALT								
	CONC		CONCRETE								
			Clay fill - brown, moist, firm		G1						
					G2	●					
1		FI			G3	●					1
					G4	●					
					G5	●				(G5): Gravel 0.9%, Sand 22.4%, Silt 57.5%, Clay 19.2%	
2			Fat CLAY - grey, firm, moist		G6	●					2
3		CH									3
			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings up to 0.30m bgs and asphalt patch to original ground surface.								

LOG OF TEST HOLE 2022-12-20- SASKATCHEWAN AVE. (MIDLAND ST-EMPRESS ST).GPJ UMA WINN.GDT 1/6/23



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: German Leal      COMPLETION DATE: 10/4/22  
 PROJECT ENGINEER: Ryan Cunningham      Page 1 of 1



PROJECT: 2022 Local Streets Package No. 22-RI-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH22-03
LOCATION: EB Saskatchewan Ave. - 2.4 m N of S curb, 5.5 m E of NE corner of ANCAST Bldg.		PROJECT NO.: 60672138
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Track Rig - 125 mm SSA	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)			
0	ASPH		ASPHALT								
	CONC		CONCRETE								
			Clay fill - brown, moist, firm		G1						
					G2	●					
1	FI				G3	●				(G2): Gravel 0.0%, Sand 11.4%, Silt 78.0%, Clay 10.6%	1
					G4	●					
					G5	●					
2	CH		Fat CLAY - brown, moist, firm		G6	●					2
3			END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings up to 0.30m bgs and asphalt patch to original ground surface.								3
4											4
5											5

LOG OF TEST HOLE 2022-12-20- SASKATCHEWAN AVE. (MIDLAND ST-EMPRESS ST).GPJ UMA WINN.GDT 1/6/23



LOGGED BY: Enrico Manimbao	COMPLETION DEPTH: 2.59 m
REVIEWED BY: German Leal	COMPLETION DATE: 10/4/22
PROJECT ENGINEER: Ryan Cunningham	Page 1 of 1

PROJECT: 2022 Local Streets Package No. 22-RI-02      CLIENT: City of Winnipeg      TESTHOLE NO: TH22-04  
 LOCATION: EB Saskatchewan Ave. - 2.3 m N of S curb, 22.0 m E of W entrance of ANCAST      PROJECT NO.: 60672138  
 CONTRACTOR: Maple Leaf Drilling Ltd.      METHOD: Track Rig - 125 mm SSA      ELEVATION (m):

SAMPLE TYPE     GRAB     SHELBY TUBE     SPLIT SPOON     BULK     NO RECOVERY     CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)			
0	ASPH		ASPHALT								
	CONC		CONCRETE								
			Clay fill - brown, moist, firm		G1						
					G2	45				Gravel 0.0%, Sand 26.2%, Silt 51.1%, Clay 22.7%	
1					G3	55				(B4) SPMD: 1940 kg/m3, OMC: 11.8%, CBR @ 95% SPMD: 8.3%	1
	FI				G4	65					
					G5	75					
2			Fat CLAY - grey, firm, moist		G6	105					
3	CH		END OF TEST HOLE AT 2.59 m IN CLAY Notes: 1. No seepage observed during augering. 2. No sloughing observed during augering. 3. Test hole backfilled with auger cuttings up to 0.30m bgs and asphalt patch to original ground surface.								

LOG OF TEST HOLE 2022-12-20- SASKATCHEWAN AVE. (MIDLAND ST-EMPRESS ST).GPJ UMA WINN.GDT 1/6/23



LOGGED BY: Enrico Manimbao      COMPLETION DEPTH: 2.59 m  
 REVIEWED BY: German Leal      COMPLETION DATE: 10/4/22  
 PROJECT ENGINEER: Ryan Cunningham      Page 1 of 1

# Appendix B

## Test Hole Summary

22-RI-02 Industrial Streets Package - Geotechnical Investigation

Table 01 – Test Hole Summary for Saskatchewan Avenue (from Midland Street to Empress Street)

Hole No.	Test Hole Location	Pavement Structure		Remarks	Subgrade Description*	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
TH22-01	EB Saskatchewan Ave. – 2.4 m N of S curb, 63.0 m W of Midland St.	Asphalt	100		No sample obtained	0.3								
					Fill	0.6	16.3							
		Concrete	200		Fill	0.9	27.9							
					Fill	1.2	22.1							
					Fill	1.5	22.2							
Granular Fill	0	CH	2.4	23.9										
TH22-02	EB Saskatchewan Ave. – 2.4 m N of S curb, 43.0 m E of E entrance of ANCAST	Asphalt	100		No sample obtained	0.3								
					Fill	0.6	7.1							
		Concrete	200		Fill	0.9	8.8							
					Fill	1.2	21.7							
					Fill	1.5	21.4	0.9	22.4	57.5	19.2	25.8	14.2	11.6
Granular Fill	0	CH	2.4	24.8										
TH22-03	EB Saskatchewan Ave. – 2.4 m N of S curb, 5.5 m E of NE corner of ANCAST Bldg.	Asphalt	100		No sample obtained	0.3								
					Fill	0.6	11.4							
		Concrete	200		Fill	0.9	20.7	0	11.4	78.0	10.6	22.3	12.7	9.6
					Fill	1.2	23.9							
					Fill	1.5	25.5							
Granular Fill	0	CH	2.4	41.2										
TH22-04	EB Saskatchewan Ave. – 2.3 m N of S curb, 22.0 m E of W entrance of ANCAST	Asphalt	100		No sample obtained	0.3								
					Fill	0.6	11.2	0	26.2	51.1	22.7	24.6	13.1	11.5
		Concrete	200		Fill	0.9	15.8							
					Fill	1.2	21.8							
					Fill	1.5	21.7							
Granular Fill	0	CH	2.4	40.4										

# Appendix C

## Laboratory Test Results

## Memorandum

To Rico Manimbao Page 1

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CC

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Subject 2022 Industrial Streets Package No. 22-RI-02 – CoW - Test Results

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From German Leal

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Date December 20, 2022 Project Number 60672138.05-0049

---

Please find attached the following material test result(s) on sample(s) submitted to the Winnipeg Geotechnical Laboratory:

- Twenty (20) Moisture Content Determination Test.
- Three (3) Atterberg Limits (3 Points) Test.
- Three (3) Grain Size Distribution (Hydrometer method) Test.
- Two (2) Soaked CBR Test.

If you have any questions, please contact the undersigned.

Sincerely,



**German Leal M.Eng., P.Eng.**  
Discipline Lead, Geotechnical

Att.



AECOM Canada Ltd.  
Winnipeg Geotechnical Laboratory  
99 Commerce Drive  
Winnipeg, Manitoba  
R3P 0Y7  
Phone: 204 477 5381



Fax: 204 284 2040

**Project Name:** 2022 Industrial Streets (22-RI-02)  
**Project Number:** 60672138  
**Client:** City of Winnipeg  
**Sample Location:** Saskatchewan Ave. (Midland-Empres  
**Sample Depth:** Varies  
**Sample Number:** Varies

**Supplier:** AECOM  
**Specification:** N/A  
**Field Technician:** EManimbao  
**Sample Date:** October 4, 2022  
**Lab Technician:** EManimbao  
**Date Tested:** December 12, 2022

### Moisture Content (ASTM D2216-10)

Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Location	Sample	Depth (m)	Moisture Content (%)
TH22-01	G1	0.30 - 0.46 m	-
	G2	0.61 - 0.76 m	16.3%
	B1	0.61 - 1.52 m	-
	G3	0.91 - 1.07 m	27.9%
	G4	1.22 - 1.37 m	22.1%
	G5	1.52 - 1.68 m	22.2%
	G6	2.44 - 2.59 m	23.9%
TH22-02	G1	0.30 - 0.46 m	-
	G2	0.61 - 0.76 m	7.1%
	G3	0.91 - 1.07 m	8.8%
	G4	1.22 - 1.37 m	21.7%
	G5	1.52 - 1.68 m	21.4%
	G6	2.44 - 2.59 m	24.8%
TH22-03	G1	0.30 - 0.46 m	-
	G2	0.61 - 0.76 m	11.4%
	G3	0.91 - 1.07 m	20.7%
	G4	1.22 - 1.37 m	23.9%
	G5	1.52 - 1.68 m	25.5%
	G6	2.44 - 2.59 m	41.2%
TH22-04	G1	0.30 - 0.46 m	-
	G2	0.61 - 0.76 m	11.2%
	G3	0.91 - 1.07 m	15.8%
	B4	0.61 - 1.52 m	-
	G4	1.22 - 1.37 m	21.8%
	G5	1.52 - 1.68 m	21.7%
	G6	2.44 - 2.59 m	40.4%

Location	Sample	Depth (m)	Moisture Content (%)



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Winnipeg, Manitoba  
R3P 0Y7  
Phone: 204 477 5381



Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: CoW  
Sample Location: TH22-02  
Sample Depth: 1.52 - 1.68 m  
Sample Number: G5

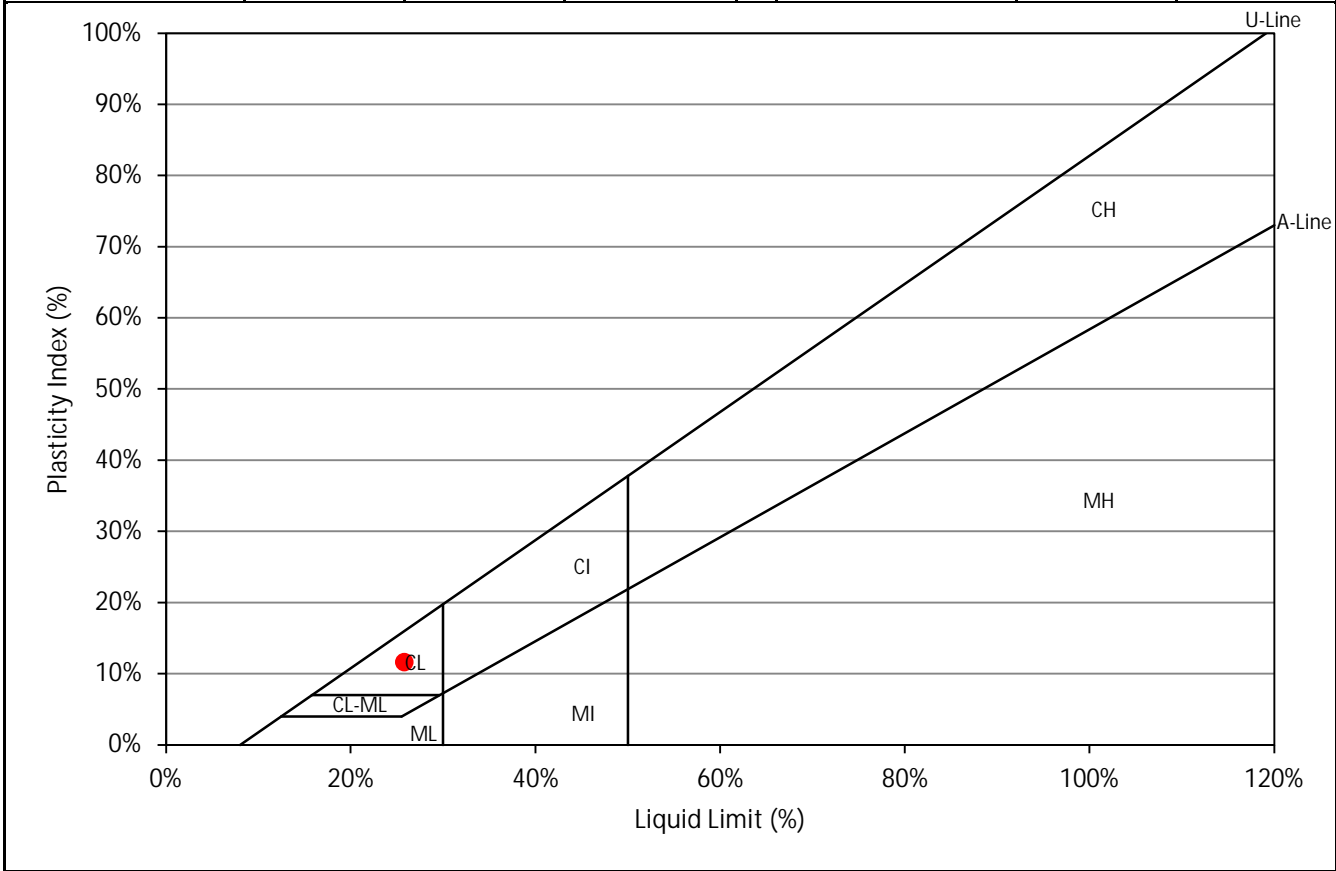
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: October 4, 2022  
Lab Technician: EManimbao  
Date Tested: December 16, 2022

### Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	29	23	17
Wet Sample (g)	11.4	11.2	11.7
Dry Sample (g)	9.1	8.9	9.2
Water Content (%)	25.4%	26.0%	26.7%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.4	8.1
Dry Sample (g)	5.6	7.1
Water Content (%)	14.2%	14.2%



Liquid Limit (%): 25.8%      Plastic Limit (%): 14.2%      Plasticity Index (%): 11.6%





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99 Commerce Drive  
Winnipeg, Manitoba  
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Phone: 204 477 5381



Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: CoW  
Sample Location: TH22-03  
Sample Depth: 0.91 - 1.07 m  
Sample Number: G3

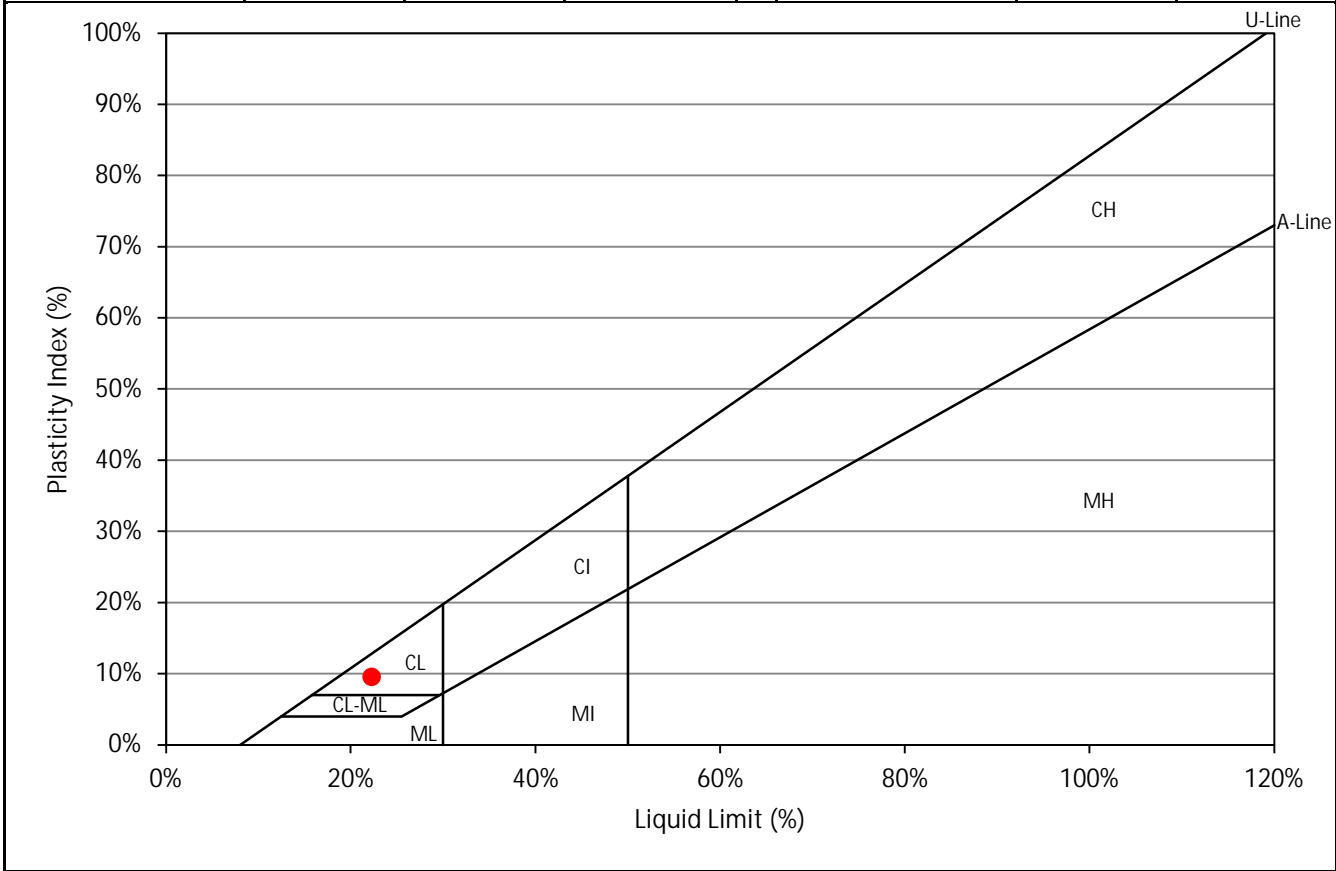
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: October 4, 2022  
Lab Technician: EManimbao  
Date Tested: December 16, 2022

### Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	29	24	19
Wet Sample (g)	13.7	14.6	12.1
Dry Sample (g)	11.2	11.9	9.8
Water Content (%)	21.8%	22.6%	23.4%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.4	6.5
Dry Sample (g)	5.7	5.8
Water Content (%)	12.8%	12.6%



Liquid Limit (%): 22.3%      Plastic Limit (%): 12.7%      Plasticity Index (%): 9.6%



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Winnipeg Geotechnical Laboratory  
99 Commerce Drive  
Winnipeg, Manitoba  
R3P 0Y7  
Phone: 204 477 5381



Fax: 204 284 2040

Project Name: 2022 Industrial Streets (22-RI-02)  
Project Number: 60672138  
Client: CoW  
Sample Location: TH22-04  
Sample Depth: 0.61 - 0.76 m  
Sample Number: G2

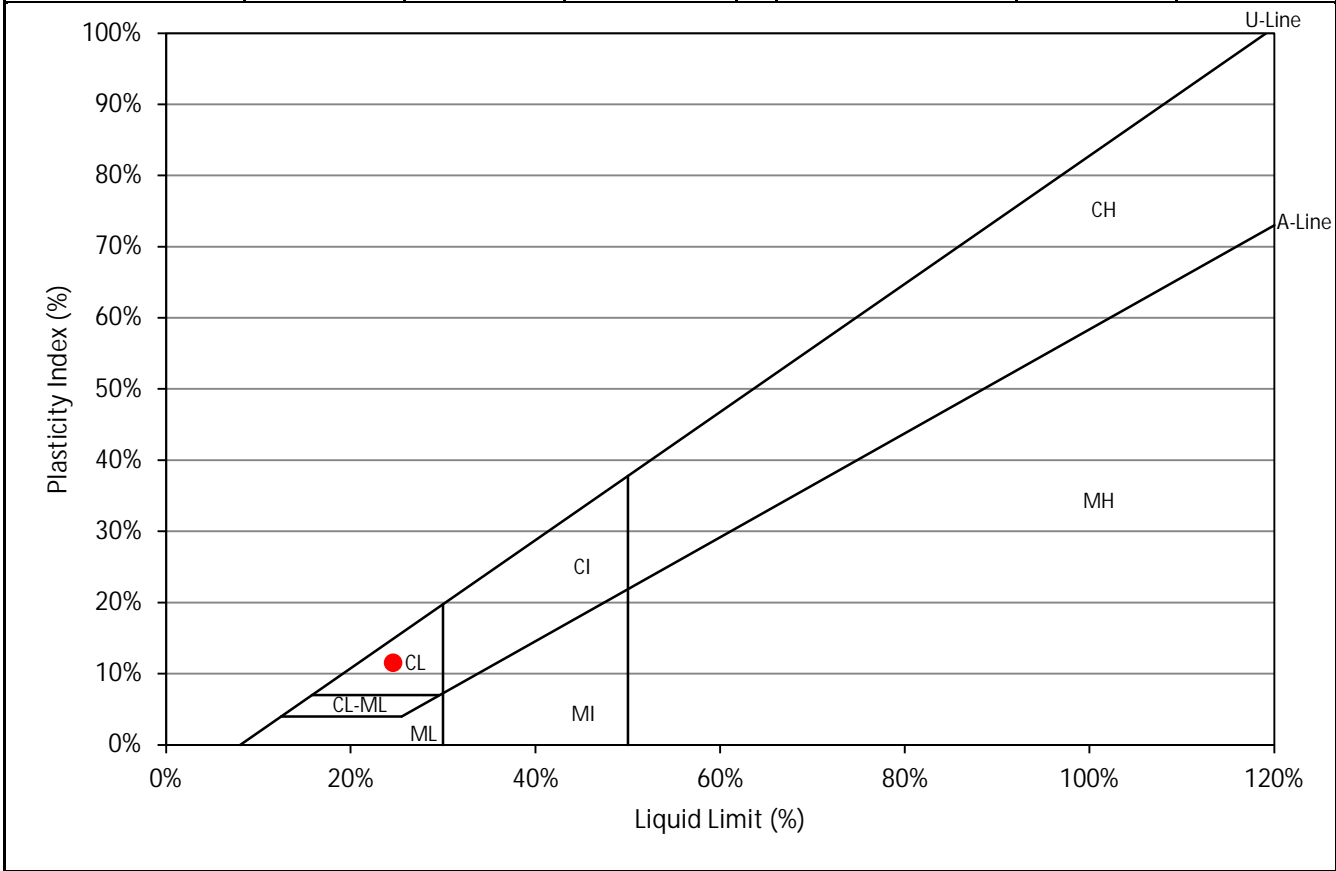
Supplier: AECOM  
Specification: N/A  
Field Technician: EManimbao  
Sample Date: October 4, 2022  
Lab Technician: EManimbao  
Date Tested: December 16, 2022

### Atterberg Limits (ASTM D4318)

Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Liquid Limit			
Blows	33	25	17
Wet Sample (g)	10.4	13.9	11.6
Dry Sample (g)	8.4	11.2	9.2
Water Content (%)	23.5%	24.6%	25.7%

Plastic Limit		
Trial	1	2
Wet Sample (g)	6.5	6.3
Dry Sample (g)	5.8	5.5
Water Content (%)	13.2%	12.9%



Liquid Limit (%): 24.6%      Plastic Limit (%): 13.1%      Plasticity Index (%): 11.5%

# GRAIN SIZE DISTRIBUTION

(ASTM D422-63)



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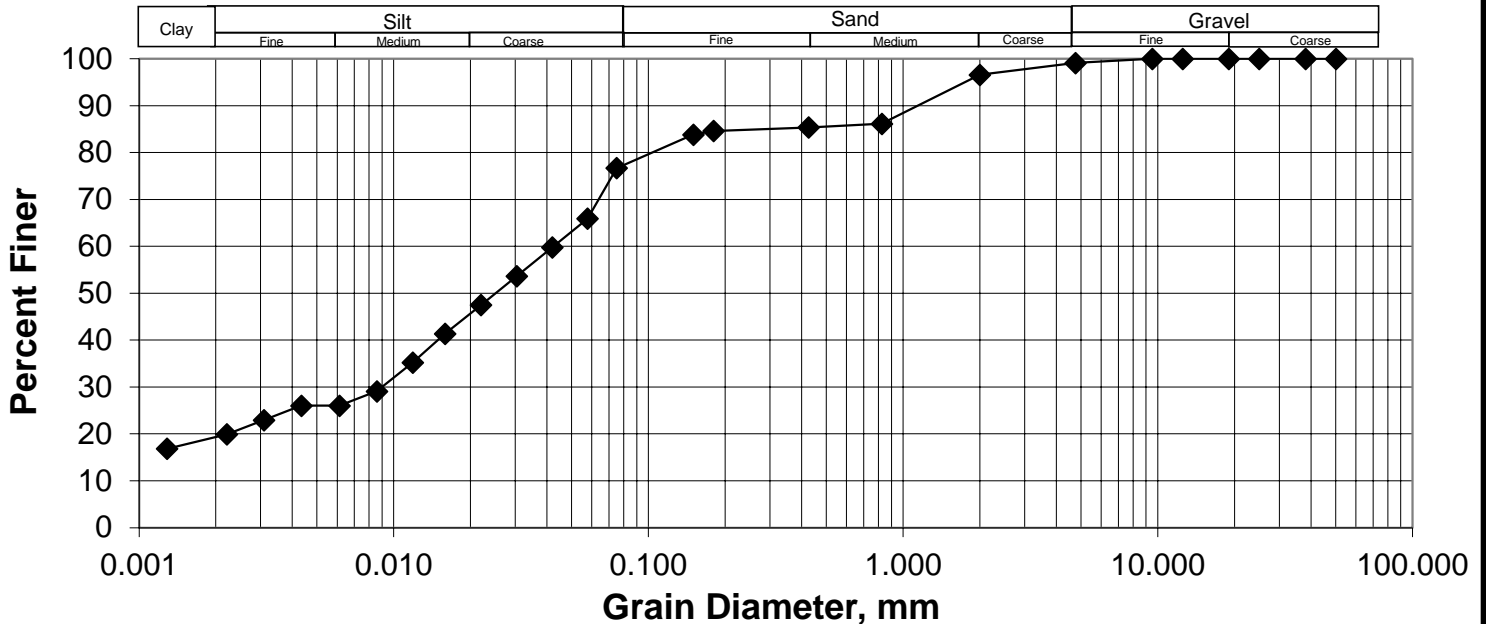


Job No.: 60672138  
 Client: City of Winnipeg  
 Project: 2022 Industrial Streets (22-RI-02)  
 Date Tested: 15-Dec-22  
 Tested By: EManimbao

Hole No.: TH22-02  
 Sample No.: G5  
 Depth: 1.52 - 1.68 m  
 Date Sampled: Varies  
 Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	99.1	0.0750	76.7
38.0	100.0	2.00	96.6	0.0577	65.9
25.0	100.0	0.825	86.1	0.0419	59.7
19.0	100.0	0.425	85.4	0.0304	53.6
12.5	100.0	0.18	84.6	0.0220	47.5
9.5	100.0	0.15	83.8	0.0159	41.3
4.75	99.1	0.075	76.7	0.0119	35.2
				0.0086	29.1
				0.0061	26.0
				0.0043	26.0
				0.0031	22.9
				0.0022	19.9
				0.0013	16.8

## GRAIN SIZE DISTRIBUTION CURVE



Gravel	0.9%	Silt	57.5%
Sand	22.4%	Clay	19.2%
D60		Cu	
D30		Cc	
D10			

# GRAIN SIZE DISTRIBUTION

(ASTM D422-63)



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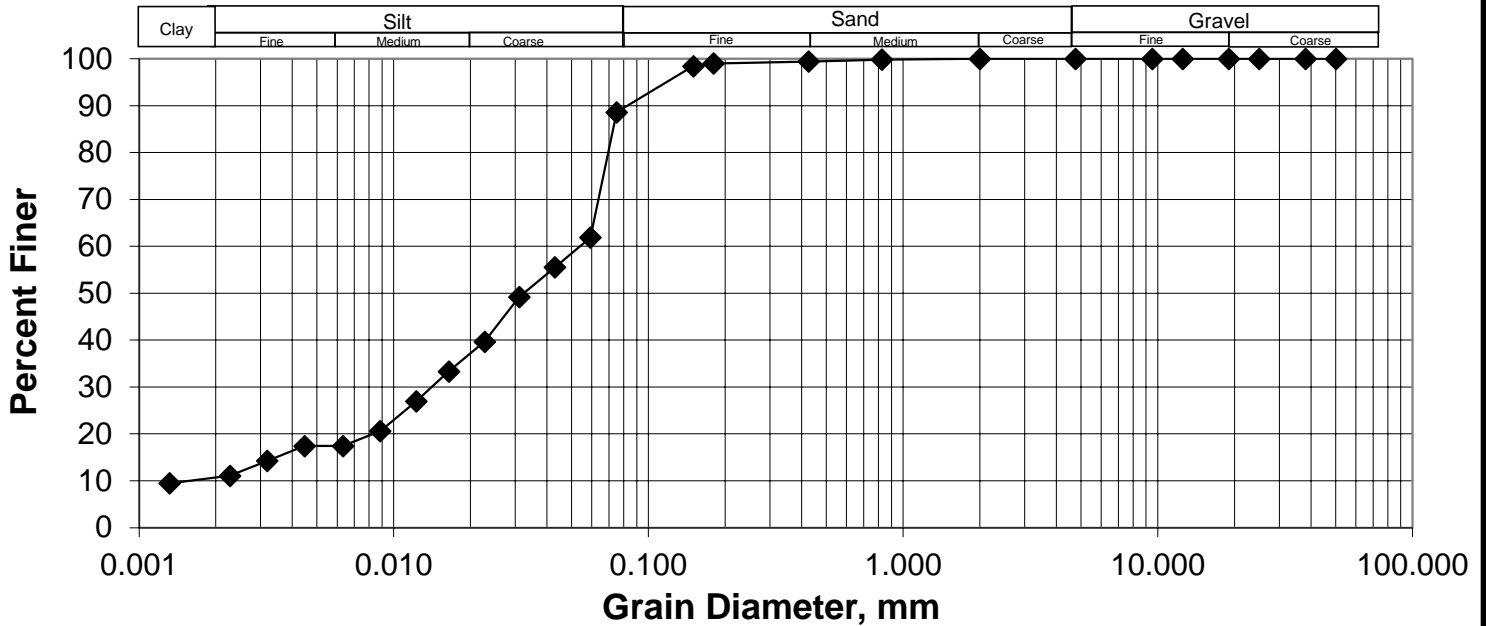


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 15-Dec-22  
Tested By: EManimbao

Hole No.: TH22-03  
Sample No.: G3  
Depth: 0.91 - 1.07 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	88.6
38.0	100.0	2.00	100.0	0.0592	61.9
25.0	100.0	0.825	99.8	0.0429	55.5
19.0	100.0	0.425	99.4	0.0311	49.2
12.5	100.0	0.18	99.0	0.0228	39.6
9.5	100.0	0.15	98.4	0.0164	33.3
4.75	100.0	0.075	88.6	0.0123	26.9
				0.0088	20.6
				0.0063	17.4
				0.0045	17.4
				0.0032	14.2
				0.0023	11.1
				0.0013	9.5

## GRAIN SIZE DISTRIBUTION CURVE



Gravel	0.0%	Silt	78.0%
Sand	11.4%	Clay	10.6%
D60		Cu	
D30		Cc	
D10			

**GRAIN SIZE DISTRIBUTION**  
(ASTM D422-63)



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tel (204) 477-5381 fax (431) 800-1210

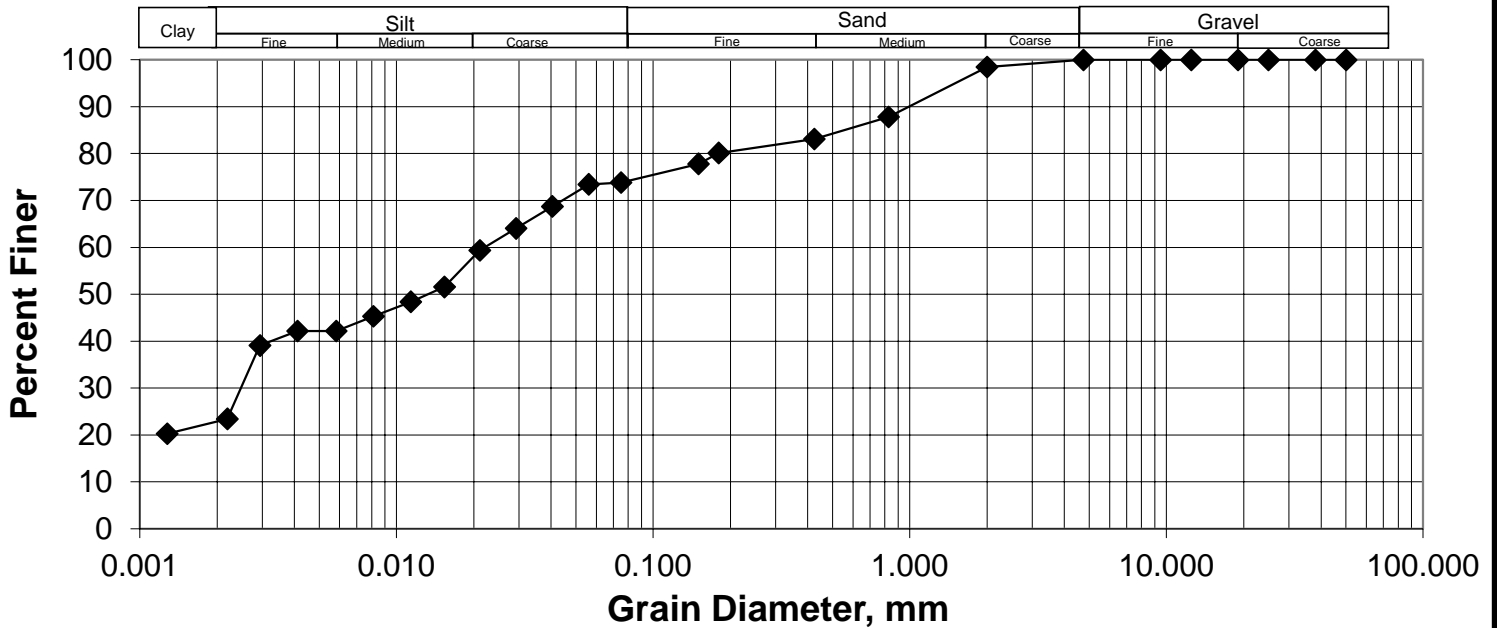


Job No.: 60672138  
Client: City of Winnipeg  
Project: 2022 Industrial Streets (22-RI-02)  
Date Tested: 15-Dec-22  
Tested By: EManimbao

Hole No.: TH22-04  
Sample No.: G2  
Depth: 0.61 - 0.76 m  
Date Sampled: Varies  
Sampled By: AECOM

GRAVEL SIZES		SAND SIZES		FINES	
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing
50.0	100.0	4.75	100.0	0.0750	73.8
38.0	100.0	2.00	98.5	0.0561	73.4
25.0	100.0	0.825	87.8	0.0405	68.7
19.0	100.0	0.425	83.1	0.0292	64.1
12.5	100.0	0.18	80.1	0.0211	59.4
9.5	100.0	0.15	77.8	0.0154	51.5
4.75	100.0	0.075	73.8	0.0114	48.4
				0.0081	45.3
				0.0058	42.2
				0.0041	42.2
				0.0029	39.0
				0.0022	23.4
				0.0013	20.3

**GRAIN SIZE DISTRIBUTION CURVE**



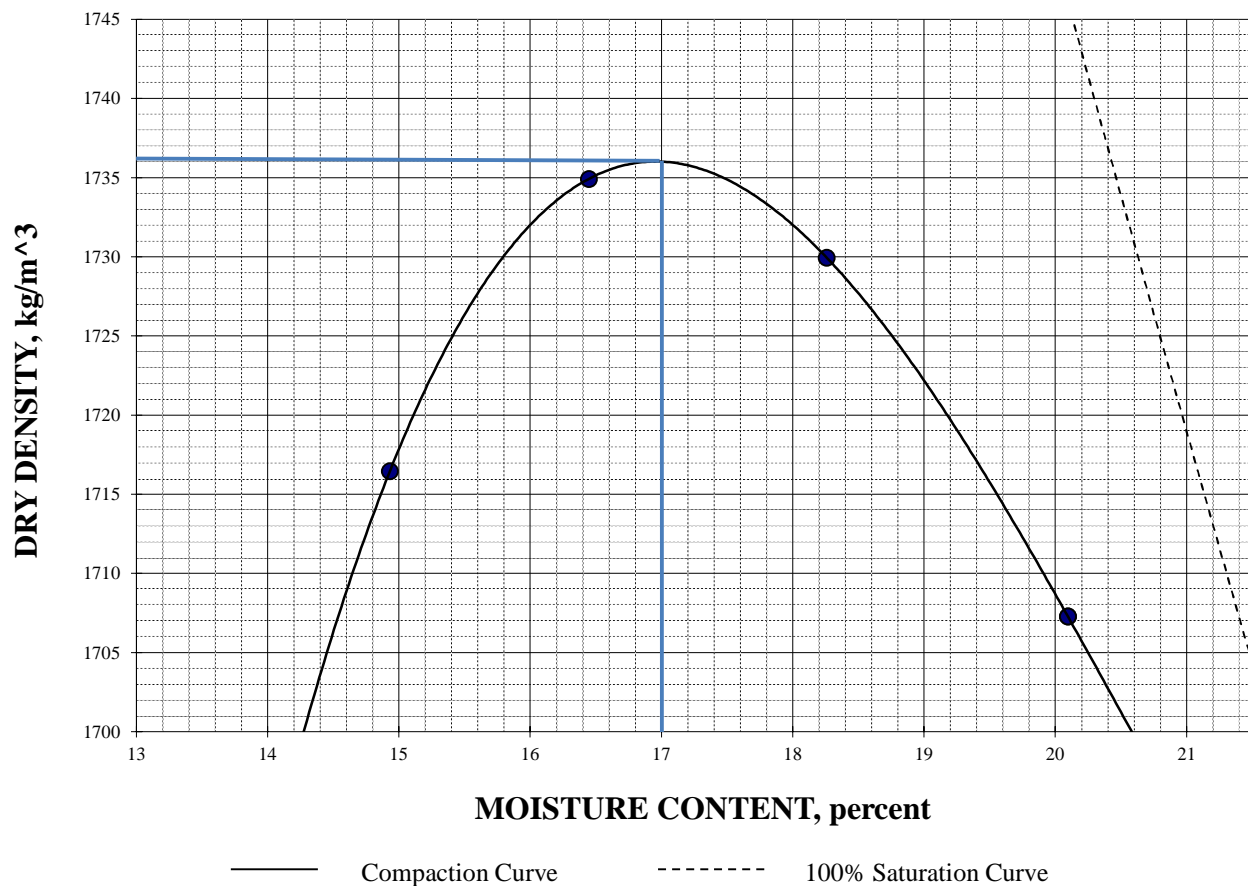
Gravel	0.0%	Silt	51.1%
Sand	26.2%	Clay	22.7%
D60		Cu	
D30		Cc	
D10			

**AECOM WINNIPEG GEOTECHNICAL LABORATORY**99 Commerce Drive, Winnipeg, Manitoba, R3P 0Y7  
tel (204) 477-5381 fax (431) 800-1210

**Client:** CoW **Job No:** 60672138  
**Project:** 2022 Industrial Streets Package **Sample:** Clay Fill  
**Lab No.:** **Supplier:** AECOM  
**Date Tested:** 2-Dec-22 **Source:** TP22-01 B1

**ASTM D698**

TRIAL NUMBER	1	2	3	4	5
Wet Unit Weight (kg/cu.m.)	1973	2020	2046	2050	
Dry Unit Weight (kg/cu.m.)	1716	1735	1730	1707	
Moisture Content (%)	14.9	16.4	18.3	20.1	



Description / Remarks:			
As received moisture content (%)	N/A	<b>Maximum Dry Density</b> 1736 kg/m <sup>3</sup> <b>Optimum Moisture Content</b> 17.0%	
Specific Gravity (Assumed)	2.69		
Method Used	A		
Method of Preparation	Moist	<b>PROCTOR NO:</b> P1917	
Type of Rammer	Manual		

# CALIFORNIA BEARING RATIO (CBR) TEST

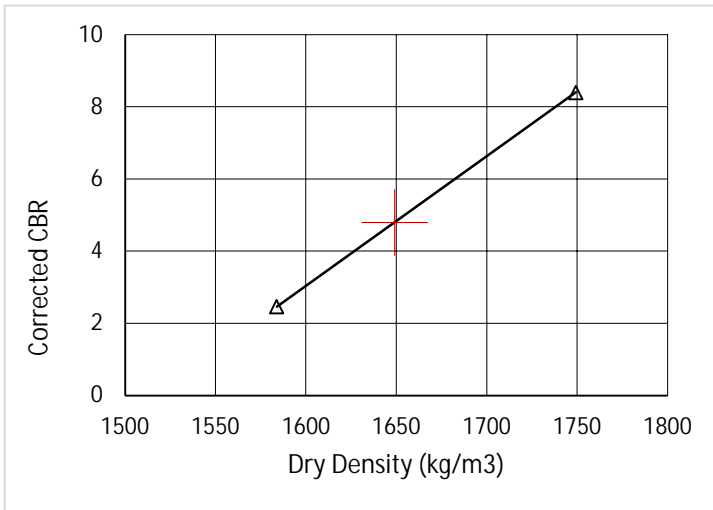
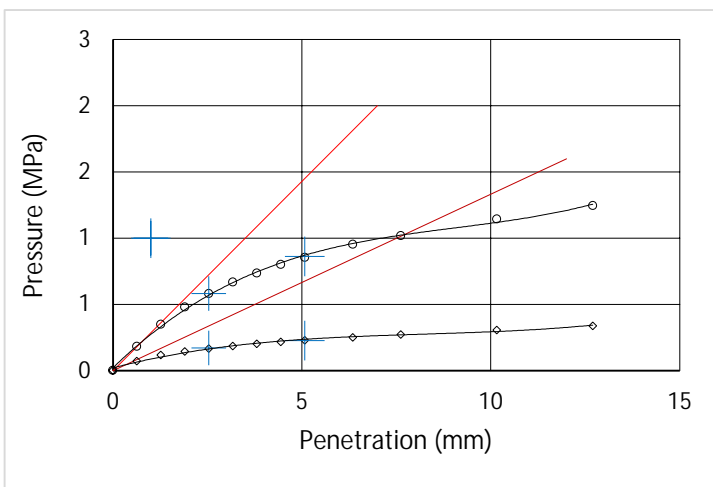


ASTM D1883

Client: City of Winnipeg	Test Hole ID: TH22-01	
Project Name: 2022 Industrial Streets (22-RI-02)	Sample ID: B1	Sample Depth (m): 0.60 - 1.50
Project Number: 60672138	Soil Description: Clay Fill	
Location: Saskatchewan Ave. (Midland-Empress)	Tested By: EM/LT	Tested Date: 12/19/2022

PROCTOR DATA	CBR DATA	10 blows	25 blows	56 blows
Optimum Moisture Content (%) <b>17</b>	Moisture Content, MC (%)		16.9%	16.9%
Maximum Dry Density (kg/m3) <b>1736</b>	Wet Density (kg/m3)		1851.4	2044.8
Proctor Test Method <b>Standard</b>	Dry Density (kg/m3)		1583.8	1749.2
Tested by: <b>EM</b>	Compaction Degree (%)		91%	101%
<u>Remark:</u>	Surcharge Weight (g)		<b>4506</b>	<b>4506</b>
	Soaked for (days)		<b>4</b>	<b>4</b>
	Swell (%)		1.2%	0.5%

## PENETRATION DATA



Penetration (mm)	Pressure (MPa)	
0	0.0	0.0
0.635	0.07	0.18
1.27	0.12	0.35
1.905	0.14	0.48
<b>2.54</b>	<b>0.17</b>	<b>0.58</b>
3.175	0.18	0.67
3.81	0.20	0.74
4.445	0.22	0.80
<b>5.08</b>	<b>0.23</b>	<b>0.85</b>
6.35	0.25	0.95
7.62	0.27	1.02
10.16	0.31	1.14
12.7	0.34	1.25
Corrected Pressure (MPa)		
at 2.54 mm	0.17	0.58
at 5.08 mm	0.23	0.86
Corrected Bearing Ratio		
at 2.54 mm	2	8
at 5.08 mm	2	8
Standard pressure: 6.9 Mpa at 2.54 mm penetration 10.3 Mpa at 5.08mm penetration		
CBR Value		
CBR at	<b>95 % of</b>	maximum dry density
Dry density, kg/m3:	1649	
CBR:	<b>4.8</b>	

Note

**AECOM WINNIPEG GEOTECHNICAL LABORATORY**

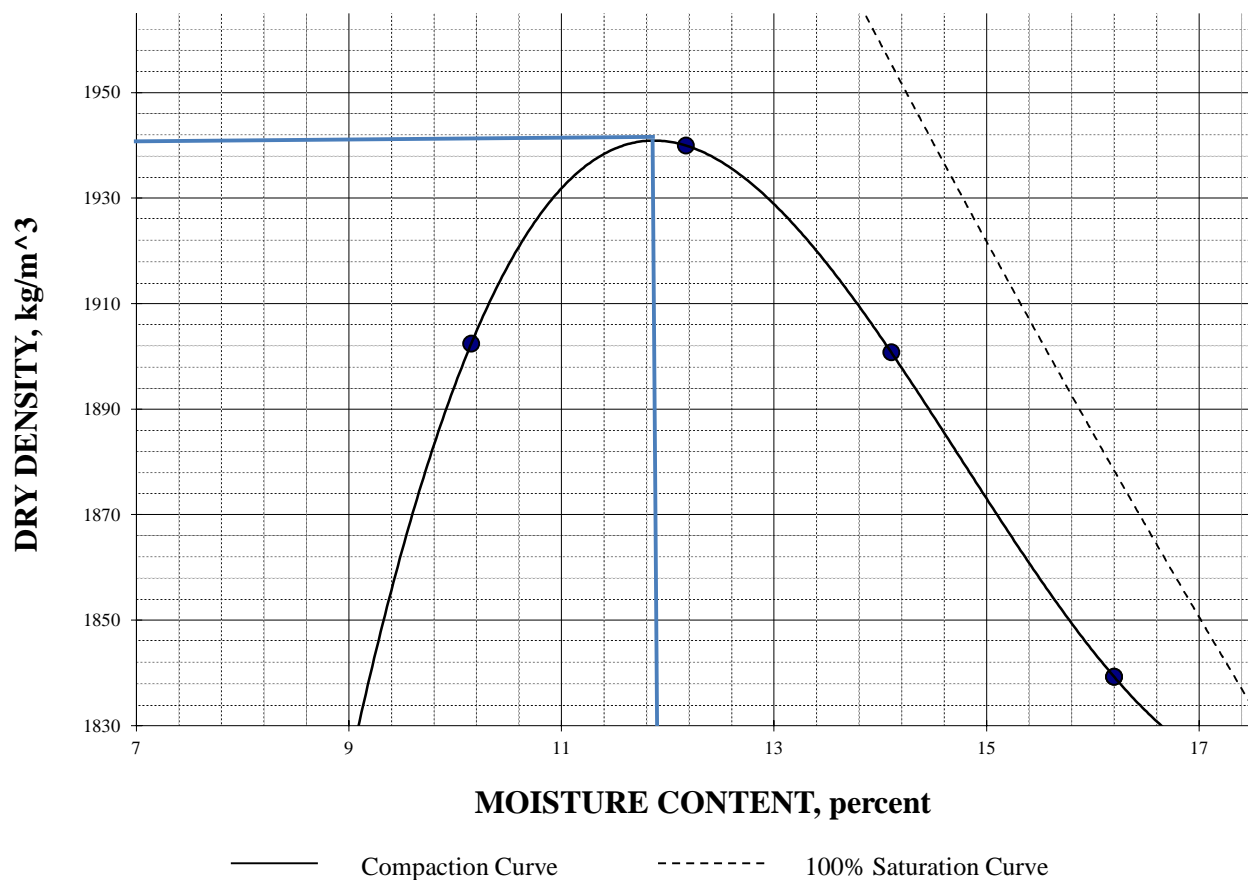
99 Commerce Drive, Winnipeg, Manitoba, R3P 0Y7

tel (204) 477-5381 fax (431) 800-1210

**Client:** CoW **Job No:** 60672138  
**Project:** 2022 Industrial Streets Package **Sample:** Clay  
**Lab No.:** **Supplier:** AECOM  
**Date Tested:** 2-Dec-22 **Source:** TP22-04 B4

**ASTM D698**

TRIAL NUMBER	1	2	3	4	5
Wet Unit Weight (kg/cu.m.)	2096	2176	2169	2137	
Dry Unit Weight (kg/cu.m.)	1902	1940	1901	1839	
Moisture Content (%)	10.2	12.2	14.1	16.2	



Description / Remarks:			
As received moisture content (%)	N/A	<b>Maximum Dry Density</b> 1940 kg/m <sup>3</sup> <b>Optimum Moisture Content</b> 11.8%	
Specific Gravity (Assumed)	2.7		
Method Used	A		
Method of Preparation	Moist	<b>PROCTOR NO:</b>	<b>P1918</b>
Type of Rammer	Manual		



# CALIFORNIA BEARING RATIO (CBR) TEST

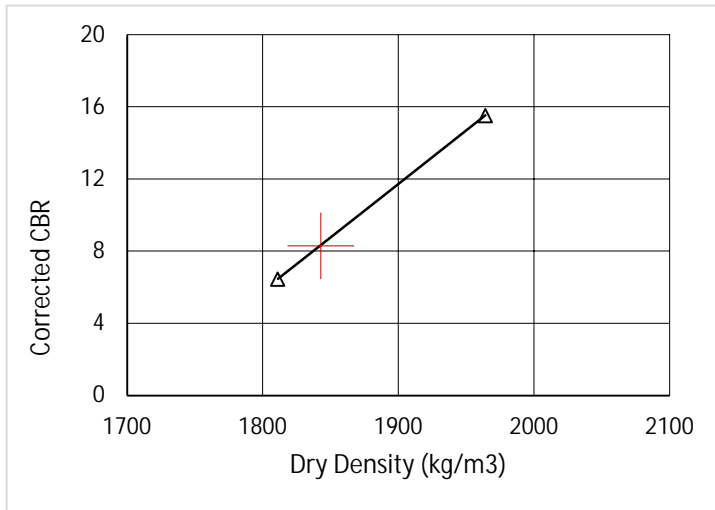
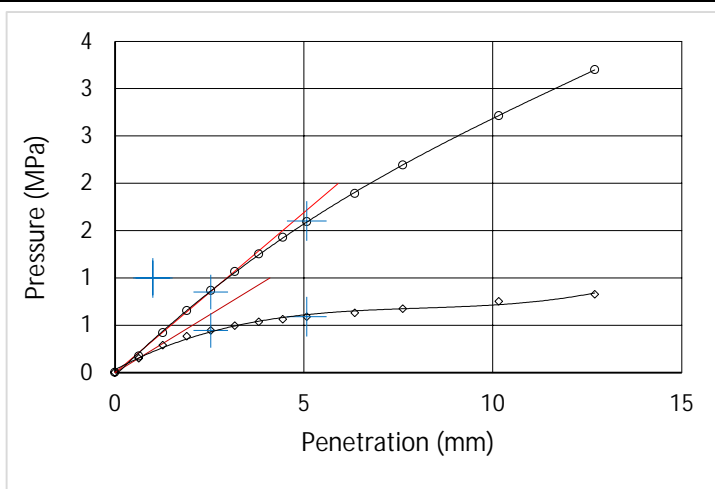


ASTM D1883

Client: City of Winnipeg	Test Hole ID: TH22-04	
Project Name: 2022 Industrial Streets	Sample ID: B4	Sample Depth (m): 0.60 - 1.50
Project Number: 60672138	Soil Description: Clay Fill	
Location: Saskatchewan Ave. (Midland-Empress)	Tested By: EM/LT	Tested Date: 12/19/2022

PROCTOR DATA	CBR DATA	10 blows	25 blows	56 blows
Optimum Moisture Content (%) <b>11.8</b>	Moisture Content, MC (%)		12.2%	12.2%
Maximum Dry Density (kg/m <sup>3</sup> ) <b>1940</b>	Wet Density (kg/m <sup>3</sup> )		2032.1	2203.8
Proctor Test Method <b>Standard</b>	Dry Density (kg/m <sup>3</sup> )		1811.1	1964.2
Tested by: <b>EM</b>	Compaction Degree (%)		93%	101%
<u>Remark:</u>	Surcharge Weight (g)		<b>4506</b>	<b>4506</b>
	Soaked for (days)		<b>4</b>	<b>4</b>
	Swell (%)		0.3%	0.2%

## PENETRATION DATA



Penetration (mm)	Pressure (MPa)	
0	0.0	0.0
0.635	0.15	0.17
1.27	0.29	0.42
1.905	0.38	0.66
<b>2.54</b>	<b>0.45</b>	<b>0.87</b>
3.175	0.50	1.07
3.81	0.54	1.25
4.445	0.56	1.43
<b>5.08</b>	<b>0.59</b>	<b>1.59</b>
6.35	0.63	1.89
7.62	0.68	2.19
10.16	0.75	2.72
12.7	0.83	3.20
Corrected Pressure (MPa)		
at 2.54 mm	0.45	0.85
at 5.08 mm	0.59	1.60
Corrected Bearing Ratio		
at 2.54 mm	6	12
at 5.08 mm	6	16
Standard pressure: 6.9 Mpa at 2.54 mm penetration 10.3 Mpa at 5.08mm penetration		
CBR Value		
CBR at	<b>95 % of</b>	maximum dry density
Dry density, kg/m <sup>3</sup> :	1843	
CBR:	<b>8.3</b>	

Note: The test for 65 blows specimen was rerun and the bearing ratio of 16.0 was selected as per paragraph 10.2 of ASTM D1883.