



FOUNDATION INVESTIGATION REPORT

For

**HIGH MAST LIGHT POLES AND OVERHEAD SIGNS
HIGHWAY 403 AND QUEEN ELIZABETH WAY
TOWN OF OAKVILLE
REGIONAL MUNICIPALITY OF HALTON, ONTARIO
G.W.P. 2163-10-00
ASSIGNMENT NO. 2012-E-0057**

PETO MacCallum LTD.
165 CARTWRIGHT AVENUE
TORONTO, ONTARIO
M6A 1V5
Phone: (416) 785-5110
Fax: (416) 785-5120
Email: toronto@petomaccallum.com

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PML Ref.: 14TF005-HM
Index No.: 109FIR
GEOCRES No.: 30M5-328
February 12, 2018



PART A –FOUNDATION INVESTIGATION REPORT

For

**HIGH MAST LIGHT POLES AND OVERHEAD SIGNS
QUEEN ELIZABETH WAY AND HIGHWAY 403
TOWN OF OAKVILLE
REGIONAL MUNICIPALITY OF HALTON, ONTARIO
G.W.P. 2163-10-00
ASSIGNMENT NO. 2012-E-0057**

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PART A - FOUNDATION INVESTIGATION REPORT

For

High Mast Light Poles and Overhead Signs
Queen Elizabeth Way and Highway 403,
G.W.P. 2163-10-00, Assignment No. 2012-E-0057
Town of Oakville, Regional Municipality of Halton, Ontario

1. INTRODUCTION

Stantec Consulting Ltd. has retained Peto MacCallum Ltd. (PML) on behalf of the Ministry of Transportation Ontario (MTO) to conduct the geotechnical investigation for the design and construction of sixty-six (66) High Mast Light Poles (HML) and two (2) Overhead Signs (OHS) located on Queen Elizabeth Way (QEW) and Highway 403 in the Town of Oakville, Regional municipality of Halton, Ontario.

Initial scope of work in the RFP provided for bidding purposes was to carry out foundation investigation for forty (40) HMLs and ten (10) OHSs. The scope was subsequently revised by Stantec and requested PML by e-mail dated September 09, 2016 to include eight (8) additional HML and carry out foundation investigation for a total of forty-eight (48) HMLs. The total number of HMLs to be investigated was again revised by Pavement and Foundation Section of MTO and requested PML by e-mail dated August 09, 2017, to investigate a total of sixty-six (66) locations of HMLs, located west of Erin Mills Parkway between Sta. 21+550 and Sta. 26+460.

The locations of OHSs were also revised by Stantec and requested PML by e-mail dated November 14, 2017 to carry out foundation investigations only for two (2) OHSs.

This report presents a summary of the subsurface conditions within the project limit, based on the soil data from thirteen (13) boreholes advanced by PML under the current assignment (2012-E-0057) and twenty-six (26) boreholes from the previous investigations carried out in the vicinity of the proposed overhead signs and high mast light poles.

2. SITE DESCRIPTION

The stretch of Land within the QEW / Highway 403 corridor near the project site are generally vacant and grass covered. The topography of the area is gently sloping down towards the south.



Outside of the highway corridor, land use primarily includes commercial and light industrial buildings and businesses. The Ford Motor Company occupies the majority of the land to the south of the QEW / Highway 403 interchange.

3. FIELD INVESTIGATION PROCEDURES

The PML staff visited the site on August 20, 2017 to mark out the borehole locations. The underground services at the borehole locations were cleared by the respective utility companies. Public and private utility authorities were informed and all the utility clearance documents were obtained before the commencement of drilling work.

The fieldwork was carried out from August 22 to 30, 2017 and from September 11 to 14, 2017. The location of the boreholes in the field were established by PML staff using a portable GPS device. Subsequently, the coordinates and ground surface elevations at the location of all 13 Boreholes were provided in MTM NAD 83 northing and easting by Callon Dietz Incorporated. Table A, listing the borehole coordinates is included with this report.

The drilling equipment used was owned and operated by Canadian Soil Drilling (CSD), a specialist drilling contractor. The fieldwork was carried out under the full-time supervision of a PML field supervisor. The investigation included advancing thirteen (13) boreholes, numbered 17-01 to 17-04 and 17-06 to 17-14, to maximum depths ranging from 4.6 m to 7.8 m (El.107.9 to El.153.4). These boreholes were advanced using solid stem augers powered by a track-mounted drill rig. The locations of boreholes are shown on the attached Drawings 1 to 9 in Appendix A. Representative soil samples were recovered from the boreholes at 0.75 m intervals using a conventional 51 mm O.D split spoon sampler in accordance with the Standard Penetration Test (SPT) procedure. Standard penetration tests were conducted simultaneously with the sampling operation to assess the strength characteristics of the substrata.

The groundwater conditions at the borehole locations were observed during the drilling by visual examination of the soil samples, sampler and drill rods as the samples were retrieved. In addition, water level measurements were taken in open boreholes. Upon completion of drilling, the boreholes



were backfilled with bentonite/cement grout in accordance with the MTO guidelines and MOE Regulation 903 for borehole abandonment procedures.

The recovered soil samples were returned to our laboratory for detailed visual examination and index tests.

4. LABORATORY TEST PROCEDURES

Laboratory tests on representative SPT samples recovered during the fieldwork were carried out by the certified laboratory owned by PML, located in Toronto. The laboratory testing program included the following:

- Natural moisture content determinations (70)
- Grain size distribution analyses (17)
- Atterberg limits (12)

The laboratory tests to determine the index properties were performed in accordance with the MTO test procedures, which follow American Society for Testing Materials (ASTM) test procedures, with the exception of hydrometer test (LS-702). The results of the grain size distribution analyses are presented on Figures GS-1 to GS-3. The results of the Atterberg limit tests are provided on Figures PC-1 to PC-2. All of the test results are summarized on the attached Record of Borehole sheets.

5. SITE GEOLOGY AND SUBSURFACE CONDITIONS

5.1 Site Geology

The study area is located in the physiographic region known as the Iroquois Plain ("Physiography of Southern Ontario" by Chapman and Putnam and Map 1050 A of Lindsay-Peterborough Area, published by the Geological Survey of Canada). The Iroquois Plain extends to a distance of about 305 km around the Lake Ontario from the Niagara River at the west end to Trent River in the east end. In general, the plain is a mosaic of lacustrine sandy and



clayey deposits with till plains and drumlins. Small drainage courses and creeks currently drain the area southerly towards Lake Ontario.

5.2 Subsurface Conditions

The underlying subsoil in the area proposed for high mast light poles and overhead signs consists mainly of cohesive material followed by weathered Shale bedrock. The subsoil in this area consists of very dense to loose silty sand fill material followed by stiff to hard cohesive glacial till deposits. The till deposit is underlain by highly weathered Shale bedrock of Queenston Formation. However, for classification purposes, the soils encountered within the project area can be divided into ten different zones.

- a) Pavement Structure and Granular Base
- b) Sand to silty sand, some/with gravel (Fill)
- c) Silty clay to clayey Silt, some sand, trace gravel (Fill)
- d) Silty clay, trace/some sand, trace gravel
- e) Clayey silt, sand and gravel
- f) Silty clay, trace/some sand, trace/some gravel (Till)
- g) Silty clay to clayey silt, some sand, some gravel (Till)
- h) Silty sand, some gravel (Till)
- i) Highly weathered Shale Bedrock
- j) Weathered Shale bedrock

The subsurface conditions that may be expected in the proposed locations of the overhead signs and high mast light poles, together with the field and laboratory test results are shown on the Record of Borehole Sheets contained in the Appendix B of this report. The boreholes relevant to each high mast light pole and overhead sign and a summary of soil strata encountered at each borehole location is provided in Tables 5.2.a and 5.2.b, for reference purposes.



Table 5.2.a - Location of High Mast Light Poles and Relevant Boreholes

| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P1 | 21+550 | 110.613 | 4 | 30M05-205 | 109.1 | 109.3 | Pavement Structure |
| | | | | | 109.3 | 106.7 | Dense to compact sand, some gravel (Fill) |
| | | | | | 106.7 | 106.4 | Hard silty clay, trace/ some sand and gravel (Till) |
| | | | | | 106.4 | 104.6 | Weathered Shale bedrock |
| P2 | 21+660 | 111.577 | 4 | 30M05-205 | 109.1 | 109.3 | Pavement Structure |
| | | | | | 109.3 | 106.7 | Dense to compact sand, some gravel (Fill) |
| | | | | | 106.7 | 106.4 | Hard silty clay, trace/ some sand and gravel (Till) |
| | | | | | 106.4 | 104.6 | Weathered Shale bedrock |
| P3 | 21+775 | 112.885 | 17-01 | | 113.4 | 113.1 | 75 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 113.1 | 112.4 | Compact silty sand with gravel (Fill) |
| | | | | | 112.4 | 111.0 | Silty clay, some sand, trace gravel (Fill) |
| | | | | | 111.0 | 109.9 | Hard silty clay to clayey silt, some sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 109.9 | 108.7 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P4 | 21+890 | 114.121 | 17-01 | | 113.4 | 113.1 | 75 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 113.1 | 112.4 | Compact silty sand with gravel (Fill) |
| | | | | | 112.4 | 111.0 | Silty clay, some sand, trace gravel (Fill) |
| | | | | | 111.0 | 109.9 | Hard silty clay to clayey silt, some sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 109.9 | 108.7 | Highly weathered Shale bedrock |
| P5 | 22+002 | 114.522 | 17-01 | | 113.4 | 113.1 | 75 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 113.1 | 112.4 | Compact silty sand with gravel (Fill) |
| | | | | | 112.4 | 111.0 | Silty clay, some sand, trace gravel (Fill) |
| | | | | | 111.0 | 109.9 | Hard silty clay to clayey silt, some sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 109.9 | 108.7 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P6 | 22+115 | 114.818 | 17-01 | | 113.4 | 113.1 | 75 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 113.1 | 112.4 | Compact silty sand with gravel (Fill) |
| | | | | | 112.4 | 111.0 | Silty clay, some sand, trace gravel (Fill) |
| | | | | | 111.0 | 109.9 | Hard silty clay to clayey silt, some sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 109.9 | 108.7 | Highly weathered Shale bedrock |
| P7 | 22+230 | 115.129 | 17-02 | | 114.4 | 114.1 | 85 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 114.1 | 113.4 | Compact silty sand with gravel (Fill) |
| | | | | | 113.4 | 112.3 | Stiff silty clay, some sand, trace gravel (Fill) |
| | | | | | 112.3 | 110.4 | Dense to very dense silty sand, some gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 110.4 | 109.3 | Hard silty clay to clayey silt, some sand, some gravel (Till) |
| | | | | | 109.3 | 107.9 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|--|
| | | | | | FROM | TO | |
| P8 | 22+240 | 115.466 | 17-02 | | 114.4 | 114.1 | 85 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 114.1 | 113.4 | Compact silty sand with gravel (Fill) |
| | | | | | 113.4 | 112.3 | Stiff silty clay, some sand, trace gravel (Fill) |
| | | | | | 112.3 | 110.4 | Dense to very dense silty sand, some gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 110.4 | 109.3 | Hard silty clay to clayey silt, some sand, some gravel (Till) |
| | | | | | 109.3 | 107.9 | Highly weathered Shale bedrock |
| P9 | 22+460 | 115.808 | 17-02 | | 114.4 | 114.1 | 85 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 114.1 | 113.4 | Compact silty sand with gravel (Fill) |
| | | | | | 113.4 | 112.3 | Stiff silty clay, some sand, trace gravel (Fill) |
| | | | | | 112.3 | 110.4 | Dense to very dense silty sand, some gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 110.4 | 109.3 | Hard silty clay to clayey silt, some sand, some gravel (Till) |
| | | | | | 109.3 | 107.9 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P10 | 22+605 | 116.664 | 17-03 | | 122.5 | 122.2 | 45 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 122.2 | 122.0 | Loose silty sand with gravel (Fill) |
| | | | | | 122.0 | 119.5 | Stiff silty clay, trace sand, trace gravel (Fill) |
| | | | | | 119.5 | 116.0 | Hard silty clay to clayey silt, some sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 116.0 | 115.8 | Highly weathered Shale bedrock |
| | | | 17-02 | | 114.4 | 114.1 | 85 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 114.1 | 113.4 | Compact silty sand with gravel (Fill) |
| | | | | | 113.4 | 112.3 | Stiff silty clay, some sand, trace gravel (Fill) |
| | | | | | 112.3 | 110.4 | Dense to very dense silty sand, some gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 110.4 | 109.3 | Hard silty clay to clayey silt, some sand, some gravel (Till) |
| | | | | | 109.3 | 107.9 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P11 | 22+755 | 119.042 | 17-03 | | 122.5 | 122.2 | 45 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 122.2 | 122.0 | Loose silty sand with gravel (Fill) |
| | | | | | 122.0 | 119.5 | Stiff silty clay, trace sand, trace gravel (Fill) |
| | | | | | 119.5 | 116.0 | Hard silty clay to clayey silt, some sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 116.0 | 115.8 | Highly weathered Shale bedrock |
| P12 | 22+900 | 121.452 | 17-03 | | 122.5 | 122.2 | 45 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 122.2 | 122.0 | Loose silty sand with gravel (Fill) |
| | | | | | 122.0 | 119.5 | Stiff silty clay, trace sand, trace gravel (Fill) |
| | | | | | 119.5 | 116.0 | Hard silty clay to clayey silt, some sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 116.0 | 115.8 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P13 | 23+040 | 123.753 | 17-03 | | 122.5 | 122.2 | 45 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 122.2 | 122.0 | Loose silty sand with gravel (Fill) |
| | | | | | 122.0 | 119.5 | Stiff silty clay, trace sand, trace gravel (Fill) |
| | | | | | 119.5 | 116.0 | Hard silty clay to clayey silt, some sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 116.0 | 115.8 | Highly weathered Shale bedrock |
| P14 | 23+185 | 126.271 | 17 | 30M05-112 | 120.0 | 119.4 | Cobbles and gravel |
| | | | | | 119.4 | 118.8 | Silty clay, some sand |
| | | | | | 118.8 | 114.8 | Weathered Shale bedrock |
| | | | 13-18 | 30M5-293 | 123.7 | 123.5 | Topsoil |
| | | | | | 123.5 | 122.8 | Very stiff silty clay, trace sand, occasional Shale fragments (Fill) |
| | | | | | 122.8 | 122.5 | Very stiff silty clay, trace sand, trace gravel (Till) |
| | | | | | 122.5 | 120.5 | Very stiff silty clay, trace sand, trace gravel (Till) |
| | | | | | 120.5 | 119.2 | Highly weathered Shale bedrock |
| | | | | | 119.2 | 116.0 | Weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P15* | | | | | | | |
| P16* | | | | | | | |
| P17 | 23+325 | 128.606 | 13-20 | 30M5-291 | 127.7 | 127.6 | Topsoil |
| | | | | | 127.6 | 126.1 | Firm to very stiff silty clay, trace/ some sand, trace gravel (Fill) |
| | | | | | 126.1 | 121.3 | Weathered Shale bedrock |
| P18 | 23+330 | 126.987 | 13-22 | 30M5-296 | 128.0 | 127.9 | Topsoil |
| | | | | | 127.9 | 127.3 | Compact sand. some silt, some gravel (Fill) |
| | | | | | 127.3 | 125.7 | Stiff silty clay, trace sand, trace gravel |
| | | | | | 125.7 | 120.4 | Weathered Shale bedrock |
| P19 | 23+030 | 122.961 | 17-04 | | 123.1 | 122.7 | 210 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 122.7 | 122.5 | Compact silty sand with gravel (Fill) |
| | | | | | 122.5 | 122.3 | Silty clay, trace sand, trace gravel (Fill) |
| | | | | | 122.3 | 121.9 | Hard silty clay to clayey silt, with gravel, some sand, occasional Shale and limestone fragments (Till) |
| | | | | | 121.9 | 120.8 | Hard silty clay to clayey silt, with gravel, some sand, occasional Shale and limestone fragments (Till) |
| | | | | | 120.8 | 118.5 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P20 | 23+240 | 120.139 | 2, 3 | 30M05-115 | 118.8 | 118.7 | Topsoil |
| | | | | | 118.7 | 116.9 | Very stiff clayey silt, sand and gravel |
| | | | | | 116.9 | 115.4 | weathered Shale bedrock |
| P21* | | | | | | | |
| P22* | | | | | | | |
| P23* | | | | | | | |
| P24* | | | | | | | |
| P25 | 23+435 | 132.596 | 13-21 | 30M5-296 | 125.1 | 124.9 | 150 mm Asphalt |
| | | | | | 124.9 | 124.3 | Dense sand and gravel, some silt (Fill) |
| | | | | | 124.3 | 120.2 | weathered Shale bedrock |
| | | | 13-24 | 30M5-297 | 131.5 | 131.3 | 150 mm Asphalt |
| | | | | | 131.3 | 130.0 | Compact sand and gravel, some silt (Fill) |
| | | | | | 130.0 | 129.7 | Very stiff silty clay, trace sand, occasional Shale fragments (Till) |
| | | | | | 129.7 | 126.6 | Highly weathered Shale bedrock |
| | | | | | 126.6 | 123.6 | Weathered Shale bedrock |

| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|--|
| | | | | | FROM | TO | |
| P26 | 23+570 | 138.311 | 17-06 | | 138.4 | 137.9 | 275 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 137.9 | 137.4 | Very dense silty sand with gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 137.4 | 133.7 | Highly weathered Shale bedrock |
| P27 | 23+700 | 141.032 | 17-06 | | 138.4 | 137.9 | 275 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 137.9 | 137.4 | Very dense silty sand with gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 137.4 | 133.7 | Highly weathered Shale bedrock |
| P28 | 23+818 | 140.84 | 17-06 | | 138.4 | 137.9 | 275 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 137.9 | 137.4 | Very dense silty sand with gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 137.4 | 133.7 | Highly weathered Shale bedrock |
| P29* | | | | | | | |
| P30* | | | | | | | |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|--|
| | | | | | FROM | TO | |
| P31 | 23+485 | 133.655 | 13-19 | 30M5-291 | 131.0 | 130.9 | Topsoil |
| | | | | | 130.9 | 130.3 | Compact Shale (Fill) |
| | | | | | 130.3 | 129.6 | Very stiff silty clay, trace sand (Fill) |
| | | | | | 129.6 | 128.8 | Very stiff silty clay, trace sand, occasional Shale fragments |
| | | | | | 128.8 | 126.5 | Highly weathered Shale bedrock |
| | | | | | 126.5 | 123.4 | weathered Shale bedrock |
| P32 | 23+595 | 138.648 | 13-19 | 30M5-291 | 131.0 | 130.9 | Topsoil |
| | | | | | 130.9 | 130.3 | Compact Shale (Fill) |
| | | | | | 130.3 | 129.6 | Very stiff silty clay, trace sand (Fill) |
| | | | | | 129.6 | 128.8 | Very stiff silty clay, trace sand, occasional Shale fragments |
| | | | | | 128.8 | 126.5 | Highly weathered Shale bedrock |
| | | | | | 126.5 | 123.4 | weathered Shale bedrock |
| | | | 403-4 | 30M15-271 | 135.9 | 135.8 | Topsoil |
| | | | | | 135.8 | 134.4 | Stiff to very stiff silty clay, some sand, trace gravel, Shale fragments (Fill) |
| | | | | | 134.4 | 133.3 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|--|
| | | | | | FROM | TO | |
| P33 | 23+320 | 143.0 | 13-19 | 30M5-291 | 131.0 | 130.9 | Topsoil |
| | | | | | 130.9 | 130.3 | Compact Shale (Fill) |
| | | | | | 130.3 | 129.6 | Very stiff silty clay, trace sand (Fill) |
| | | | | | 129.6 | 128.8 | Very stiff silty clay, trace sand, occasional Shale fragments |
| | | | | | 128.8 | 126.5 | Highly weathered Shale bedrock |
| | | | | | 126.5 | 123.4 | weathered Shale bedrock |
| | | | 403-1 | 30M15-271 | 145.1 | 144.9 | Topsoil |
| | | | | | 144.9 | 143.9 | Stiff to very stiff clayey silt to silty clay, some sand, trace gravel, Shale fragments (Fill) |
| | | | | | 143.9 | 139.8 | |
| | | | | | 139.8 | 139.4 | Highly weathered Shale bedrock |
| P34 | 23+840 | 145.091 | 7 | 30M05-114 | 143.8 | 143.7 | Topsoil |
| | | | | | 143.7 | 141.1 | Hard clayey silt, trace sand |
| | | | | | 141.1 | 139.4 | weathered Shale bedrock |
| P35 | 23+955 | 142.373 | 13 | 30M05-110 | 148.7 | 146.5 | Hard clayey silt, trace sand |
| | | | | | 146.5 | 139.6 | weathered Shale bedrock |
| P36 | 23+950 | 146.519 | 3 | 30M05-114 | 146.6 | 146.5 | Topsoil |
| | | | | | 146.5 | 145.1 | Hard clayey silt, trace sand |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRETS NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|-----------------|-----------|-------|--|
| | | | | | FROM | TO | |
| | | | | | 145.1 | 142.1 | |
| P37 | 24+065 | 153.31 | 13-08 | 30M5-294 | 151.8 | 151.7 | Topsoil |
| | | | | | 151.7 | 151.3 | Very stiff silty clay, some sand (Fill) |
| | | | | | 151.3 | 149.3 | Highly weathered Shale bedrock |
| | | | | | 149.3 | 146.3 | Weathered Shale bedrock |
| P38 | 10+010 | 145.338 | 13-09 | 30M5-294 | 150.8 | 150.7 | Topsoil |
| | | | | | 150.7 | 150.0 | Very stiff silty clay, trace sand, occasional Shale fragments (Fill) |
| | | | | | 150.0 | 148.3 | Highly weathered Shale bedrock |
| | | | | | 148.3 | 144.8 | weathered Shale bedrock |
| P39 | 24+280 | 153.176 | 17-14 | | 158.1 | 157.8 | Topsoil |
| | | | | | 157.8 | 156.2 | Hard silty clay to clayey silt, with gravel, some sand, occasional Shale and limestone fragments (Till) |
| | | | | | 156.2 | 153.4 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRETS NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|-----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P40 | 24+390 | 156.496 | 17-14 | | 158.1 | 157.8 | Topsoil |
| | | | | | 157.8 | 156.2 | Hard silty clay to clayey silt, with gravel, some sand, occasional Shale and limestone fragments (Till) |
| | | | | | 156.2 | 153.4 | Highly weathered Shale bedrock |
| P41 | 10+125 | 157.545 | 13-03 | 30M5-292 | 152.6 | 152.5 | Topsoil |
| | | | | | 152.5 | 151.9 | Compact Shale (Fill) |
| | | | | | 151.9 | 151.3 | Hard silty clay, trace sand, occasional Shale fragments (Fill) |
| | | | | | 151.3 | 150.2 | Highly weathered Shale bedrock |
| | | | | | 150.2 | 147.1 | Weathered Shale bedrock |
| P42 | 23+415 | 133.68 | 13-24 | 30M5-297 | 131.5 | 131.3 | 150 mm Asphalt |
| | | | | | 131.3 | 130.0 | Compact sand and gravel, some silt (Fill) |
| | | | | | 130.0 | 129.7 | Very stiff silty clay, trace sand, occasional Shale fragments |
| | | | | | 129.7 | 128.2 | Highly weathered Shale bedrock |
| | | | | | 128.2 | 123.6 | Weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|--|
| | | | | | FROM | TO | |
| P43 | 23+565 | 135.037 | 17-6 | | 138.4 | 137.9 | 275 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 137.9 | 137.4 | Very dense silty sand with gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 137.4 | 133.7 | Highly weathered Shale bedrock |
| P44 | 23+700 | 138.608 | 17-6 | | 138.4 | 137.9 | 275 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 137.9 | 137.4 | Very dense silty sand with gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 137.4 | 133.7 | Highly weathered Shale bedrock |
| P45 | 23+985 | 146.965 | 117-A8 | 30M05-117 | 146.7 | 144.3 | Very stiff to hard silty clay, trace sand |
| | | | | | 144.3 | 141.3 | Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE | |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|--|--|
| | | | | | FROM | TO | | |
| P46 | 24+070 | 149.076 | 13-11 | 30M5-294 | 150.0 | 149.9 | Topsoil | |
| | | | | | 149.9 | 149.4 | Stiff silty clay, trace sand, occasional Shale fragments (Fill) | |
| | | | | | 149.4 | 147.6 | Highly weathered Shale bedrock | |
| | | | | | 147.6 | 144.6 | Weathered Shale bedrock | |
| | | | 13-12 | | 149.1 | 149.0 | Topsoil | |
| | | | | | 149.0 | 146.1 | Very stiff silty clay, trace sand, occasional Shale fragments (Fill) | |
| | | | | | 146.1 | 148.2 | Highly weathered Shale bedrock | |
| | | | | | 148.2 | 143.0 | Weathered Shale bedrock | |
| P47 | 24+137 | 149.154 | 13-13 | 30M5-294 | 149.9 | 149.8 | Topsoil | |
| | | | | | 149.8 | 149.0 | Stiff silty clay, trace sand, occasional rootlets (Fill) | |
| | | | | | 149.0 | 146.9 | Highly weathered Shale bedrock | |
| | | | | | 146.9 | 143.8 | Weathered Shale bedrock | |
| | | | 13-14 | | 150.2 | 150.0 | 150 mm Asphalt | |
| | | | | | 150.0 | 149.7 | Concrete | |
| | | | | | 149.7 | 149.3 | Sand and gravel (Fill) | |
| | | | | | 149.3 | 147.2 | Highly weathered Shale bedrock | |
| | | | | | 147.2 | 144.1 | Weathered Shale bedrock | |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|--|
| | | | | | FROM | TO | |
| P48 | 24+195 | 152.116 | 13-05 | 30M5-292 | 151.8 | 151.7 | Topsoil |
| | | | | | 151.7 | 150.9 | Stiff silty clay, trace sand, occasional rootlets (Fill) |
| | | | | | 150.9 | 148.8 | Highly weathered Shale bedrock |
| | | | | | 148.8 | 145.7 | Weathered Shale bedrock |
| P49 | 24+305 | 150.674 | 13-15 | 30M5-294 | 150.2 | 150.1 | Topsoil |
| | | | | | 150.1 | 149.6 | Compact sand and gravel, some silt (Fill) |
| | | | | | 149.6 | 147.8 | Highly weathered Shale bedrock |
| | | | | | 147.8 | 144.3 | Weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRETS NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|-----------------|-----------|-------|--|
| | | | | | FROM | TO | |
| P50 | 24+330 | 151.903 | 13-07 | 30M5-292 | 151.3 | 151.2 | Topsoil |
| | | | | | 151.2 | 150.4 | Stiff silty clay, trace sand, occasional rootlets (Fill) |
| | | | | | 150.4 | 148.3 | Highly weathered Shale bedrock |
| | | | | | 148.3 | 145.2 | Weathered Shale bedrock |
| P51 | 24+460 | 152.709 | 17-7 | | 151.7 | 151.3 | 60 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 151.3 | 151.1 | Compact silty sand with gravel (Fill) |
| | | | | | 151.1 | 150.2 | Hard clayey silt, trace sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 150.2 | 147.0 | Highly weathered Shale bedrock |
| P52 | 24+580 | 152.973 | 17-7 | | 151.7 | 151.3 | 60 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 151.3 | 151.1 | Compact silty sand with gravel (Fill) |
| | | | | | 151.1 | 150.2 | Hard clayey silt, trace sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 150.2 | 147.0 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P53 | 24+680 | 152.424 | 17-7 | | 151.7 | 151.3 | 60 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 151.3 | 151.1 | Compact silty sand with gravel (Fill) |
| | | | | | 151.1 | 150.2 | Hard clayey silt, trace sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 150.2 | 147.0 | Highly weathered Shale bedrock |
| P54 | 24+795 | 151.267 | 17-8 | | 150.0 | 149.3 | 70 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 149.3 | 149.0 | Loose sand and gravel, some silt (Fill) |
| | | | | | 149.0 | 148.5 | Silty clay, trace sand, trace gravel (Fill) |
| | | | | | 148.5 | 147.7 | Very stiff to hard silty clay to clayey silt, trace sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 147.7 | 145.3 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P55 | 24+910 | 150.655 | 17-8 | | 150.0 | 149.3 | 70 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 149.3 | 149.0 | Loose sand and gravel, some silt (Fill) |
| | | | | | 149.0 | 148.5 | Silty clay, trace sand, trace gravel (Fill) |
| | | | | | 148.5 | 147.7 | Very stiff to hard silty clay to clayey silt, trace sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 147.7 | 145.3 | Highly weathered Shale bedrock |
| P56 | 25+030 | 150.097 | 17-8 | | 150.0 | 149.3 | 70 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 149.3 | 149.0 | Loose sand and gravel, some silt (Fill) |
| | | | | | 149.0 | 148.5 | Silty clay, trace sand, trace gravel (Fill) |
| | | | | | 148.5 | 147.7 | Very stiff to hard silty clay to clayey silt, trace sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 147.7 | 145.3 | Highly weathered Shale bedrock |
| P57 | 25+140 | 149.309 | 6 | 30M12-121 | 144.2 | 144.1 | Topsoil |
| | | | | | 144.1 | 141.7 | Stiff to hard clayey silt, trace of organics |

| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| | | | | | | | |
| | | | | | 141.7 | 136.2 | Weathered Shale bedrock |
| P58 | 25+260 | 146.612 | 6 | 30M12-121 | 144.2 | 144.1 | Topsoil |
| | | | | | 144.1 | 141.7 | Stiff to hard clayey silt, trace of organics |
| | | | | | 141.7 | 136.2 | Weathered Shale bedrock |
| P59 | 25+360 | 143.215 | 3 | 30M12-121 | 142.7 | 141.5 | Loose sand, trace gravel, trace silt (Fill) |
| | | | | | 141.5 | 141.0 | Hard clayey silt, trace gravel |
| | | | | | 141.0 | 137.2 | Weathered Shale bedrock |
| P60* | | | | | | | |
| P61* | | | | | | | |
| P62 | 25+205 | 146.492 | 17-12 | | 147.2 | 146.8 | 220 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 146.8 | 146.4 | Silty clay, some sand, trace gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 146.4 | 144.9 | Firm to hard silty clay to clayey silt, trace sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 144.9 | 142.5 | Highly weathered Shale bedrock |
| P63* | | | | | | | |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRETS NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|-----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P64 | 25+110 | 148.524 | 17-12 | | 147.2 | 146.8 | 220 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 146.8 | 146.4 | Silty clay, some sand, trace gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 146.4 | 144.9 | Firm to hard silty clay to clayey silt, trace sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 144.9 | 142.5 | Highly weathered Shale bedrock |
| P65 | 25+335 | 142.685 | 7 | 30M12-121 | 143.8 | 143.2 | Compact sand and gravel (Fill) |
| | | | | | 143.2 | 141.2 | Hard clayey silt, layer of fine sand, trace of organics |
| | | | | | 141.2 | 137.7 | Highly weathered Shale bedrock |
| P66 | 25+405 | 143.509 | 17-13 | | 143.9 | 143.5 | Loose silty sand, with gravel (Fill) |
| | | | | | 143.5 | 141.2 | Firm to Stiff silty clay to clayey silt, some sand, trace gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 141.2 | 137.0 | Hard silty clay to clayey silt, some sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 137.0 | 136.1 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|--|
| | | | | | FROM | TO | |
| P67 | 25+110 | 140.133 | 17-13 | | 143.9 | 143.5 | Loose silty sand, with gravel (Fill) |
| | | | | | 143.5 | 141.2 | Firm to Stiff silty clay to clayey silt, some sand, trace gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 141.2 | 137.0 | Hard silty clay to clayey silt, some sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 137.0 | 136.1 | Highly weathered Shale bedrock |
| P68 | 25+485 | 141.163 | 17-9 | | 139.5 | 138.8 | 85 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 138.8 | 137.8 | Stiff to hard silty clay, some sand, trace gravel (Fill) |
| | | | | | 137.8 | 137.2 | Hard silty clay to clayey silt, some sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 137.2 | 134.8 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P69 | 25+610 | 140.28 | 17-9 | | 139.5 | 138.8 | 85 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 138.8 | 137.8 | Stiff to hard silty clay, some sand, trace gravel (Fill) |
| | | | | | 137.8 | 137.2 | Hard silty clay to clayey silt, some sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 137.2 | 134.8 | Highly weathered Shale bedrock |
| P70 | 25+715 | 139.555 | 17-9 | | 139.5 | 138.8 | 85 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 138.8 | 137.8 | Stiff to hard silty clay, some sand, trace gravel (Fill) |
| | | | | | 137.8 | 137.2 | Hard silty clay to clayey silt, some sand, some gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 137.2 | 134.8 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P71 | 25+820 | 138.897 | 17-10 | | 137.9 | 137.2 | 85 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 137.2 | 136.7 | Compact silty sand, with gravel (Fill) |
| | | | | | 136.7 | 136.2 | Stiff silty clay, some sand, trace gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 136.2 | 135.6 | Stiff silty clay to clayey silt, some sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 135.6 | 133.3 | Highly weathered Shale bedrock |
| P72 | 25+925 | 138.709 | 17-10 | | 137.9 | 137.2 | 85 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 137.2 | 136.7 | Compact silty sand, with gravel (Fill) |
| | | | | | 136.7 | 136.2 | Stiff silty clay, some sand, trace gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 136.2 | 135.6 | Stiff silty clay to clayey silt, some sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 135.6 | 133.3 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P73 | 26+035 | 137.589 | 17-10 | | 137.9 | 137.2 | 85 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 137.2 | 136.7 | Compact silty sand, with gravel (Fill) |
| | | | | | 136.7 | 136.2 | Stiff silty clay, some sand, trace gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 136.2 | 135.6 | Stiff silty clay to clayey silt, some sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 135.6 | 133.3 | Highly weathered Shale bedrock |
| P74 | 26+140 | 136.067 | 17-11 | | 133.8 | 133.4 | 75 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 133.4 | 132.9 | Compact silty sand, with gravel (Fill) |
| | | | | | 132.9 | 131.0 | Very stiff silty clay, some sand, trace gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 131.0 | 130.0 | Hard silty clay to clayey silt, trace sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 130.0 | 129.2 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P75 | 26+245 | 134.557 | 17-11 | | 133.8 | 133.4 | 75 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 133.4 | 132.9 | Compact silty sand, with gravel (Fill) |
| | | | | | 132.9 | 131.0 | Very stiff silty clay, some sand, trace gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 131.0 | 130.0 | Hard silty clay to clayey silt, trace sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 130.0 | 129.2 | Highly weathered Shale bedrock |
| P76 | 26+355 | 133.525 | 17-11 | | 133.8 | 133.4 | 75 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 133.4 | 132.9 | Compact silty sand, with gravel (Fill) |
| | | | | | 132.9 | 131.0 | Very stiff silty clay, some sand, trace gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 131.0 | 130.0 | Hard silty clay to clayey silt, trace sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 130.0 | 129.2 | Highly weathered Shale bedrock |



| HML STRUCTURE NUMBER | STATION | GROUND ELEVATION (m) | BOREHOLE NUMBER | GEOCRETS NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|----------------------------|--------------------|-----------------|-----------|-------|---|
| | | | | | FROM | TO | |
| P77 | 26+460 | 133.734 | 17-11 | | 133.8 | 133.4 | 75 mm Asphalt over silty sand with gravel (Pavement Fill) |
| | | | | | 133.4 | 132.9 | Compact silty sand, with gravel (Fill) |
| | | | | | 132.9 | 131.0 | Very stiff silty clay, some sand, trace gravel, occasional Shale and limestone fragments (Fill) |
| | | | | | 131.0 | 130.0 | Hard silty clay to clayey silt, trace sand, trace gravel, occasional Shale and limestone fragments (Till) |
| | | | | | 130.0 | 129.2 | Highly weathered Shale bedrock |



Table 5.2.b - Location of Overhead Signs and Relevant Boreholes

| OHS STRUCTURE NUMBER | STATION | BOREHOLE NUMBER | GEOCRES NO. | ELEVATION | | SOIL TYPE |
|----------------------------|---------|--------------------|----------------|-----------|-------|--|
| | | | | FROM | TO | |
| OHS 1 | 23+350 | 13-23 | 30M5-297 | 129.7 | 129.5 | 150 mm Asphalt |
| | | | | 129.5 | 128.2 | Dense to compact sand and gravel, some silt (Fill) |
| | | | | 128.2 | 126.1 | Firm to very stiff silty clay, trace sand |
| | | | | 126.1 | 123.6 | Highly weathered Shale bedrock |
| | | | | 123.6 | 120.6 | Weathered Shale bedrock |
| OHS2 | 24+150 | 13-08 | 30M5-294 | 151.8 | 151.7 | Topsoil |
| | | | | 151.7 | 151.3 | Very stiff silty clay, some sand (Fill) |
| | | | | 151.3 | 149.3 | Highly weathered Shale bedrock |
| | | | | 149.3 | 146.3 | Weathered Shale bedrock |

Notes

1. The top of the bedrock should be considered approximate and an allowance of +/- 0.5 m should be allowed.
- *2. The High Mast Light Poles identified in the table above with the asterisk (P*) are not considered structures and soil data is provided for these locations.



5.3 Groundwater Conditions

The groundwater was encountered in six (6) of the thirteen boreholes upon completion of drilling or during drilling. The groundwater level in each borehole is as follows.

Table 5.3.a - Groundwater Levels in new Boreholes

| BOREHOLE NO. | ELEVATION OF WATER LEVEL (m) |
|---------------------|-------------------------------------|
| 17-01 | 109.0 |
| 17-02 | 110.7 |
| 17-03 | --- |
| 17-04 | 120.8 |
| 17-06 | 136.3 |
| 17-07 | --- |
| 17-08 | --- |
| 17-09 | 136.2 |
| 17-10 | --- |
| 17-11 | 129.5 |
| 17-12 | --- |
| 17-13 | --- |
| 17-14 | --- |



Table 5.3.b - Groundwater Levels in Geocres Boreholes

| BOREHOLE NO. | GEOCRES NO. | ELEVATION OF WATER LEVEL (m) |
|--------------|-------------|------------------------------|
| 4 | 30M05-205 | 106.7 |
| 17 | 30M05-112 | 119.8 |
| 13-18 | 30M5-293 | 120.1 |
| 13-20 | 30M5-291 | 123.6 |
| 13-19 | | 123.5 |
| 2 | 30M05-115 | 117.8 |
| 3 | | 117.7 |
| 13-21 | 30M5-296 | 123.1 |
| 13-22 | | 122.6 |
| 13-24 | 30M5-297 | 127.6 |
| 403-4 | 30M15-271 | Dry |
| 403-1 | | Dry |
| 7 | 30M05-114 | 140.5 |
| 13 | 30M05-110 | 148.4 |
| 3 | 30M05-114 | 145.4 |
| 13-08 | 30M5-294 | 147.5 |
| 13-09 | 30M5-294 | 149.6 |
| 13-11 | | 148.3 |
| 13-12 | | 147.3 |
| 13-13 | | 147.3 |
| 13-14 | | 148.7 |
| 13-15 | | Not available |
| 13-05 | 30M5-292 | 148.2 |
| 13-07 | | 147.4 |
| 13-03 | | 148.2 |
| 6 | 30M12-121 | 143.6 |
| 7 | | Not available |
| 3 | | Not available |
| 117-A8 | 30M05-117 | 143.4 |

Notes

- The elevations and groundwater levels provided in the table are reported based on the information from previous investigations

The groundwater levels are subject to seasonal fluctuations and precipitation patterns.



6. CLOSURE

The fieldwork was carried out under the supervision of Mr. K. Pettit. Canadian Soil Drilling (CSD) supplied the drilling equipment for the subsurface exploration. The laboratory testing of the selected samples was carried out in the PML laboratory in Toronto.

This report was prepared by Ms. Asieh Khadem, M.Sc. Eng., EIT, Project Supervisor and reviewed by Mark Vasavithasan, M.Sc. Eng., P. Eng. Senior Engineer, Geotechnical Services. Mr. C.M.P. Nascimento, P. Eng., Principal Consultant, conducted an independent review of the report.

Yours very truly

Peto MacCallum Ltd.



Mark Vasavithasan, M.Sc. Eng., P.Eng.
Senior Engineer, Geotechnical Services

Asieh Khadem

Asieh Khadem, M.Sc. Eng., EIT
Project Supervisor, Geotechnical Services



Carlos M.P. Nascimento, P. Eng.
Project Manager and
MTO Designated Principal Contact

AK/MV/CN:nk



TABLE A - BOREHOLE COORDINATES

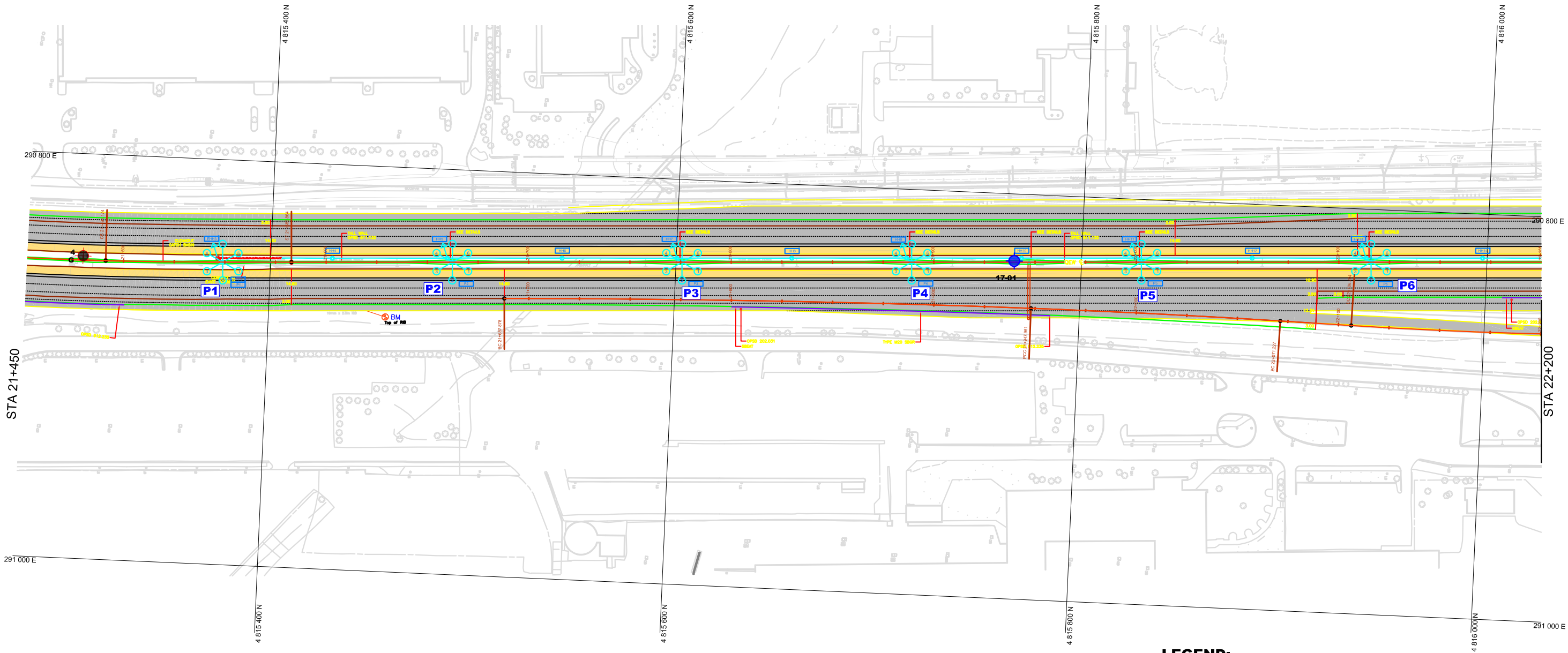
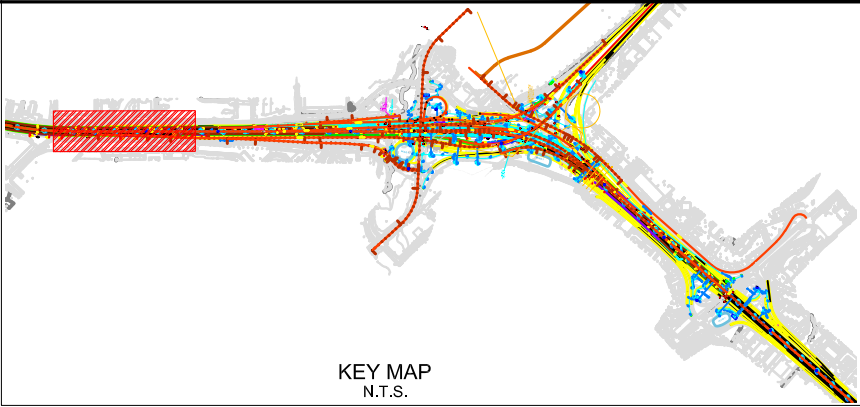
| BOREHOLE NO. | COORDINATING (MTM) | |
|---------------------|---------------------------|----------------|
| | NORTHING | EASTING |
| 17-01 | 4815766.8 | 290818.1 |
| 17-02 | 4816146.1 | 290817.1 |
| 17-03 | 4816845.8 | 290786.6 |
| 17-04 | 4817159.8 | 290970.4 |
| 17-06 | 4817643.7 | 290815.9 |
| 17-07 | 4818197.2 | 291010.0 |
| 17-08 | 4818522.5 | 291274.8 |
| 17-09 | 4819104.6 | 291739.6 |
| 17-10 | 4819356.9 | 291941.3 |
| 17-11 | 4819607.4 | 292141.9 |
| 17-12 | 4818710.8 | 291598.4 |
| 17-13 | 4819025.4 | 291516.2 |
| 17-14 | 4818046.9 | 290420.1 |



APPENDIX A

Borehole Location Plans – Drawings 1 to 9

| BOREHOLE # | NORTHINGS | EASTINGS | ELEVATION |
|------------|-------------|-----------|-----------|
| 17-01 | 4 815 766.8 | 290 818.1 | 113.4 |
| | | | |



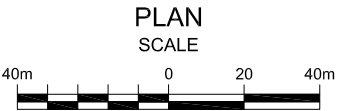
- NOTES:
1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE TEXT OF REPORT AND RECORD OF BOREHOLE LOGS.
 2. DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS ARE IN KILOMETRES AND METRES.

- LEGEND:
- BOREHOLE BY PML, UNDER PRESENT INVESTIGATIONS
 - PREVIOUS BOREHOLE FROM GEOCRE'S REPORTS

HIGH MAST LIGHT POLES AND OVERHEAD SIGNS
Queen Elizabeth Way and Highway 403 Improvements

METRIC

STA. 21+450 TO STA. 22+200



| | |
|-----------------------------|-------------------------------|
| PML REF.: 14TF005 | DATE: JAN. 24, 2018 |
| DRAWN BY: N.A. | CHECKED BY: A.K. |
| CHECKED BY: M.V. | APPROVED BY: C.N. |

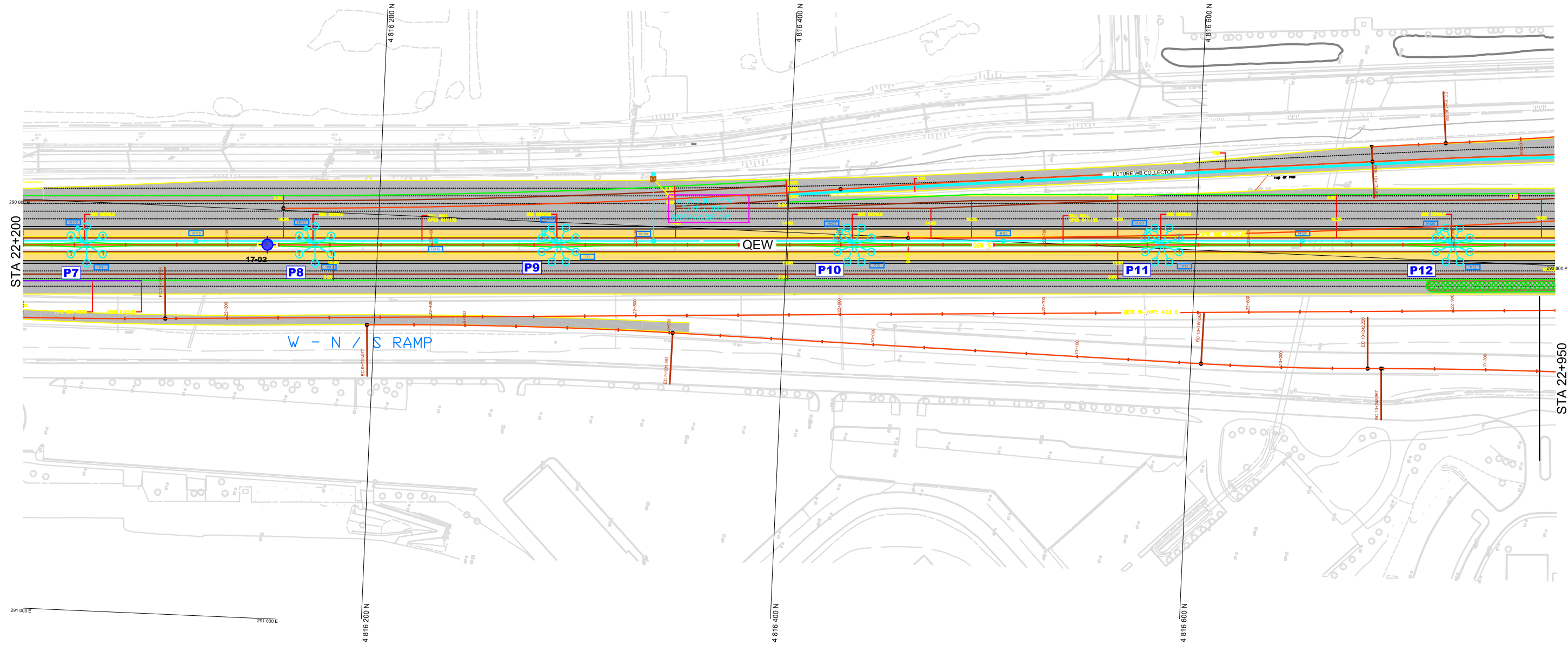
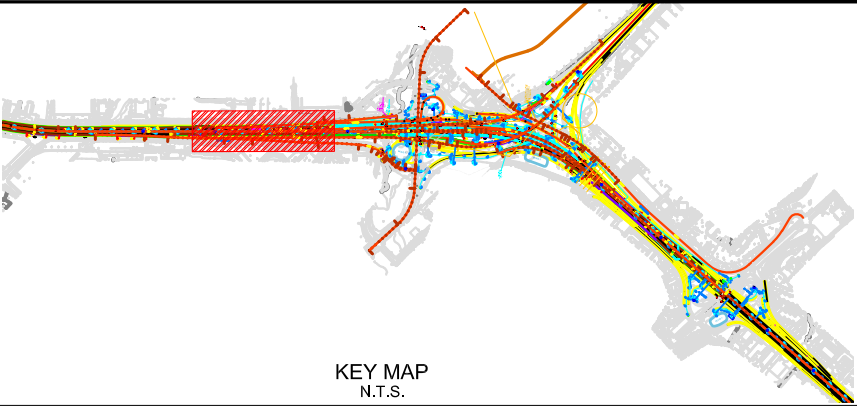


QUEEN ELIZABETH WAY
G.W.P. No. 2163-10-00



DRAWING
01

| BOREHOLE # | NORTHINGS | EASTINGS | ELEVATION |
|------------|-------------|-----------|-----------|
| 17-02 | 4 816 146.1 | 290 817.1 | 114.4 |
| | | | |



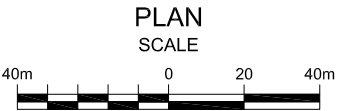
- LEGEND:**
- BOREHOLE BY PML, UNDER PRESENT INVESTIGATIONS
 - PREVIOUS BOREHOLE FROM GEOCRETS REPORTS

- NOTES:**
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HIGH MAST LIGHT POLES AND OVERHEAD SIGNS
Queen Elizabeth Way and Highway 403 Improvements

METRIC

STA. 22+200 TO STA. 22+950



| | |
|-----------------------------|-------------------------------|
| PML REF.: 14TF005 | DATE: JAN. 24, 2018 |
| DRAWN BY: N.A. | CHECKED BY: A.K. |
| CHECKED BY: M.V. | APPROVED BY: C.N. |

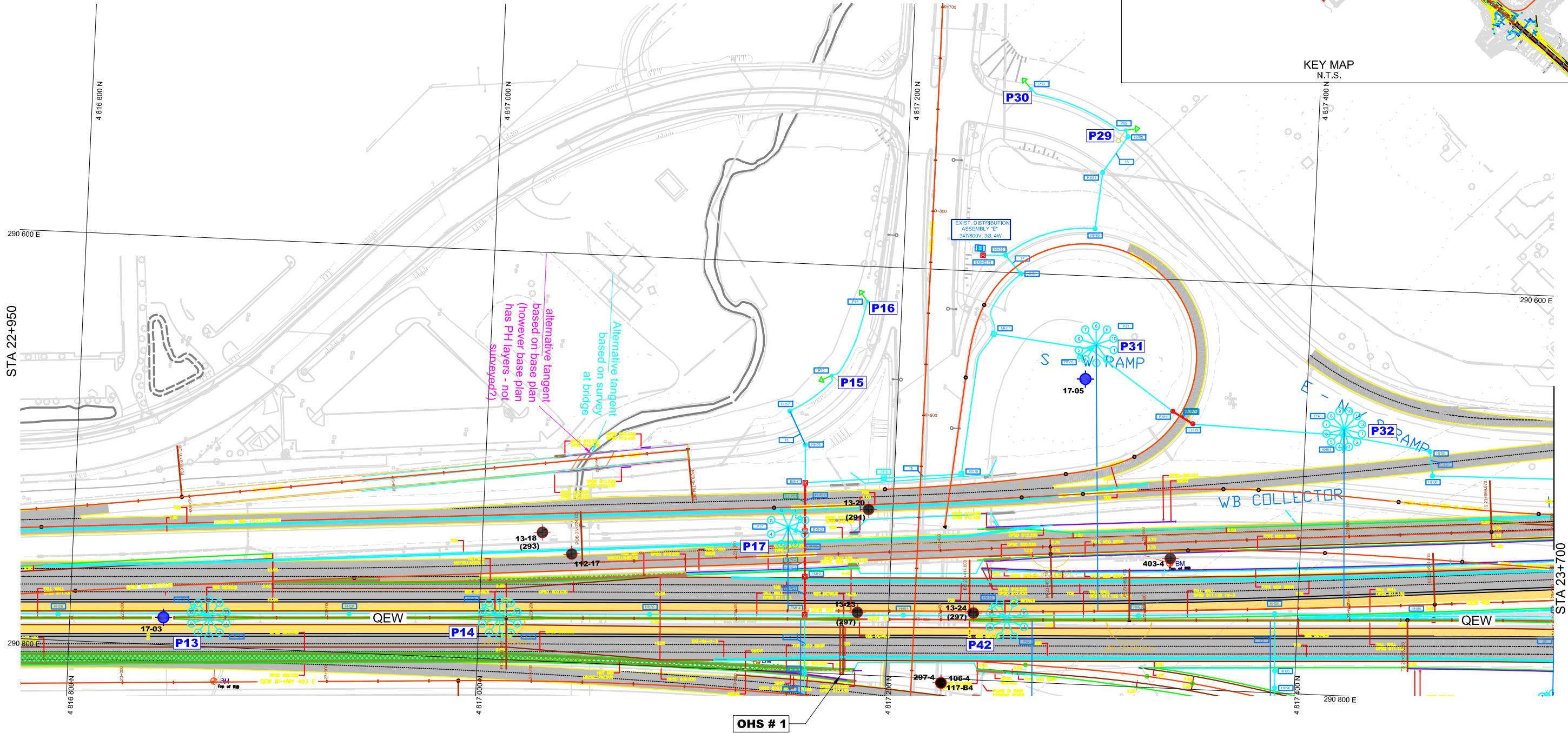
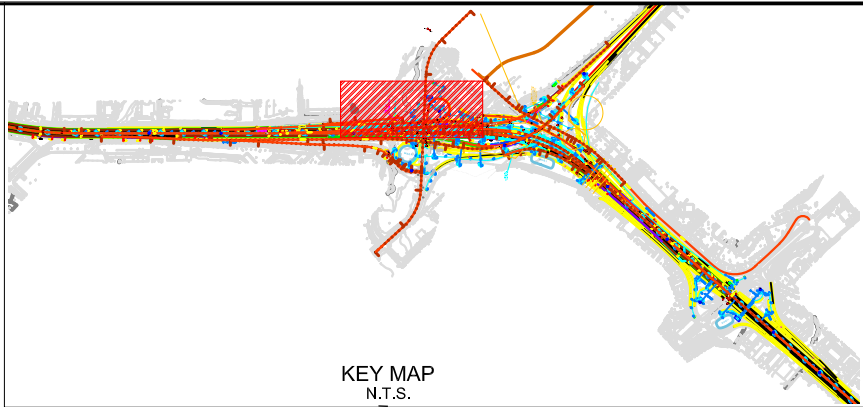


QUEEN ELIZABETH WAY
G.W.P. No. 2163-10-00



DRAWING
02

| BOREHOLE # | NORTHINGS | EASTINGS | ELEVATION |
|------------|-------------|-----------|-----------|
| 17-03 | 4 816 845.8 | 290 786.6 | 122.5 |
| | | | |



LEGEND:

- BOREHOLE BY PML, UNDER PRESENT INVESTIGATIONS
- PREVIOUS BOREHOLE FROM GEOCRE'S REPORTS

- NOTES:
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HIGH MAST LIGHT POLES AND OVERHEAD SIGNS
Queen Elizabeth Way and Highway 403 Improvements

METRIC

STA. 22+950 TO STA. 23+700 (Western Part)



| | |
|---------------------|------------------------|
| PML REF: 14TF005 | DATE: JAN. 24, 2018 |
| DRAWN BY: N.A. | CHECKED BY: A.K. |
| CHECKED BY: M.V. | APPROVED BY: C.N. |

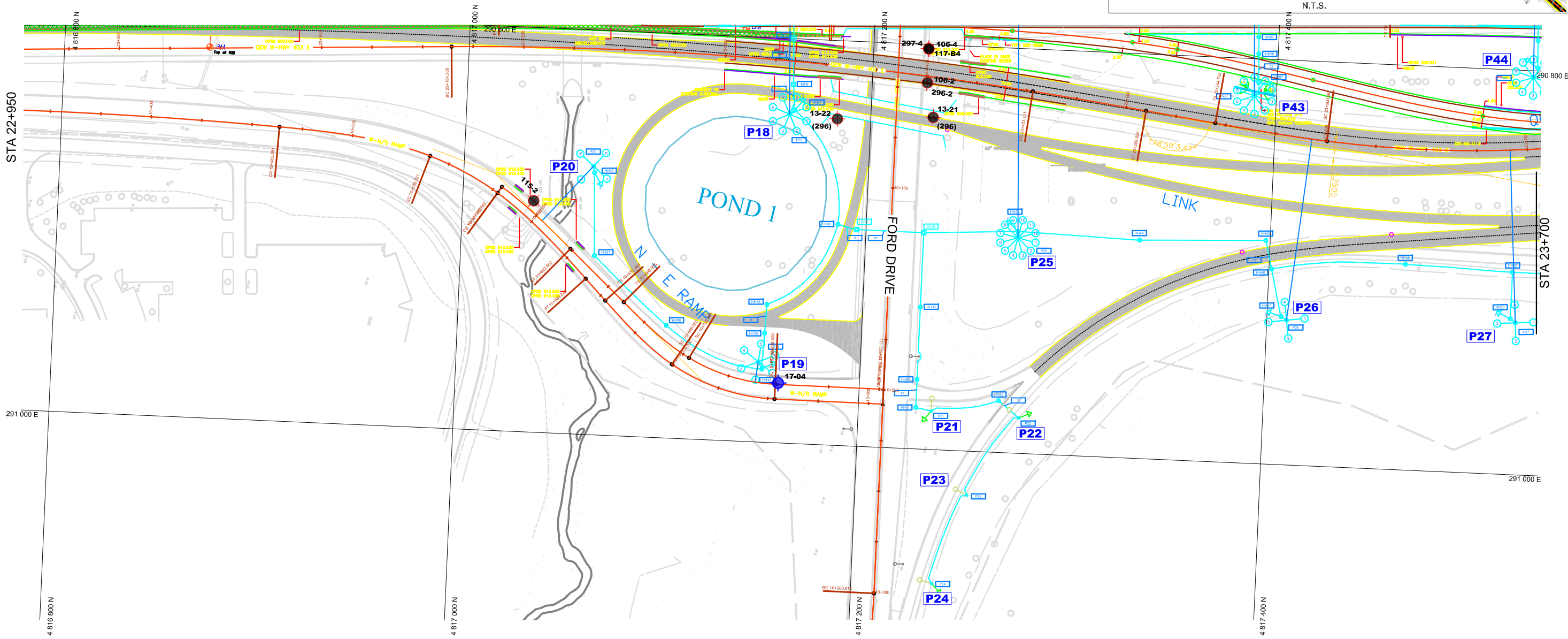
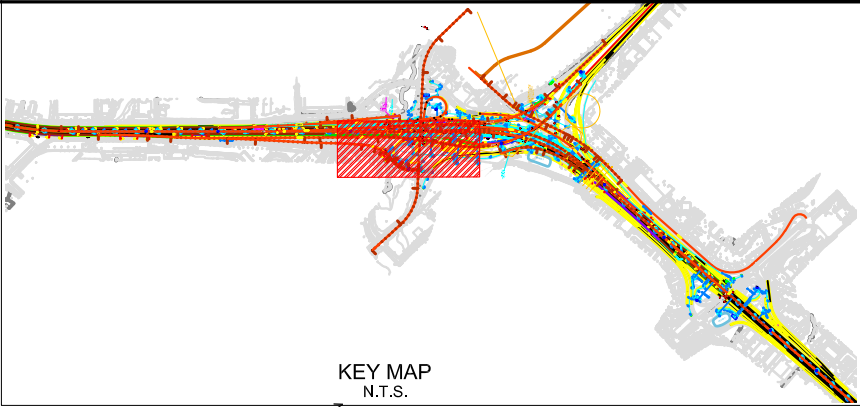


QUEEN ELIZABETH WAY
G.W.P. No. 2163-10-00



DRAWING
03

| BOREHOLE # | NORTHINGS | EASTINGS | ELEVATION |
|------------|-------------|-----------|-----------|
| 17-04 | 4 817 159.8 | 290 970.4 | 123.1 |
| | | | |



LEGEND:

BOREHOLE BY PML, UNDER PRESENT INVESTIGATIONS

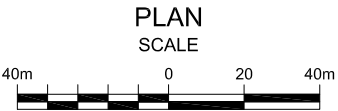
PREVIOUS BOREHOLE FROM GEOCRE'S REPORTS

- NOTES:
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HIGH MAST LIGHT POLES AND OVERHEAD SIGNS
Queen Elizabeth Way and Highway 403 Improvements

METRIC

STA. 22+950 TO STA. 23+700 (Eastern Part)



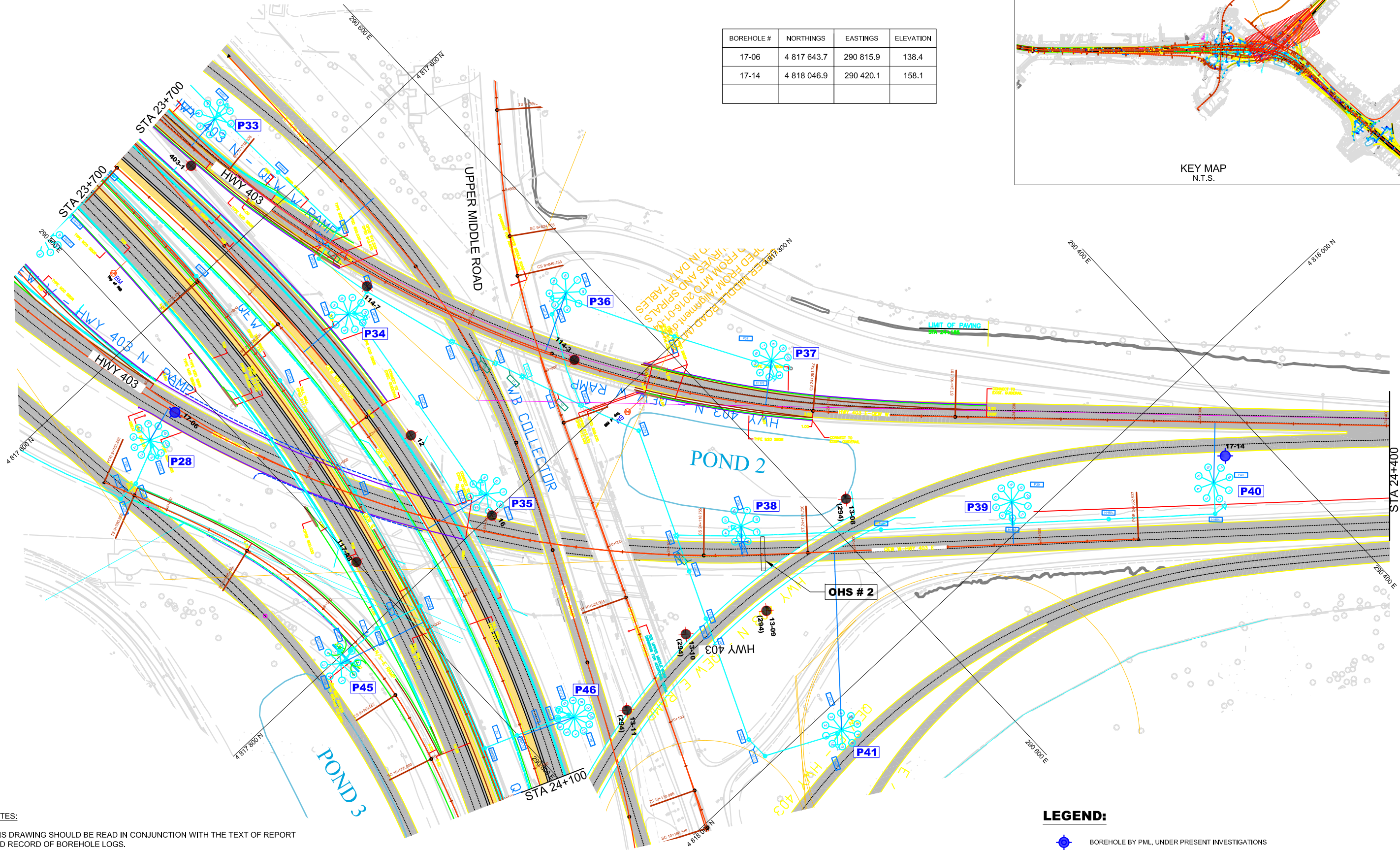
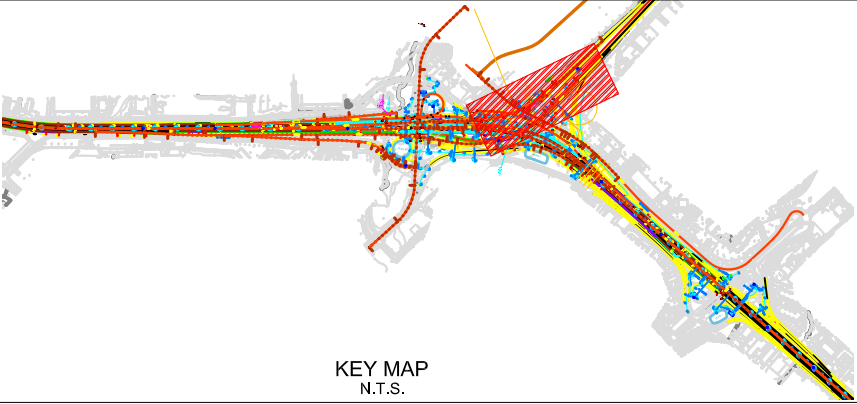
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| PML REF: 14TF005 | DATE: JAN. 24, 2018 |
| DRAWN BY: N.A. | CHECKED BY: A.K. |
| CHECKED BY: M.V. | APPROVED BY: C.N. |



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G.W.P. No. 2163-10-00

DRAWING
04

| BOREHOLE # | NORTHINGS | EASTINGS | ELEVATION |
|------------|-------------|-----------|-----------|
| 17-06 | 4 817 643.7 | 290 815.9 | 138.4 |
| 17-14 | 4 818 046.9 | 290 420.1 | 158.1 |
| | | | |



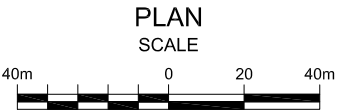
- NOTES:
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- LEGEND:
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 - PREVIOUS BOREHOLE FROM GEOCRE'S REPORTS

HIGH MAST LIGHT POLES AND OVERHEAD SIGNS
Queen Elizabeth Way and Highway 403 Improvements

METRIC

STA. 23+700 TO STA. 24+100



| | |
|----------------------------|-------------------------------|
| PML REF: 14TF005 | DATE: JAN. 24, 2018 |
| DRAWN BY: N.A. | CHECKED BY: A.K. |
| CHECKED BY: M.V. | APPROVED BY: C.N. |

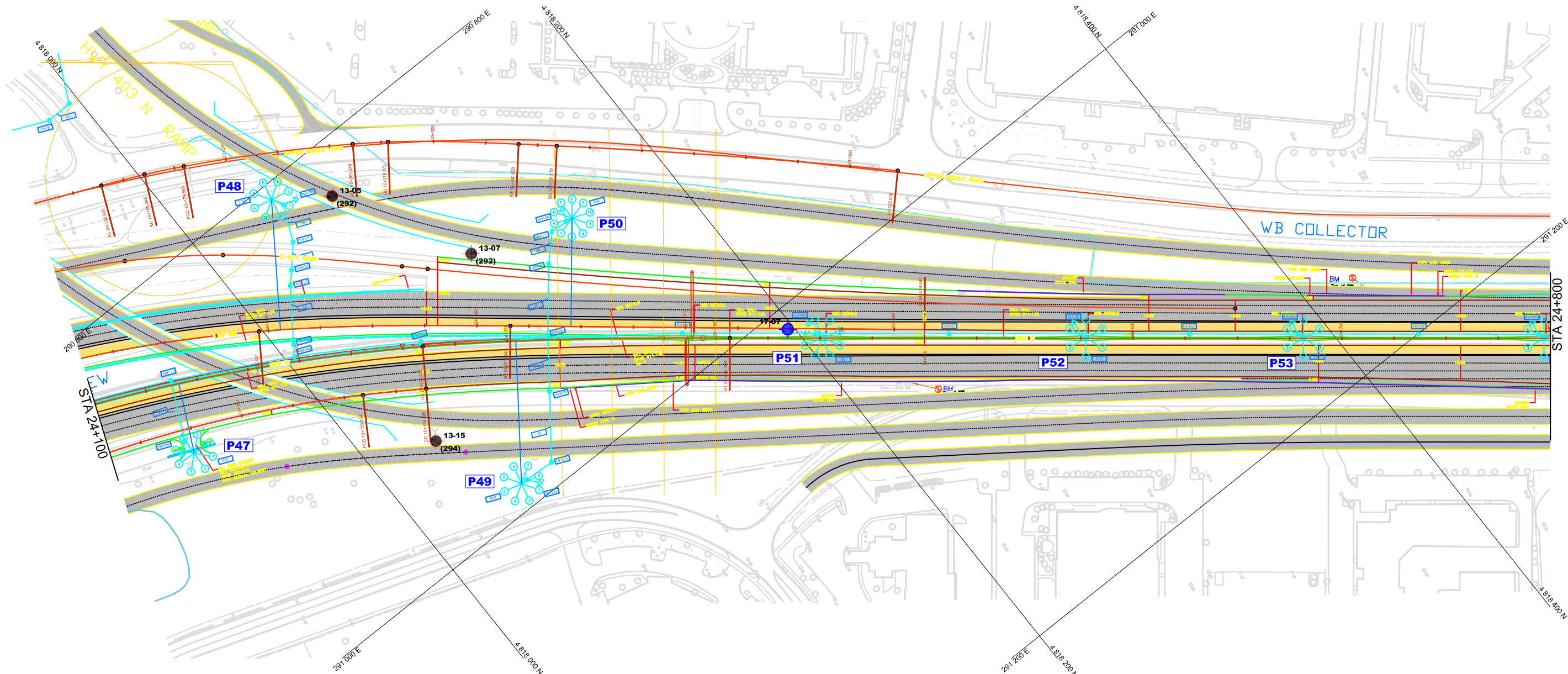


QUEEN ELIZABETH WAY
G.W.P. No. 2163-10-00



DRAWING
05

| BOREHOLE # | NORTHINGS | EASTINGS | ELEVATION |
|------------|-------------|-----------|-----------|
| 17-07 | 4 818 197.2 | 291 010.0 | 151.7 |
| | | | |



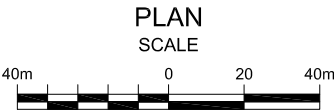
- NOTES:
- THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE TEXT OF REPORT AND RECORD OF BOREHOLE LOGS.
 - DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS ARE IN KILOMETRES AND METRES.

- LEGEND:
- BOREHOLE BY PML, UNDER PRESENT INVESTIGATIONS
 - PREVIOUS BOREHOLE FROM GEOCRES REPORTS

HIGH MAST LIGHT POLES AND OVERHEAD SIGNS
Queen Elizabeth Way and Highway 403 Improvements

METRIC

STA. 24+100 TO STA. 24+800



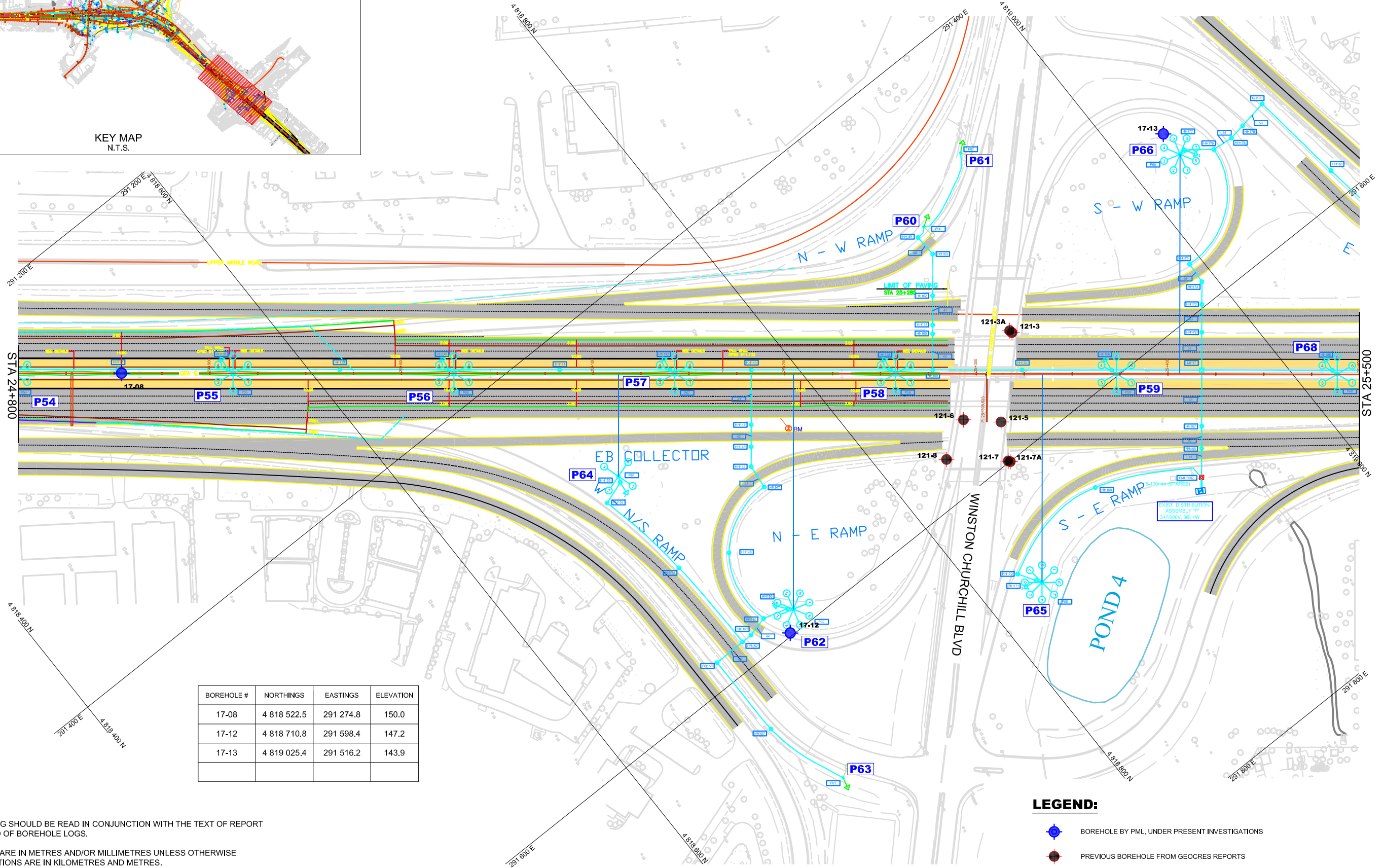
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| PML REF.: 14TF005 | DATE: JAN. 24, 2018 |
| DRAWN BY: N.A. | CHECKED BY: A.K. |
| CHECKED BY: M.V. | APPROVED BY: C.N. |



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G.W.P. No. 2163-10-00



DRAWING
06



| BOREHOLE # | NORTHINGS | EASTINGS | ELEVATION |
|------------|-------------|-----------|-----------|
| 17-08 | 4 818 522.5 | 291 274.8 | 150.0 |
| 17-12 | 4 818 710.8 | 291 598.4 | 147.2 |
| 17-13 | 4 819 025.4 | 291 516.2 | 143.9 |

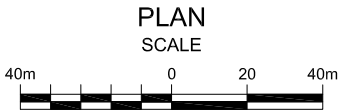
- NOTES:
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HIGH MAST LIGHT POLES AND OVERHEAD SIGNS
Queen Elizabeth Way and Highway 403 Improvements

METRIC

STA. 24+800 TO STA. 25+500



| | |
|---------------------|------------------------|
| PML REF: 14TF005 | DATE: JAN. 24, 2018 |
| DRAWN BY: N.A. | CHECKED BY: A.K. |
| CHECKED BY: M.V. | APPROVED BY: C.N. |

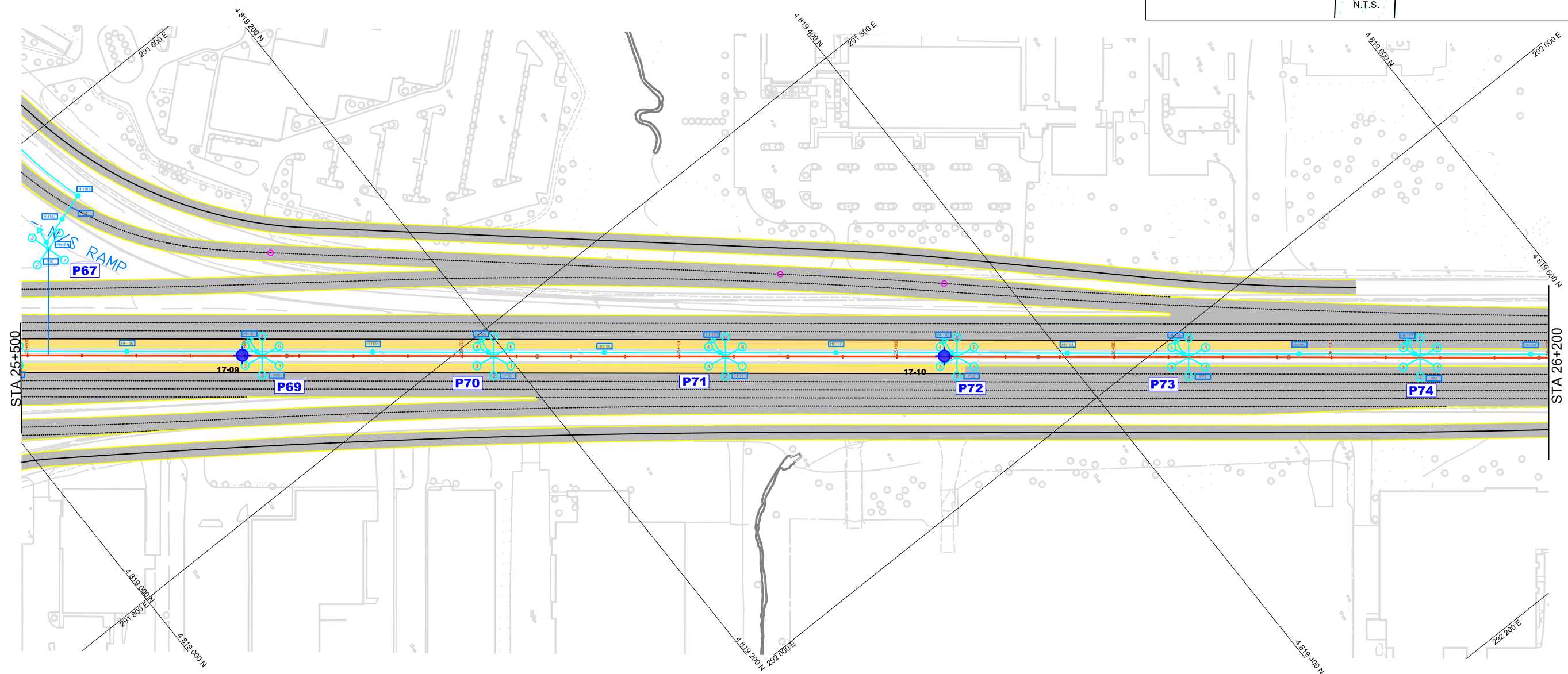
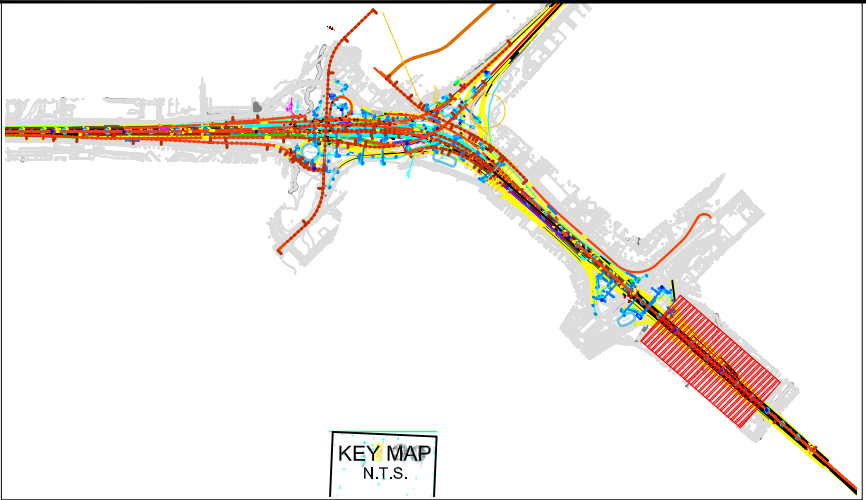


QUEEN ELIZABETH WAY
G.W.P. No. 2163-10-00





DRAWING
07

| BOREHOLE # | NORTHINGS | EASTINGS | ELEVATION |
|------------|-------------|-----------|-----------|
| 17-09 | 4 819 104.6 | 291 739.6 | 139.5 |
| 17-10 | 4 819 356.9 | 291 941.3 | 137.9 |
| | | | |



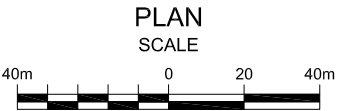
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- LEGEND:
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 -  PREVIOUS BOREHOLE FROM GEOCRES REPORTS

HIGH MAST LIGHT POLES AND OVERHEAD SIGNS
Queen Elizabeth Way and Highway 403 Improvements

METRIC

STA. 25+500 TO STA. 26+200



| | |
|-----------------------------|-------------------------------|
| PML REF.: 14TF005 | DATE: JAN. 24, 2018 |
| DRAWN BY: N.A. | CHECKED BY: A.K. |
| CHECKED BY: M.V. | APPROVED BY: C.N. |

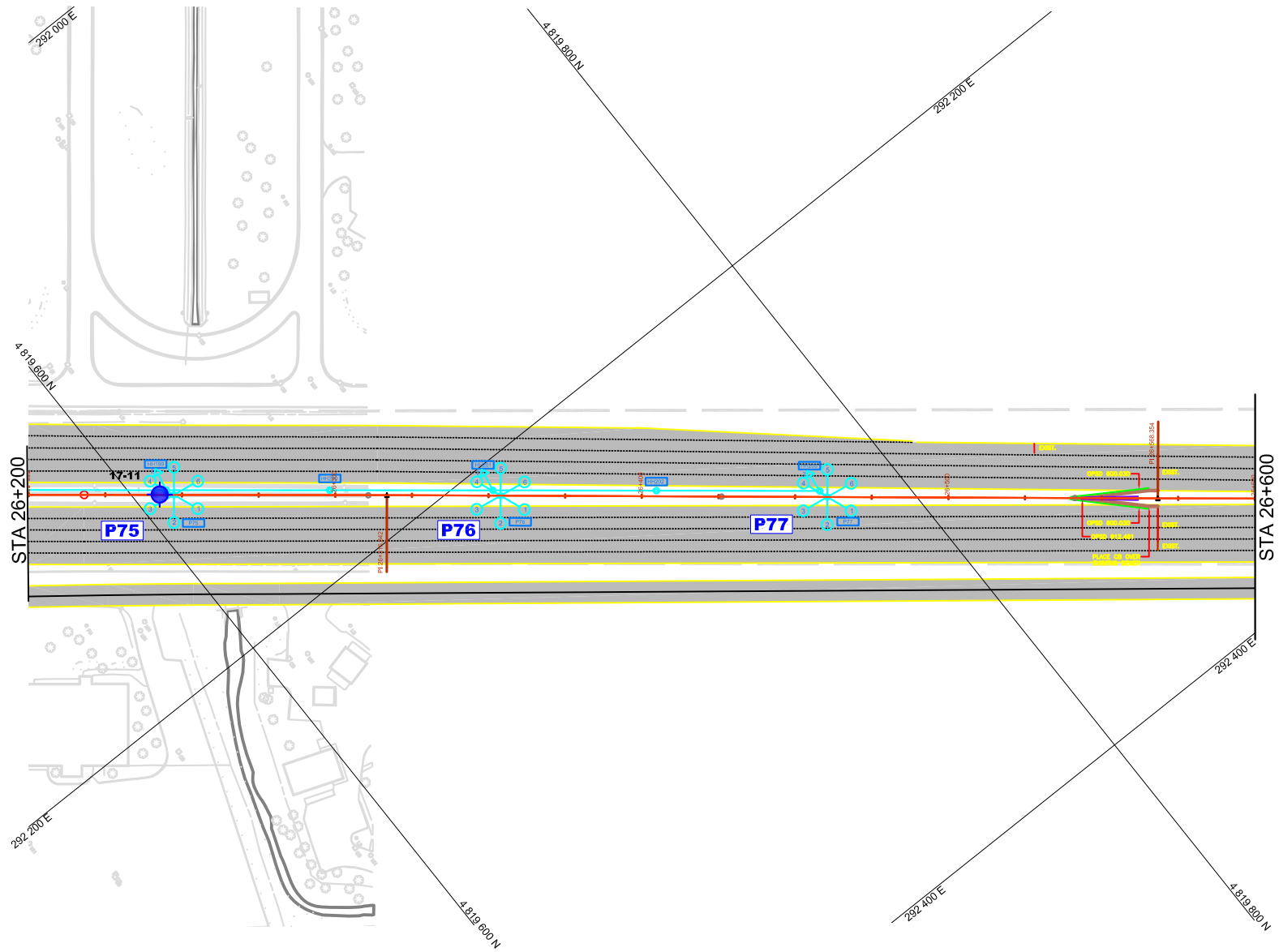
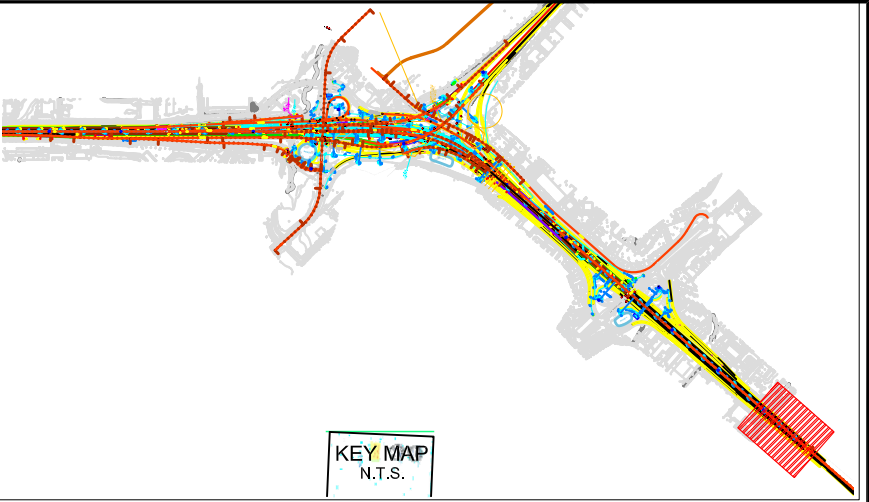


QUEEN ELIZABETH WAY
G.W.P. No. 2163-10-00



DRAWING
08

| BOREHOLE # | NORTHINGS | EASTINGS | ELEVATION |
|------------|-------------|-----------|-----------|
| 17-11 | 4 819 607.4 | 292 141.9 | 133.8 |
| | | | |



NOTES:

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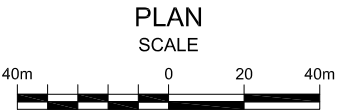
LEGEND:

- BOREHOLE BY PML, UNDER PRESENT INVESTIGATIONS
- PREVIOUS BOREHOLE FROM GEOCRE'S REPORTS

HIGH MAST LIGHT POLES AND OVERHEAD SIGNS
Queen Elizabeth Way and Highway 403 Improvements

METRIC

STA. 26+200 TO STA. 26+600



| | |
|-----------------------------|-------------------------------|
| PML REF.: 14TF005 | DATE: JAN. 24, 2018 |
| DRAWN BY: N.A. | CHECKED BY: A.K. |
| CHECKED BY: M.V. | APPROVED BY: C.N. |



QUEEN ELIZABETH WAY
G.W.P. No. 2163-10-00



DRAWING
09



APPENDIX B

Explanation of Terms Used in Report

Record of Current Borehole Sheets 17-1 to 17-4 and 17-6 to 17-14

Record of Geocres Borehole Sheets

Results of Grain Size Distribution Analyses – Figures GS-1 to GS-3

Plasticity Chart – Figures PC-1 to PC-2

EXPLANATION OF TERMS USED IN REPORT

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS \bar{N} .

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

COMPOSITION: SECONDARY SOIL COMPONENTS ARE DESCRIBED ON THE BASIS OF PERCENTAGE BY MASS OF THE WHOLE SAMPLE AS FOLLOWS:

| PERCENT BY MASS | 0 - 10 | 10 - 20 | 20 - 30 | 30 - 40 | > 40 |
|-----------------|--------|---------|---------|-------------------|----------------|
| | TRACE | SOME | WITH | ADJECTIVE (SILTY) | AND (AND SILT) |

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

| c_u (kPa) | 0 - 12 | 12 - 25 | 25 - 50 | 50 - 100 | 100 - 200 | > 200 |
|-------------|-----------|---------|---------|----------|------------|-------|
| | VERY SOFT | SOFT | FIRM | STIFF | VERY STIFF | HARD |

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

| N (BLOWS/0.3m) | 0 - 5 | 5 - 10 | 10 - 30 | 30 - 50 | > 50 |
|----------------|------------|--------|---------|---------|------------|
| | VERY LOOSE | LOOSE | COMPACT | DENSE | VERY DENSE |

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND / OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (R Q D), FOR MODIFIED RECOVERY, IS:

| R Q D (%) | 0 - 25 | 25 - 50 | 50 - 75 | 75 - 90 | 90 - 100 |
|-----------|-----------|---------|---------|---------|-----------|
| | VERY POOR | POOR | FAIR | GOOD | EXCELLENT |

JOINTING AND BEDDING:

| SPACING | 50mm | 50 - 300mm | 0.3m - 1m | 1m - 3m | > 3m |
|----------|------------|------------|------------|---------|------------|
| JOINTING | VERY CLOSE | CLOSE | MOD. CLOSE | WIDE | VERY WIDE |
| BEDDING | VERY THIN | THIN | MEDIUM | THICK | VERY THICK |

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

| | | | |
|-----|---------------------|-----|----------------------------|
| S S | SPLIT SPOON | T P | THINWALL PISTON |
| W S | WASH SAMPLE | O S | OSTERBERG SAMPLE |
| S T | SLOTTED TUBE SAMPLE | R C | ROCK CORE |
| B S | BLOCK SAMPLE | P H | T W ADVANCED HYDRAULICALLY |
| C S | CHUNK SAMPLE | P M | T W ADVANCED MANUALLY |
| T W | THINWALL OPEN | F S | FOIL SAMPLE |
| F V | FIELD VANE | | |

STRESS AND STRAIN

| | | |
|--------------------------------------|-----|-------------------------------|
| u_w | kPa | PORE WATER PRESSURE |
| u | 1 | PORE PRESSURE RATIO |
| σ | kPa | TOTAL NORMAL STRESS |
| σ' | kPa | EFFECTIVE NORMAL STRESS |
| τ | kPa | SHEAR STRESS |
| $\sigma_1, \sigma_2, \sigma_3$ | kPa | PRINCIPAL STRESSES |
| ϵ | % | LINEAR STRAIN |
| $\epsilon_1, \epsilon_2, \epsilon_3$ | % | PRINCIPAL STRAINS |
| E | kPa | MODULUS OF LINEAR DEFORMATION |
| G | kPa | MODULUS OF SHEAR DEFORMATION |
| μ | 1 | COEFFICIENT OF FRICTION |

MECHANICAL PROPERTIES OF SOIL

| | | |
|----------------|-------------------|--------------------------------------|
| m_v | kPa ⁻¹ | COEFFICIENT OF VOLUME CHANGE |
| C_c | 1 | COMPRESSION INDEX |
| C_s | 1 | SWELLING INDEX |
| C_α | 1 | RATE OF SECONDARY CONSOLIDATION |
| c_v | m ² /s | COEFFICIENT OF CONSOLIDATION |
| H | m | DRAINAGE PATH |
| T_v | 1 | TIME FACTOR |
| U | % | DEGREE OF CONSOLIDATION |
| σ'_{vo} | kPa | EFFECTIVE OVERBURDEN PRESSURE |
| σ'_p | kPa | PRECONSOLIDATION PRESSURE |
| τ_f | kPa | SHEAR STRENGTH |
| c' | kPa | EFFECTIVE COHESION INTERCEPT |
| ϕ' | -° | EFFECTIVE ANGLE OF INTERNAL FRICTION |
| c_u | kPa | APPARENT COHESION INTERCEPT |
| ϕ_u | -° | APPARENT ANGLE OF INTERNAL FRICTION |
| τ_R | kPa | RESIDUAL SHEAR STRENGTH |
| τ_r | kPa | REMOULDED SHEAR STRENGTH |
| S_i | 1 | SENSITIVITY = $\frac{c_u}{\tau_r}$ |

PHYSICAL PROPERTIES OF SOIL

| | | | | | | | | |
|----------------|-------------------|--------------------------------|-------|------|---|-----------|-------------------|---|
| ρ_s | kg/m ³ | DENSITY OF SOLID PARTICLES | n | 1, % | POROSITY | e_{max} | 1, % | VOID RATIO IN LOOSEST STATE |
| γ_s | kN/m ³ | UNIT WEIGHT OF SOLID PARTICLES | w | 1, % | WATER CONTENT | e_{min} | 1, % | VOID RATIO IN DENSEST STATE |
| ρ_w | kg/m ³ | DENSITY OF WATER | S_r | % | DEGREE OF SATURATION | I_D | 1 | DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$ |
| γ_w | kN/m ³ | UNIT WEIGHT OF WATER | w_L | % | LIQUID LIMIT | D | mm | GRAIN DIAMETER |
| ρ | kg/m ³ | DENSITY OF SOIL | w_p | % | PLASTIC LIMIT | D_n | mm | n PERCENT - DIAMETER |
| γ | kN/m ³ | UNIT WEIGHT OF SOIL | w_s | % | SHRINKAGE LIMIT | C_u | 1 | UNIFORMITY COEFFICIENT |
| ρ_d | kg/m ³ | DENSITY OF DRY SOIL | I_p | % | PLASTICITY INDEX = $w_L - w_p$ | h | m | HYDRAULIC HEAD OR POTENTIAL |
| γ_d | kN/m ³ | UNIT WEIGHT OF DRY SOIL | I_L | 1 | LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$ | q | m ³ /s | RATE OF DISCHARGE |
| ρ_{sat} | kg/m ³ | DENSITY OF SATURATED SOIL | I_C | 1 | CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$ | v | m/s | DISCHARGE VELOCITY |
| γ_{sat} | kN/m ³ | UNIT WEIGHT OF SATURATED SOIL | DTPL | | DRIER THAN PLASTIC LIMIT | i | 1 | HYDRAULIC GRADIENT |
| ρ' | kg/m ³ | DENSITY OF SUBMERGED SOIL | APL | | ABOUT PLASTIC LIMIT | k | m/s | HYDRAULIC CONDUCTIVITY |
| γ' | kN/m ³ | UNIT WEIGHT OF SUBMERGED SOIL | WTP | | WETTER THAN PLASTIC LIMIT | j | kN/m ³ | SEEPAGE FORCE |
| e | 1, % | VOID RATIO | | | | | | |

METRIC

| SOIL PROFILE | | | SAMPLES | | |
|---------------|---|------------|---------|------|------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES |
| 113.4 | GROUND SURFACE | [Symbol] | | | |
| 0.0 | 75 mm ASPHALT over silty sand with gravel | [Symbol] | | | |
| 113.1 | (PAVEMENT FILL) | [Symbol] | | | |
| 0.3 | SILTY SAND, with gravel Compact, Brown, Dry | [Symbol] | 1 | SS | 14 |
| | Silty clay to Clayey silt some sand, trace gravel | [Symbol] | 2 | SS | 14 |
| | | [Symbol] | | | |
| | | [Symbol] | 3 | SS | 11 |
| | (FILL) | [Symbol] | | | |
| 111.0 | SILTY CLAY TO CLAYEY SILT some sand, some gravel occasional shale & limestone fragments | [Symbol] | 4 | SS | 93/28cm |
| 2.4 | | [Symbol] | | | |
| | Hard, Grey/red, Wet (TILL) | [Symbol] | 5 | SS | 50/8cm |
| 109.7 | SHALE BEDROCK | [Symbol] | 6 | SS | 100/10cm |
| 3.7 | Weathered, Grey, Dry | [Symbol] | | | |
| | | [Symbol] | 7 | SS | 100/5cm |
| 108.7 | End of borehole | [Symbol] | | | |
| 4.7 | | | | | |
| | ▼ Water level measured upon completion of drilling | | | | |

ONTARIO MTO 14TF005.GPJ ONTARIO MTO.GDT 1/16/18

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No 17-02

1 OF 1

METRIC

G.W.P. 2163-10-00 LOCATION Coords: 4 816 146.1 N ; 290 817.1 E ORIGINATED BY K.P.
 DIST Central HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY A.K.
 DATUM Geodetic DATE 2017.08.22 LATITUDE 43.4851 LONGITUDE -79.67287 CHECKED BY M.V.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|----|--------------|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| | | | | | | | | ○ UNCONFINED | | + FIELD VANE | | | | | | | |
| | | | | | | | | ● QUICK TRIAXIAL | | × LAB VANE | | | | | | | |
| 114.4 | GROUND SURFACE | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | |
| 0.0 | 85 mm ASPHALT over silty sand with gravel | | | | | | | | | | | | | | | | |
| 114.1 | (PAVEMENT FILL) | | | | | | | | | | | | | | | | |
| 0.3 | SILTY SAND, with gravel Compact to loose, Brown, Wet | | 1 | SS | 12 | | | | | | | | | | | 42 24 (34) | |
| | Silty clay, some sand, trace gravel | | 2 | SS | 5 | | | | | | | | | | | | |
| | Stiff, Reddish brown, Moist | | | | | | | | | | | | | | | | |
| | | | 3 | SS | 11 | | | | | | | | | | | | |
| | Silty sand, some gravel occasional shale and limestone fragments | | | | | | | | | | | | | | | | |
| | Dense to very dense, Reddish brown, Moist | | 4 | SS | 48 | | | | | | | | | | | 14 51 (35) | |
| | (FILL) | | | | | | | | | | | | | | | | |
| | | | 5 | SS | 50/10cm | | | | | | | | | | | | |
| | | | 6 | SS | 100/15cm | | | | | | | | | | | | |
| 110.4 | SILTY CLAY TO CLAYEY SILT some sand, some gravel, occasional shale and lime ston fragments occasional shale & limestone fragments | | | | | | | | | | | | | | | | |
| 4.0 | Hard, Brown, Moist | | | | | | | | | | | | | | | | |
| 109.1 | SHALE BEDROCK | | | | | | | | | | | | | | | | |
| 5.3 | Weathered, Grey, Wet | | | | | | | | | | | | | | | | |
| 107.9 | | | 7 | SS | 100/5cm | | | | | | | | | | | | |
| 6.5 | End of borehole | | | | | | | | | | | | | | | | |
| | ▼ Water level measured upon completion of drilling | | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No 17-03

1 OF 1

METRIC

G.W.P. 2163-10-00 LOCATION Coords: 4 816 845.8 N ; 290 786.6 E ORIGINATED BY K.P.
 DIST Central HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY A.K.
 DATUM Geodetic DATE 2017.08.28 LATITUDE 43.4914 LONGITUDE -79.67326 CHECKED BY M.V.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w_p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | | | | |
|---------------|-------------|------------|---------|------|------------|----------------------------|-----------------|---|--|--|--|--|---------------------------|---------------------------------------|--------------------------|---|--|--|--|--|-------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | | | | | WATER CONTENT (%) | | |
| | | | | | | | | <div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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| | | | | | | | | | | | | | | |

NOTE: Ground water was not encountered during and after completion of drilling.

Water level measured upon completion of drilling

































METRIC

[illegible]

METRIC

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

METRIC

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | |
|---------------|---|---|---------|------|------------|----------------------------|-----------------|---|--|--|--|--|--|---|----------------|--------------------------------------|---|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | w _p | w | w _L | | | | |
| | | | | | | | | 20 40 60 80 100 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| 139.5 0.0 | GROUND SURFACE 85 mm ASPHALT over silty sand with gravel |  | | | | | | | | | | | | | | | | | |
| | (PAVEMENT FILL) |  | | | | | | | | | | | | | | | | | |
| 138.8 0.7 | Silty clay to Clayey silt some sand, trace gravel |  | 1 | SS | 23 | | | | | | | | | | | | | | |
| | Stiff to hard, Brown, Moist |  | 2 | SS | 9 | | | | | | | | | | | | | | |
| | (FILL) |  | | | | | | | | | | | | | | | | | |
| 137.8 1.7 | SILTY CLAY TO CLAYEY SILT some sand, some gravel occasional shale and limestone fragments |  | 3 | SS | 51 | | | | | | | | | | | | | | |
| 137.2 2.3 | Hard, Reddish brown, Damp (TILL) |  | | | | | | | | | | | | | | | | | |
| | SHALE BEDROCK |  | 4 | SS | 50/13cm | | | | | | | | | | | | | | |
| | Highly weathered, red, Damp |  | | | | | | | | | | | | | | | | | |
| | |  | | | | | | | | | | | | | | | | | |
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ONTARIO MTO 14TF005 HML.GPJ ONTARIO MTO.GDT 30/11/17











































+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No 17-10

1 OF 1

METRIC

G.W.P. 2163-10-00 LOCATION Coords: 4 819 356.9 N ; 291 941.3 E ORIGINATED BY K.P.
 DIST Central HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY A.K.
 DATUM Geodetic DATE 2017.09.12 LATITUDE 43.51402 LONGITUDE -79.65904 CHECKED BY M.V.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|---|---------|------|------------|----------------------------|-----------------|---|----------------------------|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| | | | | | | | | ○ UNCONFINED ● QUICK TRIAXIAL | + FIELD VANE × LAB VANE | | | | | | | | |
| 137.9 0.0 | GROUND SURFACE 85 mm ASPHALT over silty sand with gravel (PAVEMENT FILL) |  | | | | | | | | | | | | | | | |
| 137.2 0.7 | SILTY SAND, with gravel Compact to very loose, Brown, Damp Silty clay, some sand, trace gravel occasional shale and limestone fragments Stiff, Red, Damp |  | 1 | SS | 29 | | | | | | | | | | | | |
| 136.2 1.7 | (FILL) SILTY CLAY TO CLAYEY SILT some sand, trace gravel occasional shale and limestone fragments Stiff, Red, Moist |  | 2 | SS | 3 | | | | | | | | | | | | |
| 135.6 2.3 | (TILL) SHALE BEDROCK Highly weathered, Red, Damp |  | 3 | SS | 10 | | | | | | | | | | | | |
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METRIC

[illegible]

METRIC

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No 17-13

1 OF 1

METRIC

G.W.P. 2163-10-00 LOCATION Coords: 4 819 025.4 N ; 291 516.2 E ORIGINATED BY K.P.
 DIST Central HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY A.K.
 DATUM Geodetic DATE 2017.08.29 LATITUDE 43.51103 LONGITUDE -79.66429 CHECKED BY M.V.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _P | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|--|----|----|-----|--|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|-------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | | WATER CONTENT (%) | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE | | | | | | | | | | | | |
| 143.9 | GROUND SURFACE | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | | | |
| 0.0 | SILTY SAND, with gravel Loose, brown, Moist Silty clay to clayey silt some sand, trace gravel, shale fragments Firm to stiff, Reddish brown, Moist | | 1 | SS | 6 | | | | | | | | ○ | | | | | | | |
| | | | 2 | SS | 12 | | | | | | | | ○ | | | | | | | |
| | | | 3 | SS | 7 | | | | | | | | | | | | | | | |
| | Silty sand, some gravel occasional shale and limestone fragments Compact to very dense, Brown, Moist | | 4 | SS | 14 | | | | | | | | ○ | | | 13 59 (28) | | | | |
| | | | 5 | SS | 35 | | | | | | | | ○ | | | | | | | |
| | | | 6 | SS | 61 | | | | | | | | ○ | ┌──┐ | | 9 14 50 27 | | | | |
| | (FILL) | | | | | | | | | | | | | | | | | | | |
| 139.0 | | | 7 | SS | 66 | | | | | | | | ○ | | | | | | | |
| 4.9 | SILTY CLAY TO CLAYEY SILT some sand, trace gravel occasional shale and limestone fragments Hard, Reddish brown, Damp (TILL) | | | | | | | | | | | | | | | | | | | |
| 137.0 | | | | | | | | | | | | | | | | | | | | |
| 6.9 | SHALE BEDROCK Weathered, Reddish, Wet | | 8 | SS | 100/10cm | | | | | | | | ○ | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 136.1 | | | 9 | SS | 100/5cm | | | | | | | | ○ | | | | | | | |
| 7.8 | End of borehole | | | | | | | | | | | | | | | | | | | |
| | NOTE: Ground water was not encountered during and after completion of drilling. | | | | | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No 17-14

1 OF 1

METRIC

G.W.P. 2163-10-00 LOCATION Coords: 4 818 046.9 N ; 290 420.1 E ORIGINATED BY K.P.
 DIST Central HWY QEW BOREHOLE TYPE Solid Stem Augers COMPILED BY A.K.
 DATUM Geodetic DATE 2017.08.30 LATITUDE 43.50220 LONGITUDE -79.67782 CHECKED BY M.V.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | |
|---|---|------------|---------|------|------------|----------------------------|--|---|--|--|--|-------------------|---|---|---|-------------------------|---|----|--------------|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | W _P W W _L | | | | GR | SA | SI | CL |
| | | | | | | | | 20 40 60 80 100 | ○ UNCONFINED + FIELD VANE | | | WATER CONTENT (%) | | | | | | | | |
| | | | | | | 20 40 60 80 100 | ● QUICK TRIAXIAL × LAB VANE | | | | | | | | | | | | | |
| 158.1 0.0 | GROUND SURFACE | | | | | | 158 | | | | | | | | | | | | | |
| 157.8 0.3 | TOPSOIL | | 1 | SS | 24 | | | | | | | | | | | | | | | |
| | SILTY CLAY TO CLAYEY SILT with gravel, some sand occasional shale and limestone fragments | | 2 | SS | 50/10cm | | | | | | | | | | ○ | | | 32 | 24 (44) | |
| | Hard, Reddish brown, Damp | | | | | | | 157 | | | | | | | | | | | | |
| | (TILL) | | 3 | SS | 50/8cm | | | | | | | | | | ○ | H | | 7 | 18 58 17 | |
| 156.2 1.9 | SHALE BEDROCK | | | | | | | 156 | | | | | | | | | | | | |
| | Weathered, Reddish brown, Damp | | 4 | SS | 50/13cm | | | | | | | | | ○ | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | 5 | SS | 50/13cm | | 155 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | ○ | | | | | | |
| | | | | | | | 154 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 153.4 4.7 | End of borehole | | 6 | SS | 50/5cm | | | | | | | | | | | | | | | |
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| NOTE: Ground water was not encountered during and after completion of drilling. | | | | | | | | | | | | | | | | | | | | |

+3, X3 Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

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|------------------|--|---|--|--|--|------------------|--|---------------|--|
| PROJECT 991-1140 | | RECORD OF BOREHOLE No 15 | | | | 1 OF 1 | | METRIC | |
| W.P. 98-23024 | | LOCATION Sta. 21+460, 25m Right of centerline of the median | | | | ORIGINATED BY SB | | | |
| DIST HWY QEW | | BOREHOLE TYPE | | | | COMPILED BY SVB | | | |
| DATUM Geodetic | | DATE 10.9.99 | | | | CHECKED BY AMP | | | |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|----------------|--|-------------|---------|-------|----------|----------------------------|-----------------|---|--|--|--|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| ELEV. DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | W VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x REMOULDED | | | | | | | | | |
| 107.75 0.00 | Silty Sand, some gravel, trace clay, trace rootlets Dense Brown (Fill) | | 1 | 50 DO | 31 | | | | | | | | | | | | |
| 106.99 0.76 | Silty Clay, some sand and gravel Stiff Brown/grey (Fill) | | 2 | 50 DO | 9 | | | | | | | | | | | | |
| 106.38 1.37 | Silty Clay, trace to some sand and gravel Hard Brown/grey (Fill) | | 3 | 50 DO | 5100 | | | | | | | | | | | | |
| 106.15 1.60 | Shale Bedrock Weathered Grey (Georgian Bay Formation) | | 4 | 50 DO | 5100 | | | | | | | | | | | | |
| 103.94 3.81 | END OF BOREHOLE (AUGER REFUSAL) Note: Open hole dry on completion of drilling. Water level in Piezometer at Elev. 105.8m on Sept. 28/99. | | | | | | | | | | | | | | | | |

ON MOT 991-1140.GPJ ON MOT GDT 12/10/99

125-66-72

RECORD OF BOREHOLE No 17

W P 159-75-85 LOCATION Co-ords. N 15,803,222; E 953,842 ORIGINATED BY JRW
 DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Augering - BXL Core COMPILED BY JRW
 DATUM Geodetic DATE June 17, 1977 CHECKED BY JS

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|--------------|-----------------------------------|------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 393.7 | Creek Bottom | | | | | | | | | | | | | | | | |
| 391.7 | Cobbles and gravel | | | | | | | | | | | | | | | | |
| 389.7 | Silty clay some sand | | 1 | AS | | | 390 | | | | | | | | | | |
| 4.0 | Bedrock | | 2 | SS | 1.09 | | | | | | | | | | | | |
| | 80% Shale-Soft & weathered | | 4 | RC | Rec 60% | | | | | | | | | | | | RQD 50% |
| | Frequent laminations of limestone | | 5 | RC | Rec 75% | | 380 | | | | | | | | | | RQD 20% |
| | Up to 8" thick | | 6 | RC | Rec 80% | | | | | | | | | | | | RQD 20% |
| 376.8 | | | | | | | | | | | | | | | | | |
| 16.9 | End of Borehole | | | | | | | | | | | | | | | | |

+3, x5: Numbers refer to Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

METRIC

[illegible]

+³, ×³: Numbers refer to Sensitivity

RECORD OF BOREHOLE No 13-20

1 OF 1

METRIC

W.P. _____ LOCATION N 4 617 188.1 E 290 718.9 ORIGINATED BY GA
 HWY 403/QEW BOREHOLE TYPE Solid Stem Augers/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.06.04 - 2013.06.04 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|--|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 127.7 | | | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL: (100mm) | | | | | | | | | | | | | | | | |
| 0.1 | Silty CLAY, trace to some sand, trace gravel Firm to Very Stiff Brown (FILL) | | 1 | SS | 7 | | | | | | | | | | | | |
| | | | 2 | SS | 22 | | | | | | | | | | | | 2 13 49 36 |
| 126.1 | | | 3 | SS | 50/ | | | | | | | | | | | | |
| 1.6 | SHALE, with limestone interbeds, weathered, thinly bedded, grey | | | | 0.150 | | | | | | | | | | | | |
| | | | 4 | SS | 50/ | | | | | | | | | | | | |
| | | | | | 0.000 | | | | | | | | | | | | |
| | | | 5 | SS | 50/ | | | | | | | | | | | | |
| | | | | | 0.125 | | | | | | | | | | | | |
| | Start coring at 3.3m Weathered to fresh, thinly bedded, grey, occasional limestone interbeds | | | | | | | | | | | | | | | | |
| | Soft zone (175mm) at 3.3m | | 1 | RUN | | | | | | | | | | | | | RUN #1 TCR=100% SCR=87% ROD=57% UCS=43MPa (Average) |
| | Sub-vertical fracture (50mm) at 3.6m | | | | | | | | | | | | | | | | |
| | Limestone interbeds (25mm to 50mm thick) at 3.7m, 3.8m, 4.0m, 4.3m, 4.7m, 4.8m, (125mm) at 4.4m and (75mm) at 4.5m | | | | | | | | | | | | | | | | |
| | Horizontal fracture at 3.5m, 3.6m, 3.7m, 3.8m, 3.9m, 4.1m, 4.3m, 4.5m, 4.8m | | 2 | RUN | | | | | | | | | | | | | RUN #2 TCR=100% SCR=100% ROD=87% UCS=47MPa (Average) |
| | Limestone interbeds (25mm thick) at 4.9m, 5.3m, 5.7m, 5.8m, 5.9m, 6.0m, 6.1m, 6.2m, (100mm) at 5.1m and (125mm) at 5.5m | | | | | | | | | | | | | | | | |
| | Horizontal fracture at 4.9m, 5.2m, 5.4m, 5.6m, 5.7m, 5.8m, 6.0m | | | | | | | | | | | | | | | | |
| 121.3 | | | | | | | | | | | | | | | | | |
| 6.4 | END OF BOREHOLE AT 6.4m. BOREHOLE OPEN TO 6.4m AND WATER LEVEL AT 4.2m UPON COMPLETION OF CORING. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. | | | | | | | | | | | | | | | | |
| | WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) June 7/13 4.2 123.5 June 26/13 4.1 123.6 | | | | | | | | | | | | | | | | |

ONTMT4S 1184.GPJ 2012TEMPLATE(MTO).GDT 11/10/13

RECORD OF BOREHOLE No 13-22

1 OF 1

METRIC

W.P. _____ LOCATION N 4 817 183.5 E 290 838.7 ORIGINATED BY GA
 HWY 403/QEW BOREHOLE TYPE Solid Stem Augers/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.06.03 - 2013.06.04 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|--------------|----------------------------|-----------------|---|----|----|----|-----|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | |
| 128.0 | TOPSOIL: (125mm) | | | | | | | | | | | | | |
| 0.0 | | | | | | | | | | | | | | |
| 0.1 | SAND, some silt, some gravel Compact Brown Damp (FILL) | | 1 | SS | 13 | | | | | | | | | |
| 127.3 | | | | | | | | | | | | | | |
| 0.8 | Silty CLAY, trace sand, trace gravel Stiff Reddish Brown | | 2 | SS | 12 | | | | | | | | | 2 11 53 34 |
| | | | 3 | SS | 20 | | | | | | | | | |
| 125.7 | | | | | | | | | | | | | | |
| 2.4 | SHALE with limestone interbeds, highly weathered, thinly bedded, grey, iron oxide staining | | 4 | SS | 50/ 0.150 | | | | | | | | | |
| | | | 5 | SS | 50/ 0.125 | | | | | | | | | |
| | Start coring at 4.5m | | | | | | | | | | | | | |
| | Slightly weathered to fresh, thinly bedded, grey, occasional limestone interbeds | | | | | | | | | | | | | |
| | Clay seam (50mm) at 4.5m | | | | | | | | | | | | | |
| | Limestone interbeds (25mm thick) at 5.1m, 5.4m, 5.6m, 6.0m and (100mm) at 5.2m | | 1 | RUN | | | | | | | | | | RUN #1 TCR=100% SCR=83% RQD=75% UCS=49MPa (Average) |
| | Horizontal fractures at 4.8m, 4.9m, 5.4m, 5.5m, 5.7m, 5.9m | | | | | | | | | | | | | |
| | Limestone interbeds (25 to 50mm thick) at 6.1m, 6.2m, 6.4m, 6.6m, 6.8m, 7.2m and (300mm) at 7.3m | | 2 | RUN | | | | | | | | | | RUN #2 TCR=100% SCR=100% RQD=100% UCS=73MPa (Average) |
| | Horizontal fractures at 6.2m, 6.7m, 6.9m, 7.0m, 7.1m | | | | | | | | | | | | | |
| 120.4 | | | | | | | | | | | | | | |
| 7.6 | END OF BOREHOLE AT 7.6m. BOREHOLE OPEN TO 7.6m AND WATER LEVEL AT 5.4m UPON COMPLETION OF CORING. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. | | | | | | | | | | | | | |
| | WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) | | | | | | | | | | | | | |
| | June 7/13 5.4 122.6 | | | | | | | | | | | | | |
| | June 26/13 5.2 122.8 | | | | | | | | | | | | | |

ONTMT4S 1184.GPJ 2012TEMPLATE(MTO).GDT 11/10/13

RECORD OF BOREHOLE No 1

W P 125-66-23 LOCATION Co-ords N 15,803,181; E 954,335 ORIGINATED BY V.K.
DIST 4 HWY 403 BOREHOLE TYPE 3 1/2" Hollow Stem Auger; BXL Core and Cone Test COMPILED BY V.K.
DATUM Geodetic DATE November 14, 1977 CHECKED BY RS

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 389.6 | Ground Level | | | | | | | | | | | | | | | | GR SA SI CL |
| 0.0 | Topsoil | | | | | | | | | | | | | | | | |
| 384.6 | Clayey Silt, Sand & Gravel Hard | | 1 | SS | SI | | | | | | | | | | | | 28 7 39 26 |
| 5.0 | Shale Bedrock* | | | | | | | | | | | | | | | | |
| 379.6 | | | | | | | 380 | | | | | | | | | | |
| 10.0 | End of Borehole | | | | | | | | | | | | | | | | |
| | * Bedrock: Shale, grey, soft, fissile, 2" limestone seams R.Q.D. 15% | | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No 2

W P 125-66-23 LOCATION Co-ords N 15,803,193; E 954,297 ORIGINATED BY V.K.
DIST 4 HWY 403 BOREHOLE TYPE 3 1/2" Hollow Stem Auger; BXL Core and Cone Test COMPILED BY V.K.
DATUM Geodetic DATE November 14, 1977 CHECKED BY RS

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|--|------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 389.6 | Ground Level | | | | | | | | | | | | | | | | GR SA SI CL |
| 0.0 | Topsoil | | | | | | | | | | | | | | | | |
| 383.6 | Clayey Silt, Sand and Gravel Very Stiff | | 1 | SS | LS | | | | | | | | | | | | 50 22 14 5 |
| 5.0 | Weathered | | | | | | | | | | | | | | | | |
| 378.6 | Shale Bedrock* | | | | | | 380 | | | | | | | | | | |
| 11.0 | End of Borehole | | | | | | | | | | | | | | | | |
| | * Bedrock: Shale, grey, soft, fissile. 4" limestone seams R.Q.D. 20% | | | | | | | | | | | | | | | | |

+3, x5: Numbers refer to Sensitivity
20
15 10 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 3

W P 125-66-23 LOCATION Co-ords N 15,803,229; E 954,333 ORIGINATED BY V.K.
 DIST 4 HWY 403 BOREHOLE TYPE 3/4" Hollow Stem Auger; BXL Core COMPILED BY V.K.
 DATUM Geodetic DATE November 14, 1977 CHECKED BY RS

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 388.1 | Ground Level | | | | | | | | | | | | | | | | |
| 0.0 | Topsoil | | | | | | | | | | | | | | | | |
| 384.1 | Clayey Silt, sand and Gravel | | | | | | | | | | | | | | | | |
| 4.0 | | | | | | | | | | | | | | | | | |
| 379.1 | A Bedrock* | | | | | | 380 | | | | | | | | | | |
| 9.0 | End of Borehole | | | | | | | | | | | | | | | | |
| | * Bedrock: | | | | | | | | | | | | | | | | |
| | A. Shale, grey, soft fissile with 1" seams of limestone | | | | | | | | | | | | | | | | |
| | B. Limestone, light grey, fine to med. grained, hard. Fossiliferous | | | | | | | | | | | | | | | | |
| | R.Q.D. 30% | | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No 4

W P 125-66-23 LOCATION Co-ords: N 15,803,217; E 954,368 ORIGINATED BY V.K.
 DIST 4 HWY 403 BOREHOLE TYPE 3/4" Hollow Stem Auger; BXL Core COMPILED BY V.K.
 DATUM Geodetic DATE November 15, 1977 CHECKED BY RS

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|--------------|---|------------|---------|------|------------|-------------------------|-----------------|--|----|----|----|-----|---------------------------------|-------------------------------|--------------------------------|------------------|---------------------------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 388.0 | Ground Level | | | | | | | | | | | | | | | | |
| 0.0 | Topsoil | | | | | | | | | | | | | | | | |
| 383.0 | Clayey Silt, Sand and Gravel, Very Stiff | | 1 | SS | 18 | | | | | | | | | | | | 56 21 18 5 |
| 5.0 | | | | | | | | | | | | | | | | | |
| 378.0 | A Bedrock* | | | | | | 380 | | | | | | | | | | |
| 10.0 | End of Borehole | | | | | | | | | | | | | | | | |
| | * Bedrock: | | | | | | | | | | | | | | | | |
| | A. Shale, grey, soft fissile, thin seams of limestone. | | | | | | | | | | | | | | | | |
| | B. Limestone, light grey, med. grained, hard, fossiliferous | | | | | | | | | | | | | | | | |
| | R.Q.D. 30% | | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No 13-21

1 OF 1

METRIC

W.P. _____ LOCATION N 4 817 230.8 E 290 835.9 ORIGINATED BY GA
 HWY 403/OEW BOREHOLE TYPE Solid Stem Augers/NO Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.05.22 - 2013.05.22 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | *N* VALUES | | | SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE | | | | | | | WATER CONTENT (%) w _p w w _L | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 131.5 | | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

ONTMT4S 1184.GPJ 2012TEMPLATE(MTO).GDT 11/10/13

+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 13-19

1 OF 1

METRIC

W.P. _____ LOCATION N 4 817 242.3 E 290 705.9 ORIGINATED BY GA
 HWY 403/OEW BOREHOLE TYPE Solid Stem Augers/NO Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.06.03 - 2013.06.03 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|------|--------------|----------------------------|-----------------|---|----|----|----|-----|--|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | |
| 131.0 | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL: (100mm) | | | | | | | | | | | | | |
| 0.1 | SHALE, occasional clay pockets, silty | | 1 | SS | 10 | | | | | | | | | |
| 130.3 | Compact | | | | | | | | | | | | | |
| 0.7 | Reddish Brown Damp (FILL) | | 2 | SS | 24 | | | | | | | | | |
| 129.6 | Silty CLAY, trace sand Very Stiff | | | | | | | | | | | | | |
| 1.4 | Reddish Brown (FILL) | | | | | | | | | | | | | |
| 128.9 | Silty CLAY, trace sand, occasional shale fragments Very Stiff | | 3 | SS | 28 | | | | | | | | | |
| 2.2 | Brown/Reddish Brown | | 4 | SS | 50/ 0.150 | | | | | | | | | |
| | SHALE, with limestone interbeds, weathered, thinly bedded, brownish grey | | | | | | | | | | | | | |
| | | | 5 | SS | 50/ 0.125 | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | Start coring at 4.5m | | | | | | | | | | | | | |
| | Weathered to fresh, thinly bedded, grey, occasional limestone interbeds | | | | | | | | | | | | | |
| | Clay seam (100mm) at 4.6m | | | | | | | | | | | | | |
| | Limestone interbeds (25mm thick) at 4.1m, 4.8m, 5.7m and (125mm) at 5.0m | | 1 | RUN | | | | | | | | | | |
| | Horizontal fractures at 4.6m, 4.7m, 5.0m, 5.4m, 5.5m, 5.9m, 6.0m | | | | | | | | | | | | | |
| | Limestone interbeds (25mm to 50mm thick) at 6.1m, 6.6m, 7.0m, 7.1m, 7.4m, 7.5m and (150mm) at 6.2m | | 2 | RUN | | | | | | | | | | |
| | Horizontal fractures at 6.1m, 6.2m, 6.4m, 6.5m, 6.6m, 7.4m, 7.5m | | | | | | | | | | | | | |
| 123.4 | | | | | | | | | | | | | | |
| 7.6 | END OF BOREHOLE AT 7.6m. BOREHOLE OPEN TO 7.6m AND WATER LEVEL AT 4.5m UPON COMPLETION OF CORING. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. | | | | | | | | | | | | | |
| | WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) | | | | | | | | | | | | | |
| | June 7/13 7.1 123.9 | | | | | | | | | | | | | |
| | June 26/13 7.5 123.5 | | | | | | | | | | | | | |

ONTMT4S 1184.GPJ 2012TEMPLATE(MTO).GDT 11/10/13

RECORD OF BOREHOLE No 403-1

1 of 1

METRIC

| | | | | | |
|--------|------------|----------|------------------------------------|---------------|-------------------------------------|
| G.W.P. | 2163-10-00 | LOCATION | Coords: 4 817 553.0 N; 290 718.9 E | ORIGINATED BY | S.A. |
| DIST | Central | HWY | QEW | BOREHOLE TYPE | Continuous Flight Solid Stem Augers |
| DATUM | Geodetic | DATE | November 06, 2015 | CHECKED BY | C.N. |

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS * | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | |
|---------------|---|------------|---------|------|------------|-------------------------------------|-----------------|---|--|--|--|--|---|---------------------------------------|--------------------------------------|--|-------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | WATER CONTENT (%) | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| 145.1 | Ground Surface | | | | | | | | | | | | | | | | | | |
| 144.9 | Topsoil | | | | | | | | | | | | | | | | | | |
| 0.2 | Clayey silt to silty clay some sand, trace gravel rootlets, organic inclusions shale fragments Stiff to Dark Moist very stiff brown/ reddish brown < | | | | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No 403-4

1 of 1

METRIC

G.W.P. 2163-10-00 LOCATION Coords: 4 817 336.6 N; 290 736.5 E ORIGINATED BY S.A.
 DIST Central HWY QEW BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY K.D.
 DATUM Geodetic DATE November 06, 2015 CHECKED BY C.N.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS * | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | |
|---------------|--|------------|---------|------|------------|---------------------------------|-----------------|--|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|----------------------------------|--|-------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | | | WATER CONTENT (%) | | |
| | | | | | | | | <div>○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE</div> | | | | | | | | | | | | |
| 135.9 | Ground Surface | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | | |
| 135.8 | Topsoil | | 1 | SS | 9 | | 135 | | | | | | | | | | 4 11 45 40 | | | |
| 0.1 | Silty clay some sand, trace gravel organic inclusions, rootlets shale fragments | | | | | | | | | | | | | | | | | | | |
| | Stiff to Reddish Moist very stiff brown (FILL) | | 2 | SS | 23 | | | | | | | | | | | | | | | |
| 134.4 | | | | | | | | | | | | | | | | | | | | |
| 1.5 | Highly weathered shale bedrock, siltstone bands | | 3 | SS | 50/13cm | | 134 | | | | | | | | | | | | | |
| | Grey/ reddish brown | | | | | | | | | | | | | | | | | | | |
| 133.3 | | | 4 | SS | 50/10cm | | | | | | | | | | | | | | | |
| 2.6 | End of borehole Refusal to augering | | | | | | | | | | | | | | | | | | | |
| | * Borehole dry | | | | | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No 7

W P 159-75-09 LOCATION Co-ords N 15 805 259; E 953 669 ORIGINATED BY V.K.
 DIST 4 HWY 403 BOREHOLE TYPE 3 1/2" Hollow Stem Auger BXL Core COMPILED BY S1
 DATUM Geodetic DATE November 9th, 1977 CHECKED BY W.f

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|--------------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 471.8 | Ground Level | | | | | | | | | | | | | | | | |
| 0.0 | Topsoil | | | | | | | | | | | | | | | | |
| | Clayey Silt With Traces of Sand | | 1 | SS | 32 | | 470 | | | | | | | | | | |
| | Hard | | 2 | SS | 40 | | | | | | | | | | | | |
| 462.8 | | | | | | | | | | | | | | | | | |
| 9.0 | Weathered | | 3 | SS | 507 | 5" | | | | | | | | | | | |
| | Shale With Seams of Shaly Limestone | | | | | | | | | | | | | | | | |
| 457.3 | Bedrock | | 4 | BXL | 100% Rec. | | 460 | | | | | | | | | | |
| 14.5 | End of Borehole | | | | | | | | | | | | | | | | |
| | Bedrock: Shale, brown red colour, fine texture, soft and fissile. Shaly limestone, light grey colour, fine texture, medium hard to soft, shale R.Q.D.0% limestone R.Q.D.50% | | | | | | | | | | | | | | | | |

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 13

WP 159-75-07

LOCATION Co-ords. N 15,805,861; E 953,791

ORIGINATED BY VK

DIST 4 HWY 403

BORING DATE March 28, 1977

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Solid Stem Auger; BXL Core

CHECKED BY RS

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER ELEV | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w | | | UNIT WEIGHT γ | REMARKS |
|---------------|--|-------------|---------|-----------|-------------|----------------------|---|----|----|----|-----|--|-----|-------|----------------------------|-----------|
| ELEV DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | 'N' VALUES | | 20 | 40 | 60 | 80 | 100 | w_p | w | w_L | | |
| 487.8 | Ground Level | | | | | | | | | | | | | | | |
| 0.0 | Clayey silt Trace of sand Herd. Red | | 1 | SS | 38 | | | | | | | | | | | 0 6 74 20 |
| 480.8 | | | 2 | SS | 129 | 480 | | | | | | | | | | |
| 7.0 477.8 | (weathered) (sound) | | 3 | SS | 100 | 477.8 | | | | | | | | | | |
| 10.0 | Shale Bedrock | | 4 | RC BXL | 100% Rec | 470 | | | | | | | | | | RQD 30% |
| | Shale Bedrock, red, fine texture, soft, fissile with lime- stone interbedded seams up to 2" thick thin horizontal bedding. | | 5 | RC BXL | 100% Rec | 460 | | | | | | | | | | RQD 50% |
| 457.9 | | | | | | | | | | | | | | | | |
| 29.9 | End of Borehole | | | | | | | | | | | | | | | |



RECORD OF BOREHOLE No 3

W P 159-75-09 LOCATION Co-ords N 15 805 604; E 953 491 ORIGINATED BY V.K.
DIST 4 HWY 403 BOREHOLE TYPE 3 1/2" Hollow Stem Auger BXL Core COMPILED BY J.L.
DATUM Geodetic DATE November 9th, 1977 CHECKED BY J.L.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|------------|---------|------|--------------|----------------------------|-----------------|---|--|---------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | 20 40 60 80 100 | | | | | | |
| 481.1 | Ground Level | | | | | | | | | | | | | |
| 0.0 | Topsoil | | | | | | | | | | | | | |
| 476.1 | Clayey Silt with traces of sand Hard | | 1 | SS | 44 | | 480 | | | | | | | 0 9 71 20 |
| 5.0 | Shale | | 2 | BXL | 100% Rec. | | | | | | | | | |
| | Bedrock | | | | | | 470 | | | | | | | |
| 466.1 | | | | | | | | | | | | | | |
| 15.0 | End of Borehole | | | | | | | | | | | | | |
| | Bedrock: Shale, brown red colour, with few thin beds of grey shale, fine texture, soft and fissile -R.Q.D. 0% | | | | | | | | | | | | | |

+3, x5: Numbers refer to
Sensitivity

20
15 10 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 13-08

1 OF 1

METRIC

W.P. _____ LOCATION N 4 817 953.6 E 290 550.0 ORIGINATED BY GA
 HWY 403/OEW BOREHOLE TYPE Solid Stem Augers/NO Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.05.07 - 2013.05.07 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|------------|---------|------|--------------|----------------------------|-----------------|---|----|----|----|-----|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | 20 | 40 | 60 | 80 | 100 | | |
| 151.8 | TOPSOIL: (50mm) | | | | | | | | | | | | | |
| 0.0 | | | | | | | | | | | | | | |
| 151.3 | Silty CLAY, some sand Very Stiff Brown (FILL) | | 1 | SS | 17 | | | | | | | | | |
| 0.5 | SHALE, highly weathered, brown | | 2 | SS | 50/ 0.150 | | 151 | | | | | | | |
| | | | 3 | SS | 50/ 0.150 | | 150 | | | | | | | |
| | Start coring at 2.4m | | | | | | | | | | | | | |
| | Moderately weathered to fresh, occasional limestone Interbeds | | | | | | 149 | | | | | | | |
| | Horizontal fractures at 2.5m, 2.6m, 2.7m, 2.9m, 3.0m, 3.2m, 3.3m, 3.4m, 3.7m, 3.8m | | 1 | RUN | | | | | | | | | | |
| | Limestone Interbeds (25mm thick) at 3.0m, 3.2m, 3.4m, 3.7m | | | | | | 148 | | | | | | | |
| | Limestone interbed (150mm) at 4.1m | | | | | | | | | | | | | |
| | Horizontal fractures at 4.0m, 4.1m, 4.2m, 4.3m, 4.4m, 4.5m, 4.7m, 5.0m, 5.1m, 5.2m | | 2 | RUN | | | 147 | | | | | | | |
| | Limestone interbeds (25mm thick) at 3.9m, 4.3m, 4.4m, 4.5m, 4.6m, 5.3m, (75mm) at 4.7m | | | | | | | | | | | | | |
| 146.3 | END OF BOREHOLE AT 5.5m. BOREHOLE OPEN TO 5.5m AND WATER LEVEL AT 0.9m UPON COMPLETION OF CORING. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. | | | | | | | | | | | | | |
| 5.5 | | | | | | | | | | | | | | |
| | WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) May 30/13 5.5 146.3 Jun 28/13 4.3 147.5 | | | | | | | | | | | | | |

+ 3 . x 3 Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 13-09

1 OF 1

METRIC

W.P. _____ LOCATION N 4 817 924.3 E 290 584.6 ORIGINATED BY GA
 HWY 403/OEW BOREHOLE TYPE Solid Stem Augers/NO Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.05.08 - 2013.05.08 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|-----------------|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | WATER CONTENT (%) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 150.8 0.0 | TOPSOIL: (50mm) | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | </ |

ONTMT4S 1184.GPJ 2012TEMPLATE(MTO).GDT 8/1/13

METRIC

[illegible]

+ 3, x 3 Numbers refer to Sensitivity

METRIC

+ 3, x 3 Numbers refer to Sensitivity

RECORD OF BOREHOLE No 7

W P 159-75-06 LOCATION N 15 805 525 E 953 990 Co-ords. ORIGINATED BY P.J.S.
DIST 4 HWY Q.E.W. BOREHOLE TYPE Solid Auger, BX Casing, BXL Core COMPILED BY P.J.S.
DATUM Geodetic DATE December 20, 1977 CHECKED BY R.S.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|---|------------|---------|-------------|-------------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 479.4 | Ground Level | | | | | | | | | | | | | | | | GR SA SI CL |
| 0.0 | SILTY CLAY TRACE OF SAND Very Stiff | | 1 | SS | 21 | | | | | | | | | | | | 0 4 45 51 |
| 471.4 | To Hard | | 2 | SS | 116/15" | | | | | | | | | | | | 0 7 63 30 |
| 8.0 | QUEENSTON SHALE BEDROCK | | 3 | SS | 100/12" | | 470 | | | | | | | | | | 0 3 71 26 |
| | Red To Grey Red Fine Texture Soft And Fissile With Thin Bedding Including A Few Shaly Limestone Beds | | 4 | BXL Core | 98% Rec | | 460 | | | | | | | | | | RQD = 50 |
| | Shaly Limestone 15'8"-16'0" | | 5 | BXL Core | 100% Rec | | 450 | | | | | | | | | | RQD = 67 |
| | Shaly Limestone 40'8"-41'0" | | | | | | | | | | | | | | | | |
| | Shaly Limestone 43'5"-44'5" | | 6 | BXL Core | 100% Rec | | 440 | | | | | | | | | | RQD = 54 |
| 434.4 | | | | | | | | | | | | | | | | | |
| 45.0 | End Of Borehole | | | | | | | | | | | | | | | | |
| | Note: W.L. Not Established | | | | | | | | | | | | | | | | |

RECORD OF BOREHOLE No 8

W P 159-75-06 LOCATION N 15 805 601 E 954 015 Co-ords. ORIGINATED BY P.J.S.
DIST 4 HWY Q.E.W. BOREHOLE TYPE Solid Auger COMPILED BY P.J.S.
DATUM Geodetic DATE December 21, 1977 CHECKED BY R.S.

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ | REMARKS & GRAIN SIZE DISTRIBUTION (%) |
|---------------|--|------------|---------|------|------------|----------------------------|-----------------|---|----|----|----|-----|------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | 'N' VALUES | | | 20 | 40 | 60 | 80 | 100 | | | | | |
| 481.3 | Ground Level | | | | | | | | | | | | | | | | GR SA SI CL |
| 0.0 | SILTY CLAY TRACE OF SAND Very Stiff | | 1 | SS | 16 | | 480 | | | | | | | | | | |
| 473.3 | To Hard | | 2 | SS | 56 | | | | | | | | | | | | |
| 8.0 | QUEENSTON SHALE BEDROCK | | 3 | SS | 100/7" | | 470 | | | | | | | | | | |
| | Red To Grey Red | | 4 | SS | 100/5" | | | | | | | | | | | | |
| 463.6 | | | 5 | SS | 75/3" | | | | | | | | | | | | |
| 17.7 | End Of Borehole | | 6 | SS | 75/3" | | | | | | | | | | | | |

RECORD OF BOREHOLE No 13-11

1 OF 1

METRIC

W.P. _____ LOCATION N 4 817 918.5 E 290 697.1 ORIGINATED BY GA
 HWY 403/OEW BOREHOLE TYPE Solid Stem Augers/NO Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.05.10 - 2013.05.10 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
|---------------|---|------------|---------|------|--------------|----------------------------|-----------------|---|--------------|--------------------------------|--|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | |
| | | | | | | | | ○ UNCONFINED | + FIELD VANE | ● QUICK TRIAXIAL × LAB VANE | | | |
| 150.0 | | | | | | | 20 | 40 | 60 | 80 | 100 | | |
| 0.0 | TOPSOIL: (50mm) | | | | | 150 | | | | | | | |
| 149.4 | Silty CLAY, trace sand, occasional shale fragments | | 1 | SS | 8 | | | | | | | | 0 5 61 34 |
| 0.7 | Stiff Reddish Brown (FILL) | | | | | | | | | | | | |
| | SHALE, highly weathered, reddish brown | | 2 | SS | 44 | 149 | | | | | | | |
| | | | 3 | SS | 50/ 0.150 | | | | | | | | |
| | Start coring at 2.4m | | | | | 148 | | | | | | | |
| | Slightly weathered, thinly bedded, reddish brown, occasional limestone interbeds | | | | | | | | | | | | |
| | Limestone interbeds (25mm to 75mm) at 2.7m, 3.2m | | | | | | | | | | | | |
| | Horizontal fractures at 2.6m, 2.7m, 2.9m, 3.1m, 3.2m, 3.3m, 3.4m, 3.5m, 3.6m, 3.7m, 3.8m | | 1 | RUN | | 147 | | | | | | | RUN #1 TCR=100% SCR=95% RQD=57% UCS=6MPa (Average) |
| | | | | | | | | | | | | | |
| | Limestone interbeds (25mm thick) at 3.9m, 4.6m, 4.7m, 4.9m, 5.1m, 5.3m, 5.4m | | | | | 146 | | | | | | | |
| | Horizontal fractures at 3.9m, 4.5m, 4.6m, 4.7m, 4.8m, 4.9m, 5.1m, 5.3m | | 2 | RUN | | | | | | | | | RUN #2 TCR=100% SCR=97% RQD=37% UCS=14MPa (Average) |
| | | | | | | 145 | | | | | | | |
| 144.6 | | | | | | | | | | | | | |
| 5.5 | END OF BOREHOLE AT 5.5m. BOREHOLE OPEN TO 5.1m AND WATER LEVEL AT 1.8m UPON COMPLETION OF CORING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE. | | | | | | | | | | | | |

+ 3 . x 3

Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 13-12

1 OF 1

METRIC

W.P. _____ LOCATION N 4 817 926.6 E 290 748.1 ORIGINATED BY GA
 HWY 403/QEW BOREHOLE TYPE Solid Stem Augers/NO Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.05.28 - 2013.05.28 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT W _P | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | | | | | | | | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|--------------|------------------|------------------------------------|-------------------------------------|-----------------------------------|--|---|-------------------|--|----|----|----|----|----|----|----|----|----|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | | WATER CONTENT (%) | | | GR | SA | SI | CL | | | | |
| | | | | | | | | ○ UNCONFINED | + FIELD VANE | ● QUICK TRIAXIAL | | | | | | × LAB VANE | 20 | 40 | | | | | 60 | 20 | 40 | 60 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 149.1 | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | | | | | | | | | |
| 0.0 | TOPSOIL: (125mm) | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.1 | Silty CLAY, trace sand, occasional rootlets Very Stiff Reddish Brown | | 1 | SS | 16 | | | | | | | | | | | 0 | 0 63 37 | | | | | | | | | |
| 148.2 | (FILL) | | 2 | SS | 50/ | | | | | | | | | | | | | | | | | | | | | |
| 0.8 | SHALE, highly weathered, thinly bedded, reddish brown | | | | 0.150 | | | | | | | | | | | | | | | | | | | | | |
| | | | 3 | SS | 50/ | | | | | | | | | | | | | | | | | | | | | |
| | | | | | 0.100 | | | | | | | | | | | | | | | | | | | | | |
| | Start coring at 3.1m | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Slightly weathered to fresh, thinly bedded, reddish brown, occasional limestone interbeds Soft zone (175mm) at 3.0m | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Limestone Interbed (25mm) at 3.9m | | 1 | RUN | | | | | | | | | | | | | RUN #1 TCR=100% SCR=87% RQD=67% UCS=16MPa (Average) | | | | | | | | | |
| | Horizontal fractures at 3.2m, 3.3m, 3.4m, 3.7m, 3.8m, 4.2m | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Highly broken zone (75mm) at 3.9m | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Limestone Interbed (25mm) at 3.6m, 3.7m, 4.1m, 4.2m, 4.5m, 4.6m, 5.1m, 5.2m, 6.0m | | | | | | | | | | | | | | | | RUN #2 TCR=100% SCR=100% RQD=100% UCS=12MPa (Average) | | | | | | | | | |
| | Horizontal fractures at 4.7m, 5.1m, 5.7m, 5.9m | | 2 | RUN | | | | | | | | | | | | | | | | | | | | | | |
| 143.0 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.1 | END OF BOREHOLE AT 6.1m. BOREHOLE OPEN TO 6.1m AND WATER LEVEL AT 1.8m UPON COMPLETION OF CORING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE. | | | | | | | | | | | | | | | | | | | | | | | | | |

ONTMT4S 1184.GPJ 2012TEMPLATE(MTO).GDT 8/1/13

RECORD OF BOREHOLE No 13-13

1 OF 1

METRIC

W.P. _____ LOCATION N 4 817 944.0 E 290 794.5 ORIGINATED BY GA
 HWY 403/QEW BOREHOLE TYPE Solid Stem Augers/NO Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.05.28 - 2013.05.30 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
|---------------|---|------------|---------|------|--------------|----------------------------|-----------------|---|--|--|---|--|-------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) |
| 149.9 | | | | | | | | 20 40 60 80 100 | | | | | |
| 0.0 | TOPSOIL: (125mm) | | | | | | | 20 40 60 80 100 | | | | | |
| 0.1 | Silty CLAY, trace sand, occasional rootlets Stiff Reddish Brown/Brown (FILL) | | 1 | SS | 10 | | | 20 40 60 80 100 | | | | | |
| 149.0 | | | | | | | | 20 40 60 80 100 | | | | | |
| 0.9 | SHALE, highly weathered, thinly bedded, reddish brown | | 2 | SS | 48 | | 149 | 20 40 60 80 100 | | | | | |
| | | | 3 | SS | 50/ 0.150 | | 148 | 20 40 60 80 100 | | | | | |
| | Start coring at 3.0m | | | | | | | 20 40 60 80 100 | | | | | |
| | Slightly weathered to fresh, thinly bedded, reddish brown, occasional limestone interbeds Soft zone (225mm) at 3.0m | | 1 | RUN | | | 147 | 20 40 60 80 100 | | | | | |
| | Limestone interbeds (25mm thick) at 3.5m, 3.6m, 4.2m, 4.3m | | | | | | 146 | 20 40 60 80 100 | | | | | |
| | Horizontal fracture at 3.1m, 3.3m, 3.4m, 3.5m, 3.6m, 3.8m, 4.0m, 4.2m, 4.4m, 4.5m | | | | | | | 20 40 60 80 100 | | | | | |
| | Limestone interbeds (25mm thick) at 4.8m, 5.0m, 5.2m, 5.6m, 5.7m, 6.0m | | 2 | RUN | | | 145 | 20 40 60 80 100 | | | | | |
| | Horizontal fracture at 5.0m, 5.2m, 5.4m | | | | | | | 20 40 60 80 100 | | | | | |
| 143.8 | Limestone interbed at 6.0m | | | | | | 144 | 20 40 60 80 100 | | | | | |
| 6.1 | END OF BOREHOLE AT 6.1m. BOREHOLE OPEN TO 6.1m AND WATER LEVEL AT 3.3m UPON COMPLETION OF CORING. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) May 30/13 3.0 146.9 Jun 26/13 2.7 147.2 | | | | | | | | | | | | |

ONTMT4S 1184.GPJ 2012TEMPLATE(MTO).GDT 8/1/13

RECORD OF BOREHOLE No 13-14

1 OF 1

METRIC

W.P. _____ LOCATION N 4 817 955.6 E 290 844.0 ORIGINATED BY GA
 HWY 403/QEW BOREHOLE TYPE Solid Stem Augers/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.05.23 - 2013.05.23 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | UNIT WEIGHT kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL | |
|---------------|---|------------|---------|------|------------|----------------------------|-----------------|---|--|--|---|--|-------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | WATER CONTENT (%) |
| | | | | | | | | UNCONFINED + FIELD VANE | | | | | |
| | | | | | | | | QUICK TRIAXIAL x LAB VANE | | | | | |
| 150.2 | | | | | | | 20 40 60 80 100 | | | | | | |
| 0.0 | ASPHALT: (150mm) | | | | | | | | | | | | |
| 0.2 | CONCRETE: (300mm) | | | | | | | | | | | | |
| 149.7 | | | | | | | | | | | | | |
| 0.5 | SAND and GRAVEL Brown | | | | | | | | | | | | |
| 149.3 | (FILL) | | | | | | | | | | | | |
| 0.9 | SHALE, highly weathered, reddish brown | | 1 | SS | 28 | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | 2 | SS | 38 | | | | | | | | |
| | | | | | | | | | | | | | |
| | Moderately weathered | | 3 | SS | 74 | | | | | | | | |
| | Start coring at 3.0m | | | | | | | | | | | | |
| | Slightly weathered to fresh, thinly bedded, reddish brown | | | | | | | | | | | | |
| | Limestone interbeds (25mm) at 3.0m, 3.2m, 3.3m, 3.7m, 3.9m, 4.3m | | 1 | RUN | | | | | | | | | |
| | Highly broken zones: 150mm at 3.0m 225mm at 3.6m | | | | | | | | | | | | |
| | Horizontal fracture at 3.3m, 3.4m, 3.5m, 3.6m, 3.8m, 3.9m, 4.0m, 4.2m | | | | | | | | | | | | |
| | Limestone interbeds (25mm) at 5.0m, 5.3m, 5.7m, 5.9m | | 2 | RUN | | | | | | | | | |
| | Highly broken zones: 150mm at 4.8m 100mm at 6.0m | | | | | | | | | | | | |
| | Horizontal fracture at 4.5m, 4.9m, 5.1m, 5.2m, 5.5m, 5.6m, 5.8m, 6.0m | | | | | | | | | | | | |
| 144.1 | | | | | | | | | | | | | |
| 6.1 | END OF BOREHOLE AT 6.1m. BOREHOLE OPEN TO 6.1m AND WATER LEVEL AT 1.5m UPON COMPLETION OF CORING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.3m, CONCRETE TO 0.15m, THEN ASPHALT PATCH TO SURFACE. | | | | | | | | | | | | |

ONTMT4S 1184.GPJ 2012TEMPLATE(MTO).GDT 8/1/13

RECORD OF BOREHOLE No 13-05

1 OF 1

METRIC

W.P. _____ LOCATION N 4 818 066.3 E 290 824.0 ORIGINATED BY GA
 HWY 403/QEW BOREHOLE TYPE Solid Stem Augers/NO Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.05.27 - 2013.05.28 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | PLASTIC LIMIT W _p | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|------------|---------|------|--------------|----------------------------|-----------------|---|--|----|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | | |
| 151.8 | | | | | | | | 20 40 60 80 100 | | | | | | | |
| 0.0 | TOPSOIL: (110mm) | | | | | | | ○ UNCONFINED + FIELD VANE | | | | | | | |
| 0.1 | Silty CLAY, trace sand, occasional rootlets | | 1 | SS | 11 | | | ● QUICK TRIAXIAL × LAB VANE | | | | | | | |
| | Stiff | | | | | | | | | | | | | | |
| | Brown to Reddish Brown (FILL) | | | | | | | | | | | | | | |
| 150.9 | | | | | | | | 20 40 60 80 100 | | 20 | 40 | 60 | | | |
| 0.9 | SHALE, highly weathered, thinly bedded, reddish brown | | 2 | SS | 30 | | | | | | | | | | |
| | | | 3 | SS | 50/ 0.150 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | Start coring at 3.1m | | | | | | | | | | | | | | |
| | Slightly weathered to fresh, thinly bedded, reddish brown, occasional limestone interbeds | | | | | | | | | | | | | | |
| | Clay seam (100mm) at 3.2m | | | | | | | | | | | | | | |
| | Horizontal fracture at 3.1m, 3.3m, 3.6m, 4.0m, 4.4m | | 1 | RUN | | | | | | | | | | | |
| | Highly broken zone (75mm) at 3.9m | | | | | | | | | | | | | | |
| | Limestone interbeds (25mm) at 4.1m, 4.2m, 4.4m, 4.7m, 4.8m, 4.9m, 5.9m and (100mm) at 3.6m | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | Horizontal fracture at 4.9m, 5.2m, 5.5m, 5.8m | | 2 | RUN | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| 145.7 | | | | | | | | | | | | | | | |
| 6.1 | END OF BOREHOLE AT 6.1m. BOREHOLE OPEN TO 6.1m AND WATER LEVEL AT 2.4m UPON COMPLETION OF CORING. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. | | | | | | | | | | | | | | |
| | WATER LEVEL READINGS: | | | | | | | | | | | | | | |
| | DATE DEPTH (m) ELEV. (m) | | | | | | | | | | | | | | |
| | May 30/13 3.7 148.1 | | | | | | | | | | | | | | |
| | Jun 26/13 3.8 148.0 | | | | | | | | | | | | | | |

ONTM14S 1184.GPJ 2012TEMPLATE(MTO).GDT 7/24/13

+ 3 x 3 Numbers refer to Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 13-15

1 OF 1

METRIC

W.P. _____ LOCATION N 4 818 008.5 E 290 914.7 ORIGINATED BY LRB
 HWY 403/OEW BOREHOLE TYPE Solid Stem Augers/NO Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.05.14 - 2013.05.14 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | |
|---------------|---|------------|---------|------|--------------|----------------------------|-----------------|---|--|--|--|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | |
| 150.2 | | | | | | | | 20 40 60 80 100 | | | | | |
| 8.9 | TOPSOIL: (25mm) | | | | | | | ○ UNCONFINED + FIELD VANE | | | | | |
| | SAND and GRAVEL, some silt | | 1 | SS | 11 | | 150 | ● QUICK TRIAXIAL × LAB VANE | | | | | |
| 149.6 | Compact Reddish Brown Moist (FILL) | | | | | | | WATER CONTENT (%) | | | | | |
| 0.6 | SHALE, highly weathered, reddish brown, occasional limestone interbeds | | 2 | SS | 72 | | 149 | PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT | | | | | |
| | | | 3 | SS | 80/ 0.275 | | 148 | | | | | | |
| | Start coring at 2.4m | | | | | | 148 | | | | | | |
| | Moderately to slightly weathered, thinly bedded | | 1 | RUN | | | 147 | | | | | | |
| | Highly broken from 2.4m to 2.6m | | | | | | | | | | | | |
| | Clayey (50mm) at 2.4m | | | | | | 148 | | | | | | |
| | Limestone (75mm) at 2.8m and (50mm) at 2.9m | | 2 | RUN | | | 148 | | | | | | |
| | Oxidation from 4.2m to 4.3m | | | | | | | | | | | | |
| | Highly broken (150mm) at 3.0m and 4.2m | | | | | | 148 | | | | | | |
| | Limestone (25mm) at 4.0m, 4.3m and (100mm) at 3.4m | | | | | | | | | | | | |
| | Limestone (25mm to 75mm) at 4.9m, 5.3m, 5.5m, 5.7m, 5.8m | | 3 | RUN | | | 145 | | | | | | |
| | Vertical fracture (50mm) at 5.3m and (125mm) at 5.6m | | | | | | | | | | | | |
| 144.3 | | | | | | | | | | | | | |
| 5.9 | END OF BOREHOLE AT 5.9m. BOREHOLE BACKFILLED WITH BENTONITE TO SURFACE. | | | | | | | | | | | | |

ONTM14S 1184.GPJ 2012TEMPLATE(MTO).GDT 8/1/13

RECORD OF BOREHOLE No 13-07

1 OF 1

METRIC

W.P. _____ LOCATION N 4 818 101.2 E 290 887.1 ORIGINATED BY GA
 HWY 403/QEW BOREHOLE TYPE Solid Stem Augers/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.05.26 - 2013.05.27 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|------------|---------|------|--------------|----------------------------|-----------------|---|--|--|--|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | |
| 151.3 | | | | | | | | 20 40 60 80 100 | | | | | |
| 0.0 | TOPSOIL (125mm) | | | | | | | ○ UNCONFINED + FIELD VANE | | | | | |
| 0.1 | Silty CLAY, trace sand, occasional rootlets | | 1 | SS | 14 | | | ● QUICK TRIAXIAL x LAB VANE | | | | | |
| | Stiff | | | | | | | | | | | | |
| | Brown | | | | | | | | | | | | |
| 150.4 | (FILL) | | | | | | | 20 40 60 80 100 | | | | | |
| 0.9 | SHALE, highly weathered, reddish brown | | 2 | SS | 18 | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | 3 | SS | 50/ 0.150 | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | Start coring at 3.1m | | | | | | | | | | | | |
| | Highly weathered to fresh, thinly bedded, reddish brown, occasional limestone interbeds | | | | | | | | | | | | |
| | Highly broken zone (0.6m) at 3.0m | | | | | | | | | | | | |
| | Soft zone (305mm) at 3.0m | | 1 | RUN | | | | | | | | | |
| | | | | | | | | | | | | | |
| | Horizontal fracture at 3.8m, 4.1m | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | Limestone interbeds (25mm) at 3.8m, 3.9m, 4.0m, 4.1m, 4.4m, 4.6m, 4.7m, 5.5m, 5.8m, 6.0m | | 2 | RUN | | | | | | | | | |
| | | | | | | | | | | | | | |
| | Horizontal fracture at 4.6m, 4.7m, 4.9m, 5.1m, 5.2m, 5.3m, 5.5m | | | | | | | | | | | | |
| 145.2 | | | | | | | | | | | | | |
| 6.1 | END OF BOREHOLE AT 6.1m. BOREHOLE OPEN TO 6.1m AND WATER LEVEL AT 2.1m UPON COMPLETION OF CORING. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | WATER LEVEL READINGS: | | | | | | | | | | | | |
| | DATE DEPTH (m) ELEV. (m) | | | | | | | | | | | | |
| | May 30/13 3.9 147.4 | | | | | | | | | | | | |
| | Jun 30/13 3.6 147.7 | | | | | | | | | | | | |

ONTMT4S 1184.GPJ 2012TEMPLATE(MTO).GDT 7/24/13

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 6

WP 125-66-12

LOCATION Co-ords. N.15,809,150 E.956,535

ORIGINATED BY RVV

DIST 4 HWY Q.E.W.

BORING DATE October 25 & 26, 1976

COMPILED BY RVV

DATUM Geodetic

BOREHOLE TYPE Solid Auger & EXL Core & Cone Test

CHECKED BY *CP*

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER ELEV | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w | | UNIT WEIGHT γ | REMARKS |
|---------------|---------------------|-------------|---------|------|------------|----------------------|---|----|----|----|-----|--|-----|----------------------------|---------|
| ELEV DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | 'N' VALUES | | 20 | 40 | 60 | 80 | 100 | w_p | w | | |
| 473.0 | Ground Level | | | | | | | | | | | | | | |
| 0.0 | Topsoil | | | | | | | | | | | | | | |
| | Clayey silt | | 1 | SS | 14 | 470 | | | | | | | | | |
| | Red | | 2 | SS | 61 | | | | | | | | | | |
| | Stiff to Hard | | 3 | SS | 100% | | | | | | | | | | |
| 465.0 | | | 4 | EXL | 100% | | | | | | | | | | |
| 8.0 | Bedrock - Red Shale | | 5 | RC | REC. | 460 | | | | | | | | | |
| | Soft, fissile with | | 6 | RC | REC. | | | | | | | | | | |
| | bands of greyish- | | 7 | EXL | 100% | | | | | | | | | | |
| | green shale and | | | | | | | | | | | | | | |
| | limestone. | | 8 | RC | REC. | 450 | | | | | | | | | |
| | | | | EXL | 98% | | | | | | | | | | |
| 446.7 | | | | | | | | | | | | | | | |
| 26.3 | End of Borehole | | | | | | | | | | | | | | |

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3

WP 125-66-12 LOCATION Co-ords. N.15,809,308 E.956,470 ORIGINATED BY RVV
 DIST 4 HWY Q.E.W. BORING DATE October 21, 1976 COMPILED BY RVV
 DATUM Geodetic BOREHOLE TYPE Solid Auger, BXL Core & Cone Test CHECKED BY *GP*

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER ELEV | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L WATER CONTENT % | | | UNIT WEIGHT γ | REMARKS |
|---------------|--|-------------|-----------|--------------|-------------|----------------------|--|--|--|--|--|--|--|--|----------------------------|---------|
| ELEV DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | 'N' VALUES | | 20 40 60 80 100 | | | | | | | | | |
| | | | | | | | SHEAR STRENGTH | | | | | | | | | |
| | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE | | | | | | | | | |
| 468.1 | Ground Level | | | | | | | | | | | | | | | |
| 0.0 | Sand, medium to coarse trace of fine gravel & silt. Fill. Loose | | | | | | | | | | | | | | 9.83 (8) | |
| 464.1 | Clayey silt. Red | | 1 | SS | 5 | | | | | | | | | | | |
| 462.6 | trace of gravel. Hard | | 2 | SS | 65/9" | | | | | | | | | | | |
| 5.5 | Bedrock - Red Shale, Soft, Fissile with bands of greyish- green shale and limestone. | | 3 | RC BXL | Rec. 912 | 460 | | | | | | | | | | |
| | | 4 | RC BXL | Rec. 987 | | | | | | | | | | | | |
| | | 5 | RC BXL | Rec. 100% | | | | | | | | | | | | |
| 450.1 | | | | | | | | | | | | | | | | |
| 18.0 | End of Borehole Note: Water Level not established. | | | | | | | | | | | | | | | |

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 7

WP 125-66-12 LOCATION Co-ords. N.15,809,166 E.956,638 ORIGINATED BY RVV
 DIST 4 HWY Q.E.W. BORING DATE October 26, 1976 COMPILED BY RVV
 DATUM Geodetic BOREHOLE TYPE Solid Auger and Cone Test CHECKED BY *[Signature]*

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER ELEV | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w $w_p \quad w \quad w_L$ WATER CONTENT % 20 40 60 | UNIT WEIGHT γ % | REMARKS |
|---------------|---|-------------|---------|------|------------|----------------------|---|----|----|----|-----|--|------------------------------|---------|
| ELEV DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | 'N' VALUES | | 20 | 40 | 60 | 80 | 100 | | | |
| 471.9 | Ground Level | | | | | | | | | | | | | |
| 469.9 | Sand & Gravel (Rubble Fill) Compact | | 1 | SS | 20 | 470 | | | | | | | | |
| 2.0 | Clayey silt, trace of organic layers of fine sand | | 2 | SS | 16 | | | | | | | | | |
| 463.4 | Hard | | 3 | SS | 25 | | | | | | | | | |
| 8.5 | Bedrock - Red Shale Soft, fissile with bands of greyish-green shale and limestone | | 4 | SS | 130/10" | | | | | | | | | |
| | | | 5 | SS | 180/8" | 460 | | | | | | | | |
| | | | 6 | SS | 100/4" | | | | | | | | | |
| 451.7 | | | 7 | SS | 180/2" | | | | | | | | | |
| 20.2 | End of Borehole | | | | | | | | | | | | | |

RECORD OF BOREHOLE No 13-23

1 OF 2

METRIC

W.P. _____ LOCATION N 4 817 184.8 E 290 769.4 ORIGINATED BY GA
 HWY 403/OEW BOREHOLE TYPE Solid Stem Augers/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.05.25 - 2013.05.25 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | PLASTIC LIMIT w _p | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w _L | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|--|------------|---------|------|--------------|----------------------------|-----------------|---|--|------------------------------------|-------------------------------------|-----------------------------------|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | "N" VALUES | | | SHEAR STRENGTH kPa | | | | | | |
| 129.7 | | | | | | | | 20 40 60 80 100 | | | | | | |
| 0.0 | ASPHALT: (150mm) | | | | | | | 20 40 60 80 100 | | | | | | |
| 0.2 | SAND and GRAVEL, some silt Dense to Compact Brown to Reddish Brown Damp (FILL) | | 1 | SS | 31 | | 129 | | | | | | | 39 46 15 (SI+CL) |
| | | | 2 | SS | 19 | | | | | | | | | |
| 128.2 | | | | | | | 128 | | | | | | | |
| 1.5 | Silty CLAY, trace sand Firm to Very Stiff Reddish Brown | | 3 | SS | 6 | | | | | | | | | |
| | | | 4 | SS | 8 | | 127 | | | | | | | 0 4 40 56 |
| | | | 5 | SS | 19 | | | | | | | | | |
| 126.1 | | | | | | | 126 | | | | | | | |
| 3.7 | SHALE, with limestone interbeds, highly weathered, grey | | 6 | SS | 50/ 0.125 | | 125 | | | | | | | |
| | Start coring at 6.1m | | | | | | 124 | | | | | | | |
| | Slightly weathered to fresh, thinly bedded, grey, occasional limestone interbeds Clay seam (200mm) at 6.1m | | 1 | RUN | | | 123 | | | | | | | RUN #1 TCR=100% SCR=80% RQD=53% UCS=97MPa (Average) |
| | Limestone interbeds (25mm to 75mm) at 6.3m, 6.4m, 6.5m, 6.7m, 6.8m, 7.0m, 7.2m and (125mm) at 7.4m Vertical fracture (125mm) at 7.4m | | 2 | RUN | | | 122 | | | | | | | RUN #2 TCR=100% SCR=97% RQD=83% UCS=72MPa (Average) |
| | Horizontal fracture at 6.4m, 6.5m, 6.6m, 6.7m, 6.8m, 6.9m, 7.7m, 7.9m, 8.1m, 8.5m, 8.7m | | | | | | 121 | | | | | | | |
| | Limestone interbeds (25mm) at 7.6m, 7.9m, 8.0m, 8.2m, 8.5m, 8.9m, 9.1m and (75mm) at 8.7m | | | | | | | | | | | | | |
| 120.8 | | | | | | | | | | | | | | |
| 9.1 | END OF BOREHOLE AT 9.1m. BOREHOLE OPEN TO 9.1m AND WATER LEVEL AT 4.8m UPON COMPLETION OF CORING. BOREHOLE BACKFILLED WITH | | | | | | | | | | | | | |

Continued Next Page

+ 3 . x 3 Numbers refer to
Sensitivity

20
15-0-5
10 (%) STRAIN AT FAILURE

ONTMT4S 1184.GPJ 2012TEMPLATE(MTO).GDT 11/10/13

RECORD OF BOREHOLE No 13-23

2 OF 2

METRIC

W.P. _____ LOCATION N 4 817 184.8 E 290 769.4 ORIGINATED BY GA
 HWY 403/QEW BOREHOLE TYPE Solid Stem Augers/NQ Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.05.25 - 2013.05.25 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | | PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---------------|---|----------------------|---------|------------|-----------------|----------------------------|-----------------|---|----------|----------|----------|--|---|--|--|---|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT NUMBER | TYPE | "N" VALUES | 20 40 60 80 100 | | | 20 40 60 80 100 | 20 40 60 | 20 40 60 | 20 40 60 | | | | | | |
| | Continued From Previous Page BENTONITE HOLEPLUG TO 0.3m, CONCRETE TO 0.15m, THEN ASPHALT COLD PATCH TO SURFACE. | | | | | | | | | | | | | | | | |

ONTMT4S 1184.GPJ 2012TEMPLATE(MTO).GDT 11/10/13

RECORD OF BOREHOLE No 13-08

1 OF 1

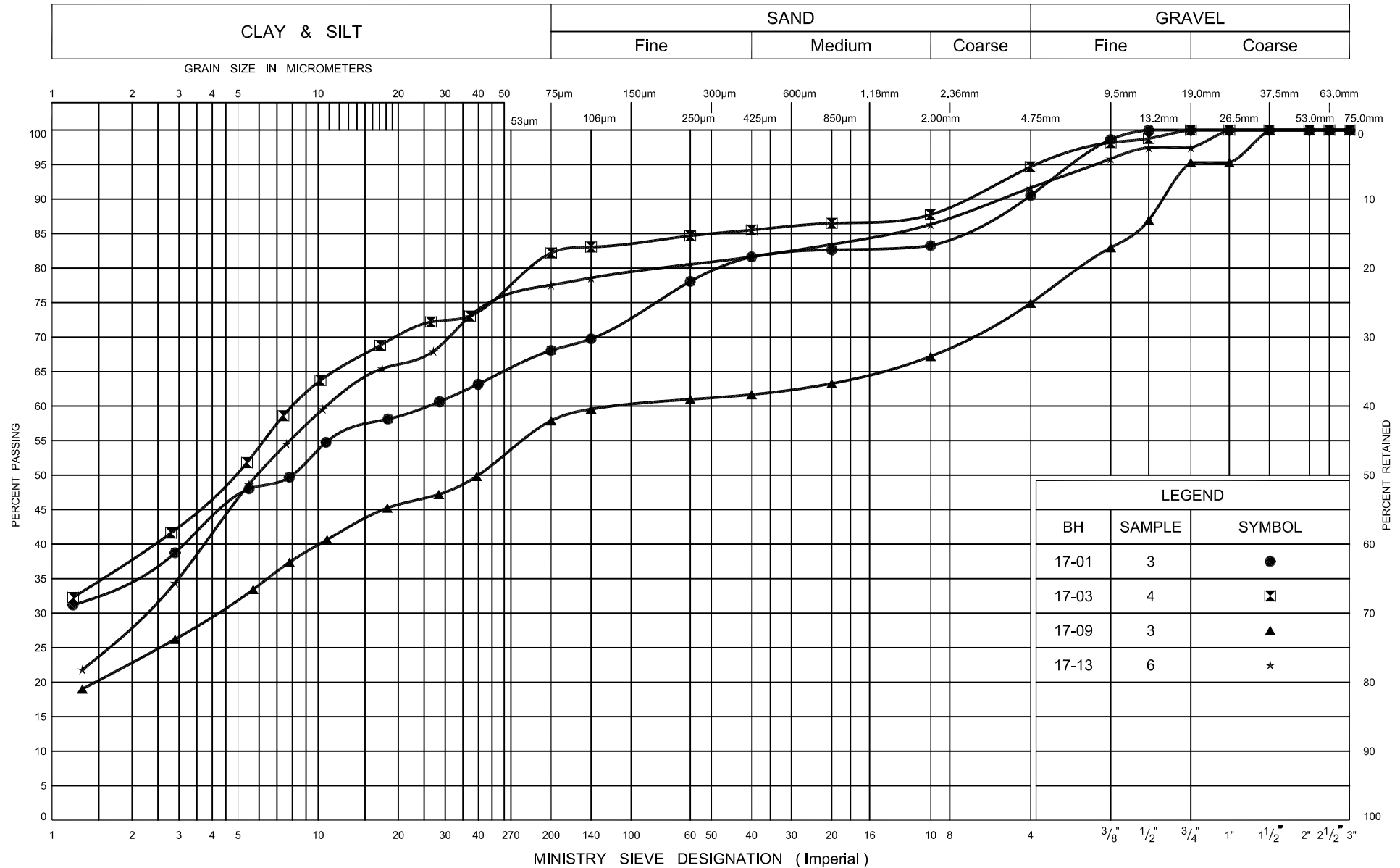
METRIC

W.P. _____ LOCATION N 4 817 953.6 E 290 550.0 ORIGINATED BY GA
 HWY 403/OEW BOREHOLE TYPE Solid Stem Augers/NO Coring COMPILED BY AN
 DATUM Geodetic DATE 2013.05.07 - 2013.05.07 CHECKED BY LRB

| SOIL PROFILE | | | SAMPLES | | | GROUND WATER CONDITIONS | ELEVATION SCALE | DYNAMIC CONE PENETRATION RESISTANCE PLOT | | | | UNIT WEIGHT γ kN/m ³ | REMARKS & GRAIN SIZE DISTRIBUTION (%) | | | | | | | |
|---------------|---|------------|---------|------|--------------|----------------------------|-----------------|--|----|----|----|---|---|--|--|--|--|--|--|--|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | *N* VALUES | | | SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE | | | | | | WATER CONTENT (%) PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT w _p w w _L | | | | | | |
| 151.8 | | | | | | | | 20 | 40 | 60 | 80 | 100 | | | | | | | | |
| 0.0 | TOPSOIL: (50mm) | | | | | | | | | | | | | | | | | | | |
| 151.3 | Silty CLAY, some sand Very Stiff Brown (FILL) | | 1 | SS | 17 | | | | | | | | | | | | | | | |
| 0.5 | SHALE, highly weathered, brown | | 2 | SS | 50/ 0.150 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | 3 | SS | 50/ 0.150 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | Start coring at 2.4m | | | | | | | | | | | | | | | | | | | |
| | Moderately weathered to fresh, occasional limestone interbeds | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | Horizontal fractures at 2.5m, 2.6m, 2.7m, 2.9m, 3.0m, 3.2m, 3.3m, 3.4m, 3.7m, 3.8m | | 1 | RUN | | | | | | | | | | | | | | | | |
| | Limestone interbeds (25mm thick) at 3.0m, 3.2m, 3.4m, 3.7m | | | | | | | | | | | | | | | | | | | |
| | Limestone interbed (150mm) at 4.1m | | | | | | | | | | | | | | | | | | | |
| | Horizontal fractures at 4.0m, 4.1m, 4.2m, 4.3m, 4.4m, 4.5m, 4.7m, 5.0m, 5.1m, 5.2m | | 2 | RUN | | | | | | | | | | | | | | | | |
| | Limestone interbeds (25mm thick) at 3.9m, 4.3m, 4.4m, 4.5m, 4.6m, 5.3m, (75mm) at 4.7m | | | | | | | | | | | | | | | | | | | |
| 146.3 | | | | | | | | | | | | | | | | | | | | |
| 5.5 | END OF BOREHOLE AT 5.5m. BOREHOLE OPEN TO 5.5m AND WATER LEVEL AT 0.9m UPON COMPLETION OF CORING. Piezometer Installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | WATER LEVEL READINGS: | | | | | | | | | | | | | | | | | | | |
| | DATE DEPTH (m) ELEV. | | | | | | | | | | | | | | | | | | | |
| | (m) | | | | | | | | | | | | | | | | | | | |
| | May 30/13 5.5 146.3 | | | | | | | | | | | | | | | | | | | |
| | Jun 26/13 4.3 147.5 | | | | | | | | | | | | | | | | | | | |
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ONTMT4S 1184.GPJ 2012TEMPLATE(MTO).GDT 8/1/13

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation

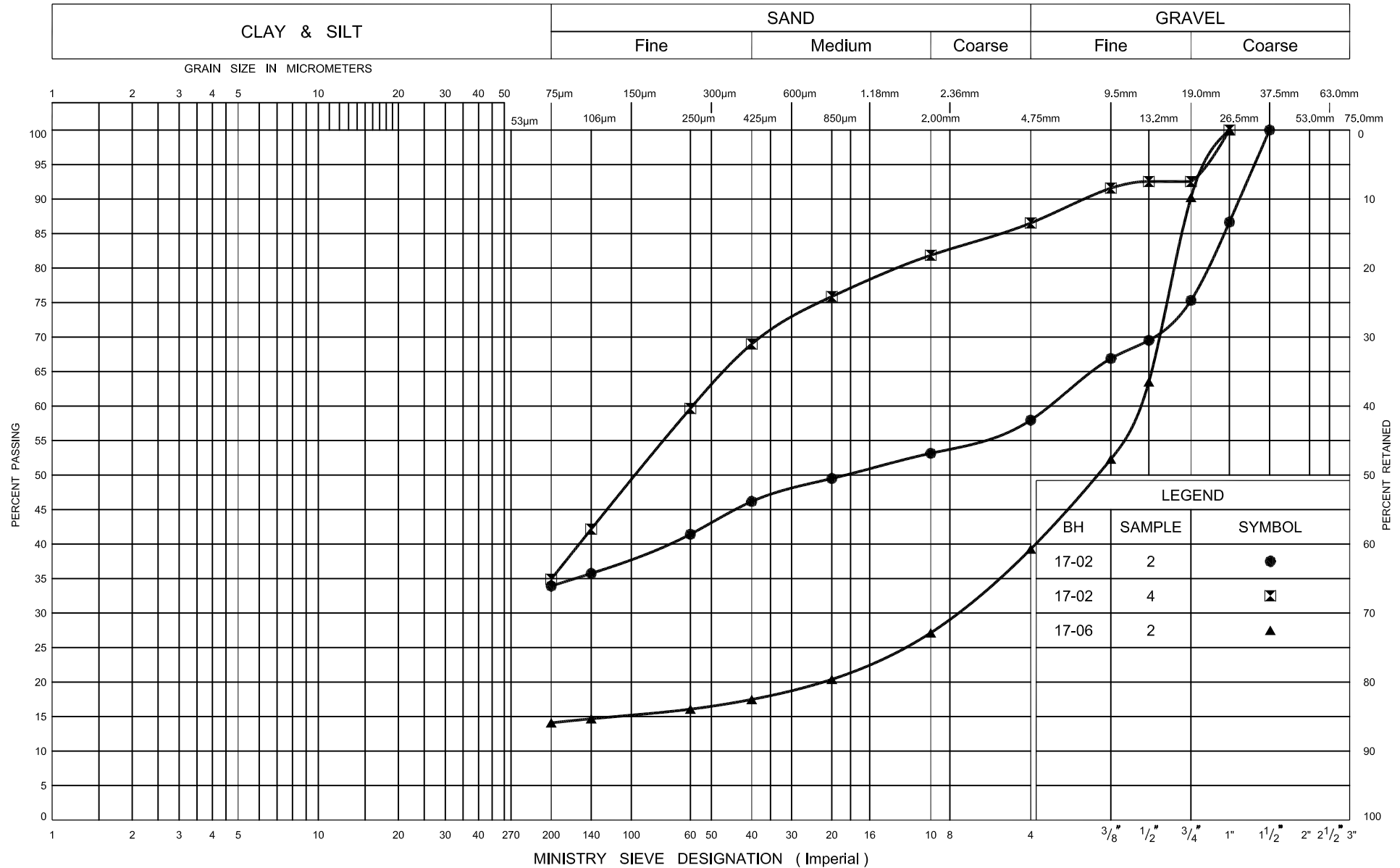
GRAIN SIZE DISTRIBUTION
 SILTY CLAY TO CLAYEY SILT, trace/some sand, trace gravel
 (FILL)

FIG No. HML-GS-1

HWY QEW

G.W.P. No.2015-E-0011-010

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation

Ontario

GRAIN SIZE DISTRIBUTION

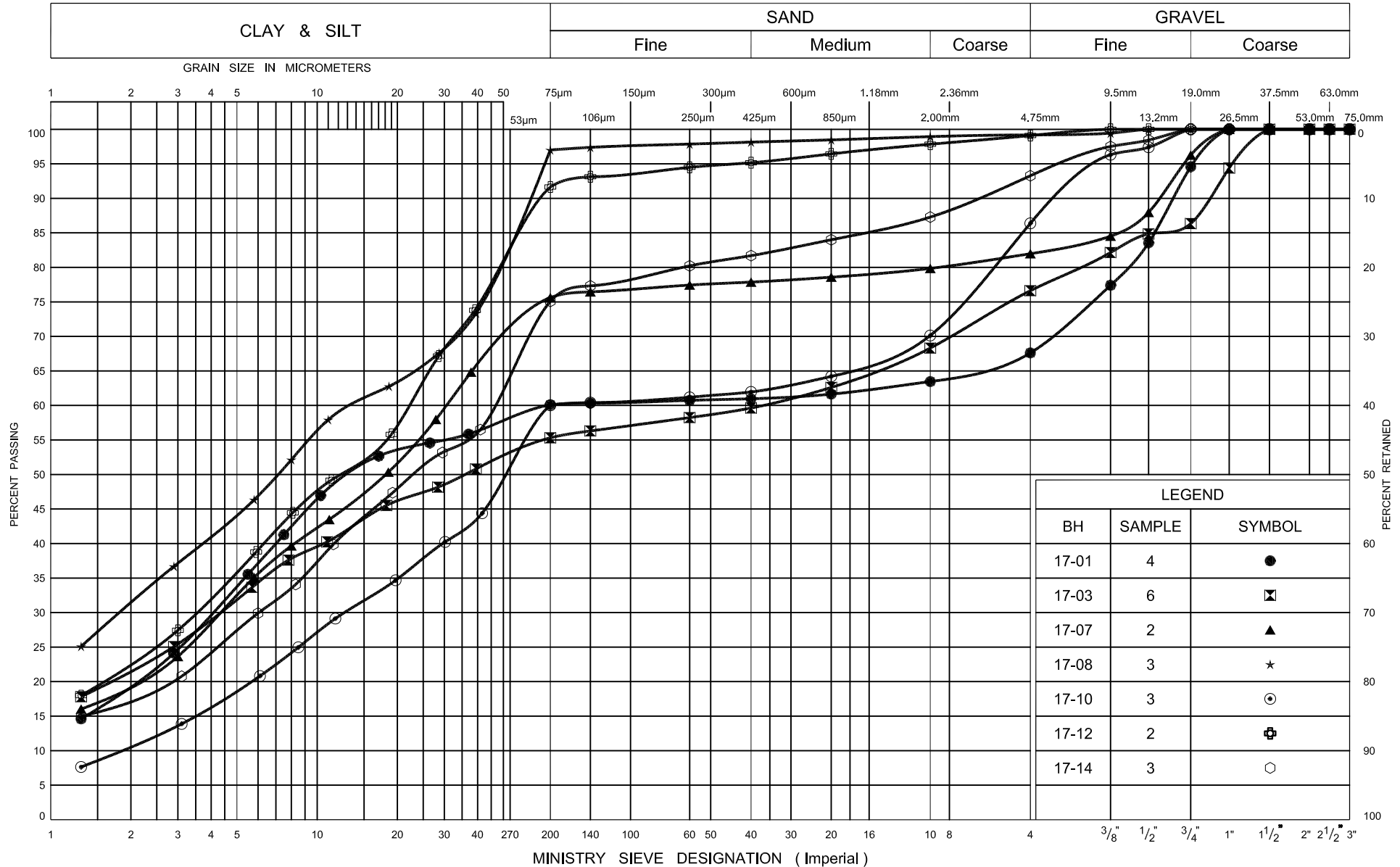
SILTY SAND, some / with gravel, occasional shale and limestone fragments
(FILL)

FIG No. HML-GS-2

HWY QEW / HWY 403

G.W.P. No. 2163-10-00

UNIFIED SOIL CLASSIFICATION SYSTEM



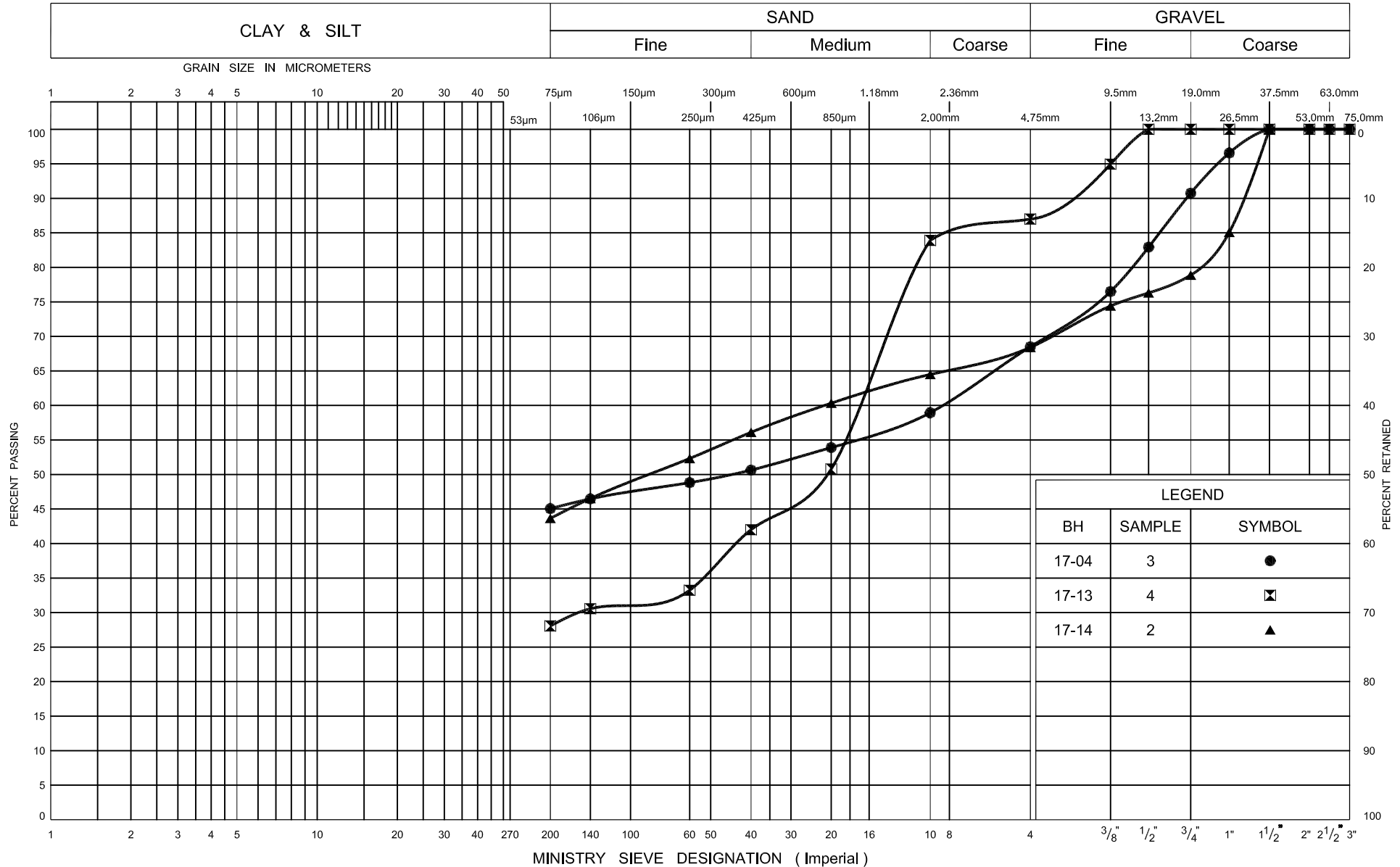
Ministry of
Transportation

Ontario

GRAIN SIZE DISTRIBUTION
 SILTY CLAY TO CLAYEY SILT, some sand, some gravel
 occasional shale and limestone fragments
 (TILL)

FIG No. HML-GS-3A
 HWY QEW / HWY 403
 G.W.P. No. 2163-10-00

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation

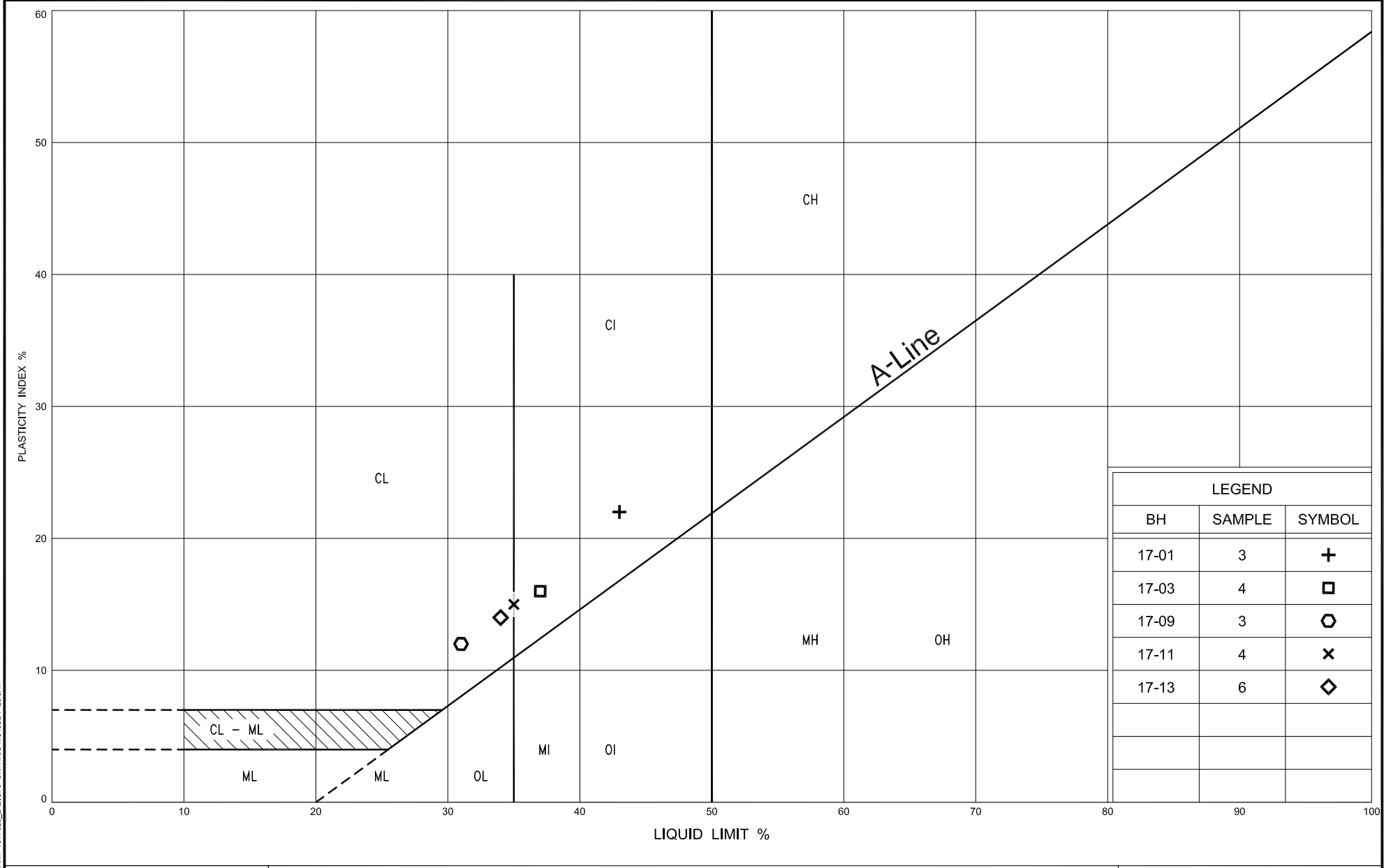
Ontario

GRAIN SIZE DISTRIBUTION
 SILTY CLAY TO CLAYEY SILT, some sand, some gravel
 occasional shale and limestone fragments
 (TILL)

FIG No. HML-GS-3B

HWY QEW / HWY 403

G.W.P. No. 2163-10-00

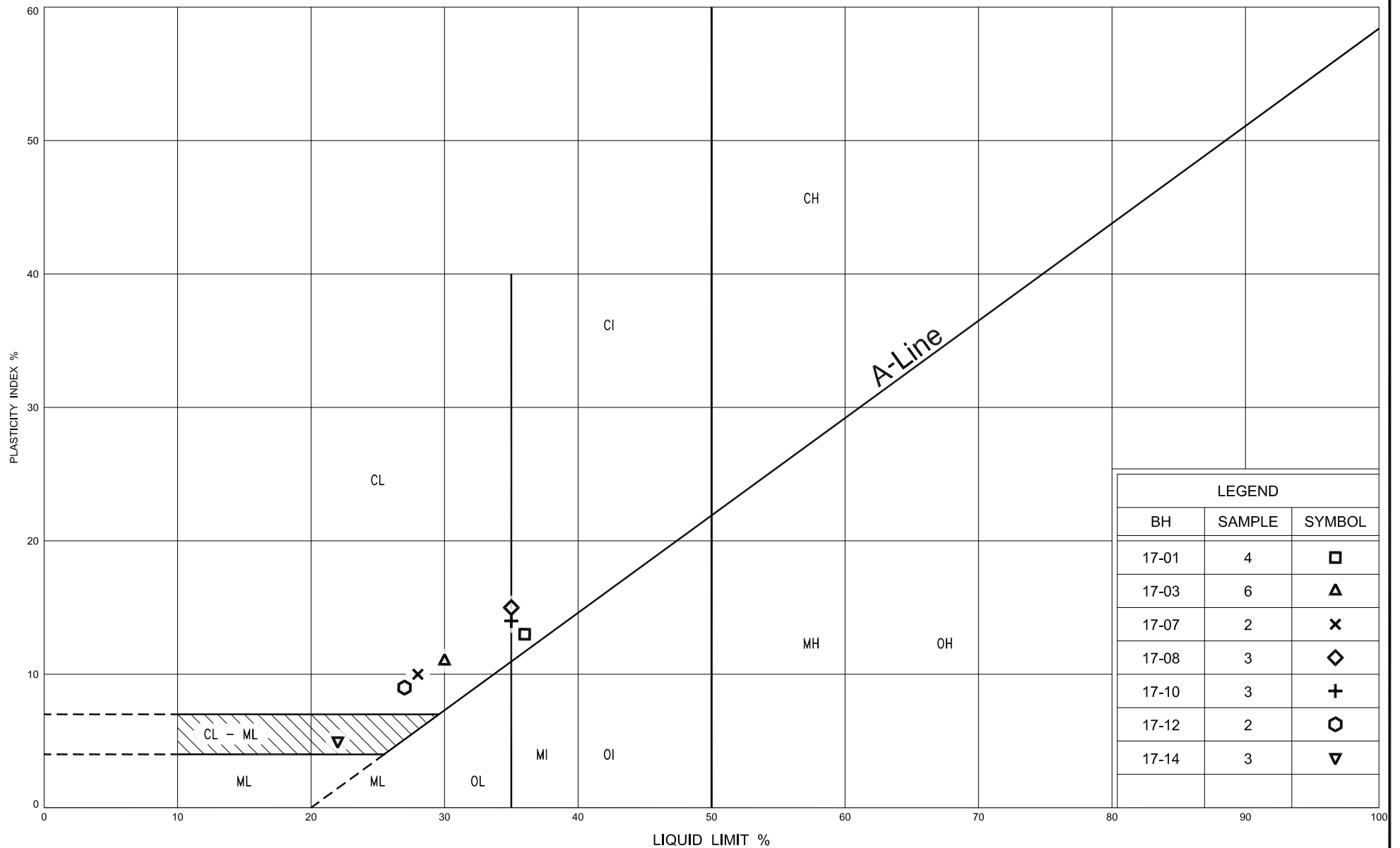


ONTARIO MOT PLASTICITY CHART 16TF028 LAB.GPJ ONTARIO MOT.GDT 23/5/17



PLASTICITY CHART
SILTY CLAY TO CLAYEY SILT, trace/some sand, trace gravel
(FILL)

| | |
|------------|---------------|
| FIG No. | HML-PC-1 |
| HWY | QEW / HWY 403 |
| G.W.P. No. | 2163-10-00 |



Ministry of
Transportation
Ontario

PLASTICITY CHART
 SILTY CLAY TO CLAYEY SILT, some sand, some gravel
 occasional shale and limestone fragments
 (TILL)

| | |
|------------|---------------|
| FIG No. | HML-PC-2 |
| HWY | QEW / HWY 403 |
| G.W.P. No. | 2163-10-00 |