

# **APPENDIX 'G'**

# **GEOTECHNICAL REPORT**

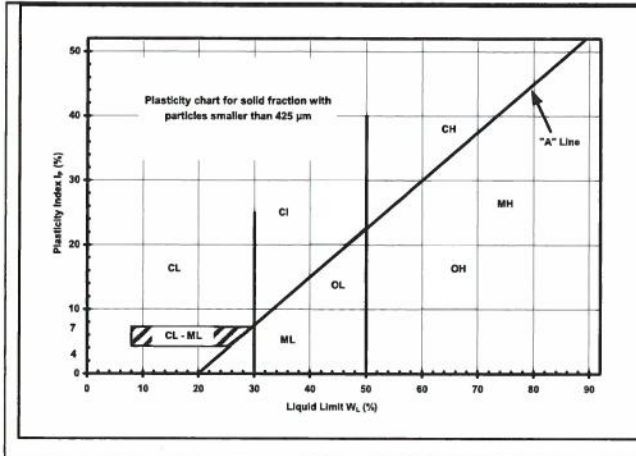
## EXPLANATION OF FIELD & LABORATORY TEST DATA

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

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

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

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



| FRACTION                                     | SEIVE SIZE (mm) |          | DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS |                     |
|--|-----------------|----------|---|---------------------|
|  | Passing         | Retained | Percent   | Identifier          |
| Gravel                                       | Coarse          | 76       | 19  | 35-50 and           |
|  | Fine            | 19       | 4.75  |                     |
| Sand   | Coarse          | 4.75     | 2.00  | 20-35 "y" or "ey" * |
|  | Medium          | 2.00     | 0.425   |                     |
|  | Fine            | 0.425    | 0.075   |                     |
| Silt (non-plastic) or Clay (plastic)         | < 0.075 mm      |          | 10-20   | some                |
| 1-10 trace                                   |                 |          |   |                     |
| * for example: gravelly, sandy clayey, silty |                 |          |   |                     |
| Definition of Oversize Material              |                 |          |   |                     |
| COBBLES: 76mm to 300mm diameter              |                 |          |   |                     |
| BOULDERS: >300mm diameter                    |                 |          |   |                     |

**LEGEND OF SYMBOLS**

Laboratory and field tests are identified as follows:

- q<sub>u</sub> - undrained shear strength (kPa) derived from unconfined compression testing.
- T<sub>v</sub> - undrained shear strength (kPa) measured using a torvane
- pp - undrained shear strength (kPa) measured using a pocket penetrometer.
- L<sub>v</sub> - undrained shear strength (kPa) measured using a lab vane.
- F<sub>v</sub> - undrained shear strength (kPa) measured using a field vane.
- γ - bulk unit weight (kN/m<sup>3</sup>).
- SPT - Standard Penetration Test. Recorded as number of blows (N) from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 51 mm O.D. Raymond type sampler 0.30 m into the soil.
- DPPT - Drive Point Pentrometer Test. Recorded as number of blows from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 50 mm drive point 0.30 m into the soil.
- w - moisture content (W<sub>L</sub>, W<sub>P</sub>)

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

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

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

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

## **F2. SEWER TELEVISION GUIDELINES FOR PUBLIC WORKS PROJECTS (JANUARY 2009)**

- F2.1 The Consultant is required to assess the extent of Closed Circuit Television (CCTV) inspection for all combined, wastewater, land drainage and storm relief sewers to confirm any sewer repairs required in the right-of-way within the limits of the street renewal.
- F2.2 The criteria provided are general guidelines and are not intended to replace sound municipal engineering judgement specific to the individual Project scope and/or location.
- F2.3 The available sewer televising information is contained within the City of Winnipeg's Sewer Management System (SMS) application.
- F2.4 Confirm televising requirements with Project Manager.
- F2.5 CCTV inspection general guidelines:
- (a) Confirm CCTV requirements with Water & Waste Department for sewers 1050 mm and larger in diameter;
  - (b) Televising if no previous CCTV inspections have been completed;
  - (c) Re-televising sewers in Categories A/B/C/X with a Structural Performance Grade (SPG) of 3 or higher that have not been televised in the previous 5 years;
  - (d) Sewers located more than two metres from the curb line (i.e. not located under pavement) do not need to be re-televised if previous CCTV inspection data exist. If a sewer repair or renewal requiring excavation is noted, contact the WWD;
  - (e) On all street reconstructions, regardless of location of the sewer (within the right-of-way);
  - (f) If the street exhibits obvious distress at/along the underground plant;
  - (g) Of all CB leads to be reused, as part of a street reconstruction or major rehabilitation.
- F2.6 For any uncertain situations and/or locations, contact the Project Manager.
- F2.7 The Consultant is required to coordinate the sewer-televising contract and communicate the results to the Water & Waste Department. Any repairs or other activities deemed necessary from these inspections must be coordinated with the Water & Waste Department.

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

- F3.1 Fieldwork
- (a) Clear all underground services at each test-hole location.
  - (b) As this street project is greater than 500 metres, test holes may be taken every 100 m. More or fewer test-holes may be required depending upon Site conditions – confirm with the Project Manager.
  - (c) Record location of test-hole (offset from curb, distance from cross street and house number).
  - (d) Drill 150 mm-diameter cores in pavement.
  - (e) Drill 125 mm-diameter test-holes into fill materials and subgrade.
  - (f) If a service trench backfilled with granular materials is encountered, another hole shall be drilled to define the existing sub-surface conditions.
  - (g) Test-holes shall be drilled to depth of 2 m  $\pm$ 150 mm below surface of the pavement.
  - (h) Recover pavement core sample and representative samples of soil (fill materials, pavement structure materials and subgrade).
  - (i) Measure and record pavement section exposed in the test-hole (thickness of concrete or asphalt and different types of pavement structure materials).

- (j) Pavement structure materials to be identified as crushed limestone or granular fill and the maximum aggregate size of the material (20 mm, 50 mm or 150 mm).
- (k) Log soil profile for the subgrade.
- (l) Representative samples of soil must be obtained at the following depths below the bottom of the pavement structure materials – 0.1 m, 0.4 m, 0.7 m, 1.0 m, 1.3 m, 1.6 m, etc. Ensure a sample is obtained from each soil type encountered in the test-hole.
- (m) Make note of any water seepage into the test-hole.
- (n) Backfill test-hole with native materials and additional granular fill, if required. Patch pavement surface with hot mix asphalt or high strength durable concrete mix.
- (o) Return core sample from the pavement and soil samples to the laboratory.

### F3.2 Lab Work

- (a) Test all soil samples for moisture content.
- (b) Photograph core samples recovered from the pavement surface.
- (c) Conduct tests for plasticity index and hydrometer analysis on selected soil samples which are between 0.5 m and 1 m below top of pavement (this is the sub-grade on which the pavement and sub-base will be built). The selection will be based upon visual classification and moisture content test results, with a minimum of one sample of each soil type per street to be tested.
- (d) Prepare test-hole logs and classify subgrade (based on hydrometer) as follows:
  - < 30% silt                    - classify as clay
  - 30% - 50% silt            - classify as silty clay
  - 50% - 70% silt            - classify as clayey silt
  - > 70% silt                 - classify as silt
- (e) For any uncertain situations and/or locations, or clarification of these requirements, contact the Project Manager.

|  |  |                       |
|--|--|-----------------------|
| PROJECT: Local Streets Package - 17-R-05                                       | CLIENT: City of Winnipeg   | TESTHOLE NO: TH17-06  |
| LOCATION: 207 Olive Street, 1.4 m W of E curb, 61 m N of N curb of Portage Ave |  | PROJECT NO.: 60536514 |
| CONTRACTOR: Maple Leaf Drilling Ltd.   | METHOD: Truck-mounted CME 55, 125 mm SSA   | ELEVATION (m): N/A    |
| 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) | SOIL SYMBOL | SOIL DESCRIPTION   | SAMPLE TYPE | SAMPLE # | SPT (N) | PENETRATION TESTS  |   | UNDRAINED SHEAR STRENGTH |  | COMMENTS  | DEPTH |
|-----------|-------------|--|-------------|----------|---------|--|---|--------------------------|--|---|-------|
|           |             |  |             |          |         | * Becker *<br>◇ Dynamic Cone ◇<br>◆ SPT (Standard Pen Test) ◆<br>(Blows/300mm)<br>Total Unit Wt (kN/m <sup>3</sup> ) | + Torvane +<br>× QU/2 ×<br>□ Lab Vane □<br>△ Pocket Pen. △<br>● Field Vane ●<br>(kPa) |                          |  |   |       |
| 0         |             | ASPHALT - 38 mm<br>CONCRETE - 159 mm   |             |          |         |  |   |                          |  |   |       |
|           |             | SAND and GRAVEL FILL - 101 mm  |             |          |         |  |   |                          |  |   |       |
|           |             | CLAY - some silt<br>- brown, frozen to 1.1 m, high plasticity  |             | G31      |         |  |   |                          |  |   |       |
|           |             |  |             | G32      |         |  |   |                          |  |   |       |
|           |             | - (G33): LL = 82.1%, PL = 24.1%  |             | G33      |         |  |   |                          |  | (G33): Gravel: 0.0%,<br>Sand: 0.0%, Silt: 14.5%,<br>Clay: 85.5% |       |
| 1         |             | - firm, dry to moist below 1.1 m   |             | G34      |         |  |   |                          |  |   |       |
|           |             |  |             | G35      |         |  |   |                          |  |   |       |
|           |             |  |             | G36      |         |  |   |                          |  |   |       |
| 2         |             | END OF TEST HOLE AT 2.00 m IN CLAY   |             |          |         |  |   |                          |  |   |       |
|           |             | Notes:<br>1. No seepage observed during drilling.<br>2. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion. |             |          |         |  |   |                          |  |   |       |

LOG OF TEST HOLE BOREHOLE LOGS TO REV1.GPJ UMA WINN.GDT 3/15/17



|                             |                          |
|-----------------------------|--------------------------|
| LOGGED BY: Tessa Christi    | COMPLETION DEPTH: 2.00 m |
| REVIEWED BY: Alex Hill      | COMPLETION DATE: 2/22/17 |
| PROJECT ENGINEER: Kevin Rae | Page 1 of 1              |

|   |  |                       |
|---|--|-----------------------|
| PROJECT: Local Streets Package - 17-R-05  | CLIENT: City of Winnipeg   | TESTHOLE NO: TH17-07  |
| LOCATION: 231 Olive Street, 1.8 m W of E curb, 162 m N of N curb of Portage Ave |  | PROJECT NO.: 60536514 |
| CONTRACTOR: Maple Leaf Drilling Ltd.  | METHOD: Truck-mounted CME 55, 125 mm SSA   | ELEVATION (m): N/A    |
| 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) | SOIL SYMBOL | SOIL DESCRIPTION   | SAMPLE TYPE | SAMPLE # | SPT (N) | PENETRATION TESTS   |   | UNDRAINED SHEAR STRENGTH |  | COMMENTS | DEPTH |
|-----------|-------------|--|-------------|----------|---------|---|---|--------------------------|--|----------|-------|
|           |             |  |             |          |         | * Becker *<br>◇ Dynamic Cone ◇<br>◆ SPT (Standard Pen Test) ◆<br>(Blows/300mm)<br>Total Unit Wt (kN/m <sup>3</sup> )<br>Plastic MC Liquid | + Torvane +<br>× QU/2 ×<br>□ Lab Vane □<br>△ Pocket Pen. △<br>● Field Vane ●<br>(kPa) |                          |  |          |       |
| 0         |             | ASPHALT - 51 mm<br>CONCRETE - 140 mm   |             |          |         |   |   |                          |  |          |       |
|           |             | SAND and GRAVEL FILL - 101 mm  |             |          |         |   |   |                          |  |          |       |
|           |             | CLAY - trace to some silt, trace sand<br>- brown, frozen to 1.2 m  |             | G37      |         |   |   |                          |  |          |       |
|           |             |  |             | G38      |         |   |   |                          |  |          |       |
|           |             |  |             | G39      |         |   |   |                          |  |          |       |
|           |             |  |             | G40      |         |   |   |                          |  |          |       |
|           |             | - firm, dry to moist, high plasticity below 1.2 m<br>- sandy silt inclusions (< 20 mm diam.) below 1.2 m   |             | G41      |         |   |   |                          |  |          |       |
|           |             |  |             | G42      |         |   |   |                          |  |          |       |
| 2         |             | END OF TEST HOLE AT 2.00 m IN CLAY   |             |          |         |   |   |                          |  |          |       |
|           |             | Notes:<br>1. No seepage observed during drilling.<br>2. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion. |             |          |         |   |   |                          |  |          |       |

LOG OF TEST HOLE BOREHOLE LOGS TO REV1.GPJ UMA WINN.GDT 3/15/17



|                             |                          |
|-----------------------------|--------------------------|
| LOGGED BY: Tessa Christi    | COMPLETION DEPTH: 2.00 m |
| REVIEWED BY: Alex Hill      | COMPLETION DATE: 2/22/17 |
| PROJECT ENGINEER: Kevin Rae | Page 1 of 1              |

|   |  |                       |
|---|--|-----------------------|
| PROJECT: Local Streets Package - 17-R-05                                      | CLIENT: City of Winnipeg   | TESTHOLE NO: TH17-08  |
| LOCATION: 267 Olive Street, 1.7 m W of E curb, 195 m S of S curb of Lodge Ave |  | PROJECT NO.: 60536514 |
| CONTRACTOR: Maple Leaf Drilling Ltd.  | METHOD: Truck-mounted CME 55, 125 mm SSA   | ELEVATION (m): N/A    |
| 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) | SOIL SYMBOL | SOIL DESCRIPTION   | SAMPLE TYPE | SAMPLE # | SPT (N) | PENETRATION TESTS  |   | UNDRAINED SHEAR STRENGTH |  | COMMENTS | DEPTH |
|-----------|-------------|--|-------------|----------|---------|--|---|--------------------------|--|----------|-------|
|           |             |  |             |          |         | * Becker *<br>◇ Dynamic Cone ◇<br>◆ SPT (Standard Pen Test) ◆<br>(Blows/300mm)<br>Total Unit Wt (kN/m <sup>3</sup> ) | + Torvane +<br>× QU/2 ×<br>□ Lab Vane □<br>△ Pocket Pen. △<br>● Field Vane ●<br>(kPa) |                          |  |          |       |
| 0         |             | ASPHALT - 38 mm<br>CONCRETE - 152 mm   |             |          |         |  |   |                          |  |          |       |
|           |             | SAND and GRAVEL FILL - 114 mm  |             |          |         |  |   |                          |  |          |       |
|           |             | CLAY - trace to some silt, trace sand<br>- dark brown, frozen to 1.1 m   |             | G43      |         |  |   |                          |  |          |       |
|           |             |  |             | G44      |         |  |   |                          |  |          |       |
|           |             |  |             | G45      |         |  |   |                          |  |          |       |
| 1         |             | - firm, dry to moist, high plasticity below 1.1 m  |             | G46      |         |  |   |                          |  |          |       |
|           |             |  |             | G47      |         |  |   |                          |  |          |       |
|           |             | - brown below 1.4 m, sandy silt inclusions (< 20 mm diam.) below 1.4 m   |             | G48      |         |  |   |                          |  |          |       |
| 2         |             | END OF TEST HOLE AT 2.00 m IN CLAY   |             |          |         |  |   |                          |  |          |       |
|           |             | Notes:<br>1. No seepage observed during drilling.<br>2. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion. |             |          |         |  |   |                          |  |          |       |

LOG OF TEST HOLE BOREHOLE LOGS TO REV1.GPJ UMA WINN.GDT 3/15/17



|                             |                          |
|-----------------------------|--------------------------|
| LOGGED BY: Tessa Christi    | COMPLETION DEPTH: 2.00 m |
| REVIEWED BY: Alex Hill      | COMPLETION DATE: 2/22/17 |
| PROJECT ENGINEER: Kevin Rae | Page 1 of 1              |



|   |  |                       |
|---|--|-----------------------|
| PROJECT: Local Streets Package - 17-R-05                                      | CLIENT: City of Winnipeg   | TESTHOLE NO: TH17-09  |
| LOCATION: 283 Olive Street, 1.8 m W of E curb, 132 m S of S curb of Lodge Ave |  | PROJECT NO.: 60536514 |
| CONTRACTOR: Maple Leaf Drilling Ltd.  | METHOD: Truck-mounted CME 55, 125 mm SSA   | ELEVATION (m): N/A    |
| 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) | SOIL SYMBOL | SOIL DESCRIPTION   | SAMPLE TYPE | SAMPLE # | SPT (N) | PENETRATION TESTS   |   | UNDRAINED SHEAR STRENGTH |  | COMMENTS | DEPTH |
|-----------|-------------|--|-------------|----------|---------|---|---|--------------------------|--|----------|-------|
|           |             |  |             |          |         | * Becker *<br>◇ Dynamic Cone ◇<br>◆ SPT (Standard Pen Test) ◆<br>(Blows/300mm)<br>Total Unit Wt (kN/m³) | + Torvane +<br>× QU/2 ×<br>□ Lab Vane □<br>△ Pocket Pen. △<br>● Field Vane ●<br>(kPa) |                          |  |          |       |
| 0         |             | ASPHALT - 32 mm<br>CONCRETE - 159 mm   |             |          |         |   |   |                          |  |          |       |
|           |             | SAND and GRAVEL FILL - 76 mm   |             |          |         |   |   |                          |  |          |       |
|           |             | CLAY - trace to some sand, trace to some silt<br>- dark brown, frozen to 1.2 m<br>- sandy silt inclusions (< 20 mm diam.)                                |             | G49      |         |   |   |                          |  |          |       |
|           |             |  |             | G50      |         |   |   |                          |  |          |       |
|           |             |  |             | G51      |         |   |   |                          |  |          |       |
| 1         |             | - brown, firm, dry to moist, high plasticity below 1.2 m   |             | G52      |         |   |   |                          |  |          |       |
|           |             |  |             | G53      |         |   |   |                          |  |          |       |
|           |             |  |             | G54      |         |   |   |                          |  |          |       |
| 2         |             | END OF TEST HOLE AT 2.00 m IN CLAY   |             |          |         |   |   |                          |  |          |       |
|           |             | Notes:<br>1. No seepage observed during drilling.<br>2. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion. |             |          |         |   |   |                          |  |          |       |

LOG OF TEST HOLE BOREHOLE LOGS TO REV1.GPJ UMA WINN.GDT 3/15/17



|                             |                          |
|-----------------------------|--------------------------|
| LOGGED BY: Tessa Christi    | COMPLETION DEPTH: 2.00 m |
| REVIEWED BY: Alex Hill      | COMPLETION DATE: 2/22/17 |
| PROJECT ENGINEER: Kevin Rae | Page 1 of 1              |

|  |  |                       |
|--|--|-----------------------|
| PROJECT: Local Streets Package - 17-R-05                                     | CLIENT: City of Winnipeg   | TESTHOLE NO: TH17-10  |
| LOCATION: 303 Olive Street, 1.4 m W of E curb, 30 m S of S curb of Lodge Ave |  | PROJECT NO.: 60536514 |
| CONTRACTOR: Maple Leaf Drilling Ltd.   | METHOD: Truck-mounted CME 55, 125 mm SSA   | ELEVATION (m): N/A    |
| 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) | SOIL SYMBOL | SOIL DESCRIPTION   | SAMPLE TYPE | SAMPLE # | SPT (N) | PENETRATION TESTS   |   | UNDRAINED SHEAR STRENGTH |  | COMMENTS | DEPTH |
|-----------|-------------|--|-------------|----------|---------|---|---|--------------------------|--|----------|-------|
|           |             |  |             |          |         | * Becker *<br>◇ Dynamic Cone ◇<br>◆ SPT (Standard Pen Test) ◆<br>(Blows/300mm)<br>Total Unit Wt (kN/m <sup>3</sup> )<br>Plastic MC Liquid | + Torvane +<br>× QU/2 ×<br>□ Lab Vane □<br>△ Pocket Pen. △<br>● Field Vane ●<br>(kPa) |                          |  |          |       |
| 0         |             | ASPHALT - 25 mm<br>CONCRETE - 159 mm   |             |          |         |   |   |                          |  |          |       |
|           |             | SAND and GRAVEL FILL - 101 mm  |             |          |         |   |   |                          |  |          |       |
|           |             | CLAY - trace to some silt, trace sand<br>- dark brown, frozen to 1.2 m   |             | G55      |         |   |   |                          |  |          |       |
|           |             |  |             | G56      |         |   |   |                          |  |          |       |
|           |             |  |             | G57      |         |   |   |                          |  |          |       |
|           |             |  |             | G58      |         |   |   |                          |  |          |       |
|           |             | - trace to some sand, brown, firm, dry to moist, high plasticity below 1.2 m<br>- sandy silt inclusions (< 20 mm diam.) below 1.2 m                      |             | G59      |         |   |   |                          |  |          |       |
|           |             |  |             | G60      |         |   |   |                          |  |          |       |
| 2         |             | END OF TEST HOLE AT 2.00 m IN CLAY   |             |          |         |   |   |                          |  |          |       |
|           |             | Notes:<br>1. No seepage observed during drilling.<br>2. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion. |             |          |         |   |   |                          |  |          |       |

LOG OF TEST HOLE BOREHOLE LOGS TO REV1.GPJ UMA WINN.GDT 3/15/17



|                             |                          |
|-----------------------------|--------------------------|
| LOGGED BY: Tessa Christi    | COMPLETION DEPTH: 2.00 m |
| REVIEWED BY: Alex Hill      | COMPLETION DATE: 2/22/17 |
| PROJECT ENGINEER: Kevin Rae | Page 1 of 1              |

|   |  |                       |
|---|--|-----------------------|
| PROJECT: Local Streets Package - 17-R-05  | CLIENT: City of Winnipeg   | TESTHOLE NO: TH17-11  |
| LOCATION: 2000 Portage, 2 m W of E curb of W leg of Deer Lodge Place, 37 m S of Portage Ave |  | PROJECT NO.: 60536514 |
| CONTRACTOR: Maple Leaf Drilling Ltd.  | METHOD: Truck-mounted CME 55, 125 mm SSA   | ELEVATION (m): N/A    |
| 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) | SOIL SYMBOL | SOIL DESCRIPTION   | SAMPLE TYPE | SAMPLE # | SPT (N) | PENETRATION TESTS  |  | UNDRAINED SHEAR STRENGTH |  | COMMENTS  | DEPTH |
|-----------|-------------|--|-------------|----------|---------|--|--|--------------------------|--|---|-------|
|           |             |  |             |          |         | * Becker *<br>◇ Dynamic Cone ◇<br>◆ SPT (Standard Pen Test) ◆<br>(Blows/300mm)<br>Total Unit Wt (kN/m <sup>3</sup> ) | + Torvane +<br>× QU/2 ×<br>□ Lab Vane □<br>△ Pocket Pen. △<br>● Field Vane ● |                          |  |   |       |
| 0         |             | ASPHALT - 165 mm   |             |          |         |  |  |                          |  |   |       |
|           |             | SAND and GRAVEL FILL - 140 mm  |             | G61      | ●       |  |  |                          |  |   |       |
|           |             | CLAY - some silt, trace sand<br>- brown, frozen to 1.4 m, high plasticity  |             | G62      | ●       |  |  |                          |  |   |       |
|           |             | - (G63): LL = 67.8 %, PL = 19.7%   |             | G63      | ●       |  |  |                          |  | (G63): Gravel: 0.4%,<br>Sand: 8.2%, Silt: 21.2%,<br>Clay: 70.3% |       |
|           |             | - firm, dry to moist below 1.4 m   |             | G64      | ●       |  |  |                          |  |   |       |
|           |             |  |             | G65      | ●       |  |  |                          |  |   |       |
|           |             |  |             | G66      | ●       |  |  |                          |  |   |       |
| 2         |             | END OF TEST HOLE AT 2.00 m IN CLAY   |             |          |         |  |  |                          |  |   |       |
|           |             | Notes:<br>1. No seepage observed during drilling.<br>2. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion. |             |          |         |  |  |                          |  |   |       |

LOG OF TEST HOLE BOREHOLE LOGS TO REV1.GPJ UMA WINN.GDT 3/15/17



|                             |                          |
|-----------------------------|--------------------------|
| LOGGED BY: Tessa Christi    | COMPLETION DEPTH: 2.00 m |
| REVIEWED BY: Alex Hill      | COMPLETION DATE: 2/22/17 |
| PROJECT ENGINEER: Kevin Rae | Page 1 of 1              |

|   |  |                       |
|---|--|-----------------------|
| PROJECT: Local Streets Package - 17-R-05  | CLIENT: City of Winnipeg   | TESTHOLE NO: TH17-12  |
| LOCATION: 66 Deer Lodge Place, 1.1 m E of W curb of W leg, 120 m S of Portage Ave |  | PROJECT NO.: 60536514 |
| CONTRACTOR: Maple Leaf Drilling Ltd.  | METHOD: Truck-mounted CME 55, 125 mm SSA   | ELEVATION (m): N/A    |
| 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) | SOIL SYMBOL | SOIL DESCRIPTION  | SAMPLE TYPE | SAMPLE # | PENETRATION TESTS |                                    | UNDRAINED SHEAR STRENGTH |       | COMMENTS | DEPTH |
|-----------|-------------|---|-------------|----------|-------------------|------------------------------------|--------------------------|-------|----------|-------|
|           |             |   |             |          | SPT (N)           | Total Unit Wt (kN/m <sup>3</sup> ) | +                        | (kPa) |          |       |
| 0         |             | ASPHALT - 152 mm  |             |          |                   |                                    |                          |       |          |       |
|           |             | SAND and GRAVEL FILL - 152 mm   |             | G67      | 40                | 18                                 |                          |       |          |       |
|           |             | CLAY - trace to some silt, trace gravel<br>- dark brown, frozen to 1.2 m  |             | G68      | 55                | 18                                 |                          |       |          |       |
|           |             |   |             | G69      | 60                | 18                                 |                          |       |          |       |
| 1         |             |   |             | G70      | 65                | 18                                 |                          |       |          |       |
|           |             | - firm, dry to moist, high plasticity below 1.2 m   |             | G71      | 70                | 18                                 |                          |       |          |       |
|           |             |   |             | G72      | 75                | 18                                 |                          |       |          |       |
| 2         |             | CLAY - some silt to silty<br>- brown, soft, moist<br>- intermediate to high plasticity  |             |          |                   |                                    |                          |       |          |       |
|           |             | END OF TEST HOLE AT 2.00 m IN CLAY  |             |          |                   |                                    |                          |       |          |       |
|           |             | Notes:<br>1. No seepage observed during drilling.<br>2. Testhole backfilled with drill cuttings and bentonite and patched with asphalt upon completion. |             |          |                   |                                    |                          |       |          |       |

LOG OF TEST HOLE BOREHOLE LOGS TO REV1.GPJ UMA WINN.GDT 3/15/17



|                             |                          |
|-----------------------------|--------------------------|
| LOGGED BY: Tessa Christi    | COMPLETION DEPTH: 2.00 m |
| REVIEWED BY: Alex Hill      | COMPLETION DATE: 2/22/17 |
| PROJECT ENGINEER: Kevin Rae | Page 1 of 1              |

|   |  |                       |
|---|--|-----------------------|
| PROJECT: Local Streets Package - 17-R-05  | CLIENT: City of Winnipeg   | TESTHOLE NO: TH17-13  |
| LOCATION: 54 Deer Lodge Place, 2.1 m S of N curb of centre leg, 26 m E of E curb of W leg |  | PROJECT NO.: 60536514 |
| CONTRACTOR: Maple Leaf Drilling Ltd.  | METHOD: Truck-mounted CME 55, 125 mm SSA   | ELEVATION (m): N/A    |
| 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) | SOIL SYMBOL | SOIL DESCRIPTION   | SAMPLE TYPE | SAMPLE # | SPT (N) | PENETRATION TESTS   |   | UNDRAINED SHEAR STRENGTH |  | COMMENTS  | DEPTH |
|-----------|-------------|--|-------------|----------|---------|---|---|--------------------------|--|---|-------|
|           |             |  |             |          |         | * Becker *<br>◇ Dynamic Cone ◇<br>◆ SPT (Standard Pen Test) ◆<br>(Blows/300mm)<br>Total Unit Wt (kN/m <sup>3</sup> )<br>Plastic MC Liquid | + Torvane +<br>× QU/2 ×<br>□ Lab Vane □<br>△ Pocket Pen. △<br>● Field Vane ●<br>(kPa) |                          |  |   |       |
| 0         |             | ASPHALT - 127 mm   |             |          |         |   |   |                          |  |   |       |
|           |             | SAND and GRAVEL FILL - 101 mm  |             |          |         |   |   |                          |  |   |       |
|           |             | CLAY - some silt, trace sand<br>- dark grey, frozen to 1.2 m, high plasticity<br><br>- (G74): LL = 75.5%, PL = 23.7%                                     |             |          |         |   |   |                          |  |   |       |
|           |             |  |             |          | G74     | 40  |   |                          |  | (G74): Gravel: 0.1%, Sand: 7.2%, Silt: 27.1%, Clay: 65.5% |       |
|           |             |  |             |          | G75     | 45  |   |                          |  |   |       |
|           |             |  |             |          | G76     | 50  |   |                          |  |   |       |
|           |             |  |             |          | G77     | 55  |   |                          |  |   |       |
|           |             |  |             |          | G78     | 60  |   |                          |  |   |       |
|           |             |  |             |          |         |   |   |                          |  |   |       |
| 2         |             | END OF TEST HOLE AT 2.00 m IN CLAY   |             |          |         |   |   |                          |  |   |       |
|           |             | Notes:<br>1. No seepage observed during drilling.<br>2. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion. |             |          |         |   |   |                          |  |   |       |

LOG OF TEST HOLE BOREHOLE LOGS TO REV1.GPJ UMA WINN.GDT 3/15/17



|                             |                          |
|-----------------------------|--------------------------|
| LOGGED BY: Tessa Christi    | COMPLETION DEPTH: 2.00 m |
| REVIEWED BY: Alex Hill      | COMPLETION DATE: 2/22/17 |
| PROJECT ENGINEER: Kevin Rae | Page 1 of 1              |

|   |  |                       |
|---|--|-----------------------|
| PROJECT: Local Streets Package - 17-R-05  | CLIENT: City of Winnipeg   | TESTHOLE NO: TH17-14  |
| LOCATION: 29 Deer Lodge Place, 1.2 m W of E curb of E leg, 210 m S of Portage Ave |  | PROJECT NO.: 60536514 |
| CONTRACTOR: Maple Leaf Drilling Ltd.  | METHOD: Truck-mounted CME 55, 125 mm SSA   | ELEVATION (m): N/A    |
| 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) | SOIL SYMBOL | SOIL DESCRIPTION   | SAMPLE TYPE                         | SAMPLE # | SPT (N) | PENETRATION TESTS<br>* Becker *<br>◇ Dynamic Cone ◇<br>◆ SPT (Standard Pen Test) ◆<br>(Blows/300mm)<br>Total Unit Wt (kN/m³)<br>Plastic MC Liquid<br>16 17 18 19 20 21<br>20 40 60 80 100 | UNDRAINED SHEAR STRENGTH<br>+ Torvane +<br>× QU/2 ×<br>□ Lab Vane □<br>△ Pocket Pen. △<br>● Field Vane ●<br>(kPa)<br>50 100 150 200 | COMMENTS | DEPTH |
|-----------|-------------|--|-------------------------------------|----------|---------|---|---|----------|-------|
| 0         |             | ASPHALT - 152 mm   |                                     |          |         |   |   |          |       |
|           |             | SAND and GRAVEL FILL - 102 mm  | <input checked="" type="checkbox"/> | G79      | ●       |   |   |          |       |
|           |             | CLAY - trace to some sand, trace to some silt<br>- brown, frozen to 1.2 m  | <input checked="" type="checkbox"/> | G80      | ●       |   |   |          |       |
|           |             |  | <input checked="" type="checkbox"/> | G81      | ●       |   |   |          |       |
|           |             | - firm, dry to moist, high plasticity below 1.2 m<br>- silt laminations (< 5 mm thick) below 1.2 m   | <input checked="" type="checkbox"/> | G82      | ●       |   |   |          |       |
|           |             |  | <input checked="" type="checkbox"/> | G83      | ●       |   |   |          |       |
|           |             |  | <input checked="" type="checkbox"/> | G84      | ●       |   |   |          |       |
| 2         |             | END OF TEST HOLE AT 2.00 m IN CLAY   |                                     |          |         |   |   |          |       |
|           |             | Notes:<br>1. No seepage observed during drilling.<br>2. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion. |                                     |          |         |   |   |          |       |

LOG OF TEST HOLE BOREHOLE LOGS TO REV1.GPJ UMA WINN.GDT 3/15/17



|                             |                          |
|-----------------------------|--------------------------|
| LOGGED BY: Tessa Christi    | COMPLETION DEPTH: 2.00 m |
| REVIEWED BY: Alex Hill      | COMPLETION DATE: 2/22/17 |
| PROJECT ENGINEER: Kevin Rae | Page 1 of 1              |

|   |  |                       |
|---|--|-----------------------|
| PROJECT: Local Streets Package - 17-R-05  | CLIENT: City of Winnipeg   | TESTHOLE NO: TH17-15  |
| LOCATION: 3 Deer Lodge Place, 1.2 m W of E curb of E leg, 55 m S of Portage Ave |  | PROJECT NO.: 60536514 |
| CONTRACTOR: Maple Leaf Drilling Ltd.  | METHOD: Truck-mounted CME 55, 125 mm SSA   | ELEVATION (m): N/A    |
| 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) | SOIL SYMBOL | SOIL DESCRIPTION   | SAMPLE TYPE | SAMPLE # | SPT (N) | PENETRATION TESTS |                                    | UNDRAINED SHEAR STRENGTH |       | COMMENTS   | DEPTH |
|-----------|-------------|--|-------------|----------|---------|-------------------|------------------------------------|--------------------------|-------|--|-------|
|           |             |  |             |          |         | Blows/300mm       | Total Unit Wt (kN/m <sup>3</sup> ) | +                        | (kPa) |  |       |
| 0         |             | ASPHALT - 178 mm   |             |          |         |                   |                                    |                          |       |  |       |
|           |             | SAND and GRAVEL FILL - 101 mm  |             | G85      | ●       |                   |                                    |                          |       |  |       |
|           |             | CLAY - silty, some sand<br>- dark brown, frozen to 1.2 m, high plasticity<br><br>(G86): LL = 51.1%, PL = 36.4%   |             | G86      | ●       |                   |                                    |                          |       | (G86): Gravel: 0.0%, Sand: 14.6%, Silt: 31.4%, Clay: 54.0% |       |
|           |             | - dry to moist below 1.2 m<br>- firm from 1.2 m to 1.7 m   |             | G87      | ●       |                   |                                    |                          |       |  |       |
|           |             | - brown, trace to some sand, soft, intermediate to high plasticity below 1.7 m   |             | G88      | ●       |                   |                                    |                          |       |  |       |
|           |             |  |             | G89      | ●       |                   |                                    |                          |       |  |       |
|           |             |  |             | G90      | ●       |                   |                                    |                          |       |  |       |
| 2         |             | END OF TEST HOLE AT 2.00 m IN CLAY   |             |          |         |                   |                                    |                          |       |  |       |
|           |             | Notes:<br>1. No seepage observed during drilling.<br>2. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion. |             |          |         |                   |                                    |                          |       |  |       |

LOG OF TEST HOLE BOREHOLE LOGS TO REV1.GPJ UMA WINN.GDT 3/15/17



|                             |                          |
|-----------------------------|--------------------------|
| LOGGED BY: Tessa Christi    | COMPLETION DEPTH: 2.00 m |
| REVIEWED BY: Alex Hill      | COMPLETION DATE: 2/22/17 |
| PROJECT ENGINEER: Kevin Rae | Page 1 of 1              |

| Test Hole No. | Test Hole Location  | Pavement Structure |                | Subgrade Description *        | Sample Depth (m) | Moisture Content (%) | Hydrometer Analysis |          |          |          | Atterberg Limits |               |                  |
|---------------|---|--------------------|----------------|-------------------------------|------------------|----------------------|---------------------|----------|----------|----------|------------------|---------------|------------------|
|               |   | Type               | Thickness (mm) |                               |                  |                      | Gravel (%)          | Sand (%) | Silt (%) | Clay (%) | Liquid Limit     | Plastic Limit | Plasticity Index |
| TH17-06       | 207 Olive Street -<br>1.4 m W of E curb, 61 m N<br>of N curb of Portage Ave.  | Asphalt            | 38             | CLAY                          | 0.3              | 30.8                 |                     |          |          |          |                  |               |                  |
|               |   |                    | 0.6            | CLAY                          | 0.6              | 34.5                 |                     |          |          |          |                  |               |                  |
|               |   | Concrete           | 159            | CLAY                          | 0.9              | 34.2                 | 0.0                 | 0.0      | 14.5     | 85.5     | 82.1             | 24.1          | 58.0             |
|               | CLAY  |                    | 1.2            | 38.7                          |                  |                      |                     |          |          |          |                  |               |                  |
|               | CLAY  |                    | 1.5            | 38.0                          |                  |                      |                     |          |          |          |                  |               |                  |
| TH17-07       | 231 Olive Street -<br>1.8 m W of E curb, 162 m N<br>of N curb of Portage Ave. | Asphalt            | 51             | CLAY                          | 1.8              | 39.4                 |                     |          |          |          |                  |               |                  |
|               |   |                    | 0.3            | CLAY                          | 0.3              | 38.9                 |                     |          |          |          |                  |               |                  |
|               |   | Concrete           | 140            | CLAY                          | 0.6              | 36.0                 |                     |          |          |          |                  |               |                  |
|               | CLAY  |                    | 0.9            | 37.5                          |                  |                      |                     |          |          |          |                  |               |                  |
|               | CLAY  |                    | 1.2            | 42.0                          |                  |                      |                     |          |          |          |                  |               |                  |
| TH17-08       | 267 Olive Street -<br>1.7 m W of E curb, 195 m S<br>of S curb of Lodge Ave.   | Asphalt            | 38             | SAND AND GRAVEL FILL/<br>CLAY | 1.5              | 43.1                 |                     |          |          |          |                  |               |                  |
|               |   |                    | 0.6            | CLAY                          | 0.6              | 25.9                 |                     |          |          |          |                  |               |                  |
|               |   | Concrete           | 152            | CLAY                          | 0.9              | 32.1                 |                     |          |          |          |                  |               |                  |
|               | CLAY  |                    | 1.2            | 33.7                          |                  |                      |                     |          |          |          |                  |               |                  |
|               | CLAY  |                    | 1.5            | 37.9                          |                  |                      |                     |          |          |          |                  |               |                  |
| TH17-09       | 283 Olive Street -<br>1.8 m W of E curb, 132 m S<br>of S curb of Lodge Ave.   | Asphalt            | 32             | CLAY                          | 1.8              | 42.0                 |                     |          |          |          |                  |               |                  |
|               |   |                    | 0.3            | CLAY                          | 0.3              | 36.3                 |                     |          |          |          |                  |               |                  |
|               |   | Concrete           | 159            | CLAY                          | 0.6              | 31.1                 |                     |          |          |          |                  |               |                  |
|               | CLAY  |                    | 0.9            | 35.4                          |                  |                      |                     |          |          |          |                  |               |                  |
|               | CLAY  |                    | 1.2            | 38.6                          |                  |                      |                     |          |          |          |                  |               |                  |
| TH17-10       | 303 Olive Street -<br>1.4 m W of E curb, 30 m S<br>of S curb of Lodge Ave.    | Asphalt            | 25             | CLAY                          | 1.5              | 42.2                 |                     |          |          |          |                  |               |                  |
|               |   |                    | 0.3            | CLAY                          | 0.3              | 43.9                 |                     |          |          |          |                  |               |                  |
|               |   | Concrete           | 159            | CLAY                          | 0.6              | 44.3                 |                     |          |          |          |                  |               |                  |
|               | CLAY  |                    | 0.9            | 42.3                          |                  |                      |                     |          |          |          |                  |               |                  |
|               | CLAY  |                    | 1.2            | 40.1                          |                  |                      |                     |          |          |          |                  |               |                  |
|               |   | CLAY               | 1.5            | 43.3                          |                  |                      |                     |          |          |          |                  |               |                  |
|               |   | CLAY               | 1.8            | 44.2                          |                  |                      |                     |          |          |          |                  |               |                  |

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





Photograph 5: Test Hole TH17-05 - Moorgate Street



Photograph 6: Test Hole TH17-06 - Olive Street



Photograph 7: Test Hole TH17-07 - Olive Street



Photograph 8: Test Hole TH17-08 - Olive Street



Photograph 9: Test Hole TH17-09 - Olive Street



Photograph 10: Test Hole TH17-10 - Olive Street

| Test Hole No. | Test Hole Location   | Pavement Structure |                | Subgrade Description *                               | Sample Depth (m) | Moisture Content (%) | Hydrometer Analysis |          |          |          | Atterberg Limits |               |                  |
|---------------|--|--------------------|----------------|--|------------------|----------------------|---------------------|----------|----------|----------|------------------|---------------|------------------|
|               |  | Type               | Thickness (mm) |  |                  |                      | Gravel (%)          | Sand (%) | Silt (%) | Clay (%) | Liquid Limit     | Plastic Limit | Plasticity Index |
| TH17-11       | 2000 Portage Ave -<br>2 m W of E curb of W leg of<br>Deer Lodge Place, 37 m S of<br>Portage Ave. | Asphalt            | 165            | SAND AND GRAVEL FILL<br>CLAY<br>CLAY<br>CLAY<br>CLAY | 0.3              | 13.7                 |                     |          |          |          |                  |               |                  |
|               |  |                    |                |  | 0.6              | 36.6                 |                     |          |          |          |                  |               |                  |
|               |  | Concrete           | 0              |  | 1.2              | 33.8                 | 8.2                 | 21.2     | 70.3     | 67.8     | 19.7             | 48.1          |                  |
| TH17-12       | 66 Deer Lodge Place -<br>1.1 m E of W curb of W leg,<br>120 m S of Portage Ave                   | Asphalt            | 152            | SAND AND GRAVEL FILL<br>CLAY<br>CLAY<br>CLAY<br>CLAY | 0.3              | 9.5                  |                     |          |          |          |                  |               |                  |
|               |  |                    |                |  | 0.6              | 36.9                 |                     |          |          |          |                  |               |                  |
|               |  | Concrete           | 0              |  | 1.2              | 38.3                 |                     |          |          |          |                  |               |                  |
| TH17-13       | 54 Deer Lodge Place -<br>2.1 m S of N curb of center<br>leg, 26 m E of E curb of W<br>leg        | Asphalt            | 127            | SAND AND GRAVEL FILL<br>CLAY<br>CLAY<br>CLAY<br>CLAY | 0.6              | 36.5                 | 7.2                 | 27.1     | 65.5     | 75.5     | 23.7             | 51.8          |                  |
|               |  |                    |                |  | 0.9              | 37.7                 |                     |          |          |          |                  |               |                  |
|               |  | Concrete           | 0              |  | 1.2              | 38.9                 |                     |          |          |          |                  |               |                  |
| TH17-14       | 29 Deer Lodge Place -<br>1.2 m W of E curb of E leg,<br>210 m S of Portage Ave.                  | Asphalt            | 152            | SAND AND GRAVEL FILL<br>CLAY<br>CLAY<br>CLAY<br>CLAY | 0.3              | 6.1                  |                     |          |          |          |                  |               |                  |
|               |  |                    |                |  | 0.6              | 26.7                 |                     |          |          |          |                  |               |                  |
|               |  | Concrete           | 0              |  | 1.2              | 34.7                 |                     |          |          |          |                  |               |                  |
| TH17-15       | 3 Deer Lodge Place -<br>1.2 m W of E curb of E leg,<br>55 m S of Portage Ave.                    | Asphalt            | 178            | SAND AND GRAVEL FILL<br>CLAY<br>CLAY<br>CLAY<br>CLAY | 0.3              | 9.7                  |                     |          |          |          |                  |               |                  |
|               |  |                    |                |  | 0.6              | 27.8                 | 14.6                | 31.4     | 54.0     | 51.1     | 14.7             | 36.4          |                  |
|               |  | Concrete           | 0              |  | 1.2              | 34.3                 |                     |          |          |          |                  |               |                  |

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



**Photograph 11: Test Hole TH17-11 - Deer Lodge Place**



**Photograph 12: Test Hole TH17-12 - Deer Lodge Place**

| Core ID | Location  | Asphalt Thickness (mm) | Concrete Thickness (mm) |
|---------|---|------------------------|-------------------------|
| W-C1    | Westwood Dr, 1.0 m E of W curb, 20 m S of S curb of Byrd              | 38                     | 191                     |
| W-C2    | Westwood Dr, 1.4 m E of W curb, 25 m S of S curb of N leg of Henday   | 38                     | 178                     |
| W-C3    | Westwood Dr, 1.5 m E of W curb, 24 m S of S curb of S leg of Magellan | 44                     | 171                     |



