Appendix A

Test Hole Logs



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JEFFERSON EAST COMBINED SEWER RELIEF CONTRACT 6A TEST HOLE LOCATION PLAN & SCHEDULE

Date: 2021/12/23 THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT ENGINEERING DIVISION Bid Opportunity 862-2021 Date: 2021

# AECOM Canada Ltd.

# **GENERAL STATEMENT**

# NORMAL VARIABILITY OF SUBSURFACE CONDITIONS

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

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

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

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



# **EXPLANATION OF FIELD & LABORATORY TEST DATA**

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

## 1. NATURAL MOISTURE CONTENT

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

## 2. SOIL PROFILE AND DESCRIPTION

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

# 3. TESTS ON SOIL SAMPLES

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

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



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

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

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

# 4. SOIL DENSITY AND CONSISTENCY

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

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

#### Table 1 Cohesive Soils

#### **Table 2 Cohesionless Soils**

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



# 5. SAMPLE CONDITION AND TYPE

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



# 6. WATER SOLUBLE SULPHATE CONCENTRATION

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

|                      |  |   |                                  |   |  | Performance  | requirements                           | \$\$,§§   |
|----------------------|--|---|----------------------------------|---|--|--|--|---|
|                      |  | Water-soluble                                     | Sulphate (SO4)                   | Water soluble<br>sulphate (SO <sub>4</sub> )<br>in recycled | Cementing  | Maximum e<br>when tested<br>CSA A3004-0<br>Procedure A | xpansion<br>using<br>28<br>at 23 °C, % | Maximum expansion<br>when tested using<br>CSA A3004-C8<br>Procedure B at 5 °C, %<br>††† |
| Class of<br>exposure | Degree of<br>exposure                            | sulphate (SO <sub>4</sub> )†<br>in soil sample, % | in groundwater<br>samples, mg/L‡ | aggregate<br>sample, %                                      | materials to<br>be used§††   | At 6<br>months   | At 12<br>months††                      | At 18 months‡‡  |
| S-1                  | Very severe                                      | > 2.0   | > 10 000                         | > 2.0   | HS** ,HSb,<br>HSLb*** or HSe                                       | 0.05   | 0.10                                   | 0.10  |
| S-2                  | Severe   | 0.20–2.0  | 1500-10 000                      | 0.60-2.0  | HS**, HSb,<br>HSLb*** or HSe                                       | 0.05   | 0.10                                   | 0.10  |
| S-3                  | Moderate<br>(including<br>seawater<br>exposure*) | 0.10–0.20   | 150–1500                         | 0.20-0.60   | MS, MSb, MSe,<br>MSLb***, LH,<br>LHb, HS**, HSb,<br>HSLb*** or HSe | 0.10   |  | 0.10  |

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

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

†In accordance with CSA A23.2-3B.

‡In accordance with CSA A23.2-2B.

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

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



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

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

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

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

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

# 7. SOIL CORROSIVITY

The following table, from the Handbook of Corrosion Engineering (Roberge, 1999) indicates the

corrosivity rating can be obtained from the soil resistivity, presented on the logs.

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

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

## 8. GROUNDWATER TABLE

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



|        | MAJOR DIVISION  |                         | LOG<br>SYMBOLS                        | UCS  | TYPICAL DESCRIPTION   | LABORATORY CLA<br>CRITER                                       | SSIFICATION<br>IA  |  |  |
|--------|---|-------------------------|---------------------------------------|------|---|--|--|--|--|
|        |   | CLEAN<br>GRAVELS        |                                       | GW   | WELL GRADED GRAVELS, LITTLE OR NO<br>FINES  | $C_{u} = \frac{D_{e0}}{D_{10}} > 4 C_{c} = \frac{1}{D_{e0}}$   | $\frac{D_{30}}{0} \frac{1}{2} = 1 \text{ to } 3$                 |  |  |
| N      | GRAVELS<br>(MORE THAN HALF<br>COARSE GRAINS             | (LITTLE OR NO<br>FINES) |                                       | GP   | POORLY GRADED GRAVELS AND GRAVEL-<br>SAND MIXTURES, LITTLE OR NO FINES                  | NOT MEETING ABOVE  | REQUIREMENTS   |  |  |
|        | LARGER THAN<br>4.75 mm)                                 | GRAVELS                 |                                       | GM   | SILTY GRAVELS, GRAVEL-SAND-SILT<br>MIXTURES   | CONTENT OF<br>FINES EXCEEDS                                    | ATTERBERG LIMITS<br>BELOW 'A' LINE<br>W <sub>p</sub> LESS THAN 4 |  |  |
| AINE   |   | WITH FINES              |                                       | GC   | CLAYEY GRAVELS, GRAVEL-SAND-CLAY<br>MIXTURES  | 12%  | ATTERBERG LIMITS<br>ABOVE 'A' LINE<br>W <sub>p</sub> MORE THAN 7 |  |  |
| E GR/  |   | CLEAN SANDS             | 0 $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ | SW   | WELL GRADED SANDS, GRAVELLY SANDS,<br>LITTLE OR NO FINES                                | $C_{u} = \frac{D_{60}}{D_{10}} > 6 C_{c} = \frac{(1)}{D_{10}}$ | $\frac{D_{30}}{D_{0} \times D_{60}}^{2} = 1 \text{ to } 3$       |  |  |
| DARS   | SANDS<br>(MORE THAN HALF                                | (LITTLE R NO<br>FINES)  |                                       | SP   | POORLY GRADED SANDS, LITTLE OR NO<br>FINES  | NOT MEETING ABOVE  | REQUIREMENTS   |  |  |
| ŏ      | COARSE GRAINS<br>SMALLER THAN<br>4.75 mm)               | SANDS                   |                                       | SM   | SILTY SANDS, SAND-SILT MIXTURES   |  | ATTERBERG LIMITS<br>BELOW 'A' LINE<br>W <sub>p</sub> LESS THAN 4 |  |  |
|        |   | WITH FINES              |                                       | SC   | CLAYEY SANDS, SAND-CLAY MIXTURES  | 12%  | ATTERBERG LIMITS<br>ABOVE 'A' LINE<br>W <sub>p</sub> MORE THAN 7 |  |  |
|        | SILTS<br>(BELOW 'A' LINE                                | W∟ < 50                 |                                       | ML   | INORGANIC SILTS AND VERY FINE SANDS,<br>ROCK FLOUR, SILTY SANDS OF SLIGHT<br>PLASTICITY | CLASSIFICATION IS<br>PLASTICITY (<br>(SEE BELC                 | BASED UPON<br>CHART<br>DW)                                       |  |  |
| ILS    | NEĠLIGIBLE ORGANIC<br>CONTENT)                          | W <sub>L</sub> > 50     |                                       | MH   | INORGANIC SILTS, MICACEOUS OR<br>DIATOMACEOUS FINE SANDY OR SILTY SOILS                 |  |  |  |  |
|        |   | W <sub>L</sub> < 30     |                                       | CL   | INORGANIC CLAYS OF LOW PLASTICITY,<br>GRAVELLY, SANDY, OR SILTY CLAYS, LEAN<br>CLAYS    |  |  |  |  |
| RAINE  | CLAYS<br>(ABOVE 'A' LINE NEGLIGIBLE<br>ORGANIC CONTENT) | 30 < W∟ < 50            |                                       | CI   | INORGANIC CLAYS OF MEDIUM PLASTICITY,<br>SILTY CLAYS                                    | WHENEVER THE NATU<br>CONTENT HAS NOT BEE<br>IT IS DESIGN       | RE OF THE FINE<br>EN DETERMINED,<br>IATED                        |  |  |
| Б<br>Ц |   | W <sub>L</sub> > 50     |                                       | СН   | INORGANIC CLAYS OF HIGH PLASTICITY, FAT<br>CLAYS  | E.G. SF IS A MIXTURE<br>SILT OR C                              | OF SAND WITH<br>LAY  |  |  |
| Ľ      | ORGANIC   | $W_L < 50$              |                                       | OL   | ORGANIC SILTS AND ORGANIC SILTY CLAYS<br>OF LOW PLASTICITY                              |  |  |  |  |
|        | SILTS & CLAYS<br>(BELOW 'A' LINE) WL > 50               |                         |                                       | ОН   | ORGANIC CLAYS OF HIGH PLASTICITY  |  |  |  |  |
|        | HIGHLY ORGANIC S  | SOILS                   |                                       | Pt   | PEAT AND OTHER HIGHLY ORGANIC SOILS   | STRONG COLOUR OF<br>OFTEN FIBROUS                              | R ODOUR, AND<br>TEXTURE  |  |  |
|        | BEDROCK   |                         |                                       | BR   | SEE REPORT DE   | SCRIPTION  |  |  |  |
|        | FILL  |                         |                                       | FILL | SEE REPORT DE   | SCRIPTION  |  |  |  |



NOTE: 1. BOUNDARY CLASSIFICATION POSSESSING CHARACTERISTICS OF TWO GROUPS ARE GIVEN GROUP SYMBOLS, E.G. GW-GC IS A WELL GRADED GRAVEL MIXTURE WITH CLAY BINDER BETWEEN 5% AND 12%

| FRAC                 | TION   | SIEVE S           | IZE (mm)   | DEFINING RANGES OF<br>PERCENTAGE BY WEIGHT<br>OF MINOR COMPONENTS |            |  |  |  |  |
|----------------------|--|-------------------|--|---|------------|--|--|--|--|
|                      |  | PASSING           | RETAINED   | PERCENT   | IDENTIFIER |  |  |  |  |
| GRAVEL               | COARSE   | 75                | 19   | 50.05   | 4115       |  |  |  |  |
|                      | FINE   | 19                | 4.75   | 50 - 35   | AND        |  |  |  |  |
| SAND                 | COARSE   | 4.75              | 2.00   | 05 00   | X          |  |  |  |  |
|                      | MEDIUM   | 2.00              | 0.425  | 35 – 20   | Y          |  |  |  |  |
|                      | FINE   | 0.425             | 0.080  | 20 10   | SOME       |  |  |  |  |
| SILT (no             | n-plastic)   |                   |  | 20 - 10   | SOME       |  |  |  |  |
| o                    | r  | 0.0               | 080  | 10 1  | TRACE      |  |  |  |  |
| CLAY (               | plastic)   |                   |  | 10 - 1  | TRACE      |  |  |  |  |
|                      |  | OVERSIZE          | MATERIALS  |   |            |  |  |  |  |
| ROUND<br>COBBI<br>BC | ED OR SUB-ROUN<br>ES 75 mm TO 200<br>OULDERS >200 mm | NDED<br>) mm<br>n | ANGULAR<br>ROCK FRAGMENTS<br>ROCKS > 0.75 m3 IN VOLUME |   |            |  |  |  |  |

## MODIFIED UNIFIED SOIL CLASSIFICATION SYSTEM

August 2015

| LOCATION: UTH 14 - 552300 m. M, 634923 m. E       PROJECT NO:: 665938.         CONTRACTOR: Mepic Loss finding       UPHOD: Cacacrobe 782201 - 125 mmSA.       PROJECT NO:: 665938.         SMAPLE TYPE       Count       Image: Source Source 782201 - 125 mmSA.       Project NO:: 665938.         Image: Source Source 782201 - 125 mmSA.       Project NO:: 665938.       Image: Source Source 782201 - 125 mmSA.       Project NO:: 665938.         Image: Source Source 782201 - 125 mmSA.       Project NO:: 665938.       Project NO:: 665938.       Project NO:: 665938.         Image: Source Source 782201 - 125 mmSA.       Project NO:: 665938.       Project NO:: 665938.       Project NO:: 665938.         Image: Source No:: 605938.       Source No:: 605938.       Project NO:: 605938.       Project NO:: 605938.       Project NO:: 605938.         Image: Source No:: 605938.       Source No:: 605938.       Project NO:: 605938.       Project NO:: 605938.       Project NO:: 605938.         Image: Source No:: 605938.       Source No:: 605938.       Project NO:: 605938.       Project NO:: 605938.       Project NO:: 605938.       Project NO:: 605938.         Image: Source No:: 605938.       Project NO:   | PROJ                                    | ECT:  | Jeffe       | erson East CSR Works (C  | ontract 6A)                        | CL          | len      | T: Ci   | ty of               | Winnipe  | eg   |                             |                                       |   |   | TE                                     | STHOLE NO: TH21-0   | )1        |
|--|---|-------|-------------|--|------------------------------------|-------------|----------|---------|---------------------|--|--|-----------------------------|---------------------------------------|---|---|--|---|-----------|
| CONTRACTOR: Maple Lead Diffling       INETHOD: Cooprode 78/2017 - 128 mm SSA       ELEVATION (m): 231.02         SAMPLE TYPE       ICAR   | LOCA                                    | TION  | I: UT       | M 14 - 5533040 m N, 6349   | 923 m E                            |             |          |         | 5                   | •  | •  |                             |                                       |   |   | PR                                     | OJECT NO.: 6059938  | 85        |
| SAMPLE TYPE       GRAF       Distury Tupe       Source       Distury Tupe       Distury Tupe <thdistury th="" tupe<=""> <thdistury td="" th<="" tupe<=""><td>CONT</td><td>RAC</td><td>TOR</td><td>Maple Leaf Drilling</td><td></td><td>M</td><td>ETH</td><td>OD:</td><td>Geo</td><td>orobe 78</td><td>22DT</td><td>- 12</td><td><u>5 mm</u></td><td>SSA</td><td></td><td>EL</td><td>EVATION (m): 231.02</td><td>2</td></thdistury></thdistury>  | CONT                                    | RAC   | TOR         | Maple Leaf Drilling  |                                    | M           | ETH      | OD:     | Geo                 | orobe 78   | 22DT   | - 12                        | <u>5 mm</u>                           | SSA   |   | EL                                     | EVATION (m): 231.02   | 2         |
| Solution  | SAMP                                    | LE T  | YPE         | GRAB   | SHELBY TUBE                        |             | SPLI     | T SPO   | ON                  |  | BULK   |                             |                                       | Z   | ]NO F   | RECOVE                                 | RY CORE   |           |
| 0       000  | DEPTH (m)                               | USC   | SOIL SYMBOL | SOIL DESC  | CRIPTION                           | SAMPLE TYPE | SAMPLE # | SPT (N) | ◆ SF<br>0 2<br>16 1 | ENETRATIO<br>★ Beck<br>◆ Dynamic<br>T (Standaro<br>(Blows/30<br>■ Total Ur<br>(kN/r<br>7 18<br>Hastic MC<br>0 40 | DN TESTS<br>cone<br>d Pen Te<br>00mm)<br>60 8<br>nit Wt<br>19 20<br>Liquid<br>60 8 | 5<br>st) ♦<br>0 100<br>0 21 | UNDRA                                 | INED Sł<br>+ Tor<br>X Q<br>□ Lab<br>△ Pock<br>● Fielc<br>(k | HEAR S<br>Tvane H<br>U/2 X<br>Vane (<br>et Pen<br>Vane<br>Pa) | TRENGTH<br>⊢<br>. △<br>●               | COMMENTS  | ELEVATION |
| 1       Julic of CLAV-time sind  | = 0                                     | OR    |             | TOPSOIL (75 mm) - black, froz  | zen /                              |             |          |         | ·····               |  |  |                             |                                       |   |   |  |   |           |
| 2       A       Gala       G   | 1                                       | MI-CI |             | SILT and CLAY - trace sand<br>- dark grey, stiff, moist<br>- intermediate plasticity<br>- dark brownish-grey below 0.5   | 5 m                                |             | G1<br>S2 | 11      |                     | •  |  |                             |                                       |   |   |  | SPT Blows: [3/5/6],   | 230       |
| -3       ut       SLT - some day, tace sand<br>- low plastic<br>prove pastic<br>- now molied gree, firm to sift molst<br>- low molied gree, firm to sift molst<br>- grey below 6.1 m       SPT Blows: [34/6],<br>SPT Blows: [223],<br>SPT Blows: [223],<br>SPT Blows: [224],<br>SPT Blows: [1/17],<br>SPT Blows: [1 | ĘŹ                                      |       |             |  |                                    |             | G3       |         |                     |  |  |                             |                                       |   |   | ·                                      |   | 229-      |
| 4       CLV and SLT (Causaline) - trace sand<br>- biom motion (site motion)       227         5       - biom motion (site motion)       S5       6         6       - grey below 6.1 m       - grey below 6.1 m       228         7       - grey below 6.1 m         7       - grey below 10.7 m         7       - soft to firm below 10.7 m       - soft to firm below 10.7 m       - grey below 10.7 m       - grey below 10.7 m         7       - soft to firm below 10.7 m       - grey below 5.1 m       - grey below 10.7 m  | -3                                      | ML    |             | SILT - some clay, trace sand<br>- light brown, firm to stiff, moist<br>- low plasticity                                  | 1                                  |             | S4       | 9       |                     |  |  |                             |                                       |   |   |  | SPT Blows: [3/4/5],<br>Spoon Recovery: 78%  | 228 -     |
| -5       - grey below 6.1 m  | 4                                       |       |             | CLAY and SILT (Lacustrine) -<br>- brown mottled grey, firm to st<br>- high plasticity<br>- trace silt inclusions (<15 mm | trace sand<br>iff, moist<br>diam.) |             | CE.      | 4       |                     |  |  |                             |                                       |   |   |  | SDT Player (2/2/2)  | 227 -     |
| - grey below 6.1 m       - grey below 6.1 m       225         - 7       - grey below 6.1 m       - grey below 6.1 m       10b Recovery 92%, 70% Sand 3.0%, Sand 3.   | -5                                      |       |             |  |                                    |             | 55       | 0       |                     |  |  |                             |                                       |   | · · · · · · · · · · · · · · · · · · ·                         |  | Spoon Recovery: 100%  | 226 -     |
| 8       11   | -6<br>                                  |       |             | - grey below 6.1 m   |                                    |             | G6       |         |                     |  |  |                             |                                       |   |   |  |   | 225 -     |
| 9       CH-MH       - soft to firm below 10.7 m       G8       S9       2       2       2       2       2       2       2       2       2  | 12/22/21                                |       |             |  |                                    |             | T7       |         |                     | •  |  |                             |                                       | ×   | · · · · · · · · · · · · · · · · · · ·                         | ······································ | Tube Recovery: 92%,<br>(T7): Gravel 0.0%, Sand<br>3.0%, Silt 35.5%, Clay<br>61.5% | 223 -     |
| 10       Image: Second se   | 09.<br>                                 | CH-MF |             |  |                                    |             | G8       |         |                     | ٠  |  |                             |                                       |   |   | · · · · · · · · · · · · · · · · · · ·  |   | 222 -     |
| 12       610       219         13       11       11       11         15       15       10       11         15       15       10       11         15       15       10       11         16       15       10       11         17       15       10       11         10       10       11       11         15       10       11       11         15       10       11       11         15       10       11       11         15       10       11       11         16       11       11       11         10       11       11       11         10       11       11       11         10       11       11       11         10       11       11       11       11         10       11       11       11       11       11         10       11       11       11       11       11       11         10       11       11       11       11       11       11       11       11         10   | ACT 6A.GPJ (                            |       |             | - soft to firm below 10.7 m  |                                    |             | S9       | 2       | •                   | •  |  |                             |                                       |   |   |  | SPT Blows: [1/1/1],   | 221 -     |
| 13       13       11 <td< td=""><td>1002 - CONIL</td><td></td><td></td><td></td><td></td><td></td><td>G10</td><td></td><td></td><td>•</td><td></td><td></td><td></td><td></td><td></td><td>· · · · · · · · · · · · · · · · · · ·</td><td></td><td>219 -</td></td<>  | 1002 - CONIL                            |       |             |  |                                    |             | G10      |         |                     | •  |  |                             |                                       |   |   | · · · · · · · · · · · · · · · · · · ·  |   | 219 -     |
| LOGGED BY: Ryan Harras COMPLETION DEPTH: 20.27 m<br>REVIEWED BY: Faris Alobaidy COMPLETION DATE: 12/3/21   | OLE 60593385 - TEST F<br>11<br>14<br>14 |       |             |  |                                    |             | T11      | I       |                     |  | •  |                             | · · · · · · · · · · · · · · · · · · · | ×   |   |  | Tube Recovery: 100%   | 218 -     |
| LOGGED BY: Ryan Harras COMPLETION DEPTH: 20.27 m<br>EREVIEWED BY: Faris Alobaidy COMPLETION DATE: 12/3/21  | <u>F 15</u>                             |       | 11          |  |                                    |             |          |         |                     |  |  |                             |                                       |   | <u></u>   | · · · · · · · · · · · · · · · · · · ·  |   |           |
|  |   |       |             |  | 4                                  |             |          |         |                     |  | : Ryan   | Harr                        | as                                    | ,   |   |  | ETION DEPTH: 20.27 m  |           |
| PROJECT ENGINEER: Jordan T. Page 1 of  | 000                                     |       |             |  |                                    |             |          |         | PR                  | JECT EN  | VGINEI   | ER:                         | Jordan                                | T.  | -+  | COIVIPL                                | Page  | 1 of 2    |

| PROJ  | ECT:   | Jeffe       | erson East CSR Works (Contract 6  | A) (   | LIEN                     | NT: C   | ity o          | f Winr   | nipeg   |  |             |  |   | TE                    | STHOLE NO: TH21-0                             | )1  |
|---|--|-------------|---|--|--------------------------|---------|----------------|--|---|--|-------------|--|---|-----------------------|---|---|
| LOCA  |  | : UT        | Manla L act Drilling  |  |                          |         |                |  |   |  |             |  |   | PR                    | OJECT NO.: 6059938                            | 35  |
| CONT  |  |             |   |  | <u>/ETF</u><br>Zedi      | HOD:    |                | probe  | 27822   | <u>2DT - 12</u>  | 25 mm       | <u>1 SSA</u>   |   |                       | EVATION (m): $231.02$                         | -   |
| DEPTH (m)   | nsc  | SOIL SYMBOL | SOIL DESCRIPT   |  | SAMPLE #                 | SPT (N) | ◆ S<br>0<br>16 | PENETF<br>* E<br>\$ Dyna<br>PT (Star<br>(Blov<br>20 4)<br>Tota<br>(17 18<br>Plastic<br>20 4) | RATION<br>Becker<br>amic Cc<br>ndard P<br>ws/300n<br>0 60<br>al Unit V<br>kN/m)<br>3 19<br>MC<br>0 60 | TESTS<br>#<br>pone<br>ten Test)<br>mm)<br>0 80 10<br>Wt ■<br>20 2<br>Liquid<br>0 80 10 | UNDR/<br>00 | L<br>AINED SH<br>+ Tor<br>X Qi<br>□ Lab<br>△ Pocku<br>● Field<br>(ki<br>50 1 | IEAR ST<br>vane +<br>U/2 X<br>Vane □<br>et Pen. 2<br>Vane <b>₽</b><br>Pa)<br>00 1 | RENGTH<br>△<br>50 200 | COMMENTS                                      | ELEVATION   |
| 15       15         15       16         16       17         17       18         18       19         20       21         21       22         23       24         24       25         26       27         27       28         28       29         30       30 | TILL   |             | SILT (Till) - some clay, some gravel, trace<br>- light brown, very stiff, moist<br>- low plasticity<br>END OF TEST HOLE AT 20.27 m IN SIL<br>Notes:<br>1. Seepage observed below 18.3 m durin<br>2. Sloughing observed below 3.7 m durin<br>3. Test hole backfilled with auger cuttings<br>upon completion. | e sand<br>F (Till)<br>g augering.<br>and bentonite | G12<br>G13<br>G14<br>S15 | 29      |                |  |   | N  |             |  |   |                       | SPT Blows: [9/13/16],<br>Spoon Recovery: 100% | 215 -<br>214 -<br>213 -<br>212 -<br>211 -<br>210 -<br>209 -<br>208 -<br>209 -<br>208 -<br>207 -<br>206 -<br>206 -<br>205 -<br>206 -<br>205 -<br>204 -<br>203 -<br>203 -<br>203 -<br>203 - |
| L0G 0F  | AECOM<br>REVIEWED BY: Faris Alobaidy<br>COMPLETION DATE: 12/3/21<br>PROJECT ENGINEER: Jordan T.<br>Page 2 of 2 |             |   |  |                          |         |                |  |   |  |             |  |   |                       |   |   |

| PROJ   | ECT:  | Jeffe       | erson East CSR Works (C   | contract 6A)   | С           | LIEN     | T: C    | ity of              | Winr  | nipeg  |   |                    |      |  |   | TE                                    | STHOLE NO: TH21-0   | )2        |
|--|---|-------------|---|--|-------------|----------|---------|---------------------|---|--|---|--------------------|------|--|---|---------------------------------------|---|-----------|
| LOCA   | TION  | I: UT       | M 14 - 5533306 m N, 635   | 064 m E  |             |          |         |                     |   |  |   |                    |      |  |   | PF                                    | ROJECT NO.: 6059938   | 35        |
| CONT   | RAC   | TOR         | Maple Leaf Drilling   |  | M           | ETH      | OD:     | Geo                 | probe   | e 7822   | 2DT - 1   | 125                | mm S | <u>SSA</u>   |   | EL                                    | EVATION (m): 230.95   | )         |
| SAMP   | PLE T   | YPE         | GRAB  | SHELBY TUBE  |             | SPLI     | T SPO   | ON                  |   | BU   | LK  |                    |      | $\square$  | NO F  | RECOVE                                | RY CORE   |           |
| DEPTH (m)  | USC   | SOIL SYMBOL | SOIL DES  | CRIPTION   | SAMPLE TYPE | SAMPLE # | SPT (N) | ♦ SI<br>0 :<br>16 1 | PENETF<br>★ Dyna<br>PT (Star<br>(Blow<br>20 41<br>■ Tota<br>(7 18<br>Plastic<br>20 41<br>(1)<br>(2)<br>(2)<br>(2)<br>(2)<br>(3)<br>(3)<br>(3)<br>(3)<br>(3)<br>(3)<br>(3)<br>(3 | RATION<br>Becker 3<br>amic Co<br>ndard Pe<br>vs/300m<br>0 60<br>al Unit V<br>kN/m)<br>3 19<br>MC | TESTS<br>★<br>ne ◇<br>en Test) •<br>nm)<br>80 1<br>Vt ■<br>20<br>Liquid | ◆<br>100<br>21     |      | NED SH<br>+ Torv<br>X QL<br>□ Lab '<br>Δ Pocke<br>P Field<br>(KF | EAR S<br>vane <del> </del><br>J/2 X<br>Vane [<br>et Pen.<br>Vane<br>Pa) |                                       | COMMENTS  | ELEVATION |
| = 0  | OR  | Ì           | TOPSOIL (100 mm) - black, fr  | ozen /   |             |          |         |                     | 20 41   |  | 80 1  |                    |      |  |   | 150 20                                |   |           |
| -1   | MI-CI   |             | SILT and CLAY - trace sand<br>- dark grey, firm, moist<br>- intermediate plasticity<br>- dark brownish-grey below 1.                                      | 2 m  |             | G1       | ,       |                     | •   |  |   |                    |      |  |   | · · · · · · · · · · · · · · · · · · · | ·<br>·<br>·<br>·  | 230-      |
| -2   |   |             | CLAY and SILT (Lacustrine)  | trace sand   |             | G3       | 6       | •                   | •   |  |   |                    |      |  | · · · · · · · · · · · · · · · · · · ·                                   | · · · · · · · · · · · · · · · · · · · | SP1 Blows: [3/2/4],<br>Spoon Recovery: 33%<br>(G3): Gravel 0.0%, Sand<br>3.4%, Silt 56.8%, Clay | 229       |
| E-3  | <ul> <li>blown motiled grey, inni, moist</li> <li>high plasticity</li> <li>trace silt inclusions (&lt;15 mm diam.)</li> <li>soft below 3.1 m</li> </ul> |             |   |  |             |          | 2 •     | •                   |   | •  |   |                    |      |  |   |                                       | SPT Blows: [1/1/1],<br>Spoon Recovery: 67%  | 228       |
| -4   |   |             |   |  |             | G5       |         |                     |   |  |   |                    |      |  |   |                                       |   | 227       |
| 6  |   |             | - grey below 6.1 m  |  |             | T6       |         |                     |   | •  |   |                    |      |  |   |                                       | Tube Recovery: 83%  | 225 -     |
| 17<br>17<br>18   | CH-MF   |             | - soft below 7.6 m  |  |             | G7       |         |                     |   | •  |   |                    |      |  |   | · · · · · · · · · · · · · · · · · · · |   | 224       |
| AA WINN.GDT 12/22  |   |             |   |  | X           | S8       | 2 •     | •                   |   | •  | I   |                    |      |  |   | · · · · · · · · · · · · · · · · · · · | SPT Blows: [0/1/1],<br>Spoon Recovery: 100%,<br>(S8): Gravel 0.0%, Sand                         | 222 -     |
| 010  |   |             |   |  |             | G9       |         |                     |   | •  |   |                    |      |  |   |                                       | À.4%, Silt 47.8%, Clay<br>47.8%   | 221-      |
| 12 - 2008 - 200<br>1015 - 2008 - 200                       |   |             |   | F. m IN CLAY and SILT  | X           | S10      | 2 ·     | •                   |   | •  |   |                    |      |  |   |                                       | SPT Blows: [0/1/1],<br>Spoon Recovery: 78%  | 219       |
| н ноге 60593385 - техн<br>11<br>11<br>12<br>12<br>12<br>12 |   |             | END OF TEST HOLE AT 12.6<br>Notes:<br>1. Seepage not observed duri<br>2. Sloughing not observed du<br>3. Test hole backfilled with au<br>upon completion. | ng augering.<br>ring augering.<br>ring augering.<br>ger cuttings and bentonite |             |          |         |                     |   |  |   |                    |      |  |   |                                       |   | 218 -     |
| TES  |   |             |   |  |             |          |         | LO                  | GGED  | BY: F  | Ryan Ha   | arra               | S    |  |   | COMPL                                 | ETION DEPTH: 12.65 m  |           |
| GOF  |   |             | AECON   |  |             | RE       | /IEWE   | DBY                 | Faris   | Alot   | baidy   |                    |      | COMPL  | ETION DATE: 12/1/21   |                                       |   |           |
| Ö  |   |             |   |  |             |          | PR(     | DJECT               | f eng   | INEER:   | : Jo  | ordan <sup>-</sup> | Г.   |  |   | Page                                  | 1 of 1  |           |

| PROJ                                   | ECT:  | Jefferso               | n East CSR Works (Co  | ontract 6A)               | С           | LIEN         | IT: C   | ity of                   | Winnip   | eg   |  |                                       |   |   | TE      | STHOLE NO: TH21-0   | )3        |
|--|-------|------------------------|---|---------------------------|-------------|--------------|---------|--------------------------|----------|--|--|---------------------------------------|---|---|---------|---|-----------|
| LOCA                                   |       | I: UTM 1               | 4 - 5533517 m N, 6351   | 69 m E                    |             |              |         |                          |          |  |  |                                       |   |   | PR      | OJECT NO.: 6059938  | 35        |
| SAME                                   |       | VDE                    |   |                           | N<br>▽      | 1ETH<br>1sdu | IOD:    | Geop                     | probe 7  | 822D<br>עוווס  | T - 12   | 25 mm                                 | <u>SSA</u>  |   |         | EVATION (m): $230.89$   | )         |
| BACK                                   |       |                        |   |                           |             |              |         |                          |          |  | IT   |                                       |   |   |         |   |           |
| DEPTH (m)                              | nsc   | SOIL SYMBOL<br>SLOTTED | SOIL DES  | SCRIPTION                 | SAMPLE TYPE | SAMPLE #     | SPT (N) | ● SF<br>0 2<br>16 1<br>F | PENETRAT | ION TES<br>ker ¥<br>c Cone<br>rd Pen T<br>300mm)<br>60<br>Init Wt<br>19<br>19<br>20<br>Liq | TS<br>rest) ♦<br>80 100<br>80 21<br>20 21<br>uid |                                       | INED SH<br>+ Torr<br>X QI<br>□ Lab<br>Δ Pocke<br>● Field<br>(kl | EAR ST<br>vane +<br>J/2 X<br>Vane ⊑<br>ot Pen<br>Vane <b>€</b><br>Pa) | TRENGTH | COMMENTS  | ELEVATION |
| = 0                                    | OR    |                        | TOPSOIL (125 mm) - bla  | ack, frozen               |             |              |         | 2                        | 0 40     | 60   | 80 100   | ) <u>5</u>                            | 0 1   | 00 1  | 150 200 |   | =         |
| -1                                     | MI-CI |                        | SILT and CLAY - trace s<br>- dark grey, firm to stiff, r<br>- intermediate plasticity<br>- dark brownish-grey bel | and<br>noist<br>low 1.1 m |             | G1           |         |                          | •        |  |  |                                       |   | · · · · · · · · · · · · · · · · · · ·                                 |         |   | 230       |
| -2                                     | ML    | И                      | SILT - some clay, trace s<br>- light brown, firm, moist<br>- low plasticity<br>CLAY and SILT (Lacustr             | rine) - trace sand        |             | S2<br>G3     | 5       | Фн                       | •        |  |  |                                       |   | · · · · · · · · · · · · · · · · · · ·                                 | ÷       | SPT Blows: [3/2/3],<br>Spoon Recovery: 67%<br>(G3): Gravel 0.0%, Sand<br>5.0%, Silt 83.5%, Clay | 229       |
| 3                                      |       |                        | - grey, firm, moist<br>- high plasticity<br>- trace silt inclusions (<1   | 5 mm diam.)               | X           | S4           | 6       | •                        |          |  |  |                                       |   |   |         | 11.5%<br>SPT Blows: [3/3/3],<br>Spoon Recovery: 100%  | 228       |
| 4                                      |       |                        |   |                           |             | -            |         |                          |          |  |  |                                       |   | · · · · · · · · · · · · · · · · · · ·                                 |         |   | 227       |
| 5                                      |       |                        |   |                           |             | S5           | 4       | •                        |          |  |  |                                       |   | · · · · · · · · · · · · · · · · · · ·                                 | ÷       | SPT Blows: [2/2/2],<br>Spoon Recovery: 100%   | 226       |
|  |       | Î<br>Î<br>Î            |   |                           |             | T6           |         |                          | <b> </b> | •  |  | >                                     |   |   |         | Tube Recovery: 92%  | 225       |
| 2/22/21<br>0                           |       |                        | - soft to very soft from 4.   | 6 m to 10.7 m             | X           | S7           | 1 •     | •                        |          |  |  |                                       |   | · · · · · · · · · · · · · · · · · · ·                                 |         | SPT Blows: [0/0/1],<br>Spoon Recovery: 100%   | 223       |
| WINN.GDT 1                             | CH-MH |                        |   |                           |             | G8           |         |                          |          |  |  |                                       |   |   |         |   | 222       |
| A.GPJ UMA                              |       |                        |   |                           |             |              |         |                          |          |  |  |                                       |   | ·····   |         |   | 221       |
| CONTRACT 6                             |       |                        | - firm below 10.7 m   |                           | X           | S9           | 2       | •                        | •        | · · · · · · · · · · · · · · · · · · ·  |  |                                       |   | · · · · · · · · · · · · · · · · · · ·                                 | ÷       | SPT Blows: [0/1/1],<br>Spoon Recovery: 67%  | 220       |
| 12<br>HOLE LOGS - O                    |       |                        |   |                           |             | G10          |         |                          | 1 1      | D  |  |                                       |   |   |         | (G10): Gravel 0.0%,<br>Sand 6.2%, Silt 46.5%,<br>Clay 47.3%                                     | 219       |
| 13<br>13<br>13<br>14<br>14             |       |                        |   |                           |             | T11          |         |                          |          | •  |  | · · · · · · · · · · · · · · · · · · · |   | · · · · · · · · · · · · · · · · · · ·                                 |         | Tube Recovery: 92%  | 217       |
| 9 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII |       |                        |   |                           |             |              |         |                          |          | V. Duo   |  | rac                                   |   |   |         |   | 216       |
| 3 OF T                                 |       |                        | AECOM   |                           |             |              |         | REV                      | IEWED    | т. куа<br>ВҮ: F  | aris Al  | i as<br>Iobaidy                       |   | (   | COMPL   | ETION DEPTH: 20.27 M<br>ETION DATE: 12/1/21   |           |
| ĕ                                      |       |                        |   | -                         |             |              |         | PRC                      | JECT E   | NGIN   | ER: 、  | Jordan                                | Т.  |   |         | Page  | 1 of 2    |

| PROJ                 | OJECT: Jefferson East CSR Works (Contract 6A)<br>CATION: UTM 14 - 5533517 m N, 635169 m E<br>NTRACTOR: Maple Leaf Drilling |                       |                       |   |  |                             | LIEN  | IT: C   | ity of                    | Winnip  | eg  |                                       |   |  |   | TE  | STHOLE NO: TH21-0  | )3        |
|----------------------|--|-----------------------|-----------------------|---|--|-----------------------------|---|---------|---------------------------|---------|---|---------------------------------------|---|--|---|---|--|-----------|
| LOCA                 | TION   | 1: U                  | FM 14                 | - 5533517 m N, 63516  | 59 m E   |                             |   |         |                           |         |   |                                       |   |  |   | PR  | OJECT NO.: 6059938   | 85        |
| CONI                 |  |                       | : Map                 | le Leaf Drilling  |  | <u>N</u>                    | 1ETH  | OD:     | Geop                      | orobe 7 | 822DT   | - 12                                  | 5 mm  | SSA  | 1   | EL  | EVATION (m): 230.89  | )         |
| SAMP                 |  | TVD                   |                       | GRAB  |  |                             |   |         | ON                        |         |   | -                                     |   |  |   | RECOVE  |  |           |
| BACK                 |  |                       | E<br>T 1              | BENTONITE   | GRAVEL   | Т                           | JSLO  | UGH     |                           |         | GROUT   |                                       |   |  |   | TINGS   | [:-]SAND   | I         |
| DEPTH (m)            | USC  | SOIL SYMBOL           | SLOTTED<br>PIEZOMETER | SOIL DES  | SCRIPTION  | SAMPLE TYPE                 | SAMPLE #  | SPT (N) | ◆ SF<br>0 2<br>16 1;<br>F |         | c Cone<br>c Cone<br>ird Pen Te<br>300mm)<br><u>60</u> 8<br>Jnit Wt<br><u>19</u> 20<br>C Liquic<br><u>60</u> 8 | sst) ♦<br>0 100<br>0 21<br>d<br>0 100 |   | + Toi<br>× C<br>□ Lab<br>△ Pock<br>④ Field<br>(k<br>50 | nEAK S<br>rvane <del> </del><br>QU/2 X<br>Vane [<br>ket Pen.<br>d Vane<br>KPa)<br>100 | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | COMMENTS   | ELEVATION |
| E 15                 |  |                       |                       |   |  |                             | G12   |         |                           |         |   |                                       |   |  |   |   | 1<br>•<br>•  |           |
| -16                  | CH-MI  |                       |                       |   |  |                             | C12   |         |                           |         |   |                                       |   |  | ······  | · · · · · · · · · · · · · · · · · · ·   |  | 215 -     |
| 17                   |  |                       |                       | - trace to some silt till incl<br>below 16.8 m  | lusions (<10 mm diam.)   |                             | 013   |         |                           |         |   |                                       |   |  | ·····   |   |  | 214 -     |
|                      | 18<br>SILT (Till) - some clay, some gravel, trace sand<br>- light brown, very stiff, moist                                 |                       |                       |   | ome gravel, trace sand<br>oist   |                             | G14   |         |                           |         |   |                                       |   |  | ······<br>······<br>······  |   | 1<br>-<br>-<br>-<br>-<br>-   | 213-      |
| -19                  | TILL   |                       |                       | - low plasticity  |  |                             | -   |         |                           |         |   |                                       |   |  | ·····   |   | ·<br>·<br>·<br>·   | 212-      |
| -20                  |  | .01.0<br><u>0</u> .90 |                       | - hard below 19.8 m<br>END OF TEST HOLE AT<br>Notes:  | 20.27 m IN SILT (Till)   | X                           | S15   | 34      |                           | ••      |   |                                       |   | · · · · · · · · · · · · · · · · · · ·                  | ·····   | · · · · · · · · · · · · · · · · · · ·   | SPT Blows: [12/16/18],<br>Spoon Recovery: 67%,<br>(S15): Gravel 14.0%,<br>Sand 4.6%, Silt 65.0%, | 211       |
| -21                  |  |                       |                       | <ol> <li>Standpipe piezometer<br/>completion. Test hole bai<br/>m to 19.1 m, bentonite frr<br/>sand from 0.3 m to 0.2 m<br/>installed.</li> </ol> | during augering.<br>d during augering.<br>SP21-03 installed upon<br>ckfilled with sand from 18.6<br>om 19.1 m to 0.3 m, and<br>. Flush-mount cover |                             |   |         |                           |         |   |                                       |   |  |   |   | Clay 16.4%   | 210 -     |
| -23                  |  |                       |                       | 4. Groundwater monitorir<br>- December 17, 2021 a<br>bgs)   | ıg:<br>at elev. 224.71 m (6.18 m   |                             |   |         |                           |         |   |                                       |   |  |   |   | -<br>-<br>-<br>-<br>-<br>-   | 208 -     |
| 24<br>105.NNN        |  |                       |                       |   |  |                             |   |         |                           |         |   |                                       |   | ·····  |   |   | -  | 207 -     |
| 25<br>25<br>25       |  |                       |                       |   |  |                             |   |         |                           |         |   |                                       |   |  | · · · · · · · · · · · · · · · · · · ·   | · · · · · · · · · · · · · · · · · · ·   |  | 206 -     |
| 26                   |  |                       |                       |   |  |                             |   |         |                           |         |   |                                       |   |  | ·····   |   |  | 205 -     |
| 27<br>27<br>27       |  |                       |                       |   |  |                             |   |         |                           |         |   |                                       |   |  | · · · · · · · · · · · · · · · · · · ·   |   |  | 204 -     |
| 0H - 28              |  |                       |                       |   |  |                             |   |         |                           |         |   |                                       |   |  | ·····   |   |  | 203 -     |
| 29<br>266609<br>2010 |  |                       |                       |   |  |                             |   |         |                           |         |   |                                       |   |  | ·····   |   |  | 202 -     |
|                      | 30   |                       |                       |   |  |                             |   |         |                           |         |   |                                       |   | 201 -  |   |   |  |           |
| 5                    |  |                       |                       |   |  |                             | LOGGED BY: Ryan Harras COMPLETION DEPTH: 2<br>REVIEWED RY: Earls Alabaidy COMPLETION DATE: 12 |         |                           |         |   |                                       | ETION DEPTH: 20.27 m<br>FTION DATE: 12/1/21 |  |   |   |  |           |
| 00                   |  |                       |                       |   |  | PROJECT ENGINEER: Jordan T. |   |         |                           |         |   |                                       |   |  | Page  | 2 of 2  |  |           |

| PROJ   | ECT:  | Jeffe       | erson East CSR Works (Contract 6A)   |             | CL           | IEN      | T: Ci   | ity of              | Winn   | ipeg  |  |             |                                      |   | T  | ESTHOLE NO: TH21-0   | )4             |
|--|-------|-------------|--|-------------|--------------|----------|---------|---------------------|--|---|--|-------------|--------------------------------------|---|--|--|----------------|
| LOCA   | TION  | I: UT       | M 14 - 5533701 m N, 635249 m E   |             | 1            |          |         |                     |  |   |  |             |                                      |   | F  | ROJECT NO.: 6059938  | 85             |
| CONT   | RAC   | TOR         | Maple Leaf Drilling  |             | M            | ETH(     | OD:     | Geo                 | probe  | 7822  | 2DT - 1  | 25 r        | nm SS                                | A   | E  | LEVATION (m): 231.06                                       | 5              |
| SAMP   | PLE T | YPE         | GRAB IIIISHEL  | BY TUBE     |              | SPLI     | r spo   | ON                  |  | BU  | ILK  |             |                                      | <u>/</u> NO   | RECOV  | ERY CORE   |                |
| DEPTH (m)  | USC   | SOIL SYMBOL | SOIL DESCRIPTIO  | N           | SAMPLE TYPE  | SAMPLE # | SPT (N) | ◆ SI<br>0 :<br>16 1 | PENETR<br>* B<br>Dyna<br>T (Stan<br>(Blow<br>20 40<br>Tota<br>(I<br>7 18<br>Plastic<br>20 40 | ATION<br>ecker 3<br>mic Cc<br>dard P<br>s/300n<br>60<br>I Unit V<br>(N/m <sup>3</sup> )<br>19<br>MC<br>60 | TESTS<br>★<br>one ◇<br>en Test) ◀<br>nm)<br>80 10<br>Vt ■<br>Liquid<br>Liquid<br>80 10 | UN 00 21 00 | DRAINED<br>+ '<br>⊃ L<br>△ Po<br>● F | SHEAR<br>Torvane<br>(QU/2 ><br>ab Vane<br>ocket Pe<br>field Van<br>(kPa)<br>100 | STRENG<br>++<br>←<br>en. △<br>e ●<br>150 (2) | COMMENTS   | ELEVATION      |
| E 0  | OR    | Ì           | TOPSOIL (100 mm) - black, frozen   | /           |              |          |         |                     | 20 40  |   |  |             |                                      |   | 150 2  |  | -              |
| -1   | MI-CI |             | SILT and CLAY - trace sand<br>- dark grey, firm to stiff, moist<br>- intermediate plasticity<br>- brown below 0.6 m  |             |              | G1<br>G2 |         |                     | •  |   |  |             |                                      |   |  |  | 230 -          |
| -2   | ML    |             | SILT - some clay, trace sand<br>- light brown, soft to firm, moist<br>- low plasticity   |             |              | G3<br>G4 |         |                     | •  |   |  |             |                                      |   |  |  | 229 -          |
| 4  |       |             | CLAY (Lacustrine) - silty, trace sand<br>- grey, firm, moist<br>- high plasticity  |             |              |          |         |                     |  |   |  |             |                                      |   |  |  | 227 -          |
| 5  |       |             | - trace silt inclusions (<15 mm diam.)<br>- brown from 4.6 m to 6.1 m  | -           |              | T5       |         |                     |  |   |  |             | *                                    |   |  | Tube Recovery: 100%  | 226 -          |
| -6   |       |             | - grey, soft to firm below 6.1 m   |             |              | G6       |         |                     | ť  |   |  |             |                                      |   |  | (G6): Gravel 0.0%, Sand<br>1.2%, Silt 32.9%, Clay<br>65.9% | 225 -<br>224 - |
| 12/22/21<br>11111111111111111<br>8                                 | СН    |             |  | ×<br>Z      | X            | S7       | 1 •     | •                   |  | •   |  |             |                                      |   |  | SPT Blows: [0/0/1],<br>Spoon Recovery: 100%                | 223 -          |
| TUD. MINN.GDT<br>TUD. TUD. TUD. TUD. TUD. TUD. TUD. TUD.           |       |             |  | -           |              | Т8       |         | <b>I</b>            |  | •   |  |             | ×                                    |   |  | Tube Recovery: 100%  | 222-           |
| NTRACT 6A.GPJ  |       |             |  |             |              | G9       |         |                     |  | •   |  |             |                                      |   |  |  | 220 -          |
| 12<br>   |       |             |  |             | $\mathbf{X}$ | S10      | 1 •     | •                   | •  |   |  |             |                                      |   |  |  | 219            |
| личина (1000)<br>11 13<br>14 14 14 14 14 14 14 14 14 14 14 14 14 1 |       |             | END OF TEST HOLE AT 12.65 m IN CLAY<br>Notes:<br>1. Seepage not observed during augering.<br>2. Sloughing not observed during augering.<br>3. Test hole backfilled with auger cuttings and<br>upon completion. | l bentonite |              |          |         |                     |  |   |  |             |                                      |   |  |  | 218 -          |
| 1 TEC  |       |             |  |             |              |          |         | LO                  | GGED   | BY: I   | Ryan Ha  | arras       |                                      |   | COMF   | PLETION DEPTH: 12.65 m                                     |                |
| REVIEWED BY: Faris Alobaidy  |       |             |  |             |              |          |         |                     |  |   | COMPLETION DATE: 11/30/21<br>Page 1 of 1   |             |                                      |   |  |  |                |
| ĭL   |       |             |  |             |              |          |         |                     | JJL01  | LING  |  | JUI         | Jun I.                               |   | гауе   | IUI  |                |

| LOCATION: UTM 14 - 5533781 m N, 635048 m E<br>CONTRACTOR: Maple Leaf Drilling METHOD: Mobile B-40L<br>SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON<br>BACKFILL TYPE BENTONITE GRAVEL SLOUGH<br>E COLL DECODIDITION  | PROJECT NO.: 60599385<br>DLX - 125 mm SSA ELEVATION (m): 230.88<br>BULK  ORECOVERY CORE<br>GROUT  CUTTINGS SAND<br>ION TESTS<br>INDRAINED SHEAR STRENGTH<br>+ Torvane +<br>× QU/2 ×<br>I Lab Vane □<br>Δ Pocket Pen. Δ<br>● Field Vane €<br>19 20 21 ((Pa))  | LION                                    |  |  |
|---|--|---|--|--|
| CONTRACTOR: Maple Leaf Drilling       METHOD: Mobile B-401         SAMPLE TYPE       GRAB       SHELBY TUBE       SPLIT SPOON         BACKFILL TYPE       BENTONITE       GRAVEL       SLOUGH         (a)       (b)       (c)       (c)       (c)         (b)       (c)       (c)       (c)       (c)         (c)       (c)       (c)       (c)       (c)       (c)         (c)       (c)       (c)       (c)       (c)       (c)       (c)         (c)       (c)       (c)       (c)       (c)       (c)       (c)       (c)         (c)<  | DLX - 125 mm SSA     ELEVATION (m): 230.88       BULK     NO RECOVERY     CORE       GROUT     CUTTINGS     SAND       ION TESTS     UNDRAINED SHEAR STRENGTH<br>+ Torvane +<br>ic Cone ◊<br>ard Pen Test) ♦     + Torvane +<br>× QU/2 ×       B0 100     A Pocket Pen. Δ<br>♥ Field Vane ●     COMMENTS       Init Wt     ● Field Vane ●     If the top of top o | lion                                    |  |  |
| SAMPLE TYPE       GRAB       SPLIT SPOON         BACKFILL TYPE       BENTONITE       GRAVEL       SLOUGH         (a)       (b)       (c)       (c)       (c)         (c)       (c)       (c)       (c)       (c)       (c)         (c)       (c)       (c)       (c)       (c)       (c)       (c)         (c)       (c)       (c)       (c)       (c)       (c)       (c)       (c)         (c)       (c)       (c)       (c)       (c)  | BULK   | lion                                    |  |  |
| BACKFILL TYPE ■BENTONITE GRAVEL USLOUGH   | JGROUT ∠CUTTINGS ∴ SAND<br>TON TESTS UNDRAINED SHEAR STRENGTH<br>the cone<br>trad Pen Test) ←<br>300mm)<br>0 100<br>Drit Wt ■<br>/m <sup>3</sup> ← Field Vane ←<br>19 20 21 (/Pa)  | lion                                    |  |  |
| () () () () () () () () () () () () () (  | ION TESTS UNDRAINED SHEAR STRENGTH<br>sker ¥ + Torvane +<br>ic Cone ◆ × QU/2 ×<br>ard Pen Test) ◆ □ Lab Vane □<br><u>60 80 100</u> △ Pocket Pen. △<br>/m1 ← Field Vane €<br>19 20 21 (kPa)   | LION                                    |  |  |
| Image: Second state | C Liquid   | ELEVA                                   |  |  |
| 0 OR TOPSOIL (75 mm) - black, frozen  |  | -                                       |  |  |
| SILT and CLAY - trace sand<br>- dark grey, firm to stiff, moist<br>- intermediate plasticity<br>- dark brownish-grey below 0.9 m<br>SILT - some clay, trace sand  | 2  | 230 -                                   |  |  |
| <ul> <li>light brown, soft, moist</li> <li>low plasticity</li> <li>CLAY (Lacustrine) - silty, trace sand</li> <li>G3</li> </ul>   | SPT Blows: [2/1/1],<br>Spoon Recovery: 100% 2  | 229 -                                   |  |  |
| - brown mottled grey, firm, moist<br>- high plasticity<br>- trace silt inclusions (<15 mm diam.)  | 2  | 228 -                                   |  |  |
|   | Tube Recovery: 67%,           (T4): Gravel 0.0%, Sand           5.4%, Silt 25.8%, Clay           68.8%   | 227 -                                   |  |  |
| 5 S5 6 €  | 2 SPT Blows: [3/3/3],<br>Spoon Recovery: 0%  | 226 -                                   |  |  |
| -6 - grey below 6.1 m G6  | 2  | 225 -                                   |  |  |
| -7<br>G7  | 2  | 224                                     |  |  |
|   | 2  | 223 -                                   |  |  |
| - soft below 9.1 m  | SPT Blows: [1/1/1],<br>Spoon Recovery: 100%  | 222                                     |  |  |
|   | 2  | 220 -                                   |  |  |
|   | 2  | 219 -                                   |  |  |
|   | SPT Blows: [1/1/1],           Spoon Recovery: 33%  | 218 -                                   |  |  |
| - trace to some silt till inclusions (<10 mm diam.)   | 2  | 217 -                                   |  |  |
|   | 2  | 216 -                                   |  |  |
|   | Y: Ryan Harras COMPLETION DEPTH: 18.59 m   | COMPLETION DEPTH: 18.59 m               |  |  |
|   | DT. Fails Audaluy COMPLETION DATE: 12/6/21<br>ENGINEER: Jordan T. Page 1 (   | JUMPLETION DATE: 12/6/21<br>Page 1 of 2 |  |  |

| PROJ                            | PROJECT: Jefferson East CSR Works (Contract 6A) |               |                       |  |   |                                | LIEN                        | IT: C   | ity of              | Winnipeg  | TE                       | TESTHOLE NO: TH21-05  |   |   |           |  |
|---------------------------------|---|---------------|-----------------------|--|---|--------------------------------|-----------------------------|---------|---------------------|---|--------------------------|---|---|---|-----------|--|
| LOCA                            | LOCATION: UTM 14 - 5533781 m N, 635048 m E      |               |                       |  |   |                                |                             |         |                     |   |                          |   |   | PROJECT NO.: 60599385                       |           |  |
| CONTRACTOR: Maple Leaf Drilling |   |               |                       |  | N   | METHOD: Mobile B-40LX - 125 mm |                             |         |                     |   | m SSA                    | n SSA ELEVATION (m): 230.88   |   |   |           |  |
|                                 |   |               |                       |  |   |                                | T SPC                       | ON      |                     |   |                          |   |   |   |           |  |
| BACK                            | FILL  | TYP           | E<br>I T              | BENTONITE  | GRAVEL  | _Ш                             | SLO                         | UGH     |                     | GROUT   |                          |   | TTINGS  | SAND  |           |  |
| DEPTH (m)                       | NSC   | SOIL SYMBOL   | SLOTTED<br>PIEZOMETER | SOIL DES   | SCRIPTION   | SAMPLE TYPE                    | SAMPLE #                    | SPT (N) | ◆ SF<br>0 2<br>16 1 | PENE IRATION TESTS           ★ Becker ¥           ◊ Dynamic Cone ◊           T (Standard Pen Test<br>(Blows/300mm)           0         40         60         80           Total Unit Wt ■<br>(kN/m)         T 18         19         20           Pastic         MC         Liquid         0 | t) ◆<br>100<br>21<br>100 | UNDRAINED SHEAR<br>+ Torvane<br>× QU/2 ×<br>□ Lab Vane<br>△ Pocket Per<br>✔ Field Vane<br>(kPa)<br>50 100 | STRENGTH<br>+<br><<br>□<br>n. Δ<br>⊕ ⊕<br>150 200 | COMMENTS                                    | ELEVATION |  |
| = 15<br>E                       |   |               |                       |  |   |                                | ,                           |         |                     |   |                          |   |   |   | -         |  |
|                                 | СН  |               |                       |  |   |                                | 512                         | 3       | •                   | •   |                          |   |   | SPT Blows: [1/2/1],<br>Spoon Recovery: 100% | 215       |  |
|                                 | TILL  |               |                       | SILT (Till) - some clay, so<br>- light brown, moist<br>- low plasticity  | ome gravel, trace sand  |                                | G14                         |         |                     |   |                          |   |   |   | 213 -     |  |
| -19                             |   | <u>d Yd Y</u> |                       | END OF TEST HOLE AT<br>REFUSAL<br>Notes:<br>1. Seenage observed be   | 18.59 m ON AUGER  |                                | 014                         |         |                     |   |                          |   | · · · · · · · · · · · · · · · · · · ·             | 4<br>-<br>-<br>-<br>-<br>-                  | 212 -     |  |
| -20                             |   |               |                       | <ol> <li>Seepage observed be</li> <li>Water to 2.1 m below g<br/>completion of augering.</li> <li>Sloughing observed be<br/>augering.</li> </ol> | elow 3.1 m during   |                                |                             |         |                     |   |                          |   |   | -<br>-<br>-<br>-<br>-                       | 211 -     |  |
| -21                             |   |               |                       | <ol> <li>4. Test hole open to 18.6<br/>augering.</li> <li>5. Auger refusal at 18.6 r</li> <li>6. Standpipe piezometer</li> </ol>                 | 8.6 m upon completion of<br>6 m in silt (till).<br>er SP21-05 installed upon<br>backfilled with sand from 18.6<br>from 17.8 m to 0.3 m, and<br>m. Flush-mount cover<br>pring: |                                |                             |         |                     |   |                          |   |   |   | 210 -     |  |
| -22                             |   |               |                       | m to 17.8 m, bentonite fro<br>sand from 0.3 m to 0.2 m<br>installed.<br>7. Groundwater monitorir   |   |                                |                             |         |                     |   |                          |   | · · · · · · · · · · · · · · · · · · ·             | -<br>-<br>-<br>-<br>-                       | 209 -     |  |
| 23                              |   |               |                       | - December 17, 2021 a<br>bgs)  | at elev. 221.10 m (9.79 m   |                                |                             |         |                     |   |                          |   | · · · · · · · · · · · · · · · · · · ·             | -<br>-<br>-<br>-<br>-                       | 208 -     |  |
| 24                              |   |               |                       |  |   |                                |                             |         |                     |   |                          |   |   |   | 207 -     |  |
| 25<br>29<br>29<br>20            |   |               |                       |  |   |                                |                             |         |                     |   |                          |   |   | -<br>-<br>-<br>-                            | 206 -     |  |
| 26                              |   |               |                       |  |   |                                |                             |         |                     |   |                          |   |   | -<br>-<br>-<br>-                            | 205 -     |  |
| 27                              |   |               |                       |  |   |                                |                             |         |                     |   |                          |   |   |   | 204 -     |  |
| 28<br>                          |   |               |                       |  |   |                                |                             |         |                     |   |                          |   | ••••  |   | 203 -     |  |
|                                 |   |               |                       |  |   |                                |                             |         |                     |   |                          |   |   | -<br>-<br>-<br>-<br>-                       | 202 -     |  |
| <u>- 30</u>                     |   |               |                       |  |   |                                |                             |         | LOC                 | GED BY: Rvan  | Harr                     | as  | COMPI   | 1<br>ETION DEPTH: 18.59 m                   | 201 -     |  |
| 5<br>5                          | AECOM   |               |                       |  |   |                                | REVIEWED BY: Faris Alobaidy |         |                     |   |                          | obaidy  | COMPLETION DATE: 12/6/21                          |   |           |  |
|                                 |   |               |                       |  |   | PROJECT ENGINEER: Jordan T.    |                             |         |                     |   |                          |   | Page 2 of 2                                       |   |           |  |