# APPENDIX 'A' GEOTECHNICAL REPORT



### **Geotechnical Investigation**

City of Winnipeg Street Investigation Winnipeg, Manitoba WX19432 28 September 2021

|               |                  | Phone: (204) 4<br><u>www.woodp</u><br>Geotechnical In<br>City of Winnipeg Str | <u>vestigation</u>                        |  |
|---------------|------------------|---|---|--|
|               |                  | Wood Project Num  | ber - WX19432                             |  |
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| Third Party:  |                  |   |   |  |
| Report Classi | fication:        | Confidential Name   | Job Title                                 | Cignotium  |
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| Other Techni  | cal Contributors |   |   |  |
| Rev.          | Date             |   | Revision Notes                            |  |
| 0             | 28 Sept 2021     | Issued Final to Client  |   |  |
|               | Permit S         | tamp  | Engineer S                                | ieal   |
|               | NEED THE APPRESE | ARYK) 🗃   |   | SCIENTISTS<br>MITOBA<br>withorization<br>astructure Solutions.<br>Canada Limited |



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Mountain Avenue

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### 1.0 Introduction

At the authorization of Mr. Ron Bruce, P. Eng., of Morrison Hershfield, Wood Environment & Infrastructure Solutions, a division of Wood Canada Limited (Wood), completed a pavement coring and test hole drilling program related to the pavement evaluation and potential asphalt reconstruction and rehabilitation for twenty-five (25) street locations in the City of Winnipeg, Manitoba. Locations and scope are itemized in Table 1-1.

| Street Name     | Location            | Number<br>of Cores | Number of<br>Test Holes | Test Hole Numbers  |
|-----------------|---------------------|--------------------|-------------------------|--------------------|
|                 | Arlington Street to | 10                 | 10                      | Mountain – TH01 to |
| Wountain Avenue | McPhillips Street   | 12                 | 12                      | Mountain - TH12    |
| McGregor Street | Mountain Avenue to  | 6                  | 6                       | MS1 – MS6          |
| (South)         | Church Avenue       |                    |                         |                    |
| McGregor Street | McAdam Avenue to    | 7                  | 7                       | MN1 – MN7          |
| (North)         | Seven Oaks Avenue   | 1                  | /                       |                    |
|                 | Total               | 25                 | 25                      |                    |

#### Table 1-1: Street Location and Investigation Scope

The geotechnical investigation was completed in accordance with the Scope of Work and Terms and Conditions outlined in Wood Proposal No. WPG2021.462Rev01, dated 30 June 2021.

### 2.0 Geotechnical Investigation

Prior to initiating drilling, Wood notified public utility providers (i.e. Manitoba Hydro, MTS, Shaw, etc.) of the intent to drill in order to clear public utilities, and where required, met with said representatives onsite. Additionally, Wood utilized the services of ATS Traffic to provide traffic control during drilling. All drilling was completed without incident,

Between 4 and 30 August 2021, Wood supervised the drilling and coring of twenty-five test holes along Mountain Avenue and McGregor Street. The test hole locations are illustrated in Figures A1, B1 and C1. All locations were cored using a 150 mm diameter core barrel, while test hole drilling was conducted using a truck mounted Mobile B40LX or Geoprobe drill rig equipped with 125 mm solid stem augers, owned and operated by Maple Leaf Drilling of Springfield, Manitoba. Coring and test hole locations were initially selected by Morrison Hershfield, however underground utilities required some adjustments to the original test hole locations.

During coring, Wood field personnel identified pavement types and thicknesses, as well as underlying granular structure, while during drilling, Wood field personnel visually classified the soil stratigraphy within the test holes in accordance with ASTM D3282 and ASTM D2487, as well as noted observed seepage and/or sloughing conditions where present. Soil sampling consisted of grab samples of the auger cuttings at all test hole locations. All grab samples were retained in sealed plastic bags and shipped to Wood's Winnipeg laboratory for review and selected testing. All pavement core samples were shipped to Winnipeg laboratory to be measured and photographed. The core photos and underlying pavement structure information are provided in Appendices A, B and C for Mountain Avenue, McGregor South and McGregor North, respectively.



During drilling, Wood field personnel visually classified the soil stratigraphy within the test holes in accordance with ASTM D2487 – *Standard Practice for Classification of Soils for Engineering Purposes* and recorded observed seepage and/or sloughing conditions. Soil sampling consisted of grab samples of the auger cuttings at all test hole locations at depths of about 0.6 m, 0.9 m, 1.2 m, 1.6 m, 2.0 m, and 2.5 m. Test holes were advanced to a depth of about 3.0 m below the pavement surface. The in-situ relative consistency of cohesive soil (i.e. clay) was evaluated during drilling using a pocket penetrometer.

Following completion of the field drilling program, a laboratory testing program was conducted on all soil samples obtained from the test holes. The laboratory testing program consisted of moisture content determinations on all samples, as well as Atterberg limits, particle size distributions (hydrometer method), Standard Proctor Testing and California Bearing Ratio (CBR) evaluations on selected samples of the anticipated subgrade soils at approximate depths between 0.6 and 1.2 m below the pavement structure. It should be noted that all the above testing has been completed with the exception of CBR testing, which is currently underway. Laboratory testing results and detailed test hole logs summarizing the sampling, field testing, laboratory test results, and subsurface conditions encountered at the test hole locations are presented in Appendices A, B and C for Mountain Avenue, McGregor South and McGregor North, respectively. CBR results will be issued under separate cover as they become available. Actual depths noted on the test hole logs may vary by  $\pm$  0.3 m from those recorded due to the method by which the soil cuttings are returned to the surface.

### 3.0 Pavement Summary

The following sections provide summaries of the pavement structure encountered at each test hole location. Details of the soil structure underlying the pavements observed at each test hole can be found on the test hole logs found in Appendices A, B and C, while laboratory testing result summaries are also provided in Appendices A, B and C.

#### 3.1 Mountain Avenue

Table 3-1 provides a summary of the pavement type and thickness encountered at each of the test locations on Mountain Avenue.

| Test Hole Number | Street Location                   | Asphalt<br>Thickness (mm) | Concrete<br>Thickness (mm) |
|------------------|-----------------------------------|---------------------------|----------------------------|
| Mountain – TH01  | EB Median, 50m East of McPhillips | 150                       | 250                        |
| Mountain – TH02  | WB Median, 1120 Mountain          | 175                       | 125                        |
| Mountain – TH03  | EB Curb, 1084 Mountain            | 85                        | 200                        |
| Mountain – TH04  | EB Curb, 1040 Mountain            | 50                        | 275 (rubble)               |
| Mountain – TH05  | EB Median, 1006 Mountain          | 115                       | 165 (rubble)               |
| Mountain – TH06  | EB Median, 972 Mountain           | 50                        | 175                        |
| Mountain – TH07  | WB Median, 958 Mountain           | 200                       | 150                        |
| Mountain – TH08  | WB Median, 902 Mountain           | 200                       | 300                        |
| Mountain – TH09  | WB Median, 862 Mountain           | 150                       | 200                        |
| Mountain – TH10  | WB Median, 834 Mountain           | 175                       | 325                        |
| Mountain – TH11  | EB Median, 794 Mountain           | 100                       | 275                        |

#### Table 3-1: Mountain Avenue Pavement Summary



Mountain – TH12 WB Median, 772 Mountain 100 200

#### **3.2 McGregor Street (South)**

Table 3 provides a summary of the pavement type and thickness encountered at each of the test hole locations on McGregor Avenue (South).

Table 3-2: McGregor (South) Pavement Summary

| Test Hole Number | Street Location         | Asphalt<br>Thickness (mm) | Concrete<br>Thickness (mm) |
|------------------|-------------------------|---------------------------|----------------------------|
| MS1              | NB Median, 394 McGregor | 100                       | 100                        |
| MS2              | NB Median, 410 McGregor | 50                        | 175                        |
| MS3              | NB Median, 416 McGregor | 100                       | 175                        |
| MS4              | SB Median, 442 McGregor | 175                       | 125                        |
| MS5              | SB Median, 453 McGregor | 150                       | 150                        |
| MS6              | SB Median, 463 McGregor | 140                       | 160                        |

#### 3.3 McGregor Street (North)

Table 3-3 provides a summary of the pavement type and thickness encountered at each of the test hole locations on McGregor Avenue (North).

 Table 3-3: McGregor (North) Pavement Summary

| Test Hole Number | Street Location                     | Asphalt<br>Thickness (mm) | Concrete<br>Thickness (mm) |
|------------------|-------------------------------------|---------------------------|----------------------------|
| MN1              | NB Curb, 682 McGregor               | 165                       | 225                        |
| MN2              | SB Curb, 692 McGregor               | 90                        | 215                        |
| MN3              | NB Curb, 696 McGregor               | 90                        | 135 (rubble)               |
| MN4              | SB Curb, 3m North of Rupertsland    | 60                        | 215                        |
| MN5              | SB Median, 20m South of Enniskillen | 90                        | 200 (rubble)               |
| MN6              | NB Curb, 20m North of Enniskillen   | 120                       | 205                        |
| MN7              | SB Curb, 5m South of Enniskilen     | 90                        | 225                        |

#### 4.0 Closure

The findings of this report were based on the results of field and laboratory investigations at test hole locations determined based on the requirements provided by Morrison Hershfield.

The site investigation was conducted for the sole purpose of profiling the pavement and subsurface conditions. Although no environmental issues were identified during the fieldwork, this does not indicate that no such issues exist. If the owner or other parties have any concern regarding the presence of environmental issues, then an appropriate level environmental assessment should be conducted.



Soil conditions, by their nature, can be highly variable across a site. The placement of fill and prior construction activities on a site can contribute to the variability especially near surface soil conditions. A contingency should always be included in any construction budget to allow for the possibility of variation in soil conditions, which may result in modification of any potential design and construction procedures which may arise from this factual investigative report.

Respectfully submitted,

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited

WX19432 | September 2021



### Appendix B

### **McGregor South**

- Test Hole Location Plan
- Core Photos
- Test Hole Logs
- Laboratory Summary





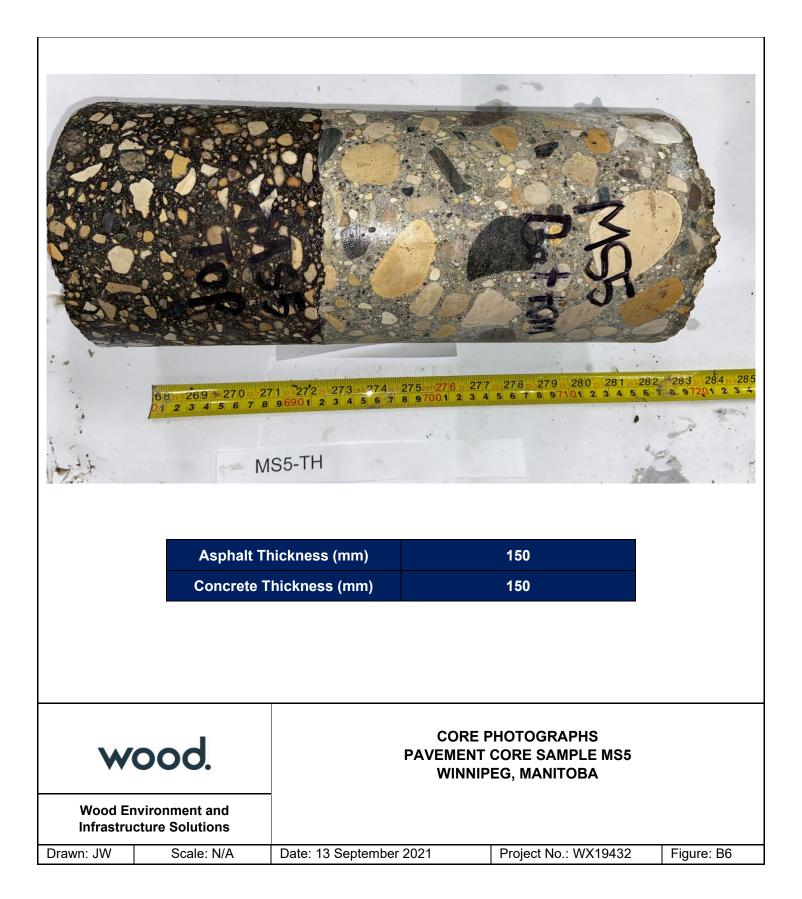
|  |                      | 73         274         275         276         27         278         27 yr         280           4         5         6         7         8         97101         2         4         5         0         97101         2 |            |
|--|----------------------|---|------------|
| Asphalt Th                                       | nickness (mm)        | 100   |            |
|  | hickness (mm)        | 100   |            |
|  |                      |   |            |
| Wood Environment and<br>Infrastructure Solutions | F                    | CORE PHOTOGRAPHS<br>PAVEMENT CORE SAMPLE MS1<br>WINNIPEG, MANITOBA  |            |
| Drawn: JW Scale: N/A                             | Date: 13 September 2 | 021 Project No.: WX19432  | Figure: B2 |

|   | 10 20 27 1 20 27 2 20 27 32           6 7 8 96901 2 3 4           MS2-TH |          |  |            |
|---|--|----------|--|------------|
|   | Thickness (mm)<br>Thickness (mm)   |          | 50<br>175                                      |            |
| Wood Environment and  |  | PAVEMENT | PHOTOGRAPHS<br>CORE SAMPLE MS2<br>EG, MANITOBA |            |
| Infrastructure Solutions           Drawn: JW         Scale: N/A | Date: 13 September   | 2021     | Project No.: WX19432                           | Figure: B3 |



|           |   | MS3-TH               |          |   |            |
|-----------|---|----------------------|----------|---|------------|
|           | Asphalt T                                 | hickness (mm)        |          | 100   |            |
|           | Concrete <sup>-</sup>                     | Thickness (mm)       |          | 175   |            |
| Wood Er   | ood.<br>nvironment and<br>cture Solutions | -<br>-               | PAVEMENT | HOTOGRAPHS<br>CORE SAMPLE MS3<br>EG, MANITOBA |            |
| Drawn: JW | Scale: N/A                                | Date: 13 September 2 | 021      | Project No.: WX19432                          | Figure: B4 |

|                     |            | 271 272 273 274 7<br>9 96901 2 3 4 5 6 7 |          | 278 279 280 281 282 28<br>5 7 8 9 7 101 2 3 4 5 6 7 8 9 |  |
|---------------------|------------|--|----------|---|--|
|                     |            | hickness (mm)                            |          | 175   |  |
|                     | Concrete T | hickness (mm)                            |          | 125   |  |
|                     |            |  |          |   |  |
| WOO<br>Wood Enviror | nment and  |  | PAVEMENT | PHOTOGRAPHS<br>CORE SAMPLE MS4<br>EG, MANITOBA          |  |
| Infrastructure      | Solutions  |  |          |   |  |



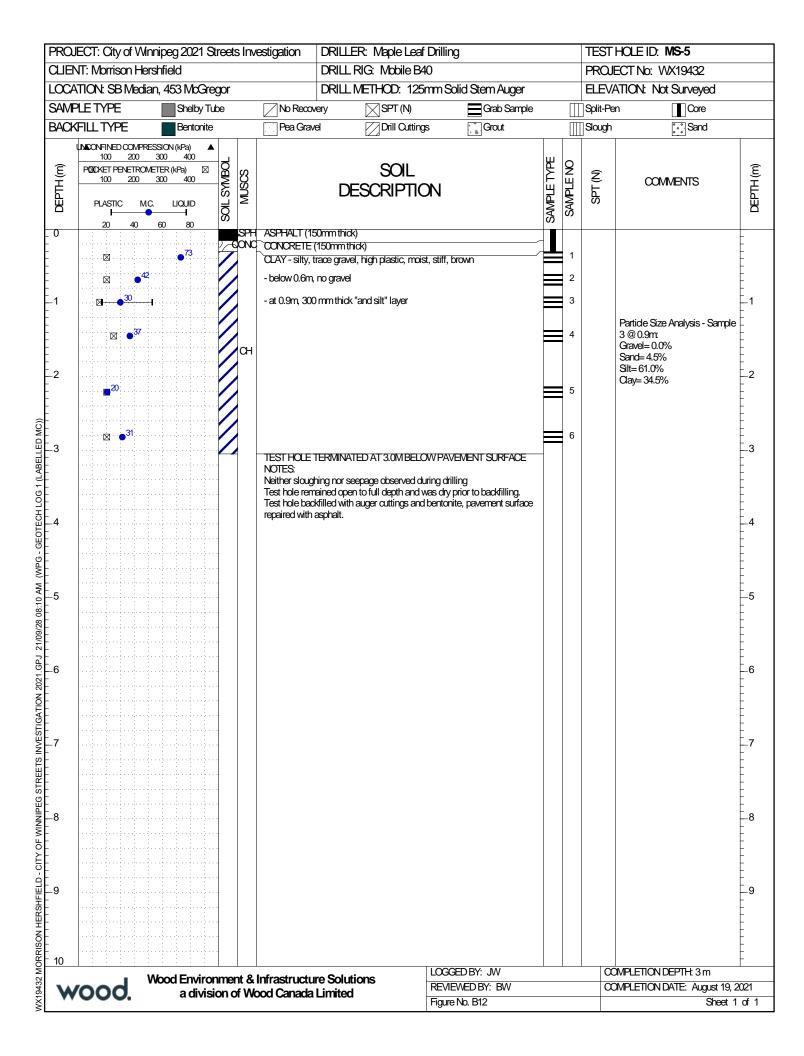
|                                    | 88 209 27<br>01 2 5 4 5 0 | 0 271 272 273 274 275<br>5 7 8 96901 2 3 4 5 6 7 8 97<br>MS6-TH | 276 277 278 279 280 281<br>01 2 3 4 5 6 7 8 97101 2 3 4 5 | 282 253 254<br>6 7 6 97201 2 |
|------------------------------------|---------------------------|---|---|------------------------------|
|                                    | Concrete                  | Thickness (mm)  | 160   |                              |
| WOO                                | d.                        | PAVE  | ORE PHOTOGRAPHS<br>MENT CORE SAMPLE MS6                   |                              |
| Wood Environm<br>Infrastructure Sc | ent and                   | Date: 13 September 2021   | Project No.: WX19432                                      | Figure: B7                   |

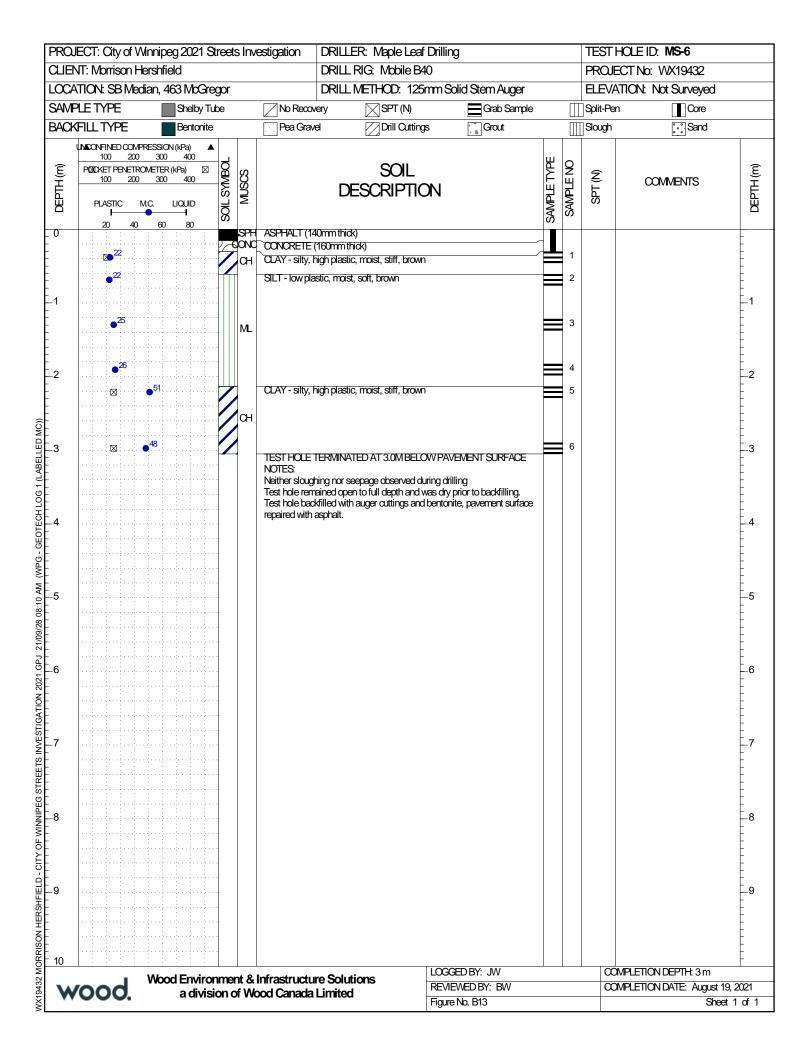
|   | -   | Minnipeg 2021 Sti  | reets Inv            | -  | LER: Maple Leaf Drilli   |                       | TEST HOLE ID: MS-1       |              |                           |                                   |  |
|---|---|--|----------------------|--|--|-----------------------|--------------------------|--------------|---------------------------|-----------------------------------|--|
|   | NT: Morrison H  |  |                      |  | LRIG: Mobile B40   |                       |                          |              | ECT No: WX19432           |                                   |  |
|   |   | xdian, 394 McGreç  | gor                  | DRILL  | LMETHOD: 125mm S   | •                     |                          | ELEV         | ATION: Not Surveyed       |                                   |  |
|   | PLE TYPE  | Shelby Tub   | e                    | No Recovery  | SPT (N)  | Grab Sample           |                          | Split-Pe     |                           |                                   |  |
| BACK                                      | (FILL TYPE  | Bentonite  |                      | Pea Gravel   | Drill Cuttings   | Grout                 |                          | Slough       | Sand Sand                 |                                   |  |
| DEPTH (m)                                 | UNCONFINED COM<br>100 200<br>POZICKET PENETIT<br>100 200<br>PLASTIC<br>PLASTIC<br>20 40 | 0 300 400<br>ROMETER (kPa) ⊠<br>0 300 400<br>M.C. LIQUID | SOIL SYMBOL<br>MUSCS | C  | SOIL<br>DESCRIPTION  |                       | SAMPLE TYPE<br>SAMPLE NO | SPT (N)      | COMMENTS                  | DEPTH (m)                         |  |
| _ 0                                       | 20 40   |  | 2/-GONC              | ASPHALT (100mm thi<br>CONCRETE (100mm<br>SILT - low plastic, moi | thick)   |                       |                          |              |                           |                                   |  |
| -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | ●21<br>●23  |  | ML                   | - below 1.2m, moist, s   |  |                       | 2                        |              |                           | -<br>-<br>                        |  |
| 2   | × •   | 5  |                      | CLAY - silty, high plas  | tic, moist, stiff, brown   |                       | 4                        |              |                           | 2                                 |  |
|   |   | <b>4</b> 9   | сн                   |  |  |                       | 5                        |              |                           |                                   |  |
| 3   |   | <b>4</b> 9   |                      |  | ATED AT 3.0M BELOW PA  | VEMENT SURFACE        | 6                        |              |                           | 3                                 |  |
|   |   |  |                      | Test hole remained op  | seepage observed during d<br>ven to full depth and was dr<br>th auger cuttings and bentc | prior to backfilling. |                          |              |                           | 4                                 |  |
|   |   |  |                      |  |  |                       |                          |              |                           |                                   |  |
|   |   |  |                      |  |  |                       |                          |              |                           |                                   |  |
|   |   |  |                      |  |  |                       |                          |              |                           | 6<br>                             |  |
|   |   |  |                      |  |  |                       |                          |              |                           | -<br><b>7</b><br>-<br>-<br>-<br>- |  |
|   |   |  |                      |  |  |                       |                          |              |                           | -<br>8<br>-<br>-<br>-<br>-<br>-   |  |
|   |   |  |                      |  |  |                       |                          |              |                           | 9                                 |  |
| 5 10<br>5                                 |   | · · · · ·  |                      |  | LOC  | GED BY: JW            |                          |              | MPLETION DEPTH: 3 m       | Γ.                                |  |
|   | hoo   |  |                      | Infrastructure Solu  | utions   | REVIEWED BY: BW       |                          |              | MPLETION DATE: August 19, | 2021                              |  |
| <u> </u>                                  | a division of V   |  |                      | Nood Canada Limited  |  | re No. B8             |                          | Sheet 1 of 1 |                           |                                   |  |

|                          | -  | Minnipeg 2021 St  | reet        | s Inv        |  | TE                               | TEST HOLE ID: MS-2       |                            |                       |  |   |  |
|--------------------------|--|---|-------------|--------------|--|----------------------------------|--------------------------|----------------------------|-----------------------|--|---|--|
| CLIE                     | NT: Morrison I   | lershfield  |             |              | DRILL RIG: Mobile  | B40                              |                          |                            | PR                    | OJECT No: WX19432  |   |  |
| LOC/                     | ATION: NB me   | edian, 410 McGree                                       | gor         |              | DRILL METHOD: 12   | 25mm Solid Stem                  | n Auger                  |                            | ELE                   | EVATION: Not Surveyed  |   |  |
|                          | PLETYPE  | Shelby Tub  | be          |              | No Recovery SPT (N)  |                                  | ab Sample                |                            | Split                 |  |   |  |
| BACH                     | <fill td="" type<=""><td>Bentonite</td><td></td><td></td><td>Pea Gravel Drill Outt</td><td>ings 🚺 Gr</td><td>out</td><td></td><td>∭ Slou</td><td>igh 👫 Sand</td><td></td></fill> | Bentonite   |             |              | Pea Gravel Drill Outt  | ings 🚺 Gr                        | out                      |                            | ∭ Slou                | igh 👫 Sand   |   |  |
| DEPTH (m)                | UNCONFINED COM<br>100 200<br>PODKET PENETIF<br>100 200<br>PLASTIC<br>20 40   | 0 300 400<br>ROMETER (kPa) ⊠<br>0 300 400<br>MC. LIQUID | SOIL SYMBOL | MUSCS        | SOIL<br>DESCRIPT   |                                  |                          | SAMPLE TYPE<br>SAMPLE TYPE | SPT (N)               | COMMENTS   | DEPTH (m)   |  |
| _ 0                      | 20 40  |   | 7           | ISPH<br>IONC | ASPHALT (50mm thick)   |                                  | /                        |                            |                       |  |   |  |
|                          | 22<br>31<br>⊮⊠∎ ● <sup>29</sup><br>⊠ ● <sup>30</sup>   |   |             | ан           | CONCRETE (175mm thick)<br>CLAY - silty, high plastic, moist, stiff, bro<br>SILT - low plastic, moist, soft, brown  | wn                               |                          |                            | 1<br>2<br>3<br>4<br>5 | Particle Size Analysis - Sample<br>3 @ 1.4m<br>Gravel= 0.0%<br>Sand= 4.0%<br>Sitt= 50.2% | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |  |
| erred Mc))<br><br>       |  | •46   |             |              | TEST HOLE TERMINATED AT 3.0M BE  | LOW PAVEMENT SI                  | URFACE                   | =                          | 6                     | Gay= 45.8%   | -<br>-<br>-<br>3  |  |
| WPG - GEOLECH LOG 1 (LAB |  |   |             |              | NOTES:<br>Neither sloughing nor seepage observed<br>Test hole remained open to full depth an<br>Test hole backfilled with auger cuttings a<br>repaired with asphalt. | d was dry prior to bac           | xfilling.<br>ent surface |                            |                       |  | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |  |
| 21/09/28 08:10 AM        |  |   |             |              |  |                                  |                          |                            |                       |  | 5<br>5<br>  |  |
| SIIGATION 2021.GP        |  |   |             |              |  |                                  |                          |                            |                       |  |   |  |
|                          |  |   |             |              |  |                                  |                          |                            |                       |  | 7<br>   |  |
|                          |  |   |             |              |  |                                  |                          |                            |                       |  |   |  |
| <u>ل</u><br>الم          |  |   |             |              |  |                                  |                          |                            |                       |  | -   |  |
| ž                        |  | Wood Environ  | me          | nt &         | Infrastructure Solutions   | LOGGED BY: J                     |                          |                            |                       | COMPLETION DEPTH: 3 m  |   |  |
| X194                     | <b>/00</b> .   |   |             |              | ood Canada Limited   | REVIEWED BY: BW<br>Figure No. B9 |                          |                            |                       | COMPLETION DATE: August 19, 2021<br>Sheet 1 of 1   |   |  |
| <                        | <b>VOOU.</b> a divisio   |   |             |              |  | J                                |                          |                            |                       | 0.000  |   |  |

|   | -   | Minnipeg 2021 Str  | eets Ir              |                     |                               |  |                                   |                           |             | TEST HOLE ID: MS-3 |  |  |   |
|---|---|--|----------------------|---------------------|-------------------------------|--|-----------------------------------|---------------------------|-------------|--------------------|--|--|---|
| CLIE  | NT: Morrison H                                | lershfield   |                      |                     | DRILLF                        | RIG: Mobile B40  |                                   |                           |             | I                  | PROJE  | ECT No: WX19432  |   |
| LOC/  | ATION: NB Me                                  | dian, 416 McGreç   | jor                  |                     | DRILL                         | VIETHOD: 125m  | m Solid Sterr                     | n Auger                   |             | I                  | ELEVA  | ATION: Not Surveyed  |   |
| SAM   | PLETYPE                                       | Shelby Tub   | е                    | No Reco             | very                          | SPT (N)  |                                   | ab Sample                 |             |                    | Split-Pe   | n Core   |   |
| BACK  | <b>VFILL TYPE</b>                             | Bentonite  |                      | Pea Grav            | e                             | Drill Cuttings   | Gr                                | rout                      |             |                    | Slough   | <b>€</b> €<br>Sand   |   |
| DEPTH (m)   | I   | 0 300 400<br>COMETER (kPa) ⊠<br>0 300 400<br>M.C. LIQUID | SOIL SYMBOL<br>MUSCS |                     | DE                            | SOIL<br>SCRIPTIO   | N                                 |                           | SAMPLE TYPE | SAMPLENO           | SPT (N)  | COMMENTS   | DEPTH (m)   |
| _ 0   | 20 40   | 60 80  | (SF<br>/_601         | H ASPHALT (10       |                               |  |                                   | /                         | -           |                    |  |  | -   |
| -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | ⊠ ● <sup>34</sup><br>⊠ <sup>25</sup>          | 5  | α                    | CLAY - sity, I      | high plastic,                 | ck)<br>moist, stiff, brown<br>flum plastic, mist, firr               | n, brown                          | /                         |             | 1<br>2<br>3<br>4   |  |  |   |
| SELLEU MC))   | <b>⊢</b> • <sup>23</sup> 1<br>• <sup>24</sup> |  |                      | - below 2.4m,       |                               | soft<br>ED AT 3.0M BELOW   | /PAVEMENTS                        | URFACE                    |             | 5<br>6             |  | Particle Size Analysis - Sample<br>5 @ 2.4m<br>Gravel = 0.0% | 3   |
| 6e01ecH F0611(LA  |   |  |                      | Test hole rem       | nained open<br>kfilled with a | epage observed durir<br>to full depth and wa<br>auger cuttings and b | s drv prior to bac                | ckfilling.<br>ent surface |             |                    |  | Sand= 5.0%<br>Silt= 79.8%<br>Qay= 15.2%                      | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |
| 5 - 5-4M) MM (11:10 - 10-10-10-10-10-10-10-10-10-10-10-10-10-1                              |   |  |                      |                     |                               |  |                                   |                           |             |                    |  |  | 5   |
| 971101 2021.957 2100  |   |  |                      |                     |                               |  |                                   |                           |             |                    |  |  | 6   |
|   |   |  |                      |                     |                               |  |                                   |                           |             |                    |  |  |   |
|   |   |  |                      |                     |                               |  |                                   |                           |             |                    |  |  |   |
| 0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0                          |   |  |                      |                     |                               |  |                                   |                           |             |                    |  |  | 9   |
| 32 M  |   | Wood Environ   | ment                 | & Infrastructu      | re Soluti                     | one i  | OGGED BY: J                       |                           |             |                    |  | MPLETION DEPTH: 3 m  |   |
|   |   |  |                      | Wood Canada Limited |                               |  | REVIEWED BY: BW<br>Figure No. B10 |                           |             |                    | COMPLETION DATE: August 19, 2021<br>Sheet 1 of 1 |  |   |

| PRO  | JECT: City of V   | Winnipeg 2021 Stre                                       | æts Inv             |  |                      |                       |             |             | TEST HOLE ID: MS-4 |  |   |  |
|--|---|--|---------------------|--|----------------------|-----------------------|-------------|-------------|--------------------|--|---|--|
| CLIE   | NT: Morrison I  | Hershfield   |                     | DRILL RIG:   | Mobile B40           |                       |             | F           | PROJE              | ECT No: WX19432                                      |   |  |
| LOC/   | ATION: SB Me  | xdian, 442 McGrego                                       | or                  | DRILL MET  | HOD: 125mm Sc        | olid Stem Auger       |             | E           | ELEVA              | ATION: Not Surveyed                                  |   |  |
| SAM  | PLETYPE   | Shelby Tube  | •                   | No Recovery  | SPT (N)              | Grab Sample           |             | mis         | Split-Pe           | n Core   |   |  |
| BAC  | (FILL TYPE  | Bentonite  |                     | Pea Gravel   | Drill Cuttings       | Grout                 |             | ms          | Slough             | :::Sand  |   |  |
| DEPTH (m)  | UNCONFINED CON<br>100 200<br>P020KET PENETH<br>100 200<br>PLASTIC<br>1<br>20 40 | 0 300 400<br>ROMETER (kPa) ⊠<br>0 300 400<br>M.C. LIQUID | SUL SYMBUL<br>MUSCS |  | SOIL<br>XRIPTION     |                       | SAMPLE TYPE | SAMPLENO    | SPT (N)            | COMMENTS   | DEPTH (m)   |  |
| _ 0  | 20 40   |  |                     | ASPHALT (175mm thick)  |                      |                       |             |             |                    |  | -   |  |
| -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-   | ⊠ ● <sup>32</sup><br>●  |  | сон                 | OONORETE (125mm thick)<br>OLAY - silty, high plastic, mois<br>SILT - low plastic, moist, soft,                               |                      |                       |             | 1<br>2<br>3 |                    |  | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |  |
| 2  | 24<br>22<br>26  |  | ML                  | CLAY - silty, high plastic, mois   | st, stiff, brown     |                       |             | 4<br>5      |                    |  | 2   |  |
| ABELLED MC))<br>• • • • • • • • • •  | ×   | 53   | сн                  | TEST HOLE TERMINATED A<br>NOTES:   | T 3.0M BELOW PAV     | EMENT SURFACE         | =           | 6           |                    |  | 3   |  |
| GEOLECH LOG 1 (L   |   |  |                     | Neither sloughing nor seepage<br>Test hole remained open to ful<br>Test hole backfilled with auger<br>repaired with asphalt. | Il depth and was dry | prior to backfilling. |             |             |                    |  | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-                               |  |
| 1/28 08:10 AM (WPG -   |   |  |                     |  |                      |                       |             |             |                    |  |   |  |
| 9/12/2017/09/21/09/21/09/21/09/21/09/21/09/21/09/21/09/21/09/21/09/21/09/21/09/21/09/21/09/21/09/21/09/21/09/2 |   |  |                     |  |                      |                       |             |             |                    |  | -<br>-<br>-<br>-<br>-<br>-  |  |
|  |   |  |                     |  |                      |                       |             |             |                    |  | -<br>-<br>-<br>-<br>-<br>-  |  |
|  |   |  |                     |  |                      |                       |             |             |                    |  |   |  |
|  |   |  |                     |  |                      |                       |             |             |                    |  |   |  |
| ∯ <u>10</u>  |   |  |                     |  |                      |                       |             |             |                    |  | -   |  |
| 132 0  |   |  |                     | Infrastructure Solutions   |                      | EDBY: JW              |             |             |                    | MPLETION DEPTH: 3 m<br>MPLETION DATE: A rouget 19, 2 | 0021  |  |
| X194   | <b>/00</b> .  | a divisio  | n of W              | cood Canada Limited REVIEWED BY: BW<br>Figure No. B11  |                      |                       |             |             |                    | COMPLETION DATE: August 19, 2021<br>Sheet 1 of 1     |   |  |
| <  | a division of V   |  |                     |  | i iguic              |                       |             |             |                    |  | <b>.</b>  |  |



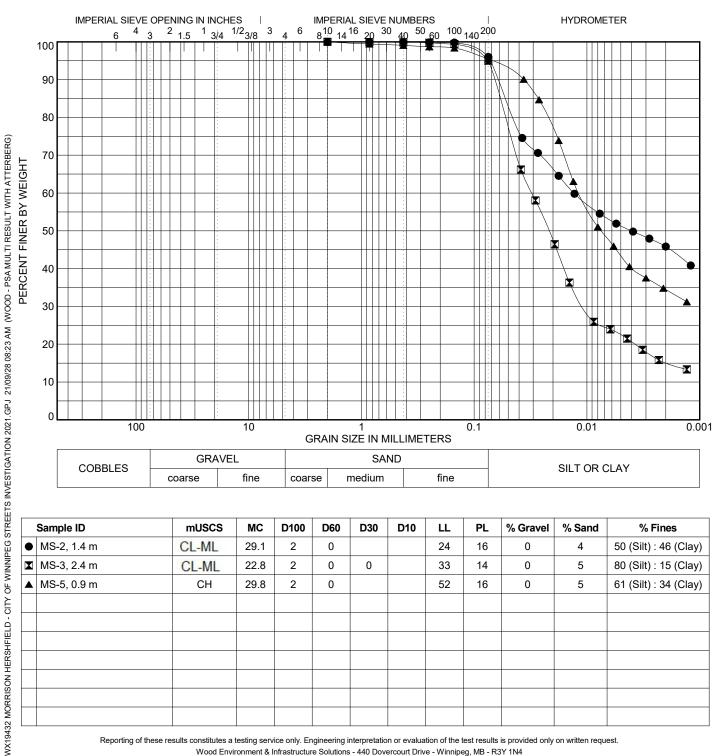


### PARTICLE SIZE ANALYSIS



| Report Date: | 28 September 2021   |              |   |
|--------------|---------------------|--------------|---|
| Client       |                     | Project      |   |
| Name:        | Morrison Hershfield | Name:        | City of Winnipeg 2021 Streets Investigation |
| Address:     |                     | Address:     | Mountain Avenue / McGregor Street           |
| Attention:   |                     | Project No.: | WX19432                                     |
| PO Number:   |                     | Manager:     | JW  |

Gradation Specification:



Wood Environment & Infrastructure Solutions - 440 Dovercourt Drive - Winnipeg, MB - R3Y 1N4

### **Appendix C**

### **McGregor North**

- Test Hole Location Plan
- Core Photos
- Test Hole Logs
- Laboratory Summary

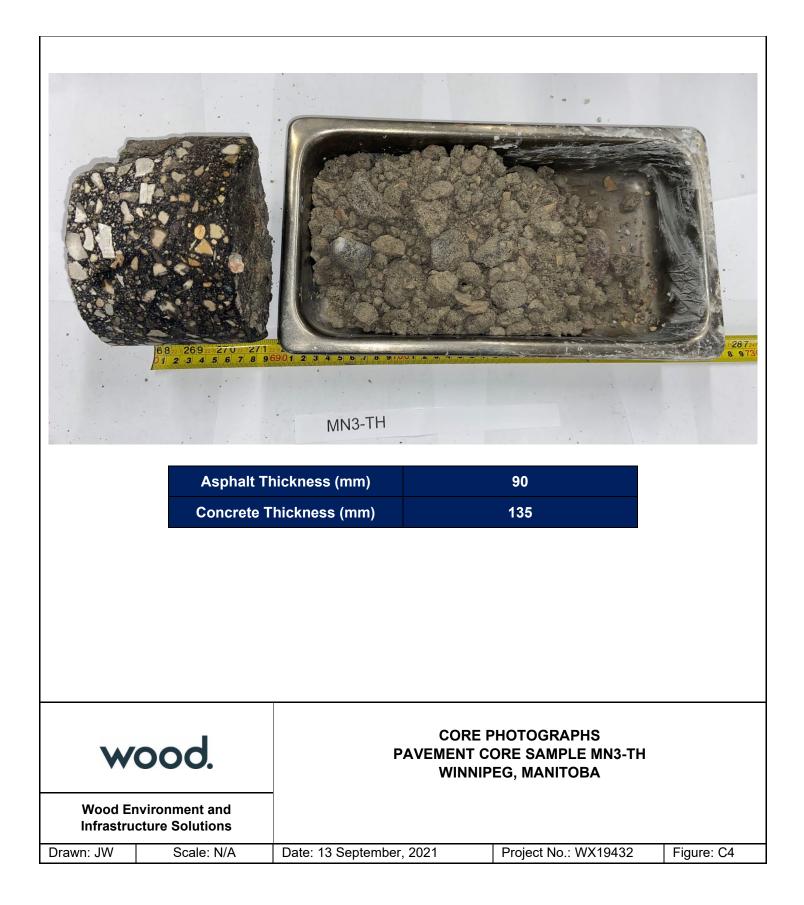


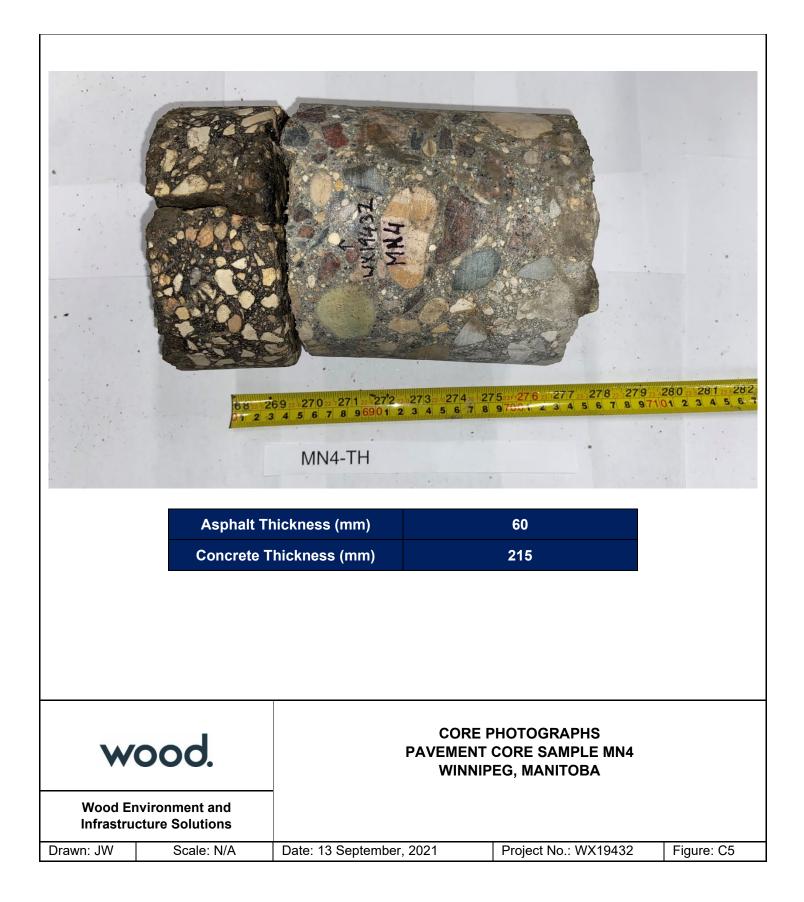


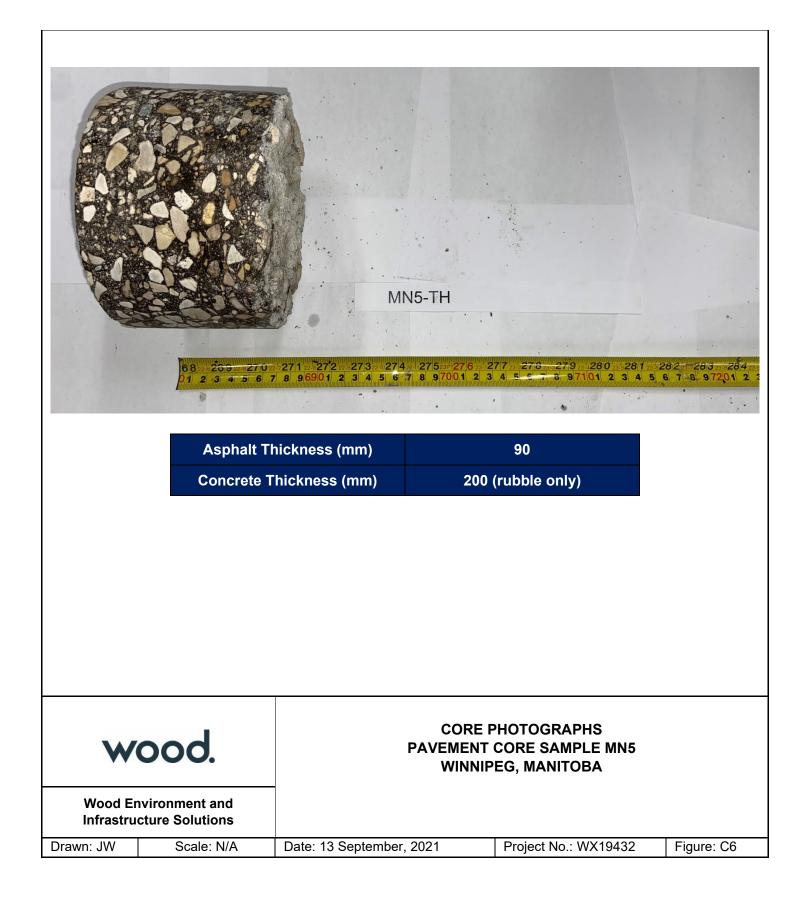
|  | 270 27<br>4 5 6 7 8 | Trip 272 273 274 275 27<br>26901 2 3 4 5 6 7 8 9700 |          |  | 283 284 225 2<br>3 97201 2 3 4 5 9 |
|--|---------------------|---|----------|--|------------------------------------|
|  |                     | hickness (mm)<br>Thickness (mm)                     |          | 165<br>225                                 |                                    |
|  |                     |   |          |  |                                    |
| WOOC<br>Wood Environmer<br>Infrastructure Solu | nt and              | PA\   | EMENT CO | OTOGRAPHS<br>DRE SAMPLE MN1<br>G, MANITOBA |                                    |
|  | le: N/A             | Date: 13 September, 202                             | 1 F      | Project No.: WX19432                       | Figure: C2                         |

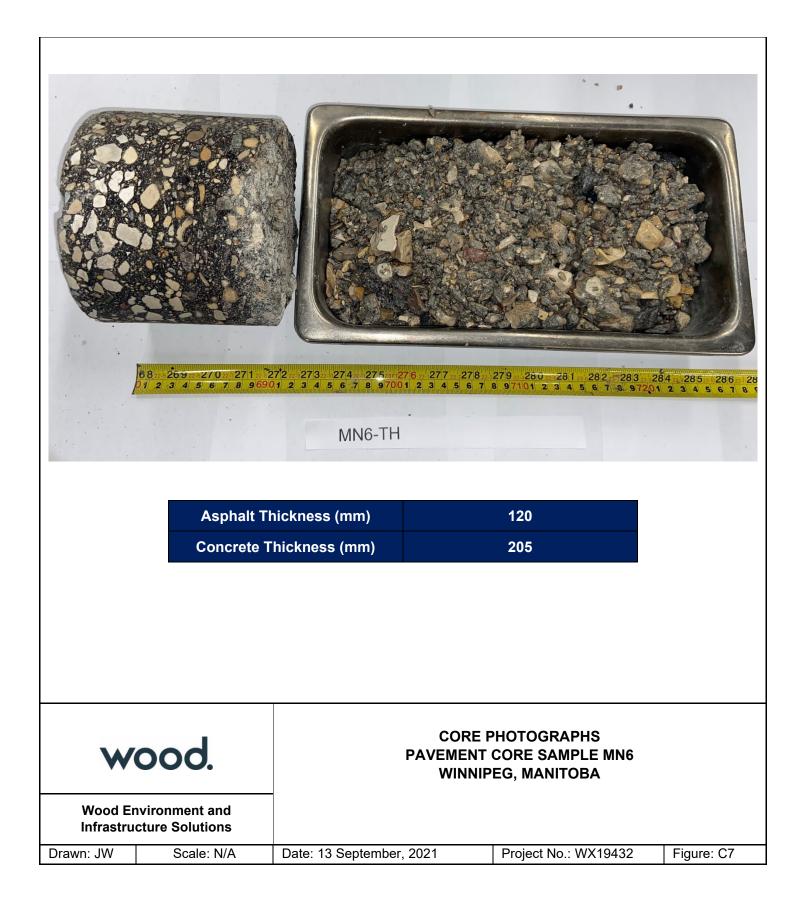


|   |                                 | 271 272 273 274 275 4<br>9 6901 2 3 4 5 6 7 8 970<br>MN2-TH |   | 282 283 284 285<br>6 7 8 97201 2 3 4 |
|---|---------------------------------|---|---|--------------------------------------|
|   | Asphalt <sup>-</sup>            | Thickness (mm)  | 90  |                                      |
|   | Concrete                        | Thickness (mm)  | 215   |                                      |
| W | ood.                            | PAV   | CORE PHOTOGRAPHS<br>EMENT CORE SAMPLE MN2<br>WINNIPEG, MANITOBA |                                      |
|   |                                 | -   |   |                                      |
|   | vironment and<br>ture Solutions |   |   |                                      |





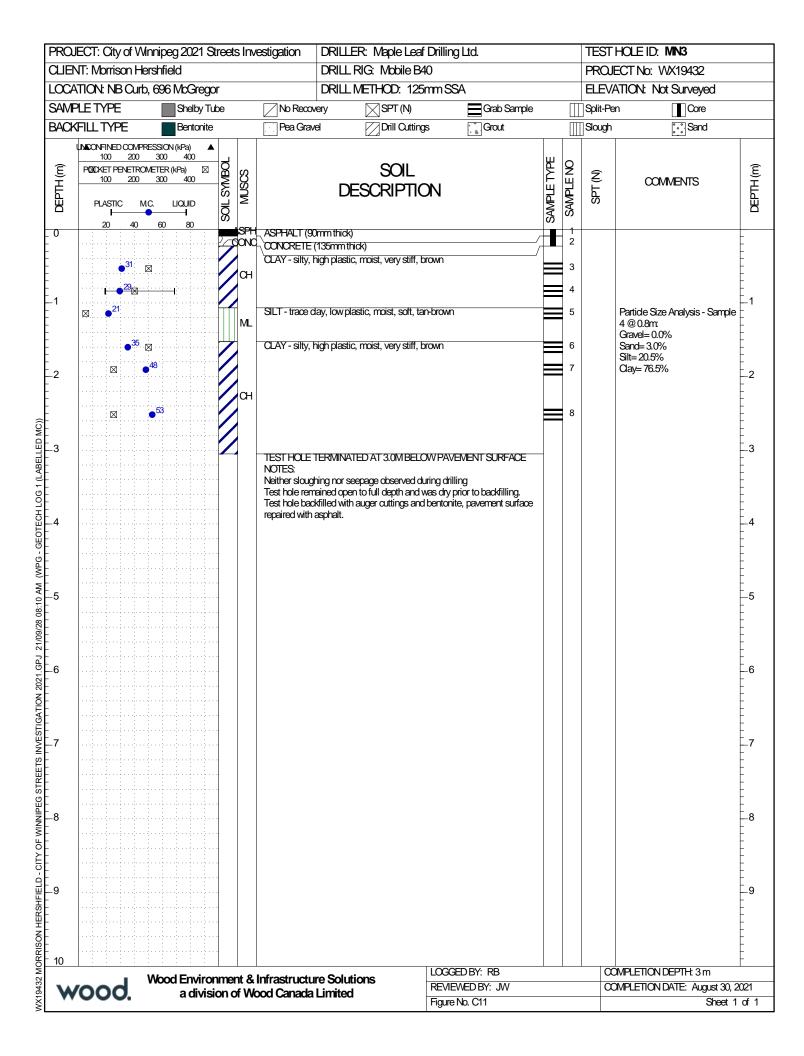




|  | 170 271 272 273 274<br>6 7 8 96901 2 3 4 5 6 7<br>MN7-TH |                   |   | 28/3 28/4 26/5 2<br>8 972 01 2 3 4 5 6 |  |  |
|--|--|-------------------|---|--|--|--|
| Asphal   | t Thickness (mm)   |                   | 90  |  |  |  |
| Concret  | e Thickness (mm)   | hickness (mm) 225 |   |  |  |  |
|  |  |                   |   |  |  |  |
| Wood Environment and<br>Infrastructure Solutions |  | PAVEME            | RE PHOTOGRAPHS<br>NT CORE SAMPLE MN7<br>NIPEG, MANITOBA |  |  |  |
| Drawn: JW Scale: N/A                             | Date: 13 September                                       | 2021              | Project No.: WX19432                                    | Figure: C8                             |  |  |

|                      | ROJECT: City of V   |   |               |                               |              |   |                   |             | TEST HOLE ID: MN1 |           |          |   |                      |
|----------------------|---|---|---------------|-------------------------------|--------------|---|-------------------|-------------|-------------------|-----------|----------|---|----------------------|
| CL                   | JENT: Morrison I  | lershfield  |               |                               |              | RIG: Mobile B40   |                   |             |                   |           | PROJ     | ECT No: WX19432                             |                      |
| LC                   | CATION: NB CU   | rb, 682 McGregor  |               |                               | DRILL        | /IETHOD: 125m   | mSSA              |             |                   |           | ELEV     | ATION: Not Surveyed                         |                      |
|                      | MPLE TYPE   | Shelby Tube   |               | No Recov                      | ery          | SPT (N)   |                   | Grab Sample |                   |           | Split-Pe | n Core                                      |                      |
| BA                   | CKFILL TYPE   | Bentonite   |               | Pea Grave                     | ł            | Drill Cuttings  |                   | Grout       |                   |           | Slough   | :: Sand                                     |                      |
| DEPTH (m)            | UNCONFINED COM<br>100 200<br>P020KET PENETH<br>100 200<br>PLASTIC<br>20 400 | ) 300 400<br>ROMETER (KPa) ⊠<br>) 300 400<br>MC. ⊔QUID<br>₹ | MUSCS         |                               |              | SOIL<br>SCRIPTIO  | N                 |             | SAMPLE TYPE       | SAMPLE NO | SPT (N)  | COMMENTS                                    | DEPTH (m)            |
| _ 0                  |   |   | SPF<br>∕⊂GONC | L `                           |              |   |                   |             | -                 |           |          |   | -                    |
|                      | _ <sup>33</sup> 30  |   | сн            |                               |              | moist, very stiff, bro  | WN                |             |                   | 1         |          |   |                      |
| 1                    | × <sup>22</sup>   |   | 2             |                               |              | atic moist caft tan   |                   |             |                   | 3         |          |   | -1                   |
| -                    |   |   | ML            | SILT - trace da               | ay, iow pia  | stic, moist, soft, tan-   | DIOWN             |             |                   |           |          |   | -                    |
| Ē                    | <b>⊢</b> ● <sup>33</sup>  | ⊠1  | Сн            | -                             |              | moist, very stiff, bro  |                   |             | F                 | 4         |          |   |                      |
| _2                   | × • <sup>23</sup>   |   | ML            |                               |              | stic, moist, soft, tan-   |                   |             | F                 | 5         |          | Particle Size Analysis - Sample<br>4 @ 1.5m | 2                    |
| -                    |   |   | СН            | CLAY - silty, h               | igh plastic, | moist, very stiff, bro  | WN                |             |                   |           |          | Gravel= 0.2%<br>Sand= 2.2%                  | -                    |
|                      | ⊠   | <b>4</b> 9  | 4             |                               | ERMINAT      | ED AT 2.6M BELOV  | VPAVEMENT         | SURFACE     |                   | 6         |          | Silt= 36.7%<br>Clay= 61.0%                  | -                    |
|                      |   |   |               | Test hole remain              | ained open   | epage observed duri<br>to full depth and wa<br>auger cuttings and b | is dry prior to b | ackfilling. |                   |           |          |   | 3                    |
|                      |   |   |               | repaired with a               |              |   | o ilo ilo, pavo.  |             |                   |           |          |   |                      |
|                      |   |   |               |                               |              |   |                   |             |                   |           |          |   | -4                   |
| ס - ס - ח<br>- ח - ח |   |   |               |                               |              |   |                   |             |                   |           |          |   |                      |
| 5                    |   |   |               |                               |              |   |                   |             |                   |           |          |   | _5                   |
| 20 02:               |   |   |               |                               |              |   |                   |             |                   |           |          |   | -                    |
| 1117                 |   |   |               |                               |              |   |                   |             |                   |           |          |   | -                    |
| 5-6                  |   |   |               |                               |              |   |                   |             |                   |           |          |   | 6                    |
|                      |   |   |               |                               |              |   |                   |             |                   |           |          |   | -                    |
|                      |   |   |               |                               |              |   |                   |             |                   |           |          |   | -                    |
|                      |   |   |               |                               |              |   |                   |             |                   |           |          |   | -<br>-<br>- <b>-</b> |
| 2                    |   |   |               |                               |              |   |                   |             |                   |           |          |   |                      |
| Ц –                  |   |   |               |                               |              |   |                   |             |                   |           |          |   |                      |
|                      |   |   |               |                               |              |   |                   |             |                   |           |          |   |                      |
| -8                   |   |   |               |                               |              |   |                   |             |                   |           |          |   | 8                    |
|                      |   |   |               |                               |              |   |                   |             |                   |           |          |   | -                    |
| 5                    |   |   |               |                               |              |   |                   |             |                   |           |          |   |                      |
| 9<br>≝9              |   |   |               |                               |              |   |                   |             |                   |           |          |   | 9                    |
|                      |   |   |               |                               |              |   |                   |             |                   |           |          |   |                      |
|                      |   |   |               |                               |              |   |                   |             |                   |           |          |   | Ē                    |
|                      | )   |   |               |                               |              |   | LOGGED BY:        | RB          |                   |           | ~        | MPLETION DEPTH: 2.6 m                       | F                    |
| 9432                 | wood.   | Wood Environm<br>a division                                 |               | Infrastructur<br>ood Canada I |              | ons   | REVIEWED B        |             |                   |           |          | MPLETION DATE: August 30, 2                 | 2021                 |
| ξ Ì                  |   | a UN 30   |               |                               |              |   | Figure No. C9     |             |                   |           |          | Sheet ?                                     | 1 of 1               |

|  | -   | Minnipeg 2021 Str  | reets Inv              | -  | ER: Maple Leaf Drilli  | TES                                | TEST HOLE ID: MN2 |                  |                                |   |
|--|---|--|------------------------|--|--|------------------------------------|-------------------|------------------|--------------------------------|---|
|  | NT: Morrison H  |  |                        |  | .RIG: Mobile B40   |                                    |                   |                  | JECT No: WX19432               |   |
|  |   | rb, 692 McGregor   |                        | DRILL  | .METHOD: 125mm S   | SA                                 |                   | ELE              | /ATION: Not Surveyed           |   |
|  | PLE TYPE  | Shelby Tub   | e                      | No Recovery  | SPT (N)  | Grab Sample                        |                   | Split-F          |                                |   |
| BACK   | (FILL TYPE  | Bentonite  |                        | Pea Gravel   | Drill Cuttings   | Grout                              |                   | Sloug            | n 🔝 Sand                       |   |
| DEPTH (m)  | UNCONFINED COM<br>100 200<br>POSOXET PENETT<br>100 200<br>PLASTIC<br>L<br>20 40 | 0 300 400<br>ROMETER (kPa) ⊠<br>0 300 400<br>M.C. LIQUID | SOIL SYNBOL            | D  | SOIL<br>ESCRIPTION   |                                    | SAMPLE TYPE       | SPT (N)          | COMMENTS                       | DEPTH (m)   |
| _ 0  |   |  | /⊂GONC<br>/_CONC<br>CH |  | k)<br>(hick)<br>ic, moist, very stiff (inferred  | 1) brown                           | ╶ <u></u> ┤┻┤     | 1                |                                |   |
| -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | ≥ <sup>20</sup><br>⊠ ● <sup>24</sup>  | 6 <sub>×</sub>   | ML                     | SILT - trace day, lowp   | ic, moist, very stiff, brown   |                                    |                   | 2<br>3<br>4<br>5 |                                | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-                |
| 2  |   |  | сн                     |  | asional sulphate inclusions  |                                    |                   | 6                |                                | 2   |
|  |   | 43   |                        |  |  |                                    |                   | 7                |                                | -<br>-<br>-<br>   |
|  |   |  |                        | NOTES:<br>Neither sloughing nor s<br>Test hole remained ope<br>Test hole backfilled with | TED AT 3.0M BELOW PA<br>eepage observed during d<br>en to full depth and was dry<br>h auger cuttings and bento | rilling<br>/ prior to backfilling. |                   |                  |                                |   |
|  |   |  |                        | repaired with asphalt.   |  |                                    |                   |                  |                                | 4<br>   |
| A) MA 01:80 82/80/12   |   |  |                        |  |  |                                    |                   |                  |                                | -<br>   |
| 6  |   |  |                        |  |  |                                    |                   |                  |                                | -<br>   |
| 7<br>  |   |  |                        |  |  |                                    |                   |                  |                                |   |
|  |   |  |                        |  |  |                                    |                   |                  |                                |   |
|  |   |  |                        |  |  |                                    |                   |                  |                                | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |
| ž  |   | Wood Environ   | ment &                 | Infrastructure Solu  | tions  | GED BY: RB                         |                   |                  | OMPLETION DEPTH: 3 m           |   |
| W 1943   | vood.   |  |                        | ood Canada Limited   |  | EWED BY: JW                        |                   | C                | COMPLETION DATE: August 30, 20 |   |
| š  **  |   |  |                        |  | Figu   | re No. C10                         |                   |                  | Sheet 1                        | of 1  |



|                | PROJECT: City of Winnipeg 2021 Streets Inv |                               |                                       |                  |        | estigation DRILLER: Maple Leaf Drilling Ltd. |  |                                      |             |                                     |                | TEST HOLE ID: MN4   |            |  |  |
|----------------|--|-------------------------------|---------------------------------------|------------------|--------|--|--|--------------------------------------|-------------|-------------------------------------|----------------|---------------------|------------|--|--|
|                | NT: Morrison I                             |                               |                                       |                  |        |  | LL RIG: Mobile B40                                       |                                      |             |                                     | PROJ           | ECT No: WX19432     |            |  |  |
| LOC/           | ATION: SB Cu                               | rb, 3m N                      | lorth of F                            | Rupe             | rtslar | nd DRII                                      | LLMETHOD: 125mm  | ISSA                                 |             |                                     | ELEV           | ATION: Not Surveyed |            |  |  |
| SAM            | PLETYPE                                    |                               | Shelby Tu                             | be               |        | No Recovery                                  | SPT (N)  | Grab Sar                             | nple        |                                     | Split-Pe       | n Core              |            |  |  |
| BACK           | (FILL TYPE                                 |                               | Bentonite                             |                  |        | Pea Gravel                                   | Drill Cuttings   | Grout                                |             |                                     | Slough         | Sand :              |            |  |  |
|                |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     |            |  |  |
| Ê              | 100 200<br>POSCKET PENETH                  |                               | <br>Pa) ⊠                             | ğ                | 6      |  | SOIL   |                                      | SAMPLE TYPE | 9                                   | 9              |                     | Ê          |  |  |
| ΗĚ             | 100 200                                    | ) 300                         | 400                                   | N.               | MUSCS  |  | DESCRIPTION  | l                                    | Г<br>Ц      | Ē                                   | SPT (N)        | COMMENTS            | ΗĚ         |  |  |
| DEPTH (m)      | PLASTIC                                    | мс. ⊔                         | IQUID                                 | SOIL SYMBO       | M      |  |  |                                      | ЧW          | SAMPLE NO                           |                |                     | DEPTH (m)  |  |  |
|                | 20 40                                      | 60                            |                                       | Ø                |        |  |  |                                      | AS          |                                     |                |                     |            |  |  |
| _ 0            |  |                               |                                       |                  |        | ASPHALT - 60mm th<br>CONCRETE (215mm         | nCk<br>mthick)   |                                      | /=          | 1<br>2<br>3                         |                |                     | F          |  |  |
| -              | _29  |                               |                                       |                  | сн     | CLAY - silty, high pla                       | astic, moist, stiff to very stiff                        | , brown                              |             | 3                                   |                |                     | E          |  |  |
| -              | 2  |                               | ····                                  |                  |        | SILT - trace day, low                        | vplastic, moist, soft, tan-br                            | own                                  |             |                                     |                |                     | F          |  |  |
| 1              |  |                               |                                       |                  |        |  |  |                                      | _           | 5                                   |                |                     | <b>_</b> 1 |  |  |
| -              | ⊠ ● <sup>24</sup>                          |                               |                                       |                  | ML     |  |  |                                      |             | 6                                   |                |                     | -          |  |  |
| -              |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | E          |  |  |
| -              | ● <sup>31</sup> ⊠                          | 1                             |                                       |                  |        | CLAY - silty, high pla                       | astic, moist, very stiff, brow                           | า                                    |             | 7                                   |                |                     | E          |  |  |
| _2             |  | 41                            | · · · · · · · · · · · · · · · · · · · |                  |        |  |  |                                      |             | 8                                   |                |                     | _2         |  |  |
| Ē              |  |                               | · · · · · · · · · · · · · · · · · · · |                  |        |  |  |                                      |             | Ĩ                                   |                |                     | Ē          |  |  |
| -              |  | ● <sup>51</sup>               |                                       |                  |        |  |  |                                      | _           | 9                                   |                |                     | F          |  |  |
|                |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | E          |  |  |
| 3              |  |                               | · · · · · · · · · · · · · · · · · · · |                  |        |  | NATED AT 3.0M BELOW F                                    |                                      | -           |                                     |                |                     | _3         |  |  |
| - ABE          |  |                               |                                       |                  |        | NOTES:                                       |  |                                      |             |                                     |                |                     | F          |  |  |
|                |  |                               |                                       |                  |        | Neither sloughing no<br>Test hole remained o | or seepage observed during<br>open to full depth and was | drilling<br>drv prior to backfilling |             |                                     |                |                     | E          |  |  |
|                |  |                               |                                       |                  |        | Test hole backfilled v                       | with auger cuttings and ber                              | tonite, pavement sur                 | ace         |                                     |                |                     | F          |  |  |
| -4             |  |                               |                                       |                  |        | repaired with asphalt                        | L.   |                                      |             |                                     |                |                     | _4         |  |  |
| 5<br>-<br>-    |  |                               | · · · · · · · · · · · · · · · · · · · |                  |        |  |  |                                      |             |                                     |                |                     | E          |  |  |
|                |  |                               |                                       | 1                |        |  |  |                                      |             |                                     |                |                     | E          |  |  |
| ≦_<br>∍⊺       |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | F          |  |  |
| 5              |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | _5         |  |  |
| 8<br>9<br>9    |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | F          |  |  |
| 180/1          |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | E          |  |  |
| 2 -            |  |                               | · · · · · · · · · · · · · · · · · · · |                  |        |  |  |                                      |             |                                     |                |                     | E          |  |  |
| <u>۹</u> –6    |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | 6          |  |  |
|                |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | E          |  |  |
|                |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | -          |  |  |
|                |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | Ē_         |  |  |
| ≣7<br>≤-       |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | -7         |  |  |
|                |  |                               |                                       | ]                |        |  |  |                                      |             |                                     |                |                     | E          |  |  |
| ¥ -            |  |                               | · · · · · · · · · · · · · · · · · · · |                  |        |  |  |                                      |             |                                     |                |                     | F          |  |  |
|                |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | -          |  |  |
| NN - 8         |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | 8          |  |  |
| 5-             |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | F          |  |  |
|                |  |                               | · · · · · · · · · · · · · · · · · · · |                  |        |  |  |                                      |             |                                     |                |                     | Ē          |  |  |
| 9              |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | 9          |  |  |
|                |  |                               |                                       | 1                |        |  |  |                                      |             |                                     |                |                     |            |  |  |
|                |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | È          |  |  |
|                |  |                               | · · · · · · · · · · · · · · · · · · · |                  |        |  |  |                                      |             |                                     |                |                     | F          |  |  |
| -<br>-<br>- 10 |  |                               |                                       |                  |        |  |  |                                      |             |                                     |                |                     | -          |  |  |
| 32 M           | I  | Wood                          |                                       |                  |        | Infrastructure So                            | lutions  | GGED BY: RB                          |             |                                     |                | MPLETION DEPTH: 3 m | 2004       |  |  |
|                | vood.                                      | OO, a division of Wood Canada |                                       | ood Canada Limit |        |  |  |                                      |             | OMPLETION DATE: August 30,<br>Sheet | 2021<br>1 of 1 |                     |            |  |  |
| <1             | <b>wooo.</b> a divi:                       |                               |                                       |                  |        |  | 110  | , <b></b>                            |             |                                     |                | G 1001              |            |  |  |

|   |  | Minnipeg 2021 S                             | reets       | Inve                   | estigation DRILLER: Maple Leaf Drilling Ltd.   |   |  |                         |             | TEST HOLE ID: MN5          |  |                     |           |  |
|---|--|---|-------------|------------------------|--|---|--|-------------------------|-------------|----------------------------|--|---------------------|-----------|--|
| CLIEN   | VT: Morrison H   | lershfield                                  |             |                        | DR   | RILL RIG: Mobile B  | 340  |                         |             |                            | PROJ   | ECT No: WX19432     |           |  |
| LOCA  | ATION: SB Me   | dian, 20m South                             | of Enr      | niski                  | llen DR  | RILL METHOD: 12   | 25mm SSA   |                         |             |                            | ELEV   | ATION: Not Surveyed |           |  |
| SAMF  | PLE TYPE   | Shelby Tu                                   | be          |                        | No Recovery  | SPT (N)   |  | Grab Sample             |             | m                          | Split-Pe   | n Core              |           |  |
| BACK  | FILL TYPE  | Bentonite                                   |             |                        | Pea Gravel   | Drill Outti   | ngs  | Grout                   |             | Ī                          | Slough   | Sand                |           |  |
|   | UNCONFINED COM   | PRESSION (kPa)                              |             |                        |  |   |  |                         |             |                            |  |                     |           |  |
| DEPTH (m)   | 100 200<br>PO20XET PENETH<br>100 200<br>PLASTIC<br>L<br>20 40                      | 80METER (kPa) ⊠<br>) 300 400<br>M.C. LIQUID | SOIL SYNBOL | MUSS                   |  | SOIL<br>DESCRIPTI   |  |                         | SAMPLE TYPE | SAMPLENO                   | SPT (N)  | COMMENTS            | DEPTH (m) |  |
| _ 0   | 40   | 60 80                                       |             | SPH                    | ASPHALT (90mm t  | thick)  |  |                         |             | 1 2                        |  |                     | -         |  |
| KREIS INVESTIGATION 2021 GPJ 2109/28 06:10 AM (WPG - GEOLECH LOG 1 LABELED MC)         VILLET         VILLET | <ul> <li>23</li> <li>23</li> <li>31</li> <li>31</li> <li>34</li> <li>24</li> </ul> |   |             | ж<br>м.<br>ж           | SILT - dayey, lowp<br>- below 1.5m, firm<br>CLAY - silty, high p<br>- from 2.4m to 2.6m<br>TEST HOLE TERM<br>NOTES:<br>Neither sloughing r<br>Test hole remained | plastic, moist, very stiff<br>plastic, damp, very stiff<br>plastic, moist, stiff, bro<br>n, frequent silt layers<br>/INATED AT 3.0M BE<br>nor seepage observed<br>d open to full depth and<br>d with auger outtings a | f, tan-brown<br>wn<br>LOW PAVEN<br>during drilling<br>d was dry prid | )<br>pr to backfilling. |             | 3<br>4<br>5<br>6<br>7<br>8 |  |                     | -1        |  |
|   |  |   |             |                        |  |   |  |                         |             |                            |  |                     |           |  |
| 10 E  |  |   |             |                        |  |   |  |                         |             |                            |  |                     | F         |  |
| 32 M  |  |   |             |                        | nfrastructure S  |   |  |                         |             |                            |  | MPLETION DEPTH: 3 m | 2024      |  |
|   | vood.  | a divisi                                    | on of       | of Wood Canada Limited |  |   | REVIEWED BY: JW<br>Figure No. C13                                    |                         |             |                            | COMPLETION DATE: August 30, 2021<br>Sheet 1 of 1 |                     |           |  |
| 51  |  |   |             |                        |  |   |  |                         |             |                            | 1  |                     |           |  |

| ſ                                      |   | PROJECT: City of Winnipeg 2021 Streets Investigation DRILLER: Maple Leaf Drilling Ltd.  |   |             |                |  |  |  |   | T                | TEST HOLE ID: MN6 |                            |                     |  |                       |
|--|---|---|---|-------------|----------------|--|--|--|---|------------------|-------------------|----------------------------|---------------------|--|-----------------------|
| Ī                                      | CLIEN                                       | CLIENT: Morrison Hershfield   |   |             |                |  |  | DRILL RIG: Mobile B40  |   |                  |                   |                            | PROJECT No: WX19432 |  |                       |
|  | LOCATION: NB Curb, 20m North of Enniskillen |   |   |             |                |  | RILLME   | THOD: 125mm;   | SSA   |                  |                   | E                          | ELEVA               | ATION: Not Surveyed                                |                       |
|  | SAVPLE TYPE Shelby Tube No Recovery         |   |   |             |                |  |  | SPT (N)  | G   | rab Sample       |                   | <u> </u> s                 | Split-Pe            | n Core   |                       |
| Ī                                      | BACK  | (FILL TYPE  | Bentonite   |             |                | Pea Gravel   | E  | Drill Cuttings   | G   | rout             |                   | ms                         | Slough              | <u>رِبْ</u> Sand                                   |                       |
|  | DEPTH (m)                                   | UNCONFINED COM<br>100 200<br>POSOKET PENETT<br>100 200<br>PLASTIC<br>L<br>20 40   | 0 300 400<br>ROMETER (kPa) ⊠<br>0 300 400<br>MC. LIQUID | SOIL SYMBOL | MUSCS          |  |  | SOIL<br>CRIPTION   |   |                  | SAMPLE TYPE       | SAMPLENO                   | SPT (N)             | COMMENTS   | DEPTH (m)             |
|  | _ 0   | 40  |   | 27          | SPH            | ASPHALT (120m<br>CONCRETE (205   | m thick)   |  |   | /                |                   | 1 2                        |                     |  | _                     |
| AM (WPG - GEOTECH LOG 1 (LABELLED MC)) |   | ● 30<br>● 27 (x)<br>3 = 24<br>3 | <ul> <li>▲46</li> </ul>                                 |             | сн<br>ML       | CLAY - silty, high<br>SILT - trace day,<br>CLAY - silty, high<br>sulphate inclusion<br>TEST HOLE TER<br>Neither sloughing<br>Test hole remaine | plastic, mc<br>low plastic,<br>plastic, mc<br>s<br>MINATED.<br>nor seepa<br>d open to f<br>ad with aug | bist, very stiff, brown<br>, moist to very moist,<br>bist, stiff to very stiff,<br>AT 3.0M BELOW P/<br>ge observed during o<br>full depth and was dr<br>fer outtings and bento | brown, occa<br>NVEMENT S<br>trilling<br>v prior to ba | sional<br>WRFACE |                   | 3<br>4<br>5<br>6<br>7<br>8 |                     |  |                       |
| PJ 21/09/28 08:10                      |   |   |   |             |                |  |  |  |   |                  |                   |                            |                     |  | -<br>-<br>-<br>-      |
| SIIGATION 2021.G                       | 6<br><br><br>                               |   |   |             |                |  |  |  |   |                  |                   |                            |                     |  | 6<br><br><br><br><br> |
| - CITY OF WINNIPEG STREETS INVE        |   |   |   |             |                |  |  |  |   |                  |                   |                            |                     |  |                       |
| 432 MORKISON HEKSHFIELU                |   |   |   |             |                | Infrastructure   |  | c  | GED BY: F   |                  |                   |                            |                     | MPLETION DEPTH: 3 m<br>MPLETION DATE: August 30, 2 |                       |
| wood Environment & a division of Wo    |   |   |   |             | ood Canada Lir | Did Canada Limited Figure No. C14  |  |  |   |                  |                   |                            | Sheet 1 of 1        |  |                       |
| >1                                     |   |   |   |             |                |  |  | 1 0  |   |                  |                   |                            | 1                   |  |                       |

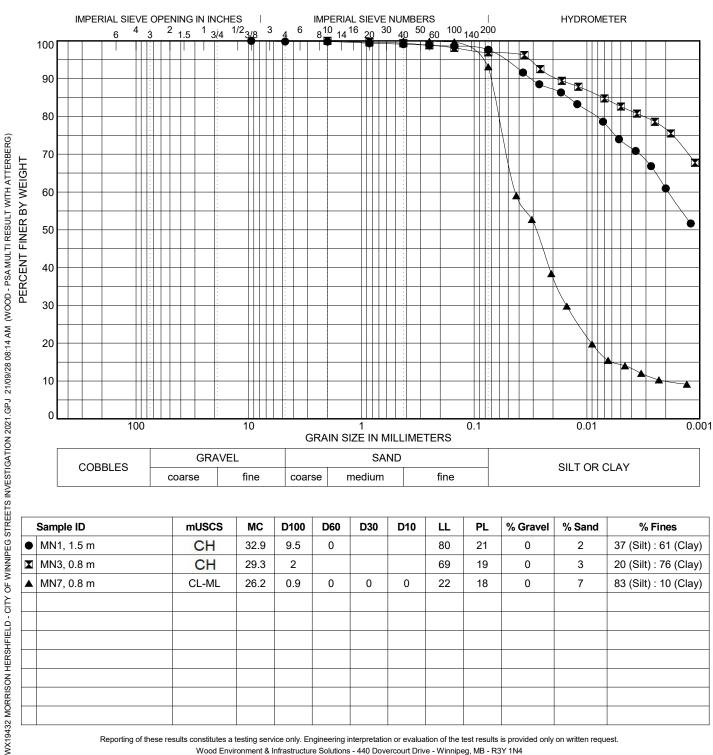
|                        | PROJECT: City of Winnipeg 2021 Streets Investigation       DRILLER: Maple Leaf Drilling Ltd.       TEST HOLE ID: MN7 |                                       |       |   |                       |  |                                   |             |           |                     |  |           |  |  |
|------------------------|--|---------------------------------------|-------|---|-----------------------|--|-----------------------------------|-------------|-----------|---------------------|--|-----------|--|--|
|                        | ENT: Morrison Hershfield   |                                       |       |   | DRILL RIG: Mobile B40 |  |                                   |             |           | PROJECT No: WX19432 |  |           |  |  |
|                        | LOCATION: SB Curb, 5m South of Enniskilen  |                                       |       |   |                       | DRILL METHOD: 125mm SSA                                |                                   |             |           |                     | ELEVATION: Not Surveyed                          |           |  |  |
|                        |  | elby Tube                             |       | No Recov                                      | ery                   | SPT (N)  | Grab Sample                       |             |           | Split-Pe            |  |           |  |  |
| BAC                    | CKFILL TYPE  | ntonite                               |       | Pea Grave                                     | e                     | Drill Outtings   | Grout                             |             |           | Slough              | :: Sand  |           |  |  |
|                        | UNCONFINED COMPRESSION (kPa<br>100 200 300 44  | a) 🔺                                  |       |   |                       |  |                                   |             |           |                     |  |           |  |  |
| Ē                      |  |                                       | S     |   |                       | SOIL   |                                   | SAMPLE TYPE | 2         | <u> </u>            |  | Ē         |  |  |
| DEPTH (m)              | 100 200 300 44   | NT S                                  | MUSCS |   | DE                    | SCRIPTION  |                                   | Ш           | 믭         | SPT (N)             | COMMENTS   | DEPTH (m) |  |  |
| Ë                      | PLASTIC M.C. LIQU  |                                       | Σ     |   |                       |  |                                   | AMP         | SAMPLE NO | S                   |  | Ë         |  |  |
| _ 0                    | 20 40 60 8   | <sub>во</sub>                         | SPF   | ASPHALT (90                                   | mm thick)             |  |                                   | ري<br>ال    |           |                     |  |           |  |  |
| Ē                      |  | 2                                     | GON   | CONCRETE (                                    | 225mm thi             |  |                                   |             | 1         |                     |  | E         |  |  |
| -                      | <b>20</b>  |                                       | сн    | -   |                       | , moist, stiff, dark grey                              |                                   |             | 2         |                     |  | F         |  |  |
| Ē                      | × • • • • • • • • • • • • • • • • • • •  |                                       | T     | SILT - trace day, low plastic, damp to moist, |                       |  | , firm to stiff, tan-brown        |             | 3         |                     |  | -<br>F    |  |  |
| 1                      |  |                                       | ML    | - below 0.9m,                                 | firm                  |  |                                   |             | 4         |                     | Particle Size Analysis - Sample                  | -1        |  |  |
| -                      | , ⊠, ● <sup>30</sup>   |                                       |       |   |                       |  |                                   |             | 4         |                     | 3 @ 0.8m   | -         |  |  |
| -                      |  |                                       | Ц     | CLAY - silty, h                               | igh plastic           | , moist, very stiff, brown                             |                                   |             | 5         |                     | Gravel=0.0%<br>Sand=6.9%                         | Ē         |  |  |
| -                      | <br>⊠ ● <sup>55</sup>  |                                       |       |   | 0.                    | · · · ·  |                                   |             | 6         |                     | Silt= 83.1%<br>Clay= 10.0%                       | -         |  |  |
| 2                      |  |                                       |       | h alau i 0 daa                                |                       |  |                                   |             |           |                     | Cidy_ 10.070                                     | 2         |  |  |
| _                      |  |                                       | СН    | - below 2.1m,                                 | grey                  |  |                                   |             |           |                     |  |           |  |  |
| -<br>                  |  |                                       |       |   |                       |  |                                   |             | 7         |                     |  | F         |  |  |
|                        |  |                                       |       |   |                       |  |                                   |             |           |                     |  |           |  |  |
|                        |  |                                       | 1     |   | ERMINAT               | ED AT 3.0M BELOW PA                                    | VEMENT SURFACE                    | -           |           |                     |  | 3         |  |  |
| - T                    |  |                                       |       |   |                       | epage observed during d                                |                                   |             |           |                     |  | -         |  |  |
| 50                     |  |                                       |       | Test hole remaind                             | ained oper            | n to full depth and was dr<br>auger cuttings and bento | y prior to backfilling.           |             |           |                     |  | Ē         |  |  |
|                        |  |                                       |       | repaired with a                               | asphalt.              |  |                                   |             |           |                     |  | 4         |  |  |
|                        |  |                                       |       |   |                       |  |                                   |             |           |                     |  |           |  |  |
| 1 L                    |  |                                       |       |   |                       |  |                                   |             |           |                     |  | E         |  |  |
|                        |  |                                       |       |   |                       |  |                                   |             |           |                     |  | -         |  |  |
|                        |  |                                       |       |   |                       |  |                                   |             |           |                     |  | _5        |  |  |
| 08:10 AM               |  |                                       |       |   |                       |  |                                   |             |           |                     |  | -         |  |  |
| 1 1 1                  |  |                                       |       |   |                       |  |                                   |             |           |                     |  | Ę         |  |  |
| $\geq$ -               |  | · · · · · · · · · · · · · · · · · · · |       |   |                       |  |                                   |             |           |                     |  |           |  |  |
| <u>-</u> 6             |  |                                       |       |   |                       |  |                                   |             |           |                     |  | _6        |  |  |
| ESIIGATION 2021.GPJ 27 |  |                                       |       |   |                       |  |                                   |             |           |                     |  | Ē         |  |  |
|                        |  |                                       |       |   |                       |  |                                   |             |           |                     |  | E         |  |  |
|                        |  |                                       |       |   |                       |  |                                   |             |           |                     |  | É         |  |  |
| ≝7                     |  |                                       |       |   |                       |  |                                   |             |           |                     |  | _7        |  |  |
| 2 -<br>1 -             |  |                                       |       |   |                       |  |                                   |             |           |                     |  | F         |  |  |
| SIREE IS               |  |                                       |       |   |                       |  |                                   |             |           |                     |  | E         |  |  |
|                        |  |                                       |       |   |                       |  |                                   |             |           |                     |  | E         |  |  |
| -8                     |  |                                       |       |   |                       |  |                                   |             |           |                     |  | -8        |  |  |
|                        |  |                                       |       |   |                       |  |                                   |             |           |                     |  | E         |  |  |
|                        |  |                                       |       |   |                       |  |                                   |             |           |                     |  | F         |  |  |
| 21                     |  |                                       |       |   |                       |  |                                   |             |           |                     |  | Ē         |  |  |
| ⊒ 9<br>±               |  |                                       |       |   |                       |  |                                   |             |           |                     |  | 9         |  |  |
| ¥<br>                  |  |                                       |       |   |                       |  |                                   |             |           |                     |  | É         |  |  |
|                        |  |                                       |       |   |                       |  |                                   |             |           |                     |  | E         |  |  |
|                        |  |                                       |       |   |                       |  |                                   |             |           |                     |  | F         |  |  |
| ž                      | March F  | nvironme                              | ent & | Infrastructu                                  | re Soluti             | IONS   | GED BY: RB                        | 1           |           |                     | MPLETION DEPTH: 3 m                              |           |  |  |
| X194                   |  | a division of W                       |       |   |                       | REV  | REVIEWED BY: JW<br>Figure No. C15 |             |           | α                   | COMPLETION DATE: August 30, 2021<br>Sheet 1 of 1 |           |  |  |
| ≥                      |  |                                       |       |   |                       | i igu  |                                   |             |           |                     |  | 0         |  |  |

### PARTICLE SIZE ANALYSIS



| Report Date: | 28 September 2021   |              |   |
|--------------|---------------------|--------------|---|
| Client       |                     | Project      |   |
| Name:        | Morrison Hershfield | Name:        | City of Winnipeg 2021 Streets Investigation |
| Address:     |                     | Address:     | Mountain Avenue / McGregor Street           |
| Attention:   |                     | Project No.: | WX19432                                     |
| PO Number:   |                     | Manager:     | WL  |

Gradation Specification:



Reporting of these results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. Wood Environment & Infrastructure Solutions - 440 Dovercourt Drive - Winnipeg, MB - R3Y 1N4