Foundation Investigation Report

Temporary Protection System, Highway 402 (Eastbound and Westbound) at Highway 40 Overpass and Wawanosh Drain Bridge Structures, City of Sarnia, Ontario, Ministry of Transportation, Ontario GWP 3106-18-00

HIGHWAY 402 AT HIGHWAY 40, SITE NO.: 14X-0338/B1 AND 14X-0338/B2.
HIGHWAY 402 AND WAWANOSH DRAIN, SITE NO.: 14X-0341/B1 AND 14X-0341/B2.

Location	Site No.	Latitude	Longitude
Hwy 402 and Modeland Road Overpass Structures (Hwy 40)	14X-0338/B1	42.990447	-82.343817
	14X-0338/B2	42.990744	-82.343830
Highway 402 & Wawanosh Drain Bridge Structures	14X-0341/B1	42.990527	-82.334680
	14X-0341/B2	42.990780	-82.334425

22 September 2023

GEOCRES NO.: 40J16-095

Distribution:

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1. Introduction

GHD Limited (GHD) was retained by the Ministry of Transportation, Ontario (MTO), to provide foundation investigation and engineering services for the temporary protection systems associated with the proposed rehabilitation and conversion to semi-integral abutments of four bridge structures as described below, located in the City of Sarnia, Ontario (see the Key Plan on Drawings 1 and 6):

- Two overpass structures on Highway 402 at Highway 40 (Modeland Rd.) eastbound (EB) and westbound (WB) (Site Numbers 14X-0338/B1 and 14X-0338/B2, respectively).
- Two bridge structures on Highway 402 over the Wawanosh Drain EB & WB (Site Numbers 14X-0341/B1 and 14X-0341/B2, respectively).

The purpose of this investigation is to establish the subsurface soil and groundwater conditions at the locations of proposed temporary protection system by means of borehole drilling and geotechnical laboratory testing on selected soil samples.

The Terms of Reference (TOR) and the scope of work for this project are identified within the agreement of services as amended between MTO and GHD for Consultant's Assignment Number 3020-E-0014. The work has been carried out in accordance with the requirements of *Guideline for Foundation Engineering Services, Version 3.0, April 2022*, prepared by the MTO.

2. Site Description

Highway 402 is a major highway in southwestern Ontario, Canada, that extends from London to Sarnia. Two of the key features along this highway are the Highway 40 overpass and Wawanosh Drain bridges, which extend beneath Highway 402 near the city of Sarnia. Further details of the existing structures are provided below:

Highway 402 and Highway 40 Overpass

The existing four span Highway 40 overpass structures were constructed in 1975. Each bridge with an overall length of 72.5 m and deck width of about 22.3 m accommodates two lanes of Highway 402 traffic and a speed change lane which are separated by a raised concrete median. The Highway 40 overpass structures are situated in an urban-setting environment with generally a flat landscape. The areas surrounding the Highway 40 overpass structures are a mix of residential and commercial land uses with vacant farm fields mostly towards the northeast side of the Highway 40 overpass structures.

The embankment slopes between the Highway 40 overpass structures are covered by grass or other vegetation (a grass median) and observed to be stable, with no visible signs of erosion. General site conditions are shown in Photographs 1 to 4 presented in **Appendix A**.

Highway 402 and Wawanosh Drain Bridges

The existing single span Wawanosh Drain bridge structures were constructed in 1975 and are a two-lane structure in each direction (EB and WB). The structures are located on Highway 402, approximately 0.6 km east of Highway 40, over Wawanosh Drain (Perch Creek). The westbound bridge carries two lanes of traffic and one lane of off-ramp traffic with the span length of about 23.8 m and deck width of about 18 m to 18.7 m, while the eastbound bridge carries only two lanes of traffic with the span length of about 23.8 m and deck width of 13.5 m to 13.9 m.

The Wawanosh Drain bridge structures are situated in an urban-setting environment with generally a flat landscape. The areas surrounding the Wawanosh Drain bridge structures are a mix of residential and

commercial land uses with vacant farm fields mostly towards the northeast side of the Highway 40 overpass structures.

The embankment slopes between the Wawanosh Drain bridge structures are covered by grass or other vegetation and observed to be stable, with no visible signs of erosion. There are also signs of pre-existing dykes on either side of Wawanosh Drain based on the Geocres Report. General site conditions are shown in Photographs 5 to 9 presented in **Appendix A**.

3. Investigation Procedures

3.1 Previous Investigation

Highway 402 and Highway 40 Overpass

Geotechnical investigations were previously carried out at this site. As per MTO 40J16-036 Report, dated December 1969, a total of twenty-one sampled boreholes and sixteen dynamic cone penetration tests (Boreholes BH100 through BH116 and BH200 through BH211) were advanced to depths ranging from 2.3 m to 9.6 m below original existing grade. The boreholes were advanced prior to the construction of the overpass structures. Geotechnical laboratory testing was carried out on selected soil samples. The results of this investigation are contained in a report titled *"Foundation Investigation Report for The Proposed Approaches in the vicinity of Modeland Road Interchange CAH #402, Township of Sarnia, County of Lambton, District No. 1 (Chatham, Ontario), WJ 69-F-119, WP 122-65-01, prepared by the Department of Highways Ontario, dated April 21, 1970"* provided in **Appendix B**. It is noted that no borehole location drawings were provided with this report, therefore the historic borehole logs have been used for informational purposes only.

As per MTO GEOCRES Report 40J16-040, in November 1969 and June 1970, a total of sixteen boreholes (Boreholes 1 through 16) were advanced to depths ranging from 6.8 m to 33.9 m below original existing grade. The boreholes were advanced prior to the construction of the overpass structures. Geotechnical laboratory testing was carried out on selected soil samples. The results of this investigation are contained in a report titled *"Foundation Investigation Report for The Proposed Hwy. #402 Overhead at Modeland Road, District No. 1 (Chatham), WO 70-11046, WP 122-65-03 & 04, prepared by the Department of Highways Ontario, dated July 8, 1970"* provided in **Appendix B**.

Highway 402 and Wawanosh Drain Bridges

A geotechnical investigation was previously carried out at the site. As per MTO GEOCRES Report 40J16-041, a total of ten boreholes were advanced to depths ranging from 4.9 m to 37.8 m. The previous boreholes were advanced about 1 m to 3 m below the current profile of Highway 402, due to the presence of dykes at the existing bridge abutment locations. Geotechnical laboratory testing was carried out on selected soil samples. The results of this investigation are contained in a report titled *"Foundation Investigation Report for The Proposed Wawanosh Drain Bridge of Hwy. #402, 0.5 Miles East of Modeland Road, District #1 (Chatham), WO 70-11047, WP 122-65-07 & 08, prepared by the Department of Highways Ontario, dated July 15, 1970"* provided in **Appendix B**.

3.2 Current Investigation

The geotechnical fieldwork for this investigation was carried out between April 10 and 18, 2023, during which time twelve boreholes designated as BH5-22 to BH16-22 were advanced to a depth of about 12.8 m below existing ground surface (existing Highway 402 road level). Four (4) boreholes (BH5-22 to BH8-22) were advanced on the Highway 402 at Highway 40 Overpass (two boreholes at each structure) and eight (8) boreholes (BH9-22 to BH15-22) were advanced on Highway 402 at Wawanosh Drain (Perch Creek) bridges (four boreholes at each structure). The boreholes were advanced through the lanes and shoulder of Highway 402 on the eastbound and westbound as shown on Drawings 1 and 6.

Prior to the start of fieldwork, utility clearance procedures were carried out through Ontario One Call, and fieldwork notification was sent to MTO West Region. A project specific Health and Safety as well as Traffic Protection Plans were prepared before commencement of the fieldwork. All drilling activity, soil sampling and logging, and backfilling of boreholes were conducted under the full-time supervision of an experienced GHD geotechnical engineer.

The boreholes were advanced using a Mobile Drill B57 and B60 truck-mounted drill rig, equipped with continuous flight, hollow stem augers, supplied and operated by Landshark Drilling of Brantford, Ontario. The asphalt and underlying concrete were cored using concrete coring equipment and municipal water supplied by the drilling subcontractor. Soil samples were obtained at 0.75 m and 1.5 m intervals of depth, using a 50 mm outer-diameter split-spoon sampler driven by an automatic hammer in accordance with the Standard Penetration Test (SPT) procedures described in ASTM D1586[1]. Where firm to stiff cohesive deposits were encountered, in-situ field vane shear tests were carried out using an MTO 'N'-size vane to assess the strength characteristics of these soils in accordance with ASTM D2573[2]. Soil samples obtained from the boreholes were inspected in the field immediately upon retrieval for type, texture, and color. All retrieved samples from the investigation were sealed in clean plastic bags and transported to the GHD laboratory in Waterloo for further visual examination, and geotechnical laboratory tests.

No monitoring wells were installed in any of the boreholes; however, groundwater conditions and water levels were observed/measured in the open boreholes during drilling by visual examination of soil samples and drill rods as well as immediately following the completion of the drilling operations at each borehole. The boreholes were backfilled with bentonite and sealed at the top with compacted auger cuttings, in accordance with Ontario Regulation 903 (as amended).

The as-drilled borehole locations and ground surface elevations were obtained using a Leica Global Navigation Satellite System (GNSS). The locations given on the Borehole Records are positioned relative to MTM Coordinates (MTM Zone 11 NAD83) northing and easting coordinates and the ground surface elevations are referenced to Geodetic datum. The coordinates and ground surface elevation are presented below, on the borehole records and on Drawings 1 and 6.

[1] ASTM D1586-08a – Standard Test Method for Standard Penetration Tests and Split Barrel Sampling of the soil.
[2] ASTM D2573-15 – Standard Test Method for Field Vane Shear Test in Saturated Fine-Grained Soils

Table 3.1 Summary of Current GHD Boreholes

Site Location	Structure Number	Borehole Number	Location	Location (MTM NAD 83, ZONE 11)		Borehole Depth (m)	Ground Surface Elevation (m)	End of Borehole Elevation (m)
				Northing (m) (Latitude, °)	Easting (m) (Longitude, °)			
Highway 402 and Highway 40 Overpass	14X-0338/B1 (Eastbound Lanes)	BH6-22	Left lane of EB of Highway 402	4761193.9 (42.990444)	317490.5 (-82.344375)	12.8	186.9	174.1
		BH8-22	Left lane of EB of Highway 402	4761194.5 (42.990448)	317571.5 (-82.343382)	12.8	186.9	174.1
	14X-0338/B2 (Westbound Lanes)	BH5-22	Left lane of WB of Highway 402	4761218.1 (42.990662)	317492.4 (-82.344352)	12.8	187.0	174.2
		BH7-22	Left lane of WB of Highway 402	4761218.8 (42.990667)	317572.8 (-82.343365)	12.8	186.9	174.1
Highway 402 and Wawanosh Drain Bridges	14X-0341/B1 (Eastbound Lanes)	BH13-22	Left lane of EB of Highway 402	4761205.1 (42.990532)	318257.5 (-82.334969)	12.8	182.9	170.1
		BH14-22	Left lane of EB of Highway 402	4761204.5 (42.990525)	318308.9 (-82.334339)	12.8	182.8	170.0
		BH15-22	Right Shoulder of Highway 402	4761194.5 (42.990437)	318237.6 (-82.335214)	12.8	182.7	169.9
		BH16-22	Right Shoulder of Highway 402	4761196.8 (42.990457)	318317.8 (-82.33423)	12.8	182.7	169.9
	14X-0341/B2 (Westbound Lanes)	BH9-22	Right Shoulder of Highway 402 Off Ramp	4761242.2 (42.990866)	318284.3 (-82.334639)	12.8	182.7	169.9
		BH10-22	Right Shoulder of Highway 402 Off Ramp	4761241.6 (42.990859)	318331.5 (-82.334061)	12.8	182.6	169.8
		BH11-22	Left lane of WB of Highway 402	4761227.7 (42.990735)	318269.8 (-82.334817)	12.8	182.8	170.0
		BH12-22	Left lane of WB of Highway 402	4761229.0 (42.990745)	318336.8 (-82.333996)	12.8	182.6	169.8

Classification testing (i.e., water content, Atterberg limits and grain size distribution) was carried out on selected soil samples. All laboratory tests were conducted in accordance with MTO and/or American Society for Testing Materials (ASTM) standards, as appropriate.

4. Site Geology and Subsurface Conditions

4.1 Regional Geology

The Highway 40 overpass and Wawanosh Drain bridge structures are located within physiographic region known as Huron Fringe, which is a subdivision of the St. Clair Clay Plain, as delineated in *The Physiography of Southern Ontario* (Chapman and Putnam, 1984)[3]. The surficial soils of the Huron Fringe region in proximity to the site generally consist of peat, muck, sand, gravel, silt and clay, and littoral deposits derived from coarse-textured lacustrine deposits. The depth to the bedrock in the area is in excess of 30 m below ground surface and consists of shale of the Kettle Point Formation.

4.2 Subsurface Conditions – Previous Investigation

As discussed in Section 3.1 previously a geotechnical investigation was carried out from the original ground surface prior to the construction of the structure. The results of previous investigation from GEOCRES No. 40J16-036, 40J16-040 and 40J16-041 are presented in **Appendix B**.

4.2.1 Highway 402 and Highway 40 Overpass

Geotechnical investigations were previously carried out at the site (MTO GEOCRES Report 40J16-036 and 40J16-040) and the boreholes were advanced to depths ranging from 2.3 m to 33.9 m.

Report 40J16-036

The subsurface conditions encountered in boreholes advanced from the original ground surface (approximately Elevation 179 m) are described below. A deposit of silty sand to sand was encountered in the boreholes immediately below the topsoil. The deposit was found at depths ranging between 1.2 and 7.0 m below ground surface. The natural moisture content ranges from 12% to 30%. The SPT “N” values presented on the borehole records range from 4 blows to 20 blows per 0.3 m of penetration, suggesting a very loose to compact state of compactness condition.

Organic silt and clay materials was found below topsoil and the silty sand to sand deposit. It was encountered below the topsoil in some boreholes and extended to a depth of 9 m below ground surface in multiple boreholes. The average natural moisture content of the organic materials was found to be 60%. In-situ vane shear testing was carried out in the boreholes and the undrained shear strength of the organic deposit varied from about 9 kPa to 43 kPa, indicating that the cohesive deposit has a very soft to firm consistency.

The groundwater level measured in the completed boreholes were found to be at or slightly below the ground surface at the time of the field investigation.

Report 40J16-040

The subsurface conditions encountered in boreholes advanced from the original ground surface (approximately Elevation 180 m) consist of organic deposits, clayey silt, and silty clay deposits. The depth of the organic deposit was found to vary between 0.5 and 4.9 m below ground surface. The organic content of the samples was as high as 25% to 29%, the Atterberg limits ranged from 38% to 210% for plastic limit and 77% to 320% for liquid limit. The natural moisture contents ranged from 94% to 242%. The SPT “N” values presented on the borehole records range from 1 blow to 5 blows per 0.3 m of penetration, suggesting a very soft to firm consistency and very loose to loose compactness condition. In-situ vane shear testing was carried out in the boreholes and the undrained shear strength of the organic deposit varied from about 7 kPa to greater than 29 kPa with an average of 19 kPa.

[3] Chapman, L.J. and Putman, D.F., 1984, The Physiography of Southern Ontario, Ontario Geological Society, Special Volume 2, Third Edition. Accompanied by Map p. 2715, Scale 1:600,000.)

A deposit of clayey silt with traces of sand and gravel was encountered underlying the organic deposit and extended to a depth of 13.7 m below ground surface. The average natural moisture content of the organic materials was found to be 20%. The SPT “N” values presented on the borehole records range from 10 blows to 46 blows per 0.3 m of penetration. The vane shear testing strength was measured exceeding 95 kPa within the upper desiccated layers and between Elevation 166.0 m and 168.0 m the in-situ vane shear testing carried out in the boreholes indicates that the undrained shear strength of the deposit varied from 24 kPa to greater than 29 kPa, indicating a firm consistency, while the remainder of the deposit has a stiff to hard consistency.

A deposit of silty clay with trace of sand and gravel was encountered underlying the clayey silt deposit and extended down to the bedrock surface. The average moisture content of the silty clay deposit was found to be about 25%. The SPT “N” values presented on the borehole records range from 5 blows to 28 blows per 0.3 m of penetration. In-situ vane shear testing was carried out in the boreholes and the undrained shear strength of the deposit varied from 24 kPa to greater than 95 kPa. The in-situ field vane tests together with the SPT “N” values indicate that the cohesive deposit has a firm to very stiff consistency.

Shale bedrock of the Kettle Point Formation was encountered at a depth of 32.5 m below ground surface (Elevation 147.0 m).

The groundwater level measured in the completed boreholes were found slightly below the ground surface during the field investigation at a depth ranging between 0.5 m and 0.9 m below ground surface.

4.2.2 Highway 402 and Wawanosh Drain Bridges

Report 40J16-041

A geotechnical investigation was previously carried out at the site (MTO GEOCRES Report 40J16-041) and sixteen boreholes were advanced to depths ranging from 15 m to 37 m below the ground surface at the time of the investigation.

The subsurface conditions encountered in boreholes advanced from the original ground surface (approximately Elevation 180 m) consist of fill material, organic deposit, clayey silt, and silty clay deposits. The depth of the fill material was found to vary from 2.1 to 2.7 mbgs. The fill material was found to consist of clayey silt with some coarse sand and gravel. The average natural moisture content of the fill material materials was found to be 14%. The SPT “N” values presented on the borehole records range from 9 blows to 24 blows per 0.3 m of penetration, suggesting a stiff to very stiff consistency.

The fill material was found to be underlain by a thin layer of organic deposit. The thickness of this layer is estimated to be 1.2 to 1.5 m. The SPT “N” values presented on the borehole records range from 5 blows to 15 blows per 0.3 m of penetration, suggesting a firm to stiff consistency and loose to compact relative density.

A deposit of clayey silt was encountered in the boreholes below the fill materials and the organic materials with a thickness ranging between 12.5 to 14.6 m. The SPT “N” values presented on the borehole records range from 8 blows to 53 blows per 0.3 m of penetration, suggesting a firm to hard consistency. In-situ vane shear testing was carried out in the boreholes and the undrained shear strength of the deposit varied from 24 kPa to greater than 95 kPa.

A deposit of silty clay encountered underlying the clayey silt deposit and extended down to bedrock. The thickness of this layer is estimated to be 16.5 to 18.6 m. In-situ vane shear testing was carried out in the boreholes and the undrained shear strength of the organic deposit varied from about 38 kPa to greater than 95 kPa, indicating that the cohesive deposit has a firm to hard consistency.

Shale bedrock of the Kettle Point Formation was encountered at a depth ranging between 33.0 and 36.0 mbgs (Elevation 148.6 and 146.1 m).

The groundwater level measured in the completed boreholes were found slightly below the ground surface during the field investigation at a depth ranging between 2.1 m and 2.4 m below pre-existing dykes and less than 0.3 m below pre-existing lower ground surface Elevations from 179.5 m to 179.2 m).

4.3 Subsurface Conditions – Current Investigation

Details of the subsurface soil and groundwater conditions as encountered in the boreholes advanced during the geotechnical investigation and the results of the laboratory tests carried out on selected soil samples are presented on the borehole records provided in **Appendix C.** The *Notes on Borehole and Test Pit Reports* are also included in **Appendix C** to assist in the interpretation of the borehole records. The results of the geotechnical laboratory testing are contained in **Appendix D**. The results of in-situ field tests (i.e., SPT "N" values), as presented on the borehole records and in the sub-sections of Section 4 are uncorrected.

The stratigraphic boundaries shown on the borehole records are inferred from non-continuous sampling, observations of drilling progress, the results of the Standard Penetration Tests and in-situ vane shear tests. These boundaries, therefore, represent transitions between soil types rather than exact planes of geological change. Furthermore, subsurface conditions will vary between and beyond the borehole locations; however, the factual data presented in the borehole records governs any interpretation of the site conditions.

In summary, the subsurface conditions at boreholes completed in the vicinity of the existing Highway 402 at Highway 40 Overpass and Highway 402 over the Wawanosh Drain bridges consist of a layer of asphalt underlain by a layer of concrete. The concrete is further underlain by granular fill consisting of gravelly sand to gravel and sand, which in turn is underlain by fill material consisting of clayey silt to sandy clayey silt. The fill material is underlain by a deposit consisting of clayey silt with interlayers of sand, in places.

Detailed descriptions of subsurface conditions are provided in the following sections of this report. The subsurface conditions are described in accordance with the Ontario Ministry of Transportation (MTO) *Guideline for Foundation Engineering Services Version 3.0 (April 2022)*.

4.3.1 Highway 402 and Highway 40 Overpass

4.3.1.1 Asphalt

Boreholes BH5-22 to BH8-22 were advanced through the eastbound and westbound lanes of Highway 402 and encountered an asphalt layer ranging in thickness from 130 mm to 220 mm.

4.3.1.2 Concrete

Underlying the asphalt in all four boreholes (BH5-22 to BH8-22), a layer of reinforced concrete was encountered, ranging in thickness from about 480 mm to 570 mm. The reinforcing steel was encountered in all boreholes at this site.

4.3.1.3 Fill

Underlying the concrete in all four boreholes (BH5-22 to BH8-22), fill material consisting of gravelly sand to gravel and sand with some fines was encountered and extended to depths ranging from 1.5 m to 3.0 m below ground surface (Elevations ranging from 185.5 m and 183.9 m).

The Standard Penetration Test (SPT) "N" values recorded within the granular fill material range from 2 blows to 45 blows per 0.3 m of penetration, indicating a very loose to dense compactness condition.

Grain size distribution testing was conducted on four (4) representative samples of the granular fill and the results are presented on Figure D-1 in **Appendix D**. The water content measured on samples of the granular fill range from approximately 4% to 7%.

The granular fill is underlain by embankment fill consisting of clayey silt to sandy clayey silt. The cohesive fill extends to depths ranging from 7.6 m to 12.2 m below ground surface (Elevations ranging from 179.3 m to 174.8 m).

The Standard Penetration Test (SPT) "N" values recorded within the cohesive fill material range from 0 blows to 18 blows per 0.3 m of penetration. In-situ vane shear testing was carried out in the boreholes and the undrained

shear strength of the cohesive fill material varied from 67 kPa to greater than 100 kPa. The in-situ field vane tests together with the SPT “N” values indicate that the cohesive fill encountered in the boreholes has a firm to very stiff consistency. The water content measured on samples of the fill range from approximately 12% to 20%.

Grain size distribution testing was conducted on four (4) representative samples of the cohesive and non-cohesive fill and the results are shown on Figure D-2 in **Appendix D**. Atterberg limits testing was carried out on ten (10) samples of the cohesive fill and the results had liquid limits ranging from about 25% to 32%, plastic limits ranging from about 13% to 17% and resulting plasticity indices of between about 11% to 15%. These results, which are plotted on a plasticity chart on Figures D-3A & D-3B in **Appendix D**, indicate that the cohesive fill consist of low plasticity clayey silt.

4.3.1.4 Clayey Silt

A cohesive deposit consisting of clayey silt was encountered beneath the cohesive fill in all of the boreholes. All boreholes terminated within the clayey silt at a depth of 12.8 m below ground surface (Elevations ranging from 174.2 m to 174.1 m).

The SPT “N” values recorded within the clayey silt deposit range from 6 blows to 22 blows per 0.3 m of penetration. In-situ vane shear testing was carried out in Borehole BH6-22 and the undrained shear strength of the clayey silt deposit was measured to be greater than 100 kPa. The in-situ field vane tests together with the SPT “N” values indicate that the cohesive deposit encountered in the boreholes has a firm to very stiff consistency. The water content measured on samples of the sandy clayey silt deposit were 13% and 21%.

Grain size distribution testing was conducted on four (4) representative samples of the deposit and the results are shown on Figure D-4 in **Appendix D**. Atterberg limits testing was carried out on five (5) samples of the deposit and the results had liquid limits ranging from about 29% to 33%, plastic limits ranging from about 15% to 18%, and resulting plasticity indices from about 13% to 16%. These results, which are plotted on a plasticity chart on Figures D-5 in **Appendix D**, indicate that the cohesive fill consist of low plasticity clayey silt.

4.3.1.5 Silty Sand (Interlayer)

An interlayer of silty sand was encountered in the clayey silt deposit within Borehole BH7-22 at a depth of 10.7 m below ground surface (Elevation 176.2 m) and extended to a depth of 12.2 m below ground surface (Elevation 174.7 m). The SPT “N” value recorded within the silty sand deposit was measured to be 10 blows per 0.3 m of penetration, suggesting a compact state of compactness. Grain size distribution testing was conducted on four (4) representative samples of the deposit and the results are shown on Figure D-6 in **Appendix D**. The water content measured on a sample of the silty sand was 15%

4.3.2 Highway 402 and Wawanosh Drain Bridges

4.3.2.1 Asphalt

Boreholes BH9-22 to BH16-22 were advanced through the eastbound and westbound lanes and shoulder of Highway 402 and encountered an asphalt layer ranging in thickness from 102 mm to 203 mm.

4.3.2.2 Concrete

Underlying the asphalt in three boreholes (BH12-22 to BH14-22), a layer of concrete was encountered, ranging in thickness from about 203 mm to 508 mm.

4.3.2.3 Fill

Underlying the concrete and asphalt in all of the boreholes, granular fill material consisting of sand to sand and gravel with some fines was encountered and extended to depths ranging from 0.8 m to 1.5 m below ground surface (Elevations ranging from 182.2 m and 181.2 m) except Boreholes BH11-22 and BH14-22, where granular fill material was not encountered.

The Standard Penetration Test (SPT) “N” values recorded within the granular fill material range from 13 blows per 0.3 m of penetration to 76 blows per 0.2 m of penetration, indicating a compact to very dense compactness condition.

Grain size distribution testing was conducted on two (2) representative samples of the granular fill and the results are presented on Figure D-7 in **Appendix D**. The water content measured on samples of the granular fill range from approximately 2% to 15%.

The granular fill is underlain by embankment fill consisting of clayey silt to sandy clayey silt. The cohesive fill extends to depths ranging from 4.6 m to 9.1 m below ground surface (Elevations ranging from 178.1 m to 173.6 m).

The Standard Penetration Test (SPT) “N” values recorded within the cohesive fill material range from 6 blows to 26 blows per 0.3 m of penetration. In-situ vane shear testing was carried out in the boreholes and the undrained shear strength of the cohesive fill material was found to be greater than 100 kPa except in BH10-22 and BH15-22 where the undrained shear test was measured to be 29 kPa and 81 kPa at a depth of 5.3 m and 6.1 m below ground surface, respectively. The in-situ field vane tests together with the SPT “N” values indicate that the cohesive encountered in the boreholes has a firm to very stiff consistency. The water content measured on samples of the cohesive fill range from approximately 6% to 28%.

Grain size distribution testing was conducted on seven (7) representative samples of the cohesive fill and the results are shown on Figure D-8 in **Appendix D**. Atterberg limits testing was carried out on fifteen (15) samples of the cohesive fill and the results had liquid limits ranging from about 24% to 31%, plastic limits ranging from about 12% to 18% and resulting plasticity indices of between about 11% to 17%. These results, which are plotted on a plasticity chart on Figures D-9A & D-9B in **Appendix D**, indicate that the cohesive fill consist of low plasticity clayey silt.

A layer of gravelly sand fill was encountered in Borehole BH15-22 at a depth of 6.9 m below ground surface (Elevation 175.8 m) and extended to a depth of 8.0 m below ground surface (Elevation 174.7 m). The SPT “N” value recorded within the gravelly sand fill was 6 blows and 14 blows per 0.3 m of penetration, suggesting a loose to compact state of compactness. Grain size distribution testing was conducted on one (1) sample of the gravelly sand shown on Figure D-10 in **Appendix D**.

4.3.2.4 Clayey Silt

A cohesive deposit consisting of clayey silt was encountered beneath the cohesive fill in all of the boreholes. All boreholes terminated within the clayey silt at a depth of 12.8 m below ground surface (between Elevation 170.1 m and 169.8 m).

The SPT “N” values recorded within the clayey silt deposit range from 0 blows to 18 blows per 0.3 m of penetration. In-situ vane shear testing was carried out in the boreholes and the undrained shear strength of the cohesive fill material varied from 57 kPa to greater than 100 kPa. The in-situ field vane tests together with the SPT “N” values indicate that the cohesive deposit encountered in the boreholes has a stiff to very stiff consistency. The water content measured on samples of the clayey silt deposit were 11% and 23%.

Grain size distribution testing was conducted on eleven (11) representative samples of the cohesive deposit and the results are shown on Figure D-11A & D-11B in **Appendix D**. Atterberg limits testing was carried out on twenty (20) samples of the deposit and the results had liquid limits ranging from about 29% to 33%, plastic limits ranging from about 14% to 18%, and resulting plasticity indices of between about 11% to 17%. These results, which are plotted on a plasticity chart on Figures D-12A, D-12B & D-12C in **Appendix D**, indicate that the cohesive deposit consist of clayey silt.

4.3.3 Groundwater

The groundwater level in the open boreholes was measured upon completion of drilling each borehole. The water levels measured in the open boreholes are summarized below in Table 4.1.

Table 4.1 Summary of Groundwater Observations

Location	Structure Number	Borehole Number	Water Level Depth (m)	Water Level Elevation (m)	Date of Observation	Remarks
Highway 402 and Highway 40 Overpass	14X-0338/B1 (Eastbound Lanes)	BH6-22	Dry		April 10, 2023	Open boreholes upon completion of drilling
		BH8-22	Dry		April 18, 2023	
	14X-0338/B2 (Westbound Lanes)	BH5-22	Dry		April 18, 2023	
		BH7-22	10.7	176.2	April 11, 2023	
Highway 402 and Wawanosh Drain Bridges	14X-0341/B1 (Eastbound Lanes)	BH13-22	Dry		April 10, 2023	
		BH14-22	10.7	172.1	April 13, 2023	
		BH15-22	Dry		April 12, 2023	
		BH16-22	Dry		April 12, 2023	
	14X-0341/B2 (Westbound Lanes)	BH9-22	10.7	172.0	April 13, 2023	
		BH10-22	Dry		April 13, 2023	
		BH11-22	Dry		April 11, 2023	
		BH12-22	Dry		April 11, 2023	

It should be noted that the groundwater level at the site will fluctuate with seasonal changes, periods of precipitation, and temperature and should be expected to be higher during wet periods of the year.

5. Closure

The fieldwork was supervised by Siham Hannan and Brice Zanne, E.I.T. This report was prepared by Madlool Alsabak, E.I.T, and Anuj Choudhari, M.Sc., P.Eng., P.E. Sandra McGaghran, M.Eng., P.Eng., a Senior Geotechnical Engineer with GHD and MTO Foundations Designated Contact conducted a separate independent review of the report.

Sincerely,

GHD Limited

Madlool Alsabak, B.Eng.
Geotechnical Engineer-in-Training

Anuj Choudhari, M.Sc., P.Eng., P.E.
Intermediate Geotechnical Engineer

Sandra McGaghran, M.Eng., P.Eng.
MTO Foundations Designated Contact, Senior Geotechnical Engineer

MINISTRY OF TRANSPORTATION, ONTARIO

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES

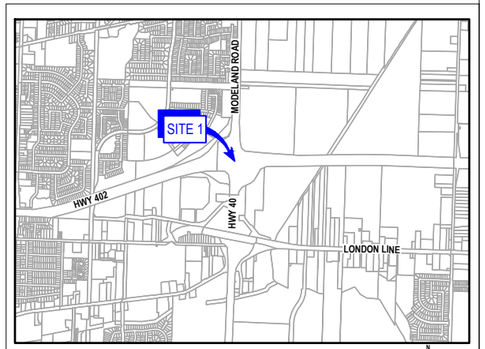
CONT No.
GWP No. 3106-18-00

HWY 402 / HWY 40 OVERPASS

BOREHOLE LOCATIONS

SHEET

GHD



KEY PLAN
SCALE 0 375 750 1500 m

GEOGRAPHIC TWP OF SARNIA
COUNTY OF LAMBTON
CITY OF SARNIA

300 CPP N

HIGHWAY 40 (SBL)

HIGHWAY 40 (NBL)

E-N RAMP

HIGHWAY 402 (WBL)

HIGHWAY 402 (EBL)

15+600 15+700 15+800 15+900

N 4761315 E 317474 N 4761315 E 317574 N 4761315 E 317674

N 4761215 E 317674

N 4761115 E 317474 N 4761115 E 317574 N 4761115 E 317674

BH5-22 BH6-22 BH7-22 BH8-22

1 40J16-040
2 40J16-040
3 40J16-040
4 40J16-040
5 40J16-040
6 40J16-040
7 40J16-040
8 40J16-040
9 40J16-040
10 40J16-040
11 40J16-040
12 40J16-040
13 40J16-040
14 40J16-040
15 40J16-040
16 40J16-040

A 1:1 A' 1:1 B 1:2 B' 1:2

C1 W ABUT BRGS C2 W ABUT BRGS C3 E ABUT BRGS C4 E ABUT BRGS

PLAN
SCALE 0 7.5 15 30 Meters

LEGEND

- Borehole Location
- Borehole Location Geocres No. 40J16-040

BOREHOLE CO-ORDINATES (MTM ZONE 11)

NO	Elevation	Northing	Easting
BH5-22	187.0	4761218.1	317492.3
BH6-22	186.9	4761193.9	317490.5
BH7-22	186.9	4761218.8	317572.8
BH8-22	186.9	4761194.5	317571.5
1-40J16-040	180.2	4761218.1	317565.6
2-40J16-040	179.9	4761240.4	317566.9
3-40J16-040	180.6	4761217.8	317553.9
4-40J16-040	179.4	4761217.4	317511.2
5-40J16-040	179.0	4761238.2	317534.4
6-40J16-040	179.5	4761217.2	317501.6
7-40J16-040	179.4	4761237.5	317502.1
8-40J16-040	180.1	4761197.6	317565.0
9-40J16-040	180.1	4761177.0	317564.6
10-40J16-040	180.5	4761172.0	317553.4
11-40J16-040	179.0	4761197.0	317533.2
12-40J16-040	179.5	4761176.2	317510.2
13-40J16-040	179.4	4761196.2	317501.1
14-40J16-040	179.5	4761176.0	317500.7
15-40J16-040	179.8	4761208.3	317576.6
16-40J16-040	179.7	4761206.7	317493.3

NOTES

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The boreholes shown in profile from GEOCRES 40J16-040 are approximate.

Boreholes from GEOCRES 40J16-040 were advanced prior to construction of the overpass.

REFERENCE

Base plans provide in digital format by CALLON DIETZ, drawing file: 402SAR.dwg, received on October 31, 2022.

LICENSED PROFESSIONAL ENGINEER S.M. McGAGHRAN 09/18/2023 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER A. CHOUDHARI 100553129 09/18/2023 PROVINCE OF ONTARIO

NO.	DATE	BY	REVISION

Geocres No.: 40J16-095

HWY. 402	PROJECT NO. 12566052		DIST. WEST
SUBM'D. MA	CHKD. AC	DATE:9.18.2023	SITE: 14X-0338/B1 and 14X-0338/B2
DRAWN: AW	CHKD. SMM	APPD. SMM	DWG. 1

Plot Date: 18 September 2023 3:17 PM
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MINISTRY OF TRANSPORTATION, ONTARIO

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES

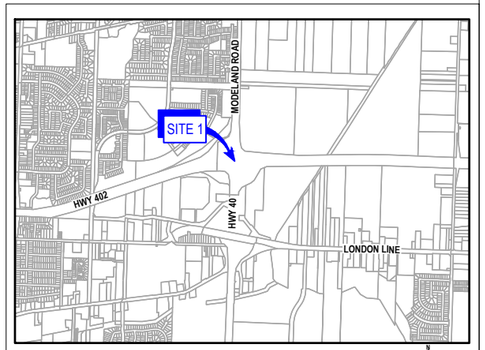
CONT No.
GWP No. 3106-18-00

SHEET

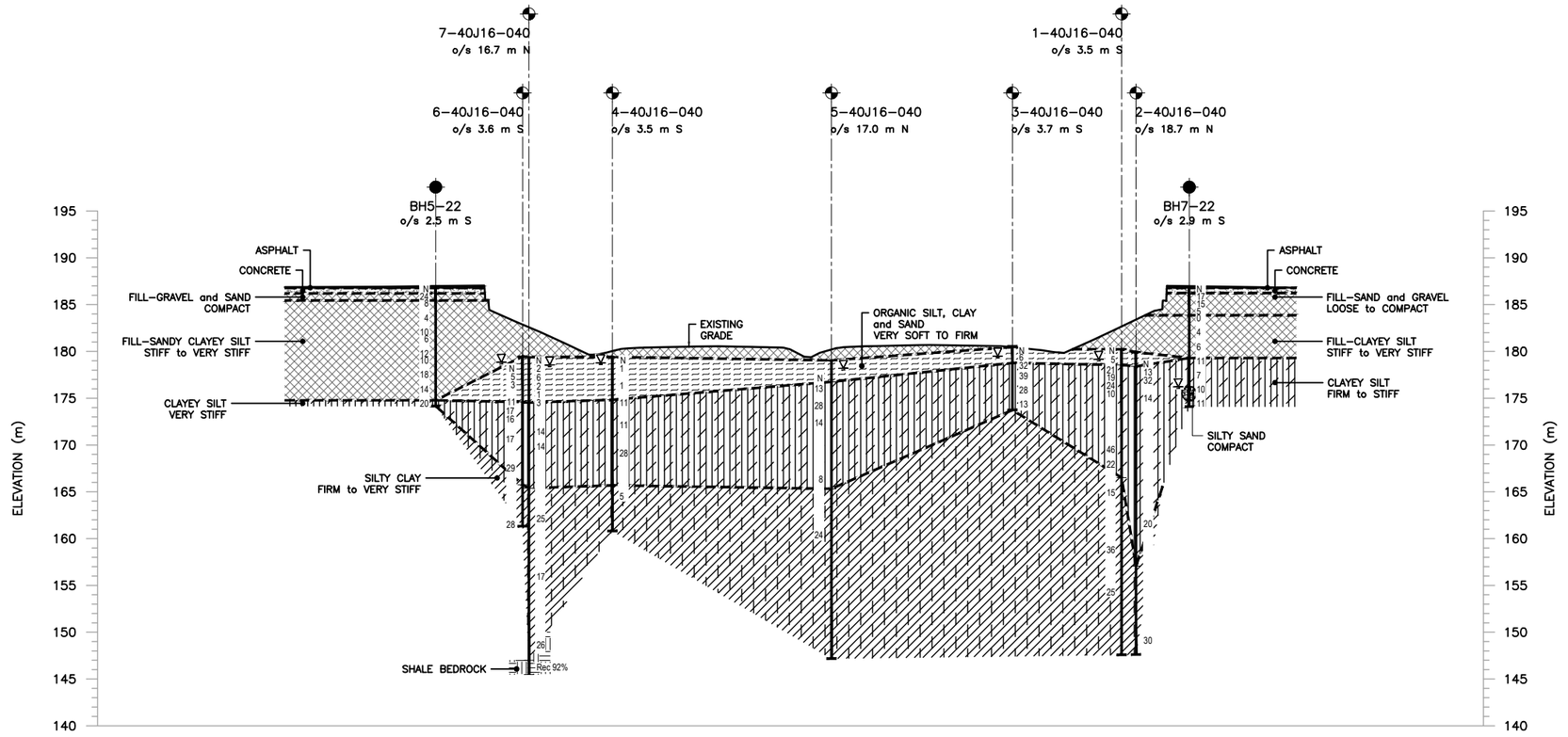
HWY 402 / HWY 40 OVERPASS

SOIL STRATA

GHD



KEY PLAN
SCALE 0 375 750 1500 m



PROFILE A-A'

HORIZONTAL 0 5 10 20 Meters

VERTICAL 0 5 10 20 Meters

LEGEND

●	Borehole Location
⊕	Borehole Location Geocres No. 40J16-040
N	Standard Penetration Test Value
16	Blows/0.3 m unless otherwise stated (Std. Pen. Test, 475 j/blow)
▽	WL upon completion of drilling
REC/%	Recovery

BOREHOLE CO-ORDINATES (MTM ZONE 11)

NO	Elevation	Northing	Easting
BH5-22	187.0	4761218.1	317492.3
BH6-22	186.9	4761193.9	317490.5
BH7-22	186.9	4761218.8	317572.8
BH8-22	186.9	4761194.5	317571.5
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4-40J16-040	179.4	4761217.4	317511.2
5-40J16-040	179.0	4761238.2	317534.4
6-40J16-040	179.5	4761217.2	317501.6
7-40J16-040	179.4	4761237.5	317502.1
8-40J16-040	180.1	4761197.6	317565.0
9-40J16-040	180.1	4761177.0	317564.6
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12-40J16-040	179.5	4761176.2	317510.2
13-40J16-040	179.4	4761196.2	317501.1
14-40J16-040	179.5	4761176.0	317500.7
15-40J16-040	179.8	4761208.3	317576.6
16-40J16-040	179.7	4761206.7	317493.3

NOTES

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REFERENCE

Base plans provide in digital format by CALLON DIETZ, drawing file: 402SAR.dwg, received on October 31, 2022.

LICENSED PROFESSIONAL ENGINEER
S.M. McGAGHRAN
09/18/2023
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
A. CHOUDHARI
100553129
09/18/2023
PROVINCE OF ONTARIO

NO.	DATE	BY	REVISION

Geocres No.: 40J16-095

HWY: 402	PROJECT NO. 12566052		DIST. WEST
SUBM'D. MA	CHKD. AC	DATE:9.18.2023	SITE: 14X-0338/B1 and 14X-0338/B2
DRAWN: AW	CHKD. SMM	APPD. SMM	DWG. 2

Plot Date: 18 September 2023 3:19 PM
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MINISTRY OF TRANSPORTATION, ONTARIO

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES

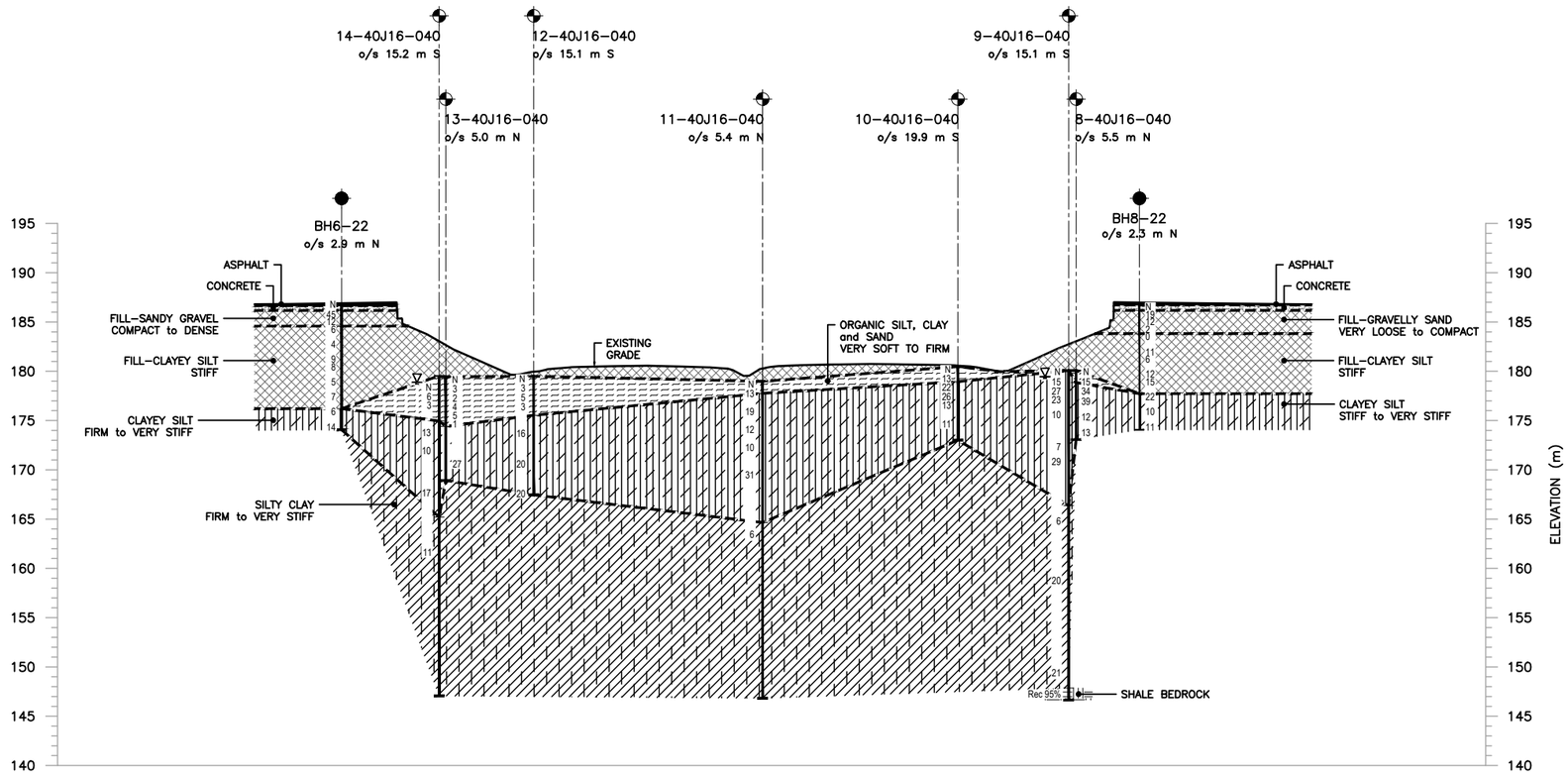
CONT No.
GWP No. 3106-18-00

HWY 402 / HWY 40 OVERPASS

SOIL STRATA

SHEET

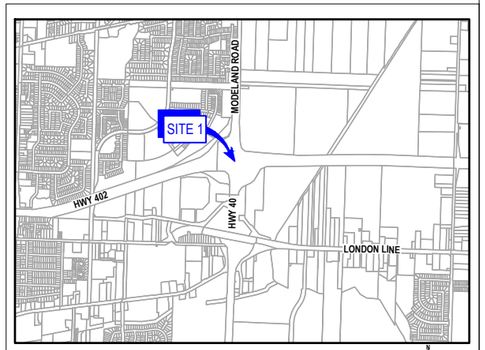
GHD



PROFILE B-B'

HORIZONTAL 0 5 10 20 Meters

VERTICAL 0 5 10 20 Meters



KEY PLAN
SCALE 0 375 750 1500 m

LEGEND

●	Borehole Location
◐	Borehole Location Geocres No. 40J16-040
N	Standard Penetration Test Value
16	Blows/0.3 m unless otherwise stated (Std. Pen. Test, 475 j/blow)
▽	WL upon completion of drilling
REC/%	Recovery

BOREHOLE CO-ORDINATES (MTM ZONE 11)

NO	Elevation	Northing	Easting
BH5-22	187.0	4761218.1	317492.3
BH6-22	186.9	4761193.9	317490.5
BH7-22	186.9	4761218.8	317572.8
BH8-22	186.9	4761194.5	317571.5
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4-40J16-040	179.4	4761217.4	317511.2
5-40J16-040	179.0	4761238.2	317534.4
6-40J16-040	179.5	4761217.2	317501.8
7-40J16-040	179.4	4761237.5	317502.1
8-40J16-040	180.1	4761197.8	317565.0
9-40J16-040	180.1	4761177.0	317564.6
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12-40J16-040	179.5	4761176.2	317510.2
13-40J16-040	179.4	4761196.2	317501.1
14-40J16-040	179.5	4761176.0	317500.7
15-40J16-040	179.8	4761208.3	317576.6
16-40J16-040	179.7	4761206.7	317493.3

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REFERENCE

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NO.	DATE	BY	REVISION

Geocres No.: 40J16-095

HWY: 402	PROJECT NO. 12566052		DIST: WEST
SUBMD. MA	CHKD. AC	DATE: 9.18.2023	SITE: 14X-0338/B1 and 14X-0338/B2
DRAWN: AW	CHKD. SMM	APPD. SMM	DWG. 3

LICENSED PROFESSIONAL ENGINEER
S.M. McGAGHRAN
09/18/2023
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
A. CHOUDHARI
100553129
09/18/2023
PROVINCE OF ONTARIO

Plot Date: 18 September 2023 3:20 PM
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MINISTRY OF TRANSPORTATION, ONTARIO

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES

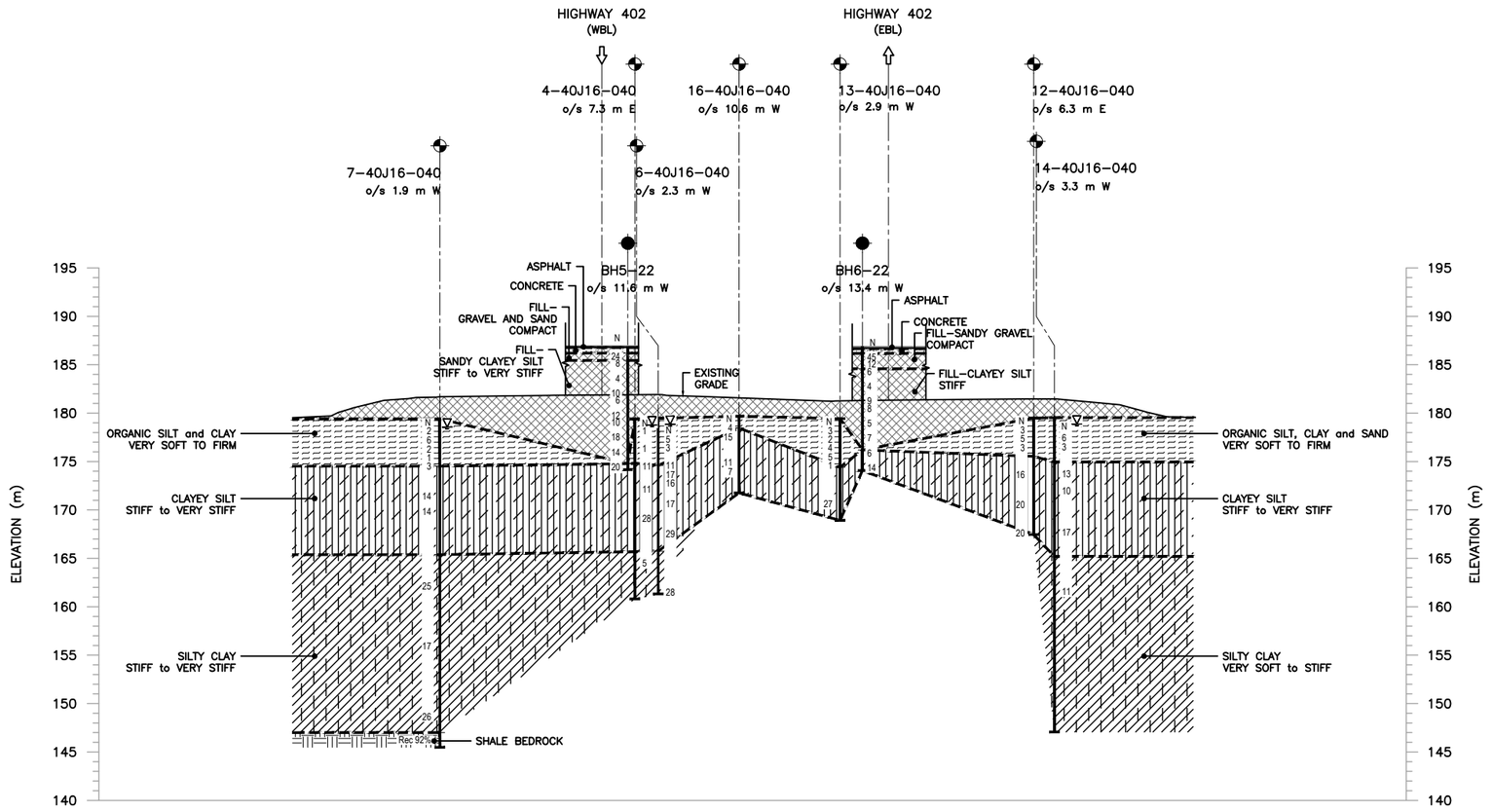
CONT No.
GWP No. 3106-18-00

SHEET

HWY 402 / HWY 40 OVERPASS

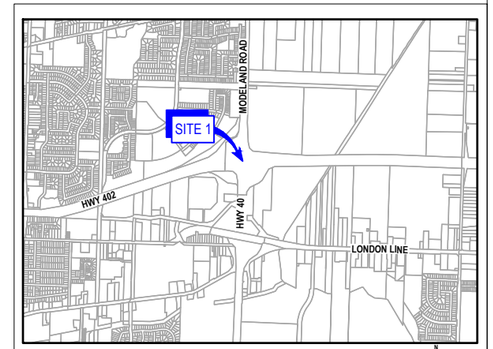
SOIL STRATA

GHD



CROSS SECTION C-C'

HORIZONTAL 0 5 10 20 Meters VERTICAL 0 5 10 20 Meters



KEY PLAN SCALE 0 375 750 1500 m

LEGEND

- Borehole Location
- Borehole Location Geocres No. 40J16-040
- N — Standard Penetration Test Value
- 16 — Blows/0.3 m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- ▽ — WL upon completion of drilling
- REC/% — Recovery

BOREHOLE CO-ORDINATES (MTM ZONE 11)

NO	Elevation	Northing	Easting
BH5-22	187.0	4761218.1	317492.3
BH6-22	186.9	4761193.9	317490.5
BH7-22	186.9	4761218.8	317572.8
BH8-22	186.9	4761194.5	317571.5
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3-40J16-040	180.6	4761217.8	317553.9
4-40J16-040	179.4	4761217.4	317511.2
5-40J16-040	179.0	4761238.2	317534.4
6-40J16-040	179.5	4761217.2	317507.6
7-40J16-040	179.4	4761237.5	317502.1
8-40J16-040	180.1	4761197.6	317565.0
9-40J16-040	180.1	4761177.0	317564.6
10-40J16-040	180.5	4761172.0	317533.4
11-40J16-040	179.0	4761197.0	317533.2
12-40J16-040	179.5	4761176.2	317510.2
13-40J16-040	179.4	4761196.2	317501.1
14-40J16-040	179.5	4761176.0	317500.7
15-40J16-040	179.8	4761208.3	317576.6
16-40J16-040	179.7	4761206.7	317493.3

NOTES

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REFERENCE

Base plans provide in digital format by CALLON DIETZ, drawing file: 402SAR.dwg, received on October 31, 2022.

NO.	DATE	BY	REVISION

Geocres No.: 40J16-095

HWY: 402	PROJECT NO. 12566052		DIST. WEST
SUBM'D. MA	CHKD. AC	**DATE:9.18.2023**	SITE: 14X-0338/B1 and 14X-0338/B2
DRAWN: AW	CHKD. SMM	APPD. SMM	DWG. 4

LICENSED PROFESSIONAL ENGINEER S.M. McGAGHRAN 09/18/2023 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER A. CHOUDHARI 100553129 09/18/2023 PROVINCE OF ONTARIO

Plot Date: 18 September 2023 3:22 PM
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MINISTRY OF TRANSPORTATION, ONTARIO

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES

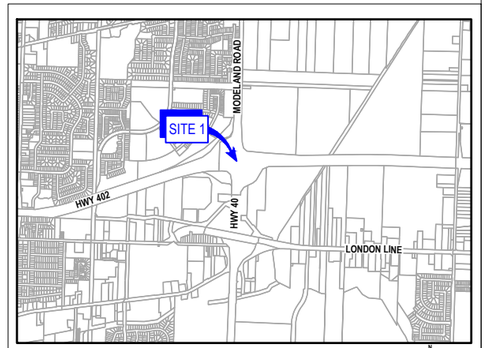
CONT No.
GWP No. 3106-18-00

SHEET

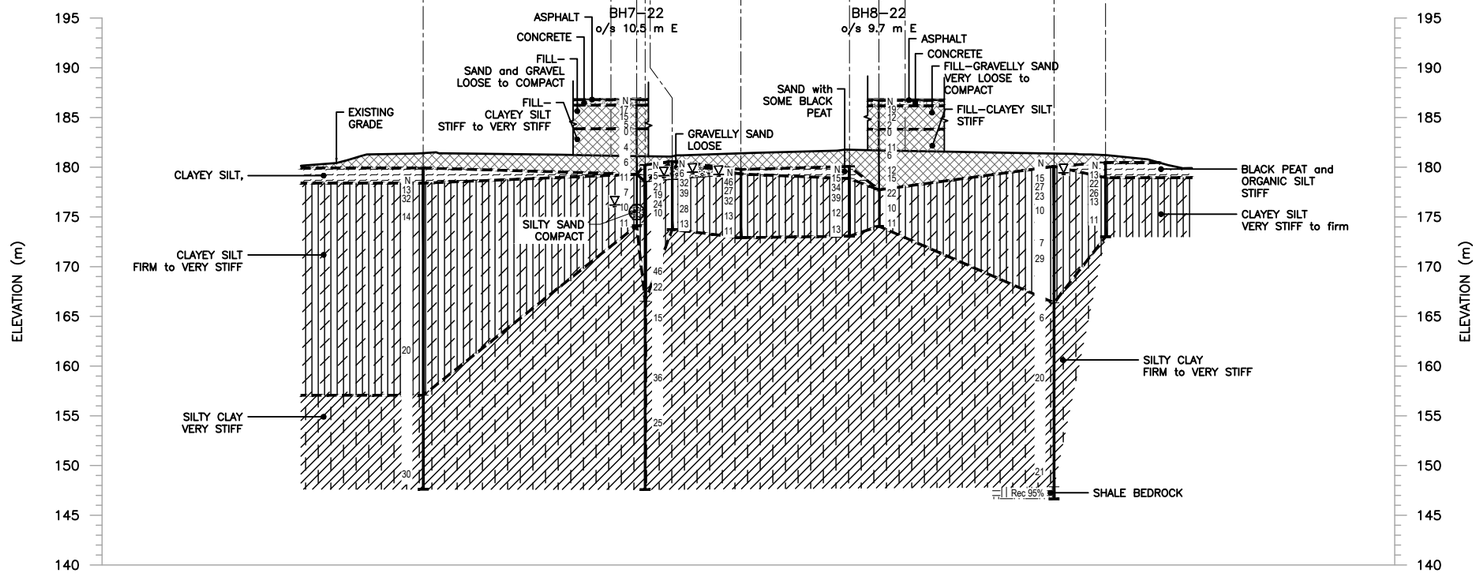
HWY 402 / HWY 40 OVERPASS

SOIL STRATA

GHD



KEY PLAN
SCALE 0 375 750 1500 m



CROSS SECTION D-D'

HORIZONTAL 0 5 10 20 Meters

VERTICAL 0 5 10 20 Meters

LEGEND

●	Borehole Location
◉	Borehole Location Geocres No. 40J16-040
N	Standard Penetration Test Value
16	Blows/0.3 m unless otherwise stated (Std. Pen. Test, 475 j/blow)
▽	WL upon completion of drilling
REC/%	Recovery

BOREHOLE CO-ORDINATES (MTM ZONE 11)

NO	Elevation	Northing	Easting
BH5-22	187.0	4761218.1	317492.3
BH6-22	186.9	4761193.9	317490.5
BH7-22	186.9	4761218.8	317572.8
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3-40J16-040	180.6	4761217.8	317553.9
4-40J16-040	179.4	4761217.4	317511.2
5-40J16-040	179.0	4761238.2	317534.4
6-40J16-040	179.5	4761217.2	317501.6
7-40J16-040	179.4	4761237.5	317522.1
8-40J16-040	180.1	4761197.6	317565.0
9-40J16-040	180.1	4761177.0	317564.6
10-40J16-040	180.5	4761172.0	317533.4
11-40J16-040	179.0	4761197.0	317533.2
12-40J16-040	179.5	4761176.2	317510.2
13-40J16-040	179.4	4761196.2	317501.1
14-40J16-040	179.5	4761176.0	317500.7
15-40J16-040	179.8	4761208.3	317576.6
16-40J16-040	179.7	4761206.7	317493.3

NOTES

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REFERENCE

Base plans provide in digital format by CALLON DIETZ, drawing file: 402SAR.dwg, received on October 31, 2022.

LICENSED PROFESSIONAL ENGINEER
S.M. McGAGHRAN
09/18/2023
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
A. CHOUDHARI
100553129
09/18/2023
PROVINCE OF ONTARIO

NO.	DATE	BY	REVISION

Geocres No.: 40J16-095

HWY: 402	PROJECT NO. 12566052		DIST: WEST
SUBM'D. MA	CHKD. AC	**DATE:9.18.2023**	SITE: 14X-0338/B1 and 14X-0338/B2
DRAWN: AW	CHKD. SMM	APPD. SMM	DWG. 5

Plot Date: 18 September 2023 3:24 PM
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MINISTRY OF TRANSPORTATION, ONTARIO

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES

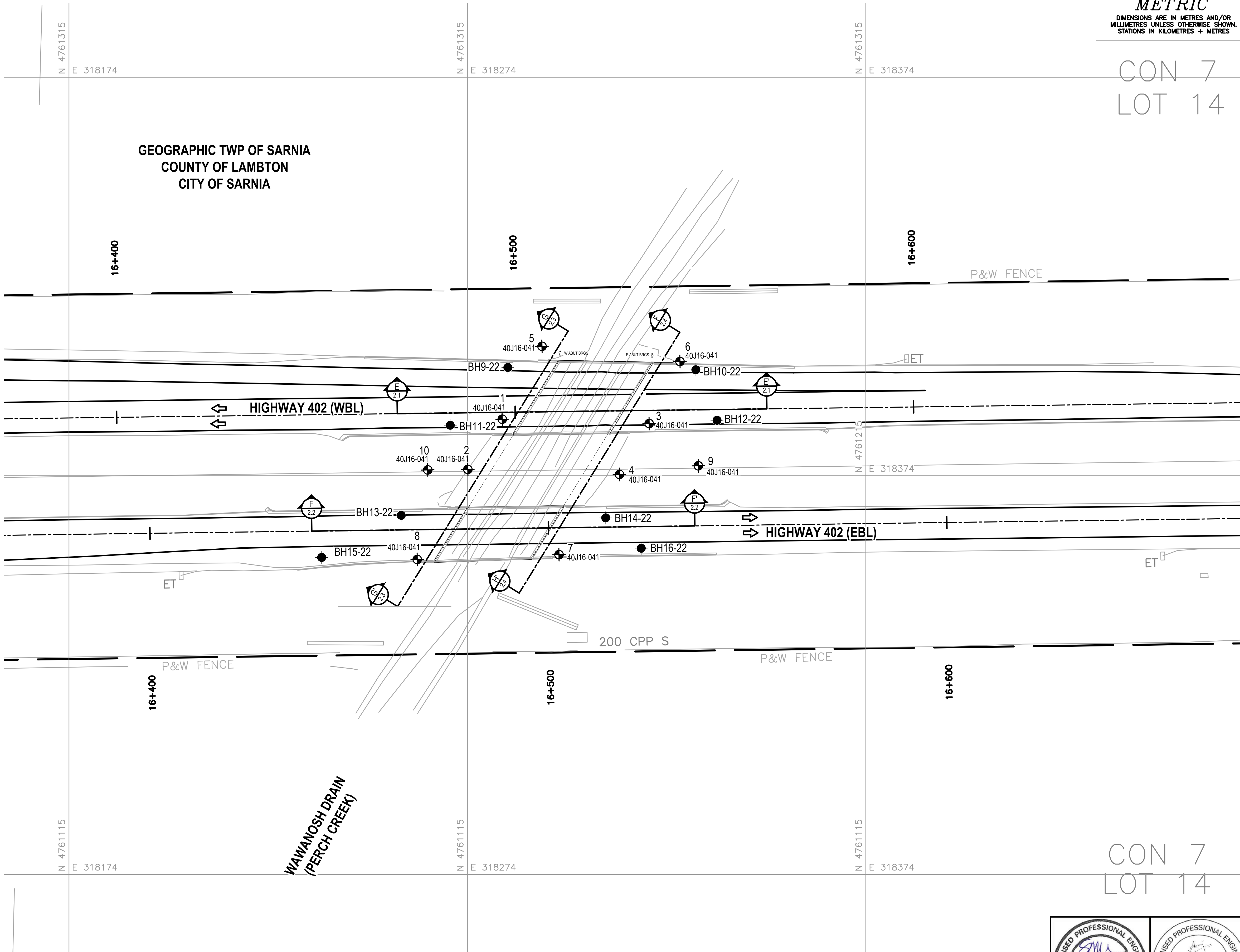
CONT No.
GWP No. 3106–18–00

SHEET

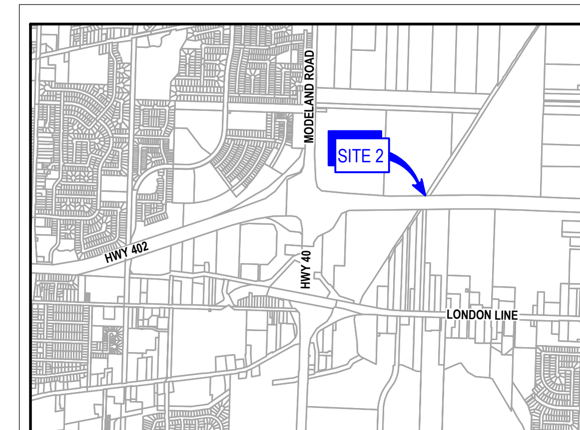
HWY 402 / WAWANOSH DRAIN BRIDGE

BOREHOLE LOCATIONS

GHD



PLAN
SCALE
0 7.5 15 30 Meters



KEY PLAN
SCALE
0 375 750 1500 m

LEGEND

- ● Borehole Location
- ◐ Borehole Location Geocres No. 40J16–041

BOREHOLE CO–ORDINATES (MTM ZONE 11)			
NO	Elevation	Northing	Easting
BH9-22	182.7	4761242.2	318284.3
BH10-22	182.6	4761241.6	318331.5
BH11-22	182.8	4761227.7	318269.8
BH12-22	182.6	4761229.0	318336.8
BH13-22	182.9	4761205.1	318257.5
BH14-22	182.8	4761204.5	318308.9
BH15-22	182.7	4761194.5	318237.6
BH16-22	182.7	4761196.8	318317.8
1-40J16-041	182.1	4761229.2	318282.9
2-40J16-041	182.4	4761216.6	318274.3
3-40J16-041	182.0	4761228.1	318319.8
4-40J16-041	182.1	4761215.4	318312.3
5-40J16-041	182.2	4761247.5	318292.9
6-40J16-041	181.8	4761243.7	318327.5
7-40J16-041	182.0	4761195.2	318297.1
8-40J16-041	181.7	4761194.0	318261.6
9-40J16-041	179.5	4761217.5	318332.1
10-40J16-041	179.8	4761216.5	318264.2

NOTES

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The boreholes shown in profile from GEOCRES 40J16–041 are approximate.

Boreholes from GEOCRES 40J16–041 were advanced prior to construction of the bridge.

REFERENCE

Base plans provide in digital format by CALLON DIETZ, drawing file: 402SAR.dwg, received on October 31, 2022.

LICENSED PROFESSIONAL ENGINEER
S.M. McGAGHRAN
09/18/2023
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
A. CHOUDHARI
100553129
09/18/2023
PROVINCE OF ONTARIO

NO.	DATE	BY	REVISION

Geocres No.: 40J16–095

HWY. 402	PROJECT NO. 12566052		DIST. WEST
SUBM'D. MA	CHKD. AC	DATE:9.18.2023	SITE: 14X-0341/B1 and 14X-0341/B2
DRAWN: AW	CHKD. SMM	APPD. SMM	DWG. 6

Plot Date: 18 September 2023 3:27 PM
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MINISTRY OF TRANSPORTATION, ONTARIO

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES

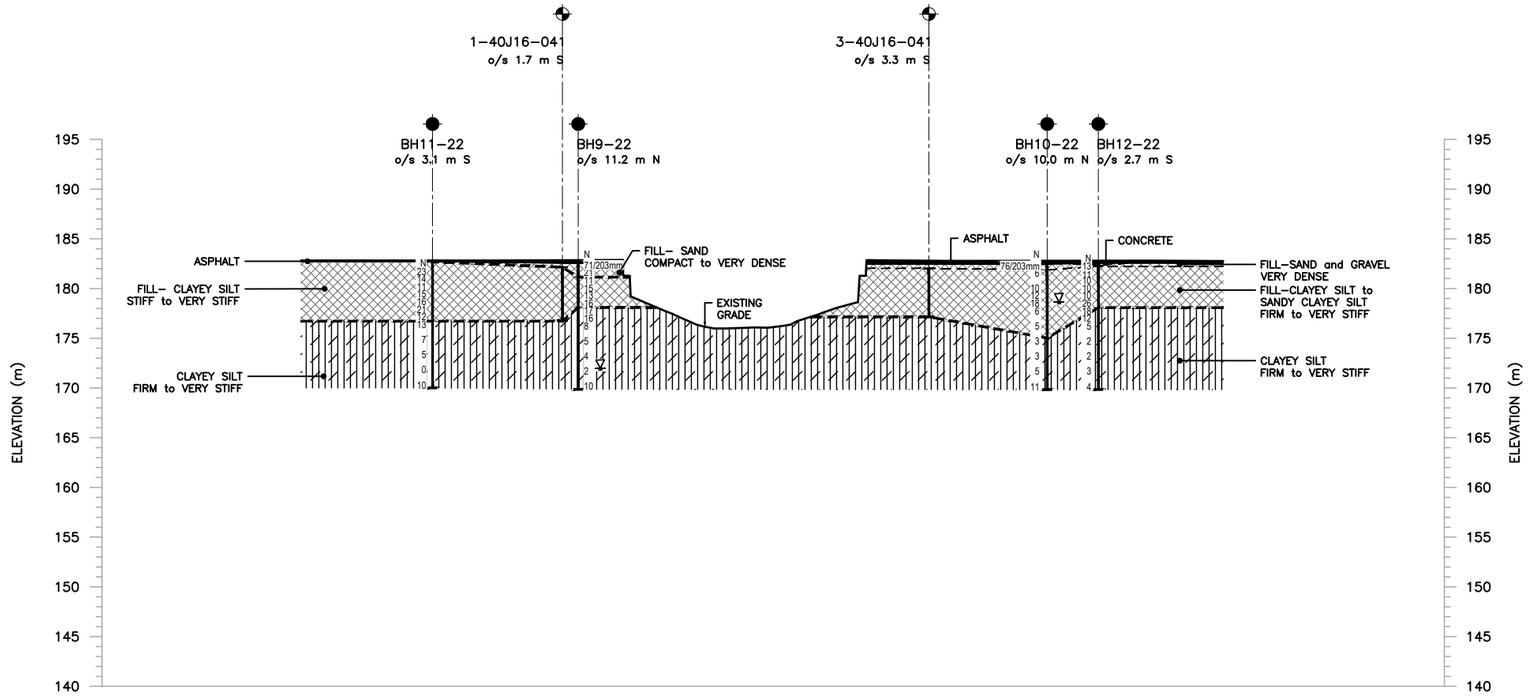
CONT No.
GWP No. 3106-18-00

SHEET

HWY 402 / WAWANOSH DRAIN BRIDGE

SOIL STRATA

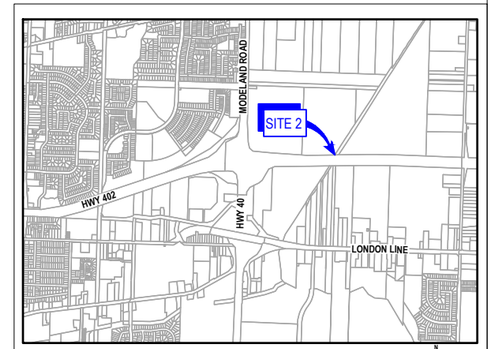
GHD



PROFILE E-E'

HORIZONTAL 0 5 10 20 Meters

VERTICAL 0 5 10 20 Meters



KEY PLAN
SCALE 0 375 750 1500 m

LEGEND

- Borehole Location
- Borehole Location Geocres No. 40J16-041
- N — Standard Penetration Test Value
- 16 — Blows/0.3 m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- WL upon completion of drilling

BOREHOLE CO-ORDINATES
(MTM ZONE 11)

NO	Elevation	Northing	Easting
BH9-22	182.7	4761242.2	318284.3
BH10-22	182.6	4761241.6	318331.5
BH11-22	182.8	4761227.7	318269.8
BH12-22	182.6	4761223.0	318336.8
BH13-22	182.9	4761205.1	318257.5
BH14-22	182.8	4761204.5	318308.9
BH15-22	182.7	4761194.5	318237.6
BH16-22	182.7	4761186.8	318317.8
1-40J16-041	182.1	4761229.2	318282.9
2-40J16-041	182.4	4761216.6	318274.3
3-40J16-041	182.0	4761228.1	318319.8
4-40J16-041	182.1	4761215.4	318312.3
5-40J16-041	182.2	4761247.5	318292.9
6-40J16-041	181.8	4761243.7	318277.5
7-40J16-041	182.0	4761195.2	318297.1
8-40J16-041	181.7	4761194.0	318261.6
9-40J16-041	179.5	4761217.5	318332.1
10-40J16-041	179.8	4761216.5	318264.2

NOTES

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REFERENCE

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LICENSED PROFESSIONAL ENGINEER
S.M. McGAGHRAN
09/18/2023
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
A. CHOUDHARI
100553129
09/18/2023
PROVINCE OF ONTARIO

NO.	DATE	BY	REVISION

Geocres No.: 40J16-095

HWY: 402	PROJECT NO. 12566052		DIST. WEST
SUBM'D. MA	CHK'D. AC	**DATE:9.18.2023**	SITE: 14X-0341/B1 and 14X-0341/B2
DRAWN: AW	CHK'D. SMM	APP'D. SMM	DWG. 7

Plot Date: 18 September 2023 3:29 PM
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MINISTRY OF TRANSPORTATION, ONTARIO

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES

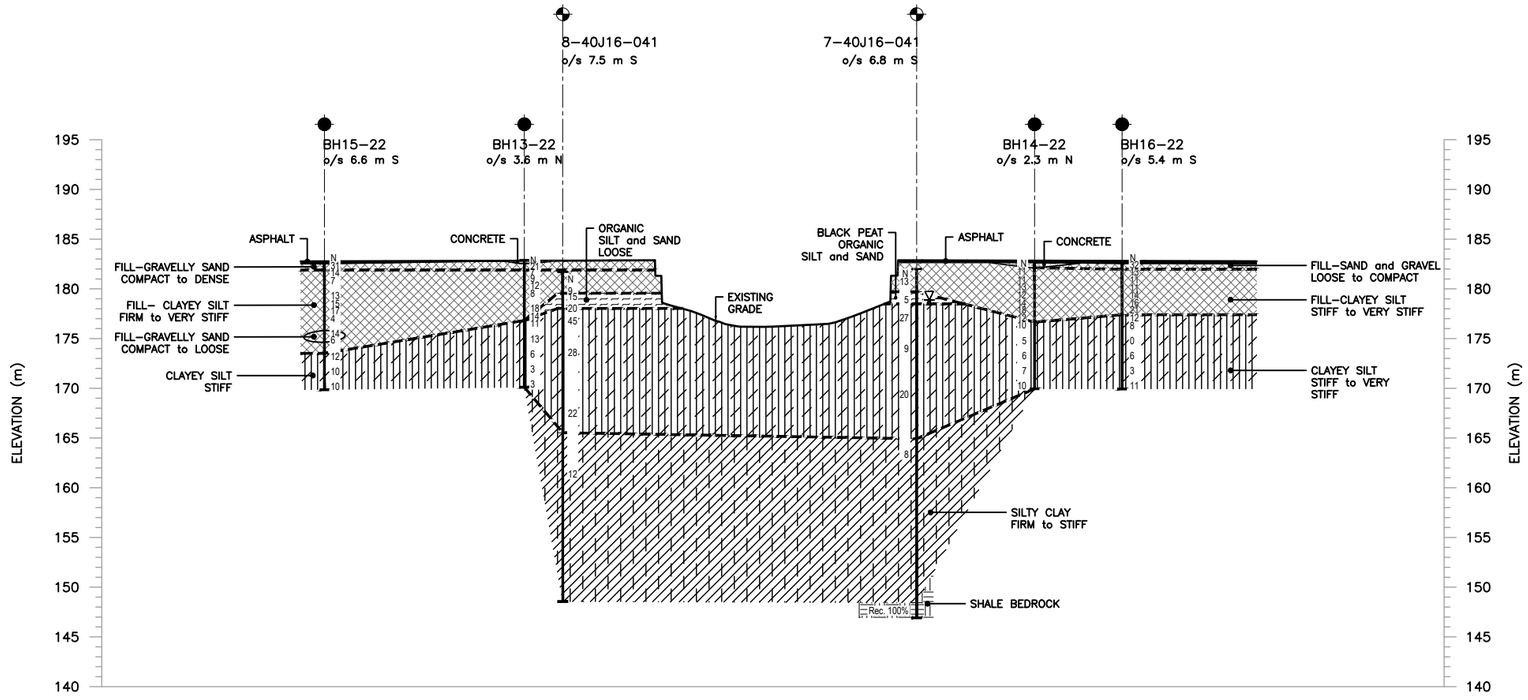
CONT No.
GWP No. 3106-18-00

SHEET

HWY 402 / WAWANOSH DRAIN BRIDGE

SOIL STRATA

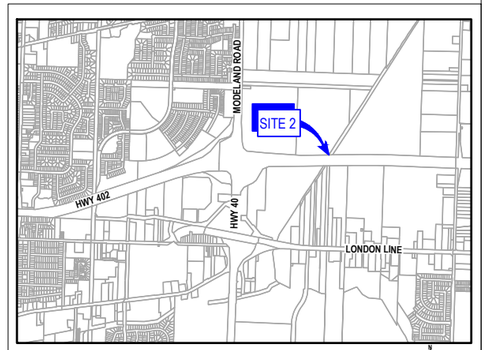
GHD



PROFILE F-F'

HORIZONTAL 0 5 10 20 Meters

VERTICAL 0 5 10 20 Meters



KEY PLAN
SCALE 0 375 750 1500 m

LEGEND

●	Borehole Location
◉	Borehole Location Geocres No. 40J16-041
N	Standard Penetration Test Value
16	Blows/0.3 m unless otherwise stated (Std. Pen. Test, 475 j/blow)
▽	WL upon completion of drilling
REC/%	Recovery

BOREHOLE CO-ORDINATES (MTM ZONE 11)

NO	Elevation	Northing	Easting
BH9-22	182.7	4761242.2	318284.3
BH10-22	182.6	4761241.6	318331.5
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NOTES

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REFERENCE

Base plans provide in digital format by CALLON DIETZ, drawing file: 402SAR.dwg, received on October 31, 2022.

LICENSED PROFESSIONAL ENGINEER
S.M. McGAGHRAN
09/18/2023
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
A. CHOUDHARI
100553129
09/18/2023
PROVINCE OF ONTARIO

NO.	DATE	BY	REVISION

Geocres No.: 40J16-095

HWY. 402	PROJECT NO. 12566052		DIST. WEST
SUBMTD. MA	CHKD. AC	DATE:9.18.2023	SITE: 14X-0341/B1 and 14X-0341/B2
DRAWN: AW	CHKD. SMM	APPD. SMM	DWG. 8

Plot Date: 18 September 2023 3:31 PM
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MINISTRY OF TRANSPORTATION, ONTARIO

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES

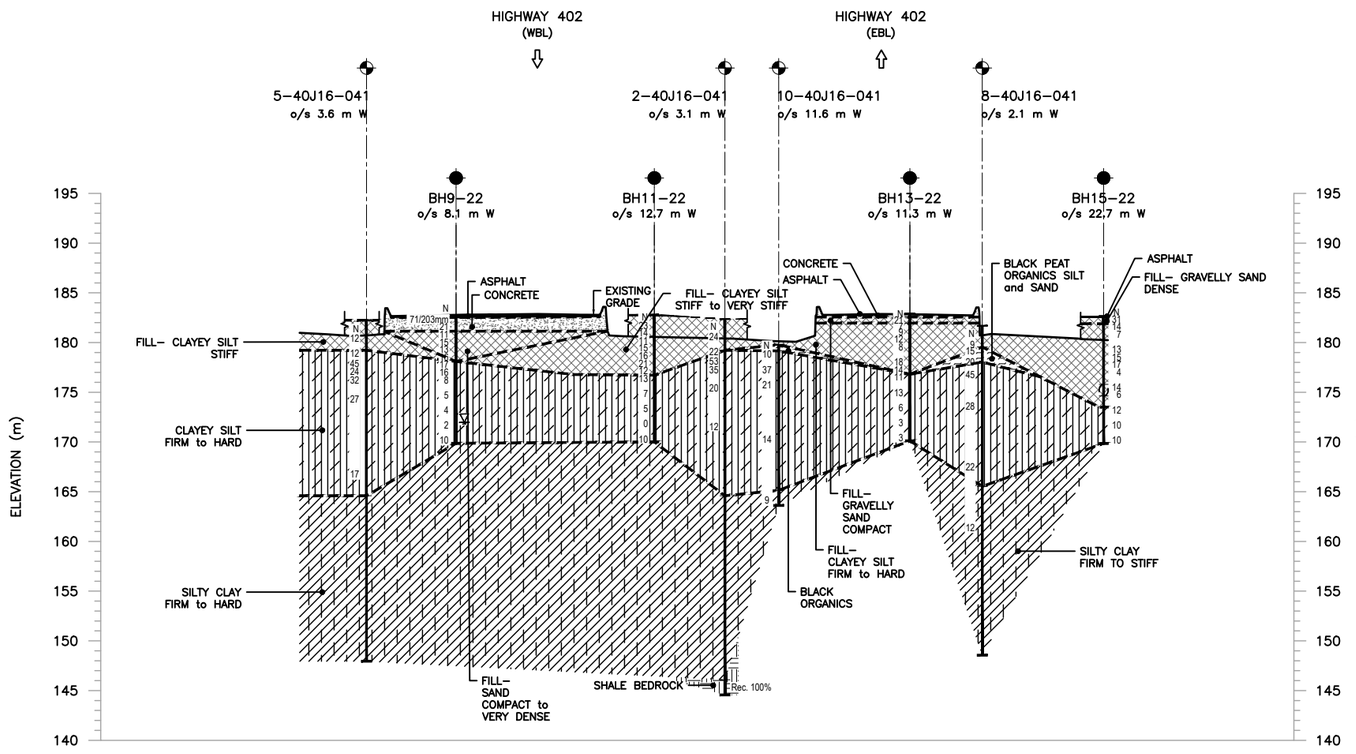
CONT No.
GWP No. 3106-18-00

SHEET

HWY 402 / WAWANOSH DRAIN BRIDGE

SOIL STRATA

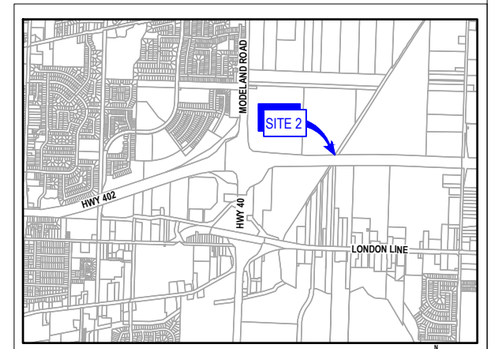
GHD



CROSS SECTION G-G'

HORIZONTAL 0 5 10 20 Meters

VERTICAL 0 5 10 20 Meters



KEY PLAN
SCALE 0 375 750 1500 m

LEGEND

●	Borehole Location
⊕	Borehole Location Geocres No. 40J16-041
N	Standard Penetration Test Value
16	Blows/0.3 m unless otherwise stated (Std. Pen. Test, 475 j/blow)
▽	WL upon completion of drilling
REC/%	Recovery

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7-40J16-041	182.0	4761196.2	318297.1
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LICENSED PROFESSIONAL ENGINEER S.M. McGAGHRAN 09/18/2023 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER A. CHOUDHARI 100553129 09/18/2023 PROVINCE OF ONTARIO

NO.	DATE	BY	REVISION

Geocres No.: 40J16-095

HWY: 402	PROJECT NO. 12566052		DIST. WEST
SUBM'D. MA	CHKD. AC	DATE:9.18.2023	SITE: 14X-0341/B1 and 14X-0341/B2
DRAWN: AW	CHKD. SMM	APP'D. SMM	DWG. 9

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MINISTRY OF TRANSPORTATION, ONTARIO

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES

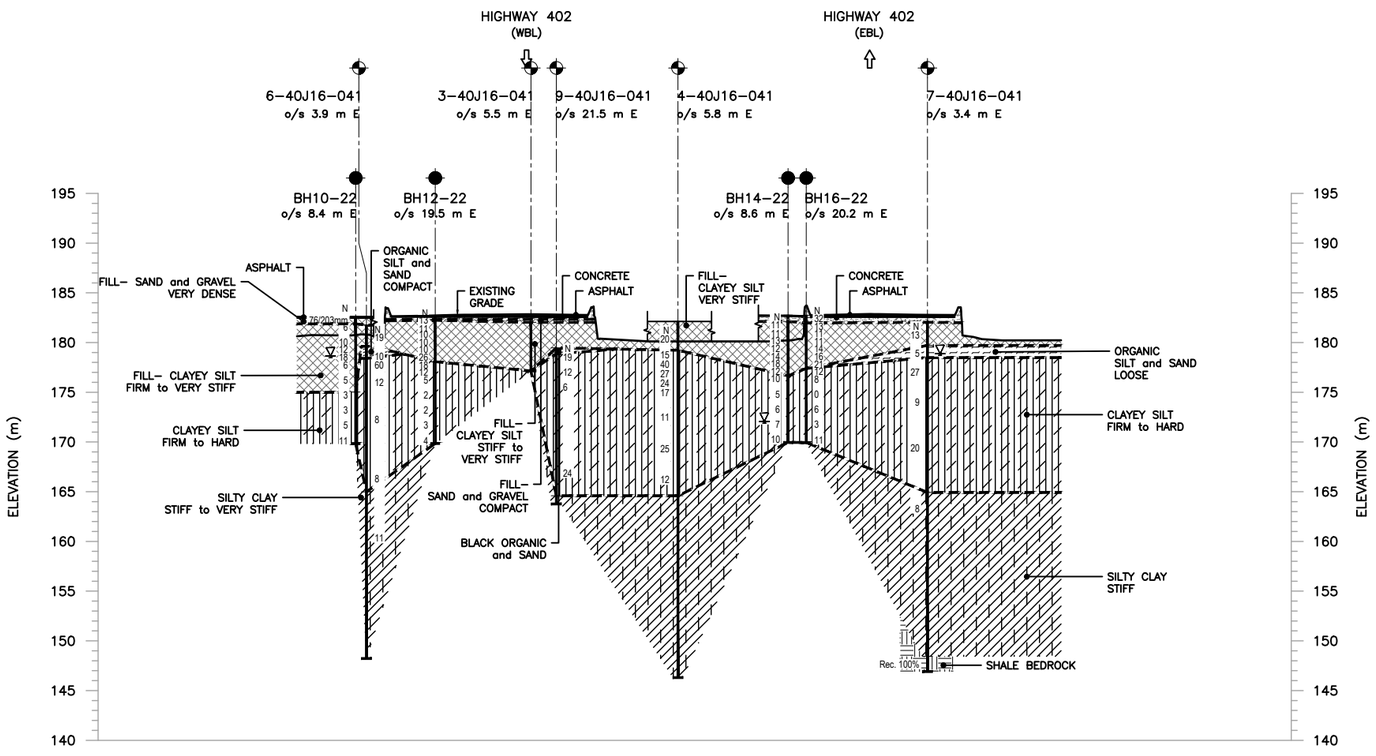
CONT No.
GWP No. 3106-18-00

HWY 402 / WAWANOSH DRAIN BRIDGE

SOIL STRATA

SHEET

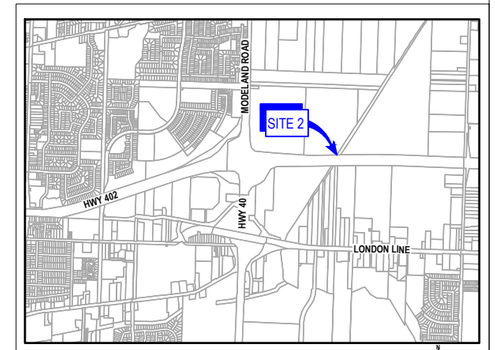
GHD



CROSS SECTION H-H'

HORIZONTAL 0 5 10 20 Meters

VERTICAL 0 5 10 20 Meters



KEY PLAN
SCALE 0 375 750 1500 m

LEGEND

●	Borehole Location
◉	Borehole Location Geocres No. 40J16-041
N	Standard Penetration Test Value
16	Blows/0.3 m unless otherwise stated (Std. Pen. Test, 475 j/blow)
▽	WL upon completion of drilling
REC/%	Recovery

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BH11-22	182.8	4761227.7	318289.8
BH12-22	182.6	4761229.0	318336.8
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4-40J16-041	182.1	4761215.4	318312.3
5-40J16-041	182.2	4761247.5	318292.9
6-40J16-041	181.8	4761243.7	318327.5
7-40J16-041	182.0	4761195.2	318297.1
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LICENSED PROFESSIONAL ENGINEER
S.M. McGAGHRAN
09/18/2023
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
A. CHOUDHARI
100553129
09/18/2023
PROVINCE OF ONTARIO

NO.	DATE	BY	REVISION

Geocres No.: 40J16-095

HWY. 402	PROJECT NO. 12566052		DIST. WEST
SUBMTD. MA	CHKD. AC	DATE:9.18.2023	SITE: 14X-0341/B1 and 14X-0341/B2
DRAWN: AW	CHKD. SMM	APPD. SMM	DWG. 10

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Appendices

Appendix A

Site Photographs

Photo 1: Highway 402 and Highway 40 Overpass
(April 11th, 2023)

Photo 2: Drilling operations at Borehole, BH7-22 – Highway 402 Westbound Lane
(April 11th, 2023)

Photo 3: Drilling operations at Borehole, BH7-22 – Highway 402 Westbound Lane, looking north (April 11th, 2023)

Photo 4: Drilling operations at Borehole, BH6-22 – Highway 402 Eastbound Lane (April 11th, 2023)

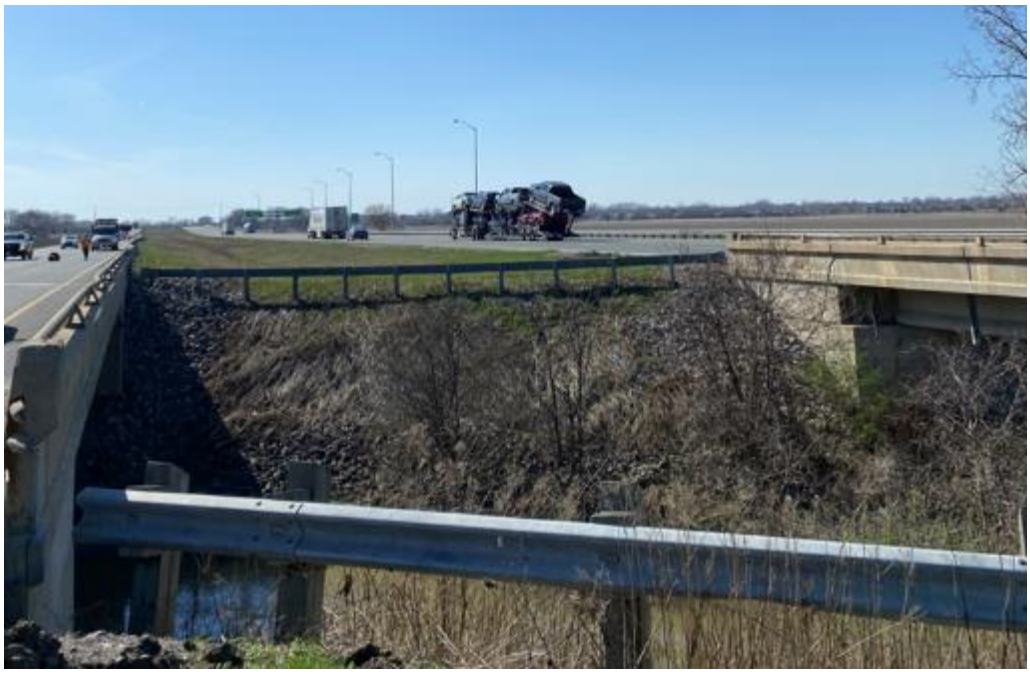

Photo 5: Highway 402 and Wawanosh Drain Overpass
(April 13th, 2023)

Photo 6: Drilling set up at Borehole, BH15-22 – Highway 402 Eastbound Lane
(April 12th, 2023)

Photo 7: Drilling set up at Borehole, BH16-22 – Highway 402 Eastbound Lane (April 12th, 2023)

Photo 8: Drilling set up at Borehole, BH14-22 – Highway 402 Eastbound Lane, looking west (April 12th, 2023)

Photo 9: Drilling set up at Borehole, BH10-22 – Highway 402 Westbound Lane, looking east (April 13th, 2023)

Appendix B

Previous Investigation

GEOCRES Nos. 40J16-036, 40J16-040 & 40J16-041

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 40J16-36

DIST. 1 REGION

W.P. No. 122-65-01

CONT. No. 75-027

W. O. No.

STR. SITE No.

HWY. No. 402

LOCATION Modeland Road, Interchange

No. of Pages -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 100

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 66 + 00 150' Lt. Hwy. 402 ORIGINATED BY AP
W.P. 122-65-01 BORING DATE December 11, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE (1000 / 2000)	LIQUID LIMIT w_L — PLASTIC LIMIT w_P — WATER CONTENT w (WATER CONTENT % 25 / 50 / 75)	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
588.4	Ground Level									
0.0	Silty sand to sand, some clay & organics.		1	SS	6			○		
			2	TW	PM					
578.4	Loose		3	SS	4	580		○		0 41 49 10
10.0	Organic silt, clay		4	TW	PM		+ 2.1	○	98	
	Layers of peat and sand		5	SS	9		+ 1.7			
			6	TW	PM	570		○	96	
	Soft to stiff		7	SS	5		+ 1.9			
			8	TW	PM		+ 1.9			
560.9			9	SS	3		+ 3.0			
27.5	End of Borehole					560				

FORM OB-MT-136 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 101

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 67 + 00 ℄ Hwy. 402 ORIGINATED BY AP
W.P. 122-65-01 BORING DATE December 12, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT
588.6	Ground Level				
0.0	Topsoil				
	Silty sand, traces of clay & organics		1	SS	5
			2	SS	4
580.6	Loose				
8.0	Organic silt, clay		3	SS	3
			4	TW	PM
	Layers of sand		5	SS	4
	Soft to stiff		6	TW	PM
			7	SS	7
560.1					
28.5	Clayey silt				
557.1	Stiff		8	SS	12
31.5	End of Borehole				

ELEV. SCALE: 580, 570, 560, 550

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
1000 2000

+2.1
+2.1
+1.9
+1.9
+1.8

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w
WATER CONTENT % 25 50 75

BULK DENSITY γ P.C.F.: 93

REMARKS: GR. SA. SI. CL.
0 82 16 2

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 102

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 68 + 00 ℄ Hwy. 402 ORIGINATED BY PP

W.P. 122-65-01 BORING DATE December 15, 1969 COMPILED BY PP

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
589.0	Ground Level				
0.0	Silty fine sand with some clay		1	SS	4
			2	SS	4
580.5	Loose				
8.5	Organic silt, clay		3	SS	4
			4	TW	PH
	Layers of peat and sand		5	SS	5
			6	TW	PM
	Soft to firm				
564.5	Clayey silt - hard		7	SS	39
24.5	End of Borehole				

ELEV. SCALE: 580, 570, 560

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

+ 2.7

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT % 25 50 75

BULK DENSITY γ P.C.F

REMARKS

GR. SA. S. CL.

0 48 42 10

FORM 08-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 103

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 68 + 00 150' Lt. Hwy. 402 ORIGINATED BY AP
W.P. 122-65-01 BORING DATE December 12, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
588.4	Ground Level					
0.0	Organic silt, clay,		1	SS	5	
			2	SS	4	
	Layers of peat and sand		3	TW	PM	580
			4	SS	4	
			5	TW	PM	
	Soft to firm					570
			6	SS	5	
			7	TW	PM	
						560
556.9	Sand & gravel. V.dense		8	SS	61	
31.5	End of Borehole					550

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT
SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000
+ 6.0
+ 5.0
+ 5.0

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
WATER CONTENT % 25 50 75

BULK DENSITY γ P.C.F.
90
114

REMARKS
586.4 ▼

GR. SA. SI. CL.

FORM 08-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 104

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 69 + 00 150' Lt. Hwy. 402 ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 15, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE (1000 / 2000)	LIQUID LIMIT w_L — PLASTIC LIMIT w_P — WATER CONTENT w — WATER CONTENT % (25 / 50 / 75)	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
588.4	Ground Level									
0.0	Organic silt		1	SS	2					
			2	SS	2					
	Layers of silty sand		3	SS	2	580				
			4	SS	2		+s12.0			
			5	SS	2		+s6.0			
	Very soft to firm		6	TW	PH	570	+s7.5		98	
			7	TW	PH		+s12.0		97	
556.9	clayey silt hard		8	SS	31	560				
31.5	End of Borehole									
						550				

FORM 08-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 105

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 70 + 00 150' Lt. Hwy. 402 ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 15, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT
589.0	Ground Level				
0.0 / 585.0	Sandy silt with traces of clay.		1	SS	5
			2	SS	4
4.0	Organic silt, clay		3	SS	2
	Layers of sand		4	SS	2
			5	SS	2
	Soft		6	TW	PH
			7	TW	PH
560.5					
28.5 / 557.5	Sand & gravel Dense		8	SS	46
31.5	End of Borehole				

ELEV. SCALE: 580, 570, 560, 550

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

+ s3.0
+ s3.3
○ +s2.7

LIQUID LIMIT w_L
PLASTIC LIMIT w_P
WATER CONTENT w
WATER CONTENT % 25 50 75

BULK DENSITY γ P.C.F.
83.5

REMARKS
GR. SA. SI. CL.
0 22 68 10

FORM 08-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 107

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 81+00 100' Lt. Hwy. 402 ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 16, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT
588.4	Ground Level				
0.0	Clayey silt with some sand.				
583.4	Stiff		1	SS	15
5.0	Silty sand with some clay. Compact		2	SS	20
579.9					
8.5	Organic silt, clay		3	SS	2
	Layers of sand		4	SS	3
			5	SS	4
	Soft		6	TW	PH
			7	SS	3
560.4					
28.0	Clayey silt with some sand & trace of gravel				
556.9	Very stiff		8	SS	28
31.5	End of Borehole				

ELEV. SCALE: 580, 570, 560, 550

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w
w_p w w_L
WATER CONTENT % 25 50 75

BULK DENSITY γ P.C.F.

REMARKS

587.0 ▼

0 78 14 8

2 16 56 26

GR. SA. SI. CL.

FORM OB-MT [illegible] (REV 1969) OFFICE REPORT [illegible] SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 108

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 81 + 00 100' Rt. Hwy. 402 ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 16, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
588.9	**Ground Level**				
0.0	**Fine sand**				
583.9	Compact		1	SS	20
5.0	**Organic silt,**		2	SS	5
	Layers of peat and sand.		3	SS	3
			4	TW	PM
	Very soft to firm		5	SS	5
566.9			6	TW	PM
22.0	Clayey silt				
564.4	Hard		7	SS	45
24.5	End of Borehole				

ELEV. SCALE: 580, 570, 560

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED ⊕ FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

+2.3
+2.3
+ 2.3

LIQUID LIMIT w_L
PLASTIC LIMIT w_P
WATER CONTENT w
WATER CONTENT % 25 50 75

BULK DENSITY γ P.C.F.
104
98

REMARKS
GR. SA. SI. CL.
0 50 44 6

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 109

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 82 + 00 100' Lt. Hwy. 402 ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 16, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE
588.4	Ground Level					
0.0	Organic silt		1	SS	10	
	Layers of peat and sand		2	SS	2	580
	Traces of clay		3	SS	2	
	Soft to stiff		4	SS	2	
			5	SS	2	570
565.4			6	TW	PM	
23.0	Sand with layers					
561.9	of clayey silt		7	SS	20	
26.5	End of Borehole					560

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT
SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT w_L
PLASTIC LIMIT w_p
WATER CONTENT w
WATER CONTENT % 25 50 75

BULK DENSITY γ P.C.F.

REMARKS	GR.	SA.	SI.	CL.
	0	45	50	5
	0	46	44	10

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DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 110

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 82 + 00 100' Rt. Hwy. 402 ORIGINATED BY PP

W.P. 122-65-01 BORING DATE December 16, 1969 COMPILED BY PP

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
588.9	Ground Level				
0.0	Silty sand to sand		1	SS	16
			2	SS	9
			3	SS	6
	Loose to compact		4	TW	PM
			5	SS	6
565.9			6	TW	PM
23.0	Organic silt, clay, Layers of sand		7	SS	5
558.9	Firm				
557.4	Clayey silt		8	SS	26
31.5	End of Borehole				

ELEV. SCALE: 580, 570, 560, 550

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w
w_p w w_L
WATER CONTENT %
25 50 75

BULK DENSITY γ P.C.F.

REMARKS

GR. SA. SI. CL.

0 84 (16)

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 111

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 83 + 00 100' Lt. Hwy. 402 ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 16, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT
588.1	Ground Level				
0.0	Fine Sand				
583.1	Loose		1	SS	7
5.0	Organic silt, clay		2	SS	2
			3	SS	3
	Layers of peat and sand		4	SS	2
	Very soft to soft		5	SS	3
568.6					
19.5	Clayey silt with		6	TW	PM
565.1	some sand				
23.0	End of Borehole				

ELEV. SCALE: 580, 570, 560, 550

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT — 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT — w_L
PLASTIC LIMIT — w_P
WATER CONTENT — w
WATER CONTENT % 25 50 75

BULK DENSITY γ P.C.F.

REMARKS

GR. SA. ▼ SI. CL.
0 72 22 6

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DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 113

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 84 + 00 100' Rt. Hwy. 402 ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 17, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT
588.4	Ground Level				
0.0	Organic silt, clay		1	SS	4
			2	SS	4
	Layers of peat and sand		3	SS	4
			4	TW	PM
	Soft to firm		5	SS	4
			6	TW	PM
565.4					
23.0	Clayey silt				
562.2	Hard		7	SS	33
26.5	End of Borehole				

ELEV. SCALE: 580, 570, 560

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT — 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE
1000 2000

+2.0
+2.0
+2.0

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w

WATER CONTENT % — 25 50 75

BULK DENSITY γ P.C.F.

REMARKS

GR. SA. SI. CL.
10 19 53 18

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 114

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 67 + 00 160' Lt. Hwy. 402 ORIGINATED BY AP
W.P. 122-65-01 BORING DATE December 11, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

SOIL PROFILE ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT — SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE (1000 / 2000)	LIQUID LIMIT w_L — PLASTIC LIMIT w_P — WATER CONTENT w (w_o, w_s, w_1) WATER CONTENT % (25 / 50 / 75)	BULK DENSITY γ P.C.F	REMARKS GR. SA. SI. CL.
588.4	Ground Level									
0.0	Organic silt, clay		1	TW	PM		+ 4.7		99	584.4 ▼
			2	SS	8		+ 4.0			
	Layers of peat and sand.		3	TW	PM	580	+ 6.0		122	
			4	SS	4					0 23 67 10
			5	TW	PM		+ 2.8		118	
			6	SS	2	570				
			7	TW	PM		+ 5.0		99	
			8	SS	9		+ 2.3			
560.4	Very soft to stiff		9	TW	PM	560			132	0 60 29 11
28.0	End of Borehole					550				

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 115

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 79 + 00 ℄ Hwy. 402 ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 17, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cone Test Only CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT (20 40 60 80 100) / SHEAR STRENGTH P.S.F. (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	LIQUID LIMIT w_L / PLASTIC LIMIT w_p / WATER CONTENT w — WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
588.4	Ground Level									
0.0										
579.6						580				
8.8	End of Cone Test					570				

FORM 08-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 116

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 77 + 00 ℄ Hwy. 402 ORIGINATED BY PP

W.P. 122-65-01 BORING DATE December 17, 1969 COMPILED BY PP

DATUM Geodetic BOREHOLE TYPE Cone Test Only CHECKED BY

SOIL PROFILE			SAMPLES				DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB. VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w w_P w w_L WATER CONTENT %	BULK DENSITY γ P.C.F	REMARKS GR.SA.SI.CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE				
588.4	Ground Level									
0.0										
500.2						580				
8.2	End of Cone Test									

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DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 200

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 416 + 60 125' Lt. Modeland Rd. ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 17, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT
588.5	Ground Level				
0.0	Organic material, Layers of sand		1	SS	2
580.5	Very soft		2	SS	2
8.0	Clayey silt with some sand & traces of gravel.		3	TW	PM
			4	TW	PM
572.0	Stiff to hard		5	SS	72
16.5	End of Borehole				

ELEV SCALE: 580, 570

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w
w_p w w_L
WATER CONTENT %
25 50 75

BULK DENSITY γ P.C.F.
96

REMARKS
GR. SA. SI. CL.

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 201

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 418 + 55 125' Lt. Modeland Rd. ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 17, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
588.5	Ground Level				
0.0	Organic clay, silt,				
			1	SS	3
	Layers of peat, sand,		2	SS	5
	silt with some gravel		3	SS	4
			4	TW	PM
			5	SS	4
	Soft to firm				
569.5					
19.0					
567.0	Sand & gravel		6	SS	40
21.5	End of Borehole				

ELEV. SCALE: 580, 570, 560

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

+2.8
+2.3

LIQUID LIMIT w_L
PLASTIC LIMIT w_P
WATER CONTENT w
WATER CONTENT %
25 50 75

BULK DENSITY γ P.C.F.
163.2

REMARKS
GR. SA. SI. CL.

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 202

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 59 + 00 200' Lt. Hwy. 402 ORIGINATED BY PP
W.P. 122-65-01 BORING DATE Dec. 18, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

SOIL PROFILE ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
588.5	Ground Level				
0.0	Layers of organic material and sand		1	SS	7
583.5					
5.0	Clayey silt with some sand & traces of gravel		2	SS	29
			3	TW	PH
			4	SS	16
572.0	Stiff to very stiff		5	SS	18
16.5	End of Borehole				

ELEV. SCALE: 580, 570

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT: 20, 40, 60, 80, 100

SHEAR STRENGTH PSF
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE
1000 2000

LIQUID LIMIT w_L
PLASTIC LIMIT w_P
WATER CONTENT w
WATER CONTENT % 25 50 75

BULK DENSITY γ P.C.F.: 129

REMARKS

GR. SA. SI. CL.

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DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 203

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 418 + 55 310' Lt. Modeland Rd. ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 18, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT
588.5	Ground Level				
0.0 / 584.5	Layers of organics & sand				
			1	SS	9
4.0	Clayey silt with some sand & traces of gravel.		2	SS	30
578.0	Hard		3	SS	31
10.5	End of Borehole				

ELEV. SCALE: 580, 570

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT — 20 40 60 80 100
SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT — w_L
PLASTIC LIMIT — w_p
WATER CONTENT — w
WATER CONTENT % — 25 50 75

BULK DENSITY γ P.C.F.

REMARKS
GR. SA. SI. CL.

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 204

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 57 + 00 200' Lt. Hwy. 402 ORIGINATED BY PP

W.P. 122-65-01 BORING DATE December 18, 1969 COMPILED BY PP

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE
588.5	Ground Level					
0.0	Probably organics					
584.5						
4.0	Probably clayey silt					
579.0			1	SS	35	580
9.5	End of Borehole					570

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w
w_p w w_L
WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS
GR. SA. SI. CL.

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 205

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 418 + 55 520' Lt. Modeland Rd. ORIGINATED BY PP

W.P. 122-65-01 BORING DATE December 18, 1969 COMPILED BY PP

DATUM Geodetic BOREHOLE TYPE Cone Test Only CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE
588.5	Ground Level					
0.0	Probably organic material and clayey silt					
578.5						580
10.0	End of Cone Test					570

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS
GR. SA. SI. CL.

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 206

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 423 + 00 115' Lt. Modeland Rd. ORIGINATED BY PP

W.P. 122-65-01 BORING DATE December 18, 1969 COMPILED BY PP

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT
588.5	Ground Level				
0.0	Layers of organics and sand		1	SS	22
4.0	Clayey silt.				
581.0	Hard		2	SS	41
7.5	End of Borehole				

ELEV. SCALE: 580, 570

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT %
25 50 75

BULK DENSITY γ P.C.F.

REMARKS
GR. SA. SI. CL.
10 27 47 16

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

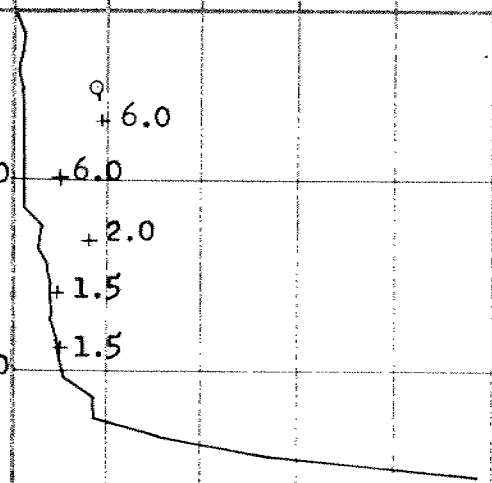
RECORD OF BOREHOLE No. 207

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 425 + 80 75' Lt. Modeland Rd. ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 18, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE
588.5	Ground Level					
0.0	Organic clay, silt, Layers of peat and sand		1	TW	PM	
			2	SS	2	
			3	TW	PM	
			4	TW	PM	
			5	SS	2	
	Very soft to firm					
567.5			6	SS	24	
21.0	Clayey silt with some sand and traces of gravel					
562.0			7	SS	39	
26.5	End of Borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — 20 40 60 80 100
SHEAR STRENGTH P.S.F. — ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE — 1000 2000



LIQUID LIMIT — w_L
PLASTIC LIMIT — w_P
WATER CONTENT — w
WATER CONTENT % — 25 50 75

BULK DENSITY γ P.C.F.

BULK DENSITY	REMARKS
108	GR. SA. SI. CL.

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 208

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 427 + 80 75' Lt. Modeland Rd. ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 13, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE
588.5	Ground Level					
0.0	Sandy silt traces of clay		1	SS	4	
582.0	Very loose		2	SS	30	
6.5	Clayey silt with some sand and traces of gravel		3	SS	28	580
575.0			4	SS	49	
13.5	End of Borehole					570

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w

WATER CONTENT %
25 50 75

BULK DENSITY γ P.C.F.

REMARKS

GR. SA. SI. CL.
2 26 47 25

FORM 08-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 209

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 425 + 80 175' Lt. Modeland Rd. ORIGINATED BY PP

W.P. 122-65-01 BORING DATE December 18, 1969 COMPILED BY PP

DATUM Geodetic BOREHOLE TYPE Cone Test Only CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w / WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
588.5	Ground Level									
0.0	Probably organic material and layers of silt & silty clay					580				
						570				
560.8										
27.7	End of Cone Test					560				

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 210

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 427 + 80 175' Lt. Modeland Rd. ORIGINATED BY PP
W.P. 122-65-01 BORING DATE December 19, 1969 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cone Test only CHECKED BY

SOIL PROFILE ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE
588.5	Ground Level					
0.0	Probably organic material					
	layers of sand and clayey silt					580
576.5						
12.0	End of Cone Test					570

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100
SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w
w_p w w_L
WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS
GR. SA. SI. CL.

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 211

FOUNDATION SECTION

JOB 69-F-119 LOCATION Sta. 423 + 00 175' Lt. Modeland Rd. ORIGINATED BY PP

W.P. 122-65-01 BORING DATE December 19, 1969 COMPILED BY PP

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE
588.5	**Ground Level**					
0.0	**Clayey silt with organics and sand.**		1	SS	5	
	Firm to stiff		2	SS	10	580
576.5						
12.0	**Clayey silt with some sand & traces of grav.**		3	SS	33	
572.0						
16.5	**End of Borehole**					570

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100

SHEAR STRENGTH P.S.F
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w

w_P w w_L

WATER CONTENT %
25 50 75

BULK DENSITY γ P.C.F.

REMARKS

GR. SA. SI. CL.

580.7 ▼

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 40J16-40

DIST. 1 REGION

W.P. No. 122-65-03/04

CONT. No. 75-027

W. O. No.

STR. SITE No. 14-338

HWY. No. 402

LOCATION Modeland Rd.
Overpass

No. of Pages -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 70-11046
W.P. 122-65-03+04
DATUM Geodetic

LOCATION STA. 62 + 88, 33 Ft. Lt. of ℄
BORING DATE June 17-18, 1970
BOREHOLE TYPE Auger

ORIGINATED BY A.K.B.
COMPILED BY A.K.B.
CHECKED BY AK

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE
591.3	Ground Level					
0.0	Black peat, seams of organic sand, silt and clay, firm.		1	SS	5	590
585.8			2	TW	PM	
5.5			3	SS	21	
			4	SS	19	
	Clayey silt,		5	SS	24	580
	Traces of sand & gravel		6	SS	10	
	stiff to hard		7	TW	PM	570
	grey					
			8	SS	46	560
			9	SS	22	550
546.3						
45.0			10	SS	15	540
	Silty clay, traces of sand and gravel					
	stiff to hard		11	TW	PM	530
	grey					
			12	SS	36	520
						510
			13	SS	25	
						490
484.2	Probable bedrock					
107.1	End of borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

+ > 2000

+ >2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT %
10 20 30

BULK DENSITY γ P.C.F.

133

128

REMARKS GR. SA. SI. CL.

20
15 ⊹ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2 (69-F-104) FOUNDATION SECTION

JOB 70-11046 LOCATION STA 62+ 94 105' Lt ORIGINATED BY A.P.
W.P. 122-65-03~~04~~ BORING DATE Nov. 18-20, 1969 COMPILED BY A.K.B.
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	REMARKS
590.3	Ground Level				590	
	Clayey silt					
	Traces of organics	1	TW	PH		
585.3 / 5.0		2	SS	13		
		3	SS	32	580	2-20-47-31
		4	TW	PH		
		5	SS	14		
	Clayey silt					
	with some sand	6	TW	PH	570	2-16-48-34
	&					
	traces of gravel	7	TW	PH		
		8	TW	PH	560	
	firm to very stiff	9	TW	PH		
		10	TW	PH	550	1-16-47-36
		11	TW	PH	540	
		12	SS	20	530	
515.3 / 75.0	Silty clay with some sand traces of gravel very stiff				520	
		13	TW	PH	510	1-9-50-40
		14	SS	30	490	
484.3	Prob. Bedrock					
106.0	End of borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT
SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT w_L
PLASTIC LIMIT w_P
WATER CONTENT w
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.
129
134
127

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 70-11046 LOCATION STA 62 + 46, 33Ft. Lt of ℄ ORIGINATED BY A.K.B.
W.P. 122-65-03&04 BORING DATE June 19, 1970 COMPILED BY A.K.B.
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE
592.5	Ground Level					
0.0	Gravelly sand (Road Base)		1	SS	6	590
586.5			2	SS	32	
6.0	Clayey silt with traces of sand & gravel Hard to stiff		3	SS	39	580
			4	SS	28	
570.0			5	SS	13	570
22.5	End of borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL x LAB. VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.

REMARKS GR.SA.SI.CL.

20
15 ⊕ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 70-11046 LOCATION Sta. 61 + 11 34 FT. Lt. of ℄ ORIGINATED BY A.K.B.
W.P. 122-65-03504 BORING DATE June 4-8, 1970 COMPILED BY A.K.B.
DATUM Geodetic BOREHOLE TYPE C.M.E. Auger CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
588.6	Ground Level					
0.0	Seams of black peat, organic sand silt and clay. numerous shells very soft		1	SS	1	
			2	TW	Pm	
			3	SS	1	580
573.6			4	TW	PH	
15.0	Clayey silt, traces of sand & gravel, stiff to very stiff Brown and Grey		5	SS	11	
			6	TW	PH	570
			7	SS	11	
			8A	TW	PH	560
			8	SS	28	
			9	TW	PH	550
543.6						
45.0	Silty clay, traces of sand and gravel stiff, grey		10	SS	5	540
			11	TW	PH	530
527.6						
61.0	End of borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.

REMARKS GR.SA.SI.CL.

0-90-(10)

W 95 Wp 35 Wl 77
W 172

BULK DENSITY P.C.F.
118
73
77
132
133
133
127
128

● 0.3040

20
15 ⊹ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 70-11046 LOCATION STA 61 + 87 100 Ft. Lt of ℄ ORIGINATED BY T.P.
W.P. 122-65-03-04 BORING DATE June 9-10, 1970 COMPILED BY A.K.B.
DATUM Geodetic BOREHOLE TYPE C.M.E. Auger CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
587.4	Ground Level					
0.0	Organic Clay, Pockets of black Peat seams of sand		1	TW	PM	
579.9	V. Soft		2	TW	PM	580
7.5	Clayey silt with traces of sand & Gravel--hard to firm Brown and Grey		3	SS	13	
			4	TW	PH	
			5	SS	28	570
			6	TW	PH	
			7	SS	14	
			8	TW	PH	560
			9	TW	PH	
			10	TW	PH	550
			11	SS	8	
542.4						
45.0			12	TW	PH	540
	Silty clay with traces of sand & gravel very stiff grey		13	SS	24	530
						520
						510
			14	TW	PH	
						490
482.9	Probably bedrock					
104.5	End of borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

5375

+ > 2000

LIQUID LIMIT w_L
PLASTIC LIMIT w_P
WATER CONTENT w
WATER CONTENT % 10 20 30

W 85
W 140 W_L 22082
W_P 99

BULK DENSITY γ P.C.F.

133
130
131
127
129
128

REMARKS

7-85-(8)

4-18-35-1

20
15 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 70-11046-
W.P. 122-65-03&04
DATUM Geodetic

LOCATION STA 60 + 80, 34 Ft. Lt. of ℄
BORING DATE June 8-9, 1970
BOREHOLE TYPE C.M.E. Auger

ORIGINATED BY T.P.
COMPILED BY A.K.B.
CHECKED BY AK

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE
588.8	Ground Level					
0.0	Organic Silt & Clay with pockets of black peat & sand numerous shells very soft to stiff		1	SS		
			2	SS	5	
			3	SS	3	
			4	TW	PH	580
572.8			5	SS	11	
16.0	Clayey silt with traces of sand & gravel stiff to very stiff brown & grey		6	SS	17	
			7	SS	16	570
			8	TW	PH	
			9	SS	17	560
			10	TW	PH	
			11	SS	29	550
543.8						
45.0	Silty clay with traces of sand & gravel. Firm to very stiff grey		12	TW	PM	540
529.3			13	SS	28	530
59.5	End of borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
WATER CONTENT % 10 20 30

W 83 139 W_P 110 W_L 170

BULK DENSITY γ P.C.F.: 91, 72, 132, 140, 141, 116, 115

REMARKS GR. SA. SI. CL.: 0-89-(11), 38-53-(9)

+ >2000

20
15 ⊹ 5 % STRAIN AT FAILURE
10

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 70-11046 LOCATION STA 60 + 83, 100 FT Lt. of ℄ ORIGINATED BY A.K.B.
W.P. 122-65-03℄04 BORING DATE June 4-5, 1970 COMPILED BY A.K.B.
DATUM Geodetic BOREHOLE TYPE Pendrill & Washboring BX casing CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
588.6	Ground level				
	Organic silt & clay numerous shells pockets of black peat and sand V. Soft to firm		1	SS	2
			2	SS	6
			3	SS	2
			4	SS	1
572.6			5	SS	3
16.0	Clayey silt with traces of sand & gravel Stiff to very stiff Brown and Grey		6	TW	PH
			7	SS	14
			8	SS	14
			9	TW	PM
542.6			10	TW	PM
46.0	Silty clay with traces of sand and gravel stiff to very stiff grey		11	SS	25
			12	TW	PM
			13	SS	17
			14	TW	PM
			15	SS	26
482.3					
106.3	Shale Bedrock		16	RC	Rec. 92%
477.3					
111.3	End of borehole				

ELEV. SCALE: 580, 570, 560, 550, 540, 530, 520, 510, 490, 480

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT: 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w
WATER CONTENT % 10 20 30

W 94 W_p 210
W_L 320
W 198 W_p 106
W_1 109

BULK DENSITY γ P.C.F.: 130, 129, 126, 125, 125

REMARKS: 0-95-(5)

GR. SA. SI. CL.

20
15 ✦ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 70-11046 LOCATION STA. 62 & 85, 34Ft. RT. of ℄ ORIGINATED BY A.K.B.
W.P. 122-65-03+04 BORING DATE June 19, 1970 COMPILED BY A.K.B.
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY AK

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE
590.8	Ground Level					
0.0 / 586.8	Sand with some black peat		1	SS	15	590
4.0	Clayey silt with Traces of sand & Gravel. Hard to stiff Brown & Grey		2	SS	34	
			3	SS	39	580
			4	SS	12	
567.8			5	SS	13	570
23.0	End of borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.

REMARKS GR.SA.SI.CL.

20
15 ⊹ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 9

FOUNDATION SECTION

JOB 70-11046 LOCATION STA 62 + 82, 101 Ft. Rt of ℄ ORIGINATED BY A.K.B.
W.P. 122-65-03&04 BORING DATE June 10-11, 1970 COMPILED BY A.K.B.
DATUM Geodetic BOREHOLE TYPE Washboring, BX and AX casings CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV SCALE
590.8	Ground Level					590
0.0	Oxidized clayey silt with traces of sand & gravel very stiff to firm brown and grey		1	SS	15	
			2	SS	27	
			3	SS	23	580
			4	SS	10	
			5	TW	Pm	570
			6	SS	7	
			7	SS	29	560
			8	TW	PM	550
545.8						
45.0	Silty clay with traces of sand & gravel firm to very stiff grey		9	SS	6	540
			10	TW	PM	530
			11	SS	20	520
			12	TW	PM	510
			13	SS	21	490
485.1						
105.7	Shale bedrock		14	RC	REC. 95%	
481.1						
109.7	End of borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT
SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
WATER CONTENT %
10 20 30

BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
129	
128	
136	
128	

20
5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 10

FOUNDATION SECTION

JOB 70-11046 LOCATION STA 62 +45 117 Ft. Rt of ℄ ORIGINATED BY T.P.

W.P. 122-65-13 & 04 BORING DATE June 19, 1970 COMPILED BY

DATUM Geodetic BOREHOLE TYPE C.M.E. Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT; SHEAR STRENGTH P.S.F. (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB. VANE) 1000 2000	LIQUID LIMIT w_L, PLASTIC LIMIT w_P, WATER CONTENT w; WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
592.1	Ground level									
0.0	Black Peat & Organic silt--stiff					590				
587.1			1	SS	13				○	
5.0	clayey silt with trace of sand & gravel		2	SS	22			○		
			3	SS	26			○		
	V. Stiff to firm		3A	SS	13	580		○		
			4	TW	PH		○ +	○	130	
			5	SS	11		+	○		
567.6			6	TW	PH	570	+ ○	○	130	
24.5	End of borehole									

20
15 ⊕ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 11

FOUNDATION SECTION

JOB 70-11046 LOCATION STA 61 + 81, 34 Ft. Rt of ℄ ORIGINATED BY T.P.
W.P. 122-65-03+04 BORING DATE June 16-17, 1970 COMPILED BY A.K.B.
DATUM Geodetic BOREHOLE TYPE C.M.E. Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
587.2 / 0.0	Ground Level				
583.2 / 4.0	Black peat & Org. silt		1	SS	13
			2	TW	PH
			3	SS	19
	Clayey silt		4	TW	PH
	with traces of sand		5	SS	12
	& gravel		6	TW	PH
	very stiff to		7	SS	10
	firm		8	TW	PH
	brown & grey		9	SS	31
			10	TW	PH
540.2 / 47.0			11	SS	6
	Silty clay with traces of sand & gravel: firm to very stiff, grey		12	TW	PH
			13	TW	PH
481.7	Probable bedrock				
105.5	End of borehole				

ELEV SCALE: 580, 570, 560, 550, 540, 530, 520, 510, 490

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT — w_L
PLASTIC LIMIT — w_p
WATER CONTENT — w
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
136	
131	
131	
138	
140	
131	
130	
130	

+ >2000

20
15 ⊹ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 12

FOUNDATION SECTION

JOB 70-11046 LOCATION STA 61 + 05 100 Ft., RT. of ℄ ORIGINATED BY T.P.
W.P. 122-65-03-04 BORING DATE June 18, 1970 COMPILED BY
DATUM Geodetic BOREHOLE TYPE C.M.E. Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
588.9	Ground Level					
0.0	Black peat with seams of organic clay, silt & sand very soft to firm		1	SS	3	
			2	SS	5	
			3	SS	3	580
575.9			4	TW	PM	
13.0			5	TW	PM	
	Clayey silt with traces of sand & gravel V. stiff to stiff Brown and grey		6	SS	16	570
			7	TW	PM	
			8	SS	20	560
			9	TW	PH	
549.4			10	SS	20	550
39.5	End of borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
WATER CONTENT % 10 20 30

67%
2200

BULK DENSITY γ P.C.F.: 131, 132, 136

REMARKS: 0-93-(7)

GR. SA. SI. CL.

20
15 ⊹ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 13

FOUNDATION SECTION

JOB 70-11046 LOCATION STA 60 + 76, 34 Ft. Rt of ℄ ORIGINATED BY T.P.
W.P. 122-65-03&04 BORING DATE June 18, 1970 COMPILED BY
DATUM Geodetic BOREHOLE TYPE C. M.E. Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT; SHEAR STRENGTH P.S.F. (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB. VANE)	LIQUID LIMIT w_L, PLASTIC LIMIT w_P, WATER CONTENT w; WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
588.7	Ground Level									
0.0	Black peat with seams of organic silt clay and sand very soft to soft		1	SS	3					0-91-6-3
			2	SS	2	580				
			3	SS	4			○ 100		
			4n	SS	5			○ 242		
512.2			5	SS	1					
16.5	Clayey silt with traces of sand & gravel Hard to stiff		6	TW	PM	570	○ .3620		134	
			7	TW	PM					
			8	SS	27	560				
554.2			9	TW	PH		○		139	
34.5	End of borehole									

1000 2000 (shear strength scale) 10 20 30 (water content %)

20
15 ⊹ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 14

FOUNDATION SECTION

JOB 70-11046 LOCATION STA 60 + 73, 100 Ft. Rt of ℄ ORIGINATED BY T.P.
W.P. 122-65-03-04 BORING DATE June 12-15 1970 COMPILED BY
DATUM Geodetic BOREHOLE TYPE C.M.E. Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
589.0	Ground Level					
0.0	Seams of black peat organic silt clay & sand very soft to firm		1	TW	PM	
			2	SS	6	
			3	SS	3	580
574.0			4	TW	PM	
			5	TW	PH	
15.0	Clayey silt with traces of sand and gravel very stiff		6	SS	13	570
			7	TW	PH	
			8	SS	10	
			9	TW	PH	560
			10	SS	17	550
542.0						
47.0	Silty clay with traces of sand and gravel very soft to stiff Grey		11	TW	PM	540
			12	SS	11	530
						520
			13	TW	PH	510
						490
482.5						
1065	End of borehole probably bedrock					

DYNAMIC PENETRATION RESISTANCE
BLOWS/FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.

REMARKS GR.SA.SI.CL.

+ > 2000
+ > 2000

○ 94 (6)
129
131
136

20
15 ⟡ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 15

FOUNDATION SECTION

JOB 70-11046. LOCATION STA 64 + 40 ℄ ORIGINATED BY A.K.B.
W.P. 122-65-03&04 BORING DATE June 18, 1970 COMPILED BY A.K.B.
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT; SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE 1000 2000	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
589.8	Ground Level									
588.3	Black Organics									
1.5	Clayey silt with traces of sand & gravel Hard to stiff Brown to grey		1	SS	46					
			2	SS	27					
			3	SS	32	580				
			4	SS	13					
567.3			5	SS	11	570				
22.5	End of borehole									

20
15 ✛ 5 % STRAIN AT FAILURE
10

FORM CB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

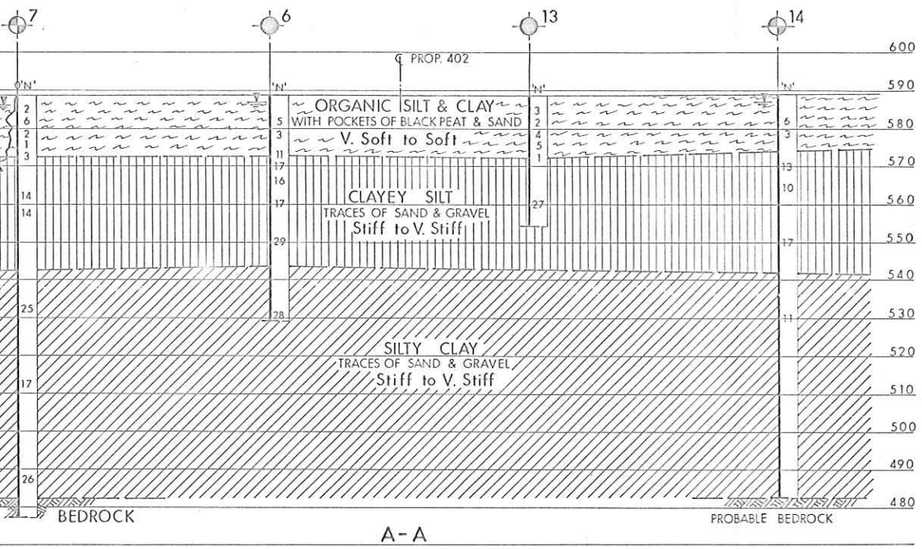
RECORD OF BOREHOLE No. 16

FOUNDATION SECTION

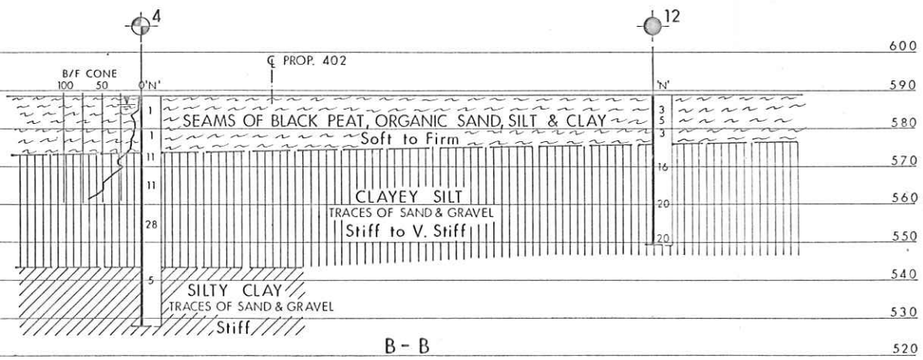
JOB 70-11046 LOCATION STA 60 + 00 ℄ ORIGINATED BY T.P.
W.P. 122-65-03-04 BORING DATE June-19,-1970 COMPILED BY A.E.
DATUM Geodetic BOREHOLE TYPE C.M.E. Auger CHECKED BY A.C.

ELEV. / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT / SHEAR STRENGTH P.S.F. (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE) 1000 2000	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w — WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
589.5	Ground Level									
0.0 / 585.5	black peat & organic clay, soft		1	SS	4					
4.0	Clayey silt with traces of sand & gravel		2	SS	15		+> 2000			
			3	TW	PH	580				
			4	TW	PH				131	
			5	SS	11					
	Stiff		6	SS	7	570				
563.5			7	TW	PH				131 133	
26.0	End of borehole									

20
15 5 % STRAIN AT FAILURE
10



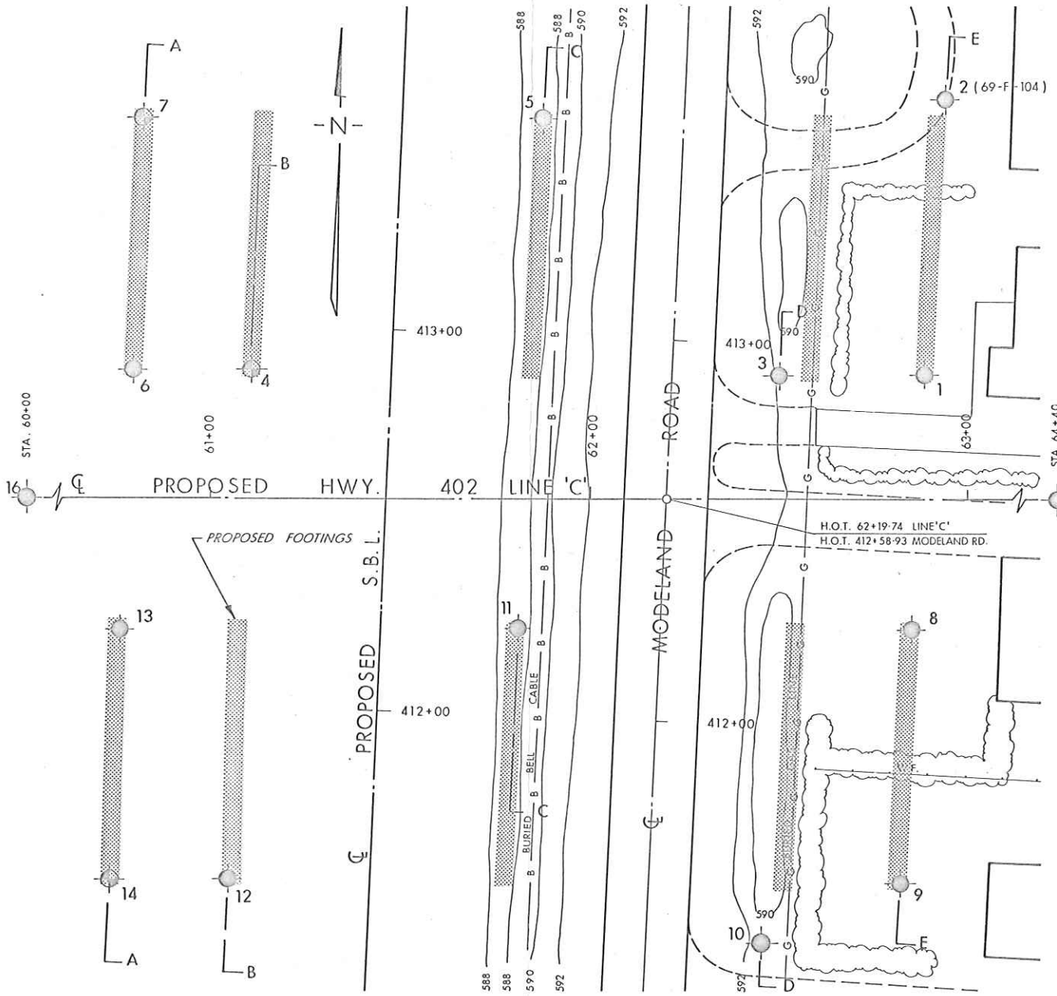
A-A



B - B

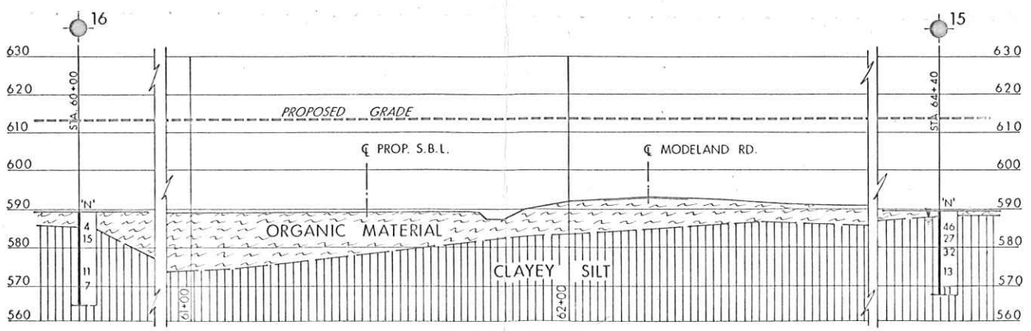
SECTIONS

SCALE 20 10 0 20 40 FT.



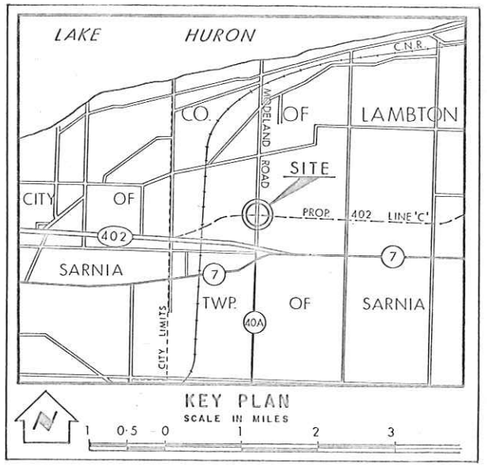
PLAN

SCALE 20 10 0 20 40 FT.



℄ PROFILE

SCALE 20 10 0 20 40 FT.



LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation. JUNE 1970

NOTE - Water Levels in Bore Holes 2, 8, 10, 11, 12, 13 & 16 not established at time of field investigation.

NO.	ELEVATION	STATION	OFFSET
1	591·3	62+88	33' LT.
2	590·3	62+94	105' LT.
3	592·5	62+46	33' LT.
4	588·6	61+11	34' LT.
5	587·4	61+87	100' LT.
6	588·8	60+80	34' LT.
7	588·6	60+83	100' LT.
8	590·8	62+85	34' RT.
9	590·8	62+82	101' RT.
10	592·1	62+45	117' RT.
11	587·2	61+81	34' RT.
12	588·9	61+05	100' RT.
13	588·7	60+76	34' RT.
14	589·0	60+73	100' RT.
15	589·8	64+40	℄
16	589·5	60+00	℄

- NOTE -

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

REVISIONS			
	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE - FOUNDATION SECTION

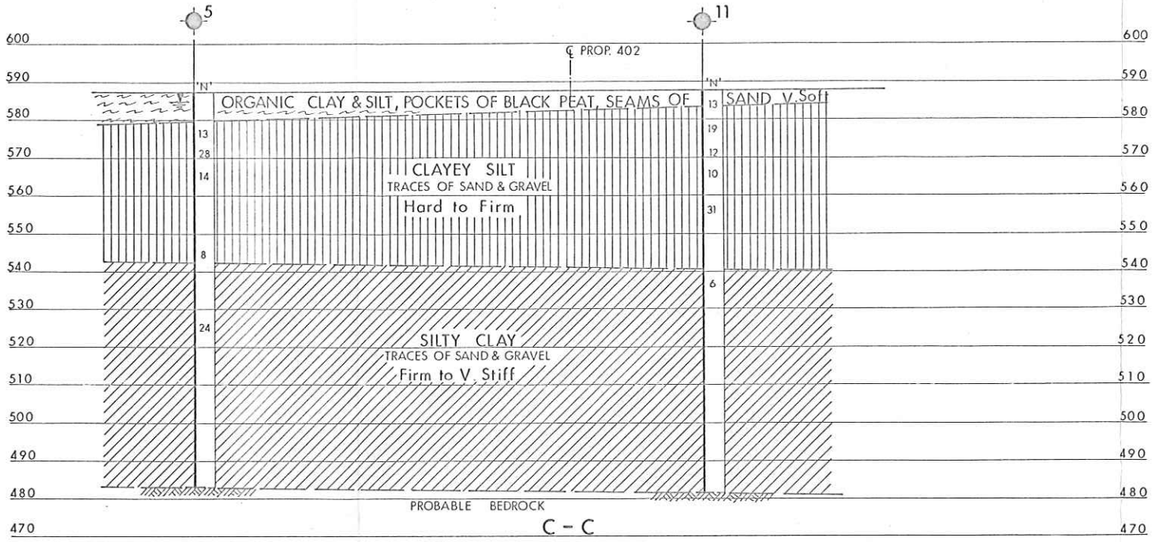
MODELAND ROAD

KING'S HIGHWAY NO. 402 LINE 'C' DIST. NO. 1
CO. LAMBTON
TWP. SARNIA LOT 15 & 16 CON. 7

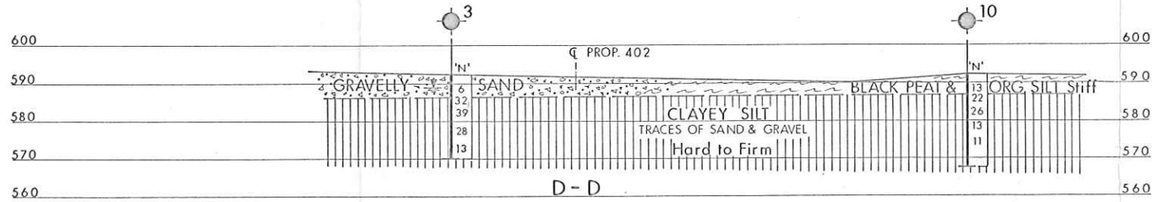
BORE HOLE LOCATIONS & SOIL STRATA

SUBM'D A.B.	CHECKED	W.P. NO. 122-65-03&04	M.B.T. DRAWING NO. 70-11046A
DRAWN S.O.	CHECKED	JOB NO. 70-11046	
DATE 7 JULY 1970		SITE NO.	BRIDGE DRAWING NO.
APPROVED A. Ostromecki PRINCIPAL FOUNDATION ENGINEER		CONT. NO.	

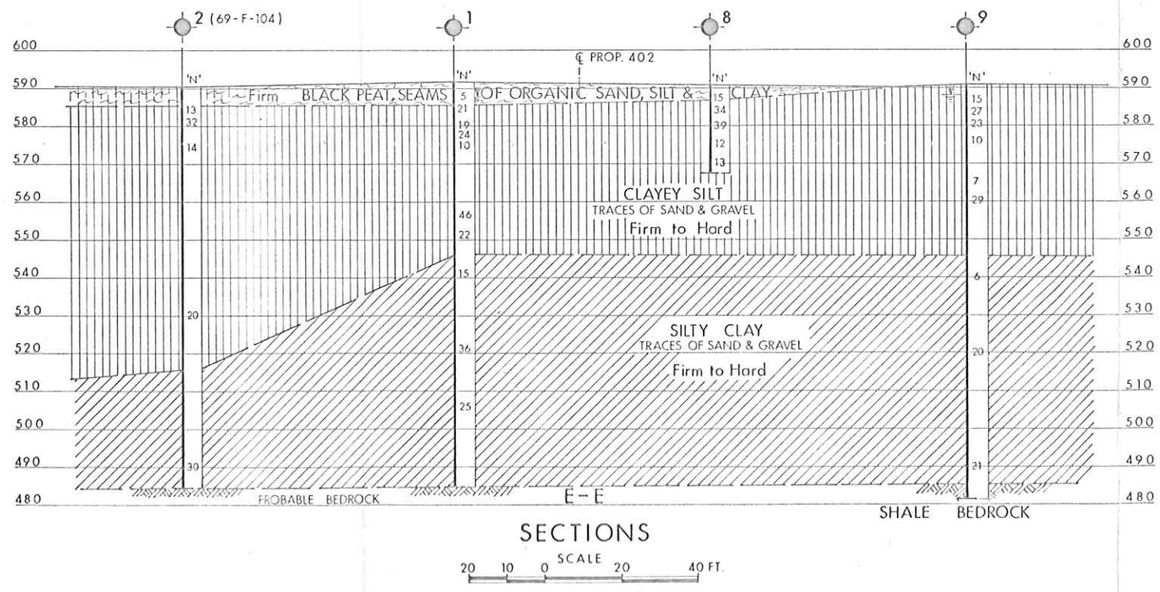
REF. NO. E-4856-1



C - C



D - D



E - E

SECTIONS

SCALE

20 10 0 20 40 FT.

SEE DRAWING Nº 70-11046A

KEY PLAN
SCALE IN MILES

LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation.

NO.	ELEVATION	STATION	OFFSET

- NOTE -

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

REVISIONS			
	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE - FOUNDATION SECTION

MODELAND ROAD

KING'S HIGHWAY NO. 402 LINE 'C' DIST. NO. 1
CO. LAMBTON
TWP. SARNIA LOT CON.

SECTIONS C-C, D-D, E-E & SOIL STRATA

SUBM'D S.B.	CHECKED	W.P. NO. 122-65-03&04	M.B.T. DRAWING NO. 70-11046B
DRAWN S.O.	CHECKED	JOB NO. 70-11046	
DATE 7 JULY 1970		SITE NO	BRIDGE DRAWING NO.
APPROVED A.G. Thomas PRINCIPAL FOUNDATION ENGINEER		CONT. NO.	

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 40J16-041

DIST. 1 REGION SOUTHWESTERN

W.P. No. 122-65-07 & 08

CONT. No. 75-027

W.O. No.

STR. SITE No. 14-341

HWY. No. 402

LOCATION WAWANOSH DRAIN

(E. OF MODECAND RD.) BRIDGE

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 1

REMARKS: ② documents to be unfolded before microfilming

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 70-11047 LOCATION Sta. 86 + 41 o/s 40' Lt. ORIGINATED BY GA
W.P. 122-65-07 & 08 BORING DATE November 26, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Dynamic ConeTest CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (20 40 60 80 100); SHEAR STRENGTH P.S.F. (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE)	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w (w_P w w_L) WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
597.6	Top of Fill									
0.0						590				
580.0						580				
17.6'	End of Cone Test									

20
15 ◇ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 70-11047 LOCATION Sta. 86 + 13 ℄ ORIGINATED BY GA
W.P. 122-65-07 & 08 BORING DATE Nov. 26, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Cont.Flight Auger, Washboring, BXL Core CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
598.3	Top of Fill				
0.0	Fill Clayey silt with some sand & traces Gravel Very Stiff		1	SS	24
588.0	O.G.		2	SS	22
10.3			3	SS	53
	Clayey silt with some sand & traces gravel		4	SS	35
			5	TW	PH
	Stiff to Hard		6	SS	20
			7	TW	PH
			8	TW	PH
			9	SS	12
			10	TW	PM
			11	TW	PH
540.0			12	TW	PH
58.3	Silty clay with traces of sand and gravel				
	Firm to Hard		13	TW	PH
479.3					
119.0	Shale Bedrock		14	RC	100%
474.3					
124.0	End of Borehole				

ELEV. SCALE: 590, 580, 570, 560, 550, 540, 530, 520, 510, 480

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT: 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

End of cone
+ s1.8
+s2.8
+s2.8
+s3.0
+> 2000
+> 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
133.5	
130.0	
129.0	
	2 15 45 38
137.5	
	1 11 43 45

15 20 5 10 % STRAIN AT FAILURE

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 70-11047 LOCATION Sta. 87 + 61 o/s 35' Lt. ORIGINATED BY GA
W.P. 122-65-07 & 08 BORING DATE November 26, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Test CHECKED BY

SOIL PROFILE ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE
597.2	Top of Fill					590
581.2						
16.0	End of Cone Test					580

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w

w_P w w_L
WATER CONTENT %

BULK DENSITY γ P.C.F.

REMARKS GR.SA.SI.CL.

20
15 ⊹ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 70-11047 LOCATION Sta. 87 + 36 o/s 6' Rt. ORIGINATED BY GA
W.P. 122-65-07 & 08 BORING DATE Nov. 27 & 28, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE
597.5	Top of Fill					
0.0	Fill Clayey silt with some sand & traces gravel Very Stiff		1	SS	20	590
588.0						
9.5			2	SS	15	
			3	SS	40	
			4	SS	27	580
			5	SS	24	
	Clayey silt with some		6	SS	17	
	sand & traces gravel		7	TW	PH	570
	Hard to Firm		8	SS	11	
			9	TW	PH	560
			10	SS	25	
			11	TW	PH	550
			12	SS	12	
			13	TW	PH	
540.0						540
57.5	Silty clay with traces of sand and gravel Firm to Hard					500
						490
480.0	Auger grinding					480
117.5	Probably Bedrock End of Borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — 20 40 60 80 100
SHEAR STRENGTH P.S.F. — ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE — 1000 2000
End of cone
+ s1.7
+ s2.0
+ s2.3
+ s2.3
+ > 2000
+ s = 2.5
+ s2.3
+ s2.4

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
WATER CONTENT % — 10 20 30

BULK DENSITY γ P.C.F.: 129, 138, 136

REMARKS: GR. SA. SI. CL.: 1 17 49 33

20
12 ⊹ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 70-11047 LOCATION Sta. 86 + 75 o/s 100' Lt. ORIGINATED BY GA
W.P. 122-65-07 & 08 BORING DATE Nov. 25 & 26, 1969 COMPILED BY GA
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
597.9	Top of Fill				
0.0	Fill Clayey silt with some sand & traces gravel Stiff		1	SS	12
588.0	O.G.				
9.9			2	SS	12
			3	SS	45
			4	SS	24
	Clayey silt with some		5	SS	32
	sand & traces gravel		6	TW	PH
	Hard to Firm		7	SS	27
			8	TW	PH
			9	TW	PH
			10	TW	PH
			11	SS	17
540.0					
57.9			12	TW	PH
	Silty clay with traces of sand and gravel Firm to Hard		13	TW	PH
			14	TW	PH
485.4	Auger Grinding				
112.5	End of Borehole Probably bedrock				

ELEV. SCALE: 590, 580, 570, 560, 550, 540, 530, 520, 500, 490

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT — 20 40 60 80 100

SHEAR STRENGTH P.S.F.
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

End of cone
+s1.4
+s1.5
+s1.9
+>2000
+s2.4
+s2.0

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w

WATER CONTENT % — 10 20 30

BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
130	
129	
134	
122	0 1 61 38
123	

20
15 ⊹ 5 % STRAIN AT FAILURE
10

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

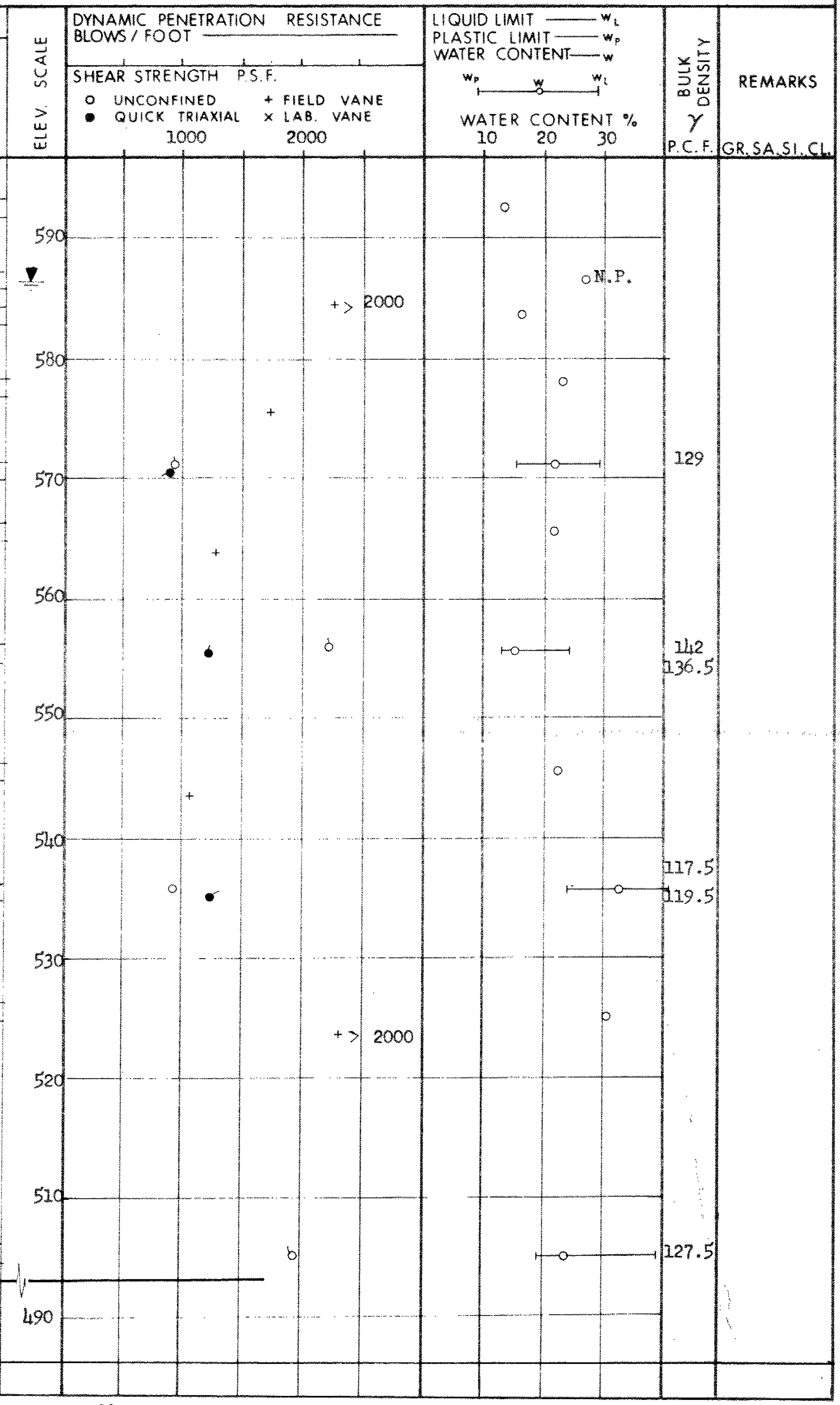
JOB 70-11047	LOCATION Sta. 87 + 86 o/s 86' Lt.	ORIGINATED BY AKB
W.P. 122-65-07 & 08	BORING DATE June 24 - 25, 1970	COMPILED BY AKB
DATUM Geodetic	BOREHOLE TYPE Auger	CHECKED BY [signature]

SOIL PROFILE

ELEV. DEPTH	DESCRIPTION
596.3	Ground Level
0.0	Clayey silt Fill. Brown Very Stiff
589.3 / 7.0	Organic silt & sand. Stiff
585.3 / 11.0	Clayey silt with traces of sand and gravel. Hard to Firm. Grey
541.3 / 55.0	Silty clay with traces of sand and gravel. Stiff to Very Stiff. Grey
486.3	Probable Bedrock
110.0	End of Borehole

SAMPLES

NUMBER	TYPE	BLOWS / FOOT
1	SS	19
2	SS	10
3	SS	60
4	SS	12
5	TW	PH
6	SS	8
7	TW	PM
8	SS	8
9	TW	PM
10	SS	11
11	TW	PM



20
15 -+- 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 70-110/47 LOCATION Sta. 86 + 86, 71 Ft. Rt. of ℄ ORIGINATED BY T.P.

W.P. 122-65-07 & 08 BORING DATE June 4-9, 1970 COMPILED BY A.K.B.

DATUM Geodetic BOREHOLE TYPE C.M.E. Auger & Diamond Drilling CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
597.1	Ground Level					
0.0	Clayey silt fill. Brown Stiff		1	SS	13	
589.6			2	TW	PM	590
7.5	Organic silt &		3	SS	5	
585.6	sand loose					
11.5			4	TW	PH	
	Clayey silt with traces of sand & gr. hard to firm		5	SS	27	580
			6	TW	PM	
	grey		7	SS	9	
			8	TW	PM	570
			9	SS	20	
						560
			10	TW	PM	
541.1						550
56.0			11	SS	8	
	Silty clay with traces of sand & gravel stiff grey					540
			12	TW	PM	530
						520
						490
487.0						
110.1	shale bedrock		13	RC	Rec. 100%	
482.0						
115.1	End of borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — 1000 — 2000

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

○ > 4000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w

w_P w w_L

WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
135	
141	
140	
129	
136.5	
124	

20
15 ✧ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 70-11047 LOCATION Sta. 85 + 70 73' Rt. of ℄ ORIGINATED BY TP
W.P. 122-65-07 & 08 BORING DATE June 25 - 29, 1970 COMPILED BY AKB
DATUM Geodetic BOREHOLE TYPE Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE
596.1	Ground Level					
0.0	Clayey Silt Fill					
589.1	Firm		1	SS	9	590
7.0	Black Peat Organic silt & sand		2	SS	15	
584.1			3	SS	20	
12.0			4	SS	45	580
			5	TW	PM	
	Clayey silt with traces of sand and gravel		6	SS	28	570
	Very stiff to stiff		7	TW	PM	560
			8	SS	22	550
543.1						
53.0			9	TW	PM	540
	Silty clay with traces of sand and gravel		10	SS	12	530
			11	TW	PM	520
	Firmtto Stiff		12	TW	PM	510
						500
			13	TW	PM	
						490
487.4	Probable Bedrock					
108.7	End of Borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w
w_p w w_L
WATER CONTENT %
10 20 30

N.P. ○=131.0

BULK DENSITY γ P.C.F.

133
132
131
116
117
121.5
125
119

REMARKS

GR.SA.SI.CL.

20
15 ✣ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 9

FOUNDATION SECTION

JOB 70-11047 LOCATION Sta. 88 + 00 ℄ ORIGINATED BY T.P.
W.P. 122-65-07&08 BORING DATE June 30, 1970 COMPILED BY A.K.B.
DATUM Geodetic BOREHOLE TYPE C.M.E. Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
588.8	Ground Level					
0.0	Black org. & sand		1	SS	19	
2.0	Clayey silt with traces of sand & gravel Stiff to firm		2	SS	12	580
			3	SS	6	
			4	TW	PM	570
			5	TW	PH	560
			6	SS	24	550
540.0						540
537.3	Silty clay with sa. & gr.		7	TW	PH	
51.5	End of borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
1000 2000
+ > 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.
130.5
137.5
118
116

REMARKS GR.SA.SI.CL.

20
15 ⊹ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 10

FOUNDATION SECTION

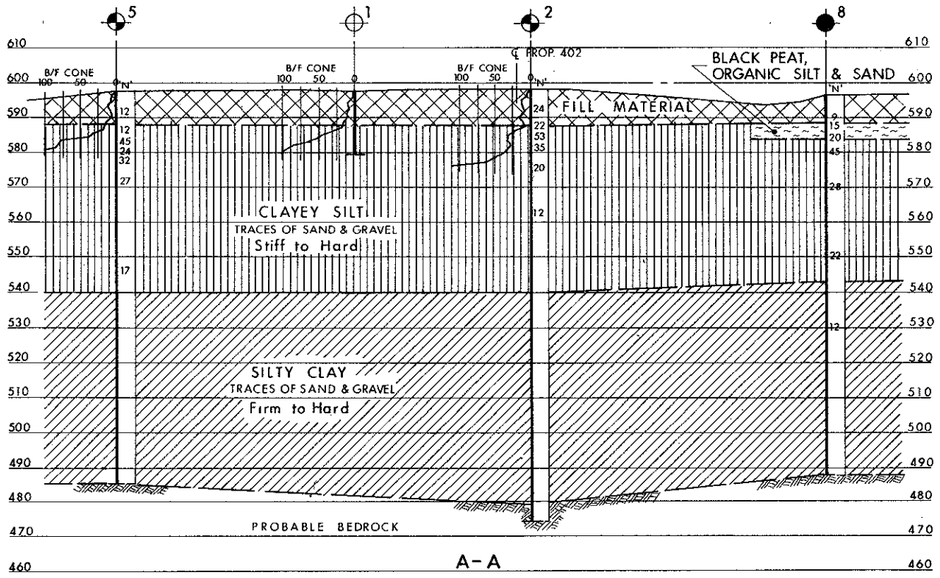
JOB 70-11047 LOCATION Sta. 85 + 80 ℄ ORIGINATED BY TP

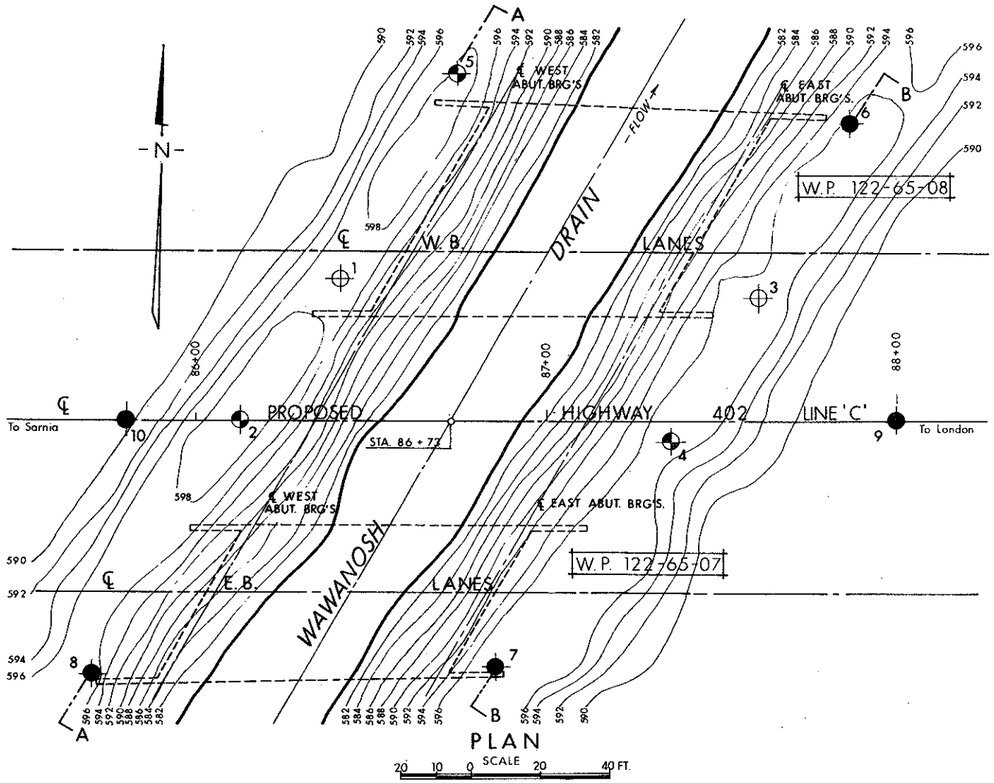
W.P. 122-65-07 & 08 BORING DATE June 30, 1970 COMPILED BY AKB

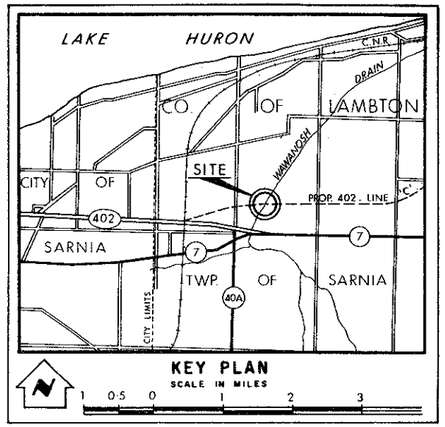
DATUM Geodetic BOREHOLE TYPE C.M.E. Auger CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT; SHEAR STRENGTH P.S.F. (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB. VANE)	LIQUID LIMIT w_L, PLASTIC LIMIT w_P, WATER CONTENT w; WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
589.8	Ground Level						1000 2000	10 20 30		
0.0	Black Organics									
2.0	Clayey silt with traces of sand and gravel		1	SS	10					
			2	SS	37	580				
			3	SS	21					
			4	TW	PM	570			131.5	
	Stiff Grey		5	SS	14	560				
			6	TW	PM	550			138	
541.8										
48.0	Silty clay, traces of sand & gravel									
536.8	Firm		7	SS	9	540				
53.0	End of Borehole									

20
15 ⊹ 5 % STRAIN AT FAILURE
10







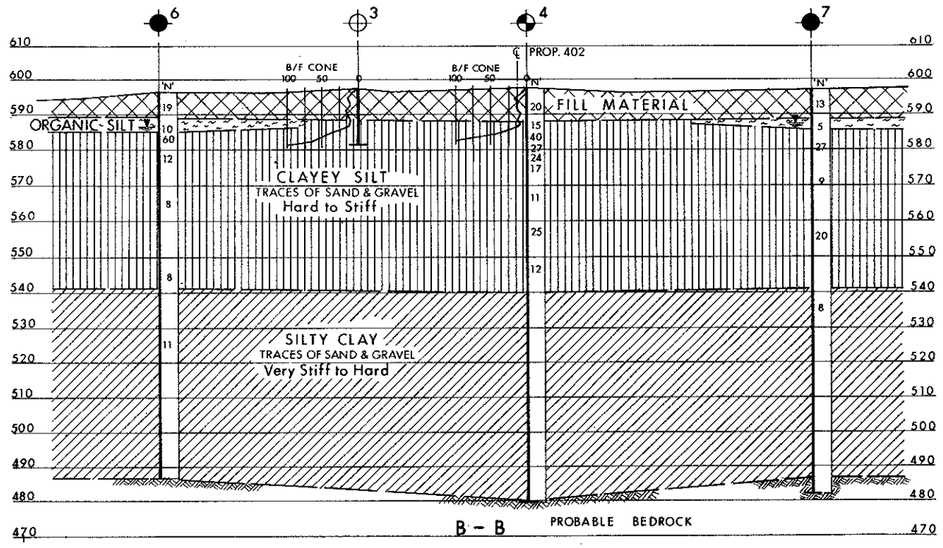
192

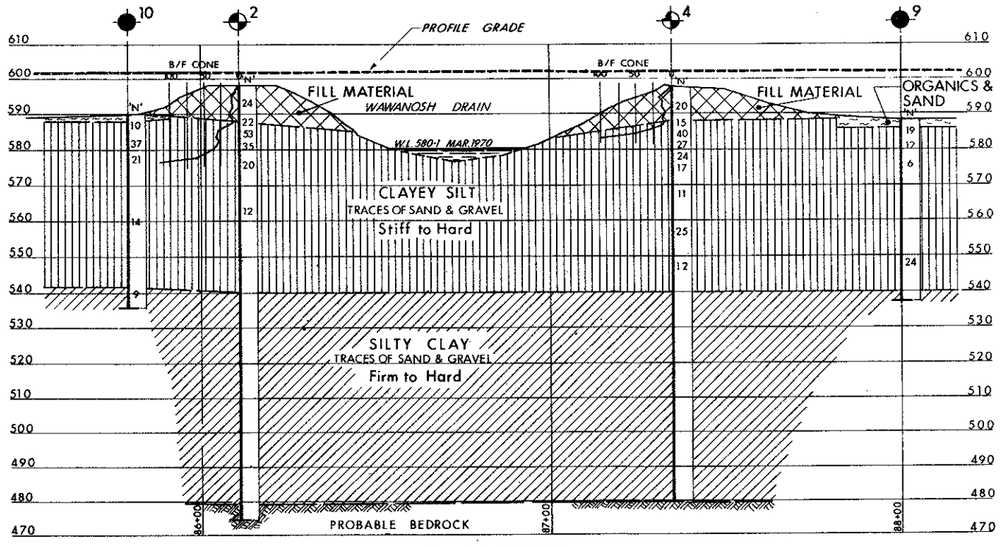
LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation. JUNE 1970

WATER LEVELS NOT ESTABLISHED FOR BORE HOLES 2,4,5,8,9&10

NO.	ELEVATION	STATION	OFFSET
1	597.6	86+41	40' LT.
2	598.3	86+13	℄
3	597.2	87+61	35' LT.
4	597.5	87+36	6' RT.
5	597.9	86+75	100' LT
6	596.3	87+86	86' LT.
7	597.1	86+86	71' RT.
8	596.1	85+70	73' RT.
9	588.8	88+00	℄
10	589.8	85+80	℄





SECTIONS

SCALE 20 10 0 20 40 FT.

℄ PROFILE

SCALE 20 10 0 20 40 FT.

NOTE: The complete soil investigation report for this structure may be examined at the Bridge Office and Foundation Office, Downsview, and at the CHATHAM District Office.

REF. NO. E-4853-1

– NOTE –

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

REVISIONS			
	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS – ONTARIO
MATERIALS & TESTING OFFICE – FOUNDATION SECTION

WAWANOSH DRAIN

KING'S HIGHWAY NO. 402 LINE 'C' DIST. NO. 1
CO. LAMBTON
TWP. SARNIA LOT 14 CON. 7

BORE HOLE LOCATIONS & SOIL STRATA

SUBM'D. A.B.	CHECKED.	W.P. NO. 122-65-07&08	M.B.T. DRAWING NO.
DRAWN S.O.	CHECKED	JOB NO. 70-11047	70-11047A
DATE 17 JULY 1970		SITE NO. 14-341	BRIDGE DRAWING NO.
APPROVED PRINCIPAL FOUNDATION ENGINEER		CONT. NO. 75-27	14-341-2

Appendix C

Current Investigation

GHD Borehole Records

Notes on Borehole and Test Pit Reports

Soil description :

Each subsurface stratum is described using the following terminology. The relative density of granular soils is determined by the Standard Penetration Index ("N" value), while the consistency ofclayey soils is measured by the value of undrained shear strength (Cu).

Classification (Unified system)

Clay	< 0.002 mm		
Silt	0.002 to 0.075 mm		
Sand	0.075 to 4.75 mm	fine	0.075 to 4.25 mm
		medium	0.425 to 2.0 mm
		coarse	2.0 to 4.75 mm
Gravel	4.75 to 75 mm	fine	4.75 to 19 mm
		coarse	19 to 75 mm
Cobbles	75 to 300 mm		
Boulders	>300 mm		

Terminology

"trace"	1-10%
"some"	10-20%
adjective (silty, sandy)	20-35%
"and"	35-50%

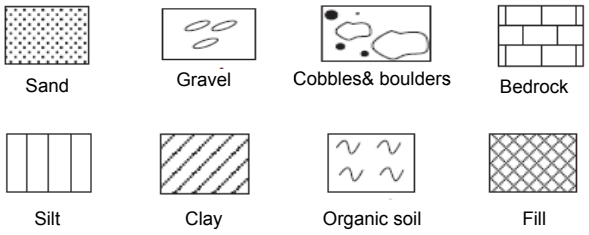
Relative density of granular soils	Standard penetration index "N" value (BLOWS/ft – 300 mm)
Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Consistency of cohesive soils	Undrained shear strength (Cu) (P.S.F)	(kPa)
Very soft	<250	<12
Soft	250-500	12-25
Firm	500-1000	25-50
Stiff	1000-2000	50-100
Very stiff	2000-4000	100-200
Hard	>4000	>200

Rock quality designation

"RQD" (%) Value	Quality
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
>90	Excellent

STRATIGRAPHIC LEGEND



Samples:

Type and Number

The type of sample recovered is shown on the log by the abbreviation listed hereafter. The numbering of samples is sequential for each type of sample.

SS: Split spoon
SSE, GSE, AGE: Environmental sampling
ST: Shelby tube
PS: Piston sample (Osterberg)
NR: No Recovery
AG: Auger
RC: Rock core
GS: Grab sample

Recovery

The recovery, shown as a percentage, is the ratio of length of the sample obtained to the distance the sampler was driven/pushed into the soil

RQD

The "Rock Quality Designation" or "RQD" value, expressed as percentage, is the ratio of the total length of all core fragments of 4 inches (10 cm) or more to the total length of the run.

IN-SITU TESTS:

N: Standard penetration index
R: Refusal to penetration
N_c: Dynamic cone penetration index
Cu: Undrained shear strength
Pr: Pressure meter
k: Permeability
ABS: Absorption (Packer test)

LABORATORY TESTS:

I_p: Plasticity index
W_l: Liquid limit
Wp: Plastic limit
H: Hydrometer analysis
GSA: Grain size analysis
NP: non-plastic
A: Atterberg limits
w: Water content
γ: Unit weight
C: Consolidation
CS: Swedish fall cone
CHEM: Chemical analysis
O.V.: Organic vapor

Ministry of Transportation Ontario

GHD

RECORD OF BOREHOLE No BH5-22

1 OF 2

METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761218.1, Easting: 317492.3, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.18 - 2023.04.18 LATITUDE 42.990662 LONGITUDE -82.344352 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
187.0											
0.0 / 186.8	ASPHALT (200 mm)										
0.2 / 186.2	CONCRETE (570 mm)										
0.8 / 185.5	FILL - GRAVEL and SAND, trace fines Compact Brown Moist		1	SS	24		186				51 39 (10)
1.5	FILL - SANDY CLAYEY SILT, trace gravel Stiff to very stiff Brown Moist		2	SS	8		185		12		2 23 42 33 LL=25% PL=14% PI=11%
				VANE				>100 kPa			
			3	SS	4		184				
				VANE			183				
			4	SS	10		182				
			5	SS	6				12		2 25 40 33 LL=26% PL=14% PI=12%
				VANE			181	× +			
	contains some shale fragments		6	SS	12		180				
			7	SS	10		179				
							178				
			8	SS	18				12		LL=27% PL=13% PI=14%
177.0											

Continued Next Page

+ 3 Numbers refer to Sensitivity

Ministry of Transportation Ontario

GHD

RECORD OF BOREHOLE No BH5-22 2 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761218.1, Easting: 317492.3, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.18 - 2023.04.18 LATITUDE 42.990662 LONGITUDE -82.344352 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10.0	FILL - SANDY CLAYEY SILT, trace gravel Stiff to very stiff Brown Moist										
			9	SS	14		176				
							175				
174.8											
12.2	CLAYEY SILT, some sand, trace gravel Very stiff Brown to grey Moist		10	SS	20				18		LL=32% PL=16% PI=16%
174.2											
12.8	END OF BOREHOLE NOTE: 1. Open borehole was dry upon completion of drilling.										

+ 3 Numbers refer to Sensitivity

File: \\GHDNET\GHD\CA\WATERLOO\PROJECTS\662\12566052\TECH\12 FOUNDATIONS\PHII - HWY 402-40 AND WAWANOSH\04-FIELDWORK\06-FIELD NOTES AND LOGS\GINT LOGS\12566052 LOGS_PHII.GPJ
Library File: 12566052 MTO LIBRARY.GLB Report: 12566052 BOREHOLE LOG V01 Date: 3/8/23

Ministry of Transportation Ontario

GHD

RECORD OF BOREHOLE No BH6-22

1 OF 2

METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761193.9, Easting: 317490.5, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.10 - 2023.04.10 LATITUDE 42.990444 LONGITUDE -82.344375 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
186.9											
0.0 / 186.7	ASPHALT (220 mm)										
0.2 / 186.2	CONCRETE (480 mm)										
0.7	FILL - SANDY GRAVEL, trace fines Compact to dense Brown Moist		1	SS	45		186		4		
			2	SS	12		185				62 31 (7)
184.6											
2.3	FILL - CLAYEY SILT, some sand, trace gravel Stiff Brown to dark brown Moist		3	SS	6		184		15		
				VANE				× +			
			4	SS	4		183		17		1 20 40 39 LL=30% PL=17% PI=13%
				VANE			182	× +			
			5	SS	9				15		
			6	SS	8		181		16		LL=32% PL=17% PI=15%
				VANE			180	× +			
			7	SS	5		179		19		LL=32% PL=17% PI=15%
				VANE			178	× +			
			8	SS	7				18		
							177				

Continued Next Page

+ 3 Numbers refer to Sensitivity

Ministry of Transportation Ontario

GHD

RECORD OF BOREHOLE No BH6-22 2 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761193.9, Easting: 317490.5, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.10 - 2023.04.10 LATITUDE 42.990444 LONGITUDE -82.344375 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
				VANE							
176.2											
10.7	CLAYEY SILT, some sand, trace gravel Firm to very stiff Brown to grey Moist		9	SS	6		176		21		2 19 39 40 LL=31% PL=18% PI=13%
				VANE			175	>100 kPa			
174.1			10	SS	14				19		
12.8	END OF BOREHOLE										

NOTE:
1. Open borehole was dry upon completion of drilling.

+ 3 Numbers refer to Sensitivity

File: \\GHDNET\GHD\CA\WATERLOO\PROJECTS\662\12566052\TECH\12 FOUNDATIONS\PHII - HWY 402-40 AND WAWANOSH\04-FIELDWORK\06-FIELD NOTES AND LOGS\GINT LOGS\12566052 LOGS_PHII.GPJ
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Ministry of Transportation Ontario

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RECORD OF BOREHOLE No BH7-22 1 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761218.8, Easting: 317572.8, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.11 - 2023.04.11 LATITUDE 42.990667 LONGITUDE -82.343365 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
186.9											
186.8 0.0	ASPHALT (130 mm)										
0.1	CONCRETE (550 mm)										
186.2											
0.7	FILL - SAND and GRAVEL, trace fines Loose to compact Brown Moist		1	SS	17		186		7		
			2	SS	15		185				49 39 (12)
			3	SS	5		184		6		
183.9											
3.0	FILL - CLAYEY SILT, some sand, trace gravel Stiff to very stiff Brown Moist		4	SS	0				17		1 18 48 33 LL=29% PL=16% PI=13%
				VANE			183	>100 kPa			
	contains trace rootlets		5	SS	4		182		14		
				VANE				× +			
			6	SS	6		181		14		LL=25% PL=13% PI=12%
				VANE			180	>100 kPa			
179.3											
7.6	CLAYEY SILT, some sand, trace gravel Firm to stiff Brown to grey Moist		7	SS	11		179		13		0 20 50 30 LL=31% PL=15% PI=16%
			8	SS	7		178		20		
							177				

Continued Next Page

+ 3 Numbers refer to Sensitivity

File: \\GHDNET\GHD\CA\WATERLOO\PROJECTS\662\12566052\TECH\12 FOUNDATIONS\PHII - HWY 402-40 AND WAWANOSH\04-FIELDWORK\06-FIELD NOTES AND LOGS\GINT LOGS\12566052 LOGS_PHII.GPJ
Library File: 12566052 MTO LIBRARY.GLB Report: 12566052 BOREHOLE LOG V01 Date: 3/8/23

Ministry of Transportation Ontario

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RECORD OF BOREHOLE No BH7-22 2 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761218.8, Easting: 317572.8, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.11 - 2023.04.11 LATITUDE 42.990667 LONGITUDE -82.343365 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
176.2				VANE		▽		× +			
10.7	SILTY SAND, some gravel, trace clay Compact Grey Moist to wet		9	SS	10		176		15		18 50 25 7
174.7							175				
12.2	CLAYEY SILT, some sand, trace gravel Stiff Brown to grey Moist		10	SS	11				18		
174.1											
12.8	END OF BOREHOLE NOTE: 1. Water level at 10.7 m below ground surface (Elevation 176.2 m) upon completion of drilling.										

+ 3 Numbers refer to Sensitivity

File: \\GHDNET\GHD\CA\WATERLOO\PROJECTS\662\12566052\TECH\12 FOUNDATIONS\PHII - HWY 402-40 AND WAWANOSH\04-FIELDWORK\06-FIELD NOTES AND LOGS\GINT LOGS\12566052 LOGS_PHII.GPJ
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RECORD OF BOREHOLE No BH8-22 1 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761194.5, Easting: 317571.5, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.18 - 2023.04.18 LATITUDE 42.990448 LONGITUDE -82.343382 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
186.9											
186.8 0.0	ASPHALT (150 mm)										
0.2	CONCRETE (540 mm)										
186.2											
0.7	FILL - GRAVELLY SAND, some silt, trace clay Very loose to compact Brown Moist		1	SS	19		186				
			2	SS	12		185		5		33 47 15 5
			3	SS	2		184				
183.9											
3.0	FILL - CLAYEY SILT, some sand, trace gravel Stiff Brown Moist		4	SS	0				14		LL=31% PL=17% PI=14%
				VANE			183	× +			
			5	SS	11		182				
			6	SS	6				12		LL=31% PL=17% PI=14%
				VANE			181	>100 kPa			
	contains trace rootlets		7	SS	12		180				
			8	SS	15		179				
							178				
177.8											
9.1	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Dark brown Moist		9	SS	22		177		15		2 20 45 33 LL=29% PL=16% PI=13%
176.9											

Continued Next Page

+ 3 Numbers refer to Sensitivity

Ministry of Transportation Ontario

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RECORD OF BOREHOLE No BH8-22 2 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761194.5, Easting: 317571.5, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.18 - 2023.04.18 LATITUDE 42.990448 LONGITUDE -82.343382 CHECKED BY A.C

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × REMOULDED) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
10.0	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Dark brown Moist										
			10	SS	10		176				
							175				
			11	SS	11				22		LL=33% PL=17% PI=16%
174.1											
12.8	END OF BOREHOLE NOTE: 1. Open borehole was dry upon completion of drilling.										

+ 3 Numbers refer to Sensitivity

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RECORD OF BOREHOLE No BH9-22

1 OF 2

METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761242.2, Easting: 318284.3, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.13 - 2023.04.13 LATITUDE 42.990866 LONGITUDE -82.334639 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.7											
182.5 0.0	ASPHALT (152 mm)										
0.2	FILL - SAND, some silt, some clay, trace gravel Compact to very dense Brown Moist		1	SS	71/ 203,mm				2		
			2	SS	21		182				5 72 (23)
181.2											
1.5	FILL - CLAYEY SILT, some sand, trace gravel Stiff to very stiff Brown Moist		3	SS	11		181		10		
			4	SS	15		180		10		
			5	SS	13				16		
			6	SS	16		179		19		
178.1											
4.6	CLAYEY SILT, some sand, trace gravel Firm to very stiff Dark Brown Moist		7	SS	17		178		11		2 18 46 34 LL=31% PL=16% PI=15%
			8	SS	16		177		15		1 21 44 34 LL=29% PL=18% PI=11%
			9	SS	8				20		
				VANE			176	>100 kPa			
			10	SS	5		175		21		
				VANE			174	>100 kPa			
			11	SS	4				23		LL=31% PL=17% PI=14%
172.7							173				

Continued Next Page

+ 3 Numbers refer to Sensitivity

Ministry of Transportation Ontario

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RECORD OF BOREHOLE No BH9-22 2 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761242.2, Easting: 318284.3, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.13 - 2023.04.13 LATITUDE 42.990866 LONGITUDE -82.334639 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × REMOULDED)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10.0	CLAYEY SILT, some sand, trace gravel Firm to very stiff Dark Brown Moist			VANE		▽	172				
			12	SS	2				21		
				VANE			171	>100 kPa			
			13	SS	10				19		LL=29% PL=16% PI=13%
169.9							170				
12.8	END OF BOREHOLE										

NOTE:

1. Water level at 10.7 m below ground surface (Elevation 174.0 m) upon completion of drilling.

+ 3 Numbers refer to Sensitivity

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RECORD OF BOREHOLE No BH10-22 1 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761241.6, Easting: 318331.5, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.13 - 2023.04.13 LATITUDE 42.990859 LONGITUDE -82.334061 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.6											
0.0 / 182.4	ASPHALT (203 mm)										
0.2	FILL - SAND and GRAVEL, trace silt, contains asphalt fragments Very dense Brown to grey		1	SS	76/ 203,mm						
181.8							182				
0.8	Moist FILL - CLAYEY SILT, some sand, trace gravel Firm to very stiff Brown Moist		2	SS	6				15		LL=30% PL=18% PI=12%
				VANE			181	>100 kPa			
			3	SS	10				15		
			4	SS	12		180		10		LL=32% PL=16% PI=16%
			5	SS	18		179		18		
			6	SS	6		178		11		2 18 47 33 LL=26% PL=14% PI=12%
				VANE			177	× +			
			7	SS	5				21		
				VANE			176	>100 kPa			
175.0							175				
7.6	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Dark brown Moist		8	SS	3				20		LL=31% PL=17% PI=14%
				VANE			174	>100 kPa			
			9	SS	3				21		
172.6							173				

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+ 3 Numbers refer to Sensitivity

File: \\GHDNET\GHD\CA\WATERLOO\PROJECTS\662\12566052\TECH\12 FOUNDATIONS\PHII - HWY 402-40 AND WAWANOSH\04-FIELDWORK\06-FIELD NOTES AND LOGS\GINT LOGS\12566052 LOGS_PHII.GPJ
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RECORD OF BOREHOLE No BH10-22 2 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761241.6, Easting: 318331.5, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.13 - 2023.04.13 LATITUDE 42.990859 LONGITUDE -82.334061 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10.0	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Dark brown Moist			VANE				>100 kPa			
			10	SS	5		172		22		2 16 47 35 LL=30% PL=17% PI=13%
				VANE			171	>100 kPa			
169.8			11	SS	11		170		14		
12.8	END OF BOREHOLE										

NOTE:
1. Open borehole was dry upon completion of drilling.

+ 3 Numbers refer to Sensitivity

File: \\GHDNET\GHD\CA\WATERLOO\PROJECTS\662\12566052\TECH\12 FOUNDATIONS\PHII - HWY 402-40 AND WAWANOSH\04-FIELDWORK\06-FIELD NOTES AND LOGS\GINT LOGS\12566052 LOGS_PHII.GPJ
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RECORD OF BOREHOLE No BH11-22 1 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761227.7, Easting: 318269.8, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.11 - 2023.04.11 LATITUDE 42.990735 LONGITUDE -82.334817 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.8											
182.7 0.0	ASPHALT (127 mm)										
0.1	FILL - CLAYEY SILT, some sand, trace gravel Stiff to very stiff Brown Moist		1	SS	23		182				
			2	SS	14		181				
			3	SS	11		180				
			4	SS	15				12		1 28 42 29 LL=26% PL=14% PI=12%
			5	SS	16		179				
			6	SS	21		178				
			7	SS	12				14		LL=29% PL=16% PI=13%
176.7							177				
6.1	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Brown to grey Moist		8	SS	13		176				
			9	SS	7		175		16		2 15 45 38 LL=32% PL=17% PI=15%
				VANE				× +			
			10	SS	5		174				
172.8							173	>100 kPa			

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RECORD OF BOREHOLE No BH11-22 2 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761227.7, Easting: 318269.8, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.11 - 2023.04.11 LATITUDE 42.990735 LONGITUDE -82.334817 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10.0	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Brown to grey Moist			VANE							
			11	SS	0		172		16		LL=30% PL=16% PI=14%
				VANE				× +			
							171				
170.0			12	SS	10						
12.8	END OF BOREHOLE										

NOTE:
1. Open borehole was dry upon completion of drilling.

+ 3 Numbers refer to Sensitivity

File: \\GHDNET\GHD\CA\WATERLOO\PROJECTS\662\12566052\TECH\12 FOUNDATIONS\PHII - HWY 402-40 AND WAWANOSH\04-FIELDWORK\06-FIELD NOTES AND LOGS\GINT LOGS\12566052 LOGS_PHII.GPJ
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RECORD OF BOREHOLE No BH12-22 1 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761229.0, Easting: 318336.8, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.11 - 2023.04.11 LATITUDE 42.990745 LONGITUDE -82.333996 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.6											
182.5 0.0	ASPHALT (102 mm)										
0.1											
182.3	CONCRETE (203 mm)										
182.2 0.3	FILL - SAND and GRAVEL, trace silt		1A								
0.4	Compact		1B	SS	13		182		14		
	Brown										
	Moist										
	FILL - SANDY CLAYEY SILT, trace gravel		2	SS	11				14		7 26 38 29 LL=29% PL=16% PI=13%
	Stiff to very stiff										
	Brown										
	Moist		3	SS	10		181		28		
			4	SS	10		180		14		
	wood pieces										
			5	SS	10				11		
							179				
			6	SS	26				11		
178.0											
4.6	CLAYEY SILT, some sand, trace gravel						178				
	Firm to stiff		7	SS	18				13		2 17 43 38 LL=31% PL=16% PI=15%
	Brown to grey										
	Moist										
			8	SS	12		177		13		
			9	SS	5				20		LL=32% PL=17% PI=15%
				VANE			176	× +			
							175				
			10	SS	2				21		
				VANE				× +			
							174				
			11	SS	2				13		3 15 47 35 LL=31% PL=17% PI=14%
							173				
172.6											

Continued Next Page

+ 3 Numbers refer to Sensitivity

Ministry of Transportation Ontario

GHD

RECORD OF BOREHOLE No BH12-22 2 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761229.0, Easting: 318336.8, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.11 - 2023.04.11 LATITUDE 42.990745 LONGITUDE -82.333996 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10.0	CLAYEY SILT, some sand, trace gravel Firm to stiff Brown to grey Moist			VANE							
			12	SS	3		172		22		
				VANE			171	× +			
			13	SS	4				19		LL=30% PL=16% PI=14%
169.8							170				
12.8	END OF BOREHOLE										

NOTE:
1. Open borehole was dry upon completion of drilling.

+ 3 Numbers refer to Sensitivity

File: \\GHDNET\GHD\CA\WATERLOO\PROJECTS\662\12566052\TECH\12 FOUNDATIONS\PHII - HWY 402-40 AND WAWANOSH\04-FIELDWORK\06-FIELD NOTES AND LOGS\GINT LOGS\12566052 LOGS_PHII.GPJ
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Ministry of Transportation Ontario

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RECORD OF BOREHOLE No BH13-22 1 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761205.1, Easting: 318257.5, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.10 - 2023.04.10 LATITUDE 42.990532 LONGITUDE -82.334969 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × REMOULDED)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.9											
182.8 0.0	ASPHALT (102 mm)										
0.1 182.5	CONCRETE (254 mm)										
0.4	FILL - GRAVELLY SAND, some fines Compact Brown Moist		1	SS	21				5		31 41 (28)
181.9 1.0	FILL - CLAYEY SILT, some sand, trace gravel Firm to very stiff Brown Moist		2	SS	7		182		13		LL=26% PL=15% PI=11%
			3	SS	9		181		9		
			4	SS	12				12		
			5	SS	8		180		11		
				VANE			179	>100 kPa			
			6	SS	18		178		14		
	contains roots		7	SS	14				16		1 18 43 38 LL=31% PL=17% PI=14%
176.8 6.1	CLAYEY SILT, some sand, trace gravel Stiff Brown to grey Moist		8	SS	11		177		17		
			9	SS	13		176		19		LL=32% PL=18% PI=14%
			10	SS	6		175		22		
172.9							174				
							173				

Continued Next Page

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File: \\GHDNET\GHD\CA\WATERLOO\PROJECTS\662\12566052\TECH\12 FOUNDATIONS\PHII - HWY 402-40 AND WAWANOSH\04-FIELDWORK\06-FIELD NOTES AND LOGS\GINT LOGS\12566052 LOGS_PHII.GPJ
Library File: 12566052 MTO LIBRARY.GLB Report: 12566052 BOREHOLE LOG_V01 Date: 3/8/23

Ministry of Transportation Ontario

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RECORD OF BOREHOLE No BH13-22 2 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761205.1, Easting: 318257.5, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.10 - 2023.04.10 LATITUDE 42.990532 LONGITUDE -82.334969 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10.0	CLAYEY SILT, some sand, trace gravel Stiff Brown to grey Moist			VANE							
			11	SS	3		172		21		2 14 42 42 LL=33% PL=16% PI=17%
				VANE				× +			
							171				
170.1			12	SS	3				11		
12.8	END OF BOREHOLE NOTE: 1. Open borehole was dry upon completion of drilling.										

+ 3 Numbers refer to Sensitivity

File: \\GHDNET\GHD\CA\WATERLOO\PROJECTS\662\12566052\TECH\12 FOUNDATIONS\PHII - HWY 402-40 AND WAWANOSH\04-FIELDWORK\06-FIELD NOTES AND LOGS\GINT LOGS\12566052 LOGS_PHII.GPJ
Library File: 12566052 MTO LIBRARY.GLB Report: 12566052 BOREHOLE LOG V01 Date: 3/8/23

Ministry of Transportation Ontario

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RECORD OF BOREHOLE No BH14-22 1 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761204.5, Easting: 318308.9, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.13 - 2023.04.13 LATITUDE 42.990525 LONGITUDE -82.334339 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.8											
182.7 0.0	ASPHALT (127 mm)										
0.1	CONCRETE (508 mm)										
182.2											
0.6	FILL - CLAYEY SILT, some sand to sandy, trace gravel Stiff to very stiff Brown to dark Moist		1	SS	11		182				
			2	SS	11		181		11		LL=27% PL=16% PI=11%
			3	SS	13		180		11		
			4	SS	12				18		1 30 38 31 LL=24% PL=12% PI=12%
			5	SS	14		179		13		
			6	SS	18		178		14		LL=28% PL=14% PI=14%
			7	SS	12				19		
176.7							177				
6.1	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Brown to grey Moist		8	SS	10				21		4 17 40 39 LL=31% PL=16% PI=15%
			9	SS	5		176				
				VANE			175		22		
							174	>100 kPa			
			10	SS	6				22		LL=31% PL=15% PI=16%
172.8							173				

Continued Next Page

+ 3 Numbers refer to Sensitivity

Ministry of Transportation Ontario

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RECORD OF BOREHOLE No BH14-22 2 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761204.5, Easting: 318308.9, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.13 - 2023.04.13 LATITUDE 42.990525 LONGITUDE -82.334339 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10.0	CLAYEY SILT, some sand, trace gravel Stiff to very stiff Brown to grey Moist			VANE		▽		× 60 + 80		
			11	SS	7		172		22	
	Auger grinding from 11.3m to 12.2m			VANE			171	>100 kPa		
170.0			12	SS	10		170		16	
12.8	END OF BOREHOLE									

NOTE:

1. Water level at 10.7 m below ground surface (Elevation 174.1 m) upon completion of drilling.

+ 3 Numbers refer to Sensitivity

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Ministry of Transportation Ontario

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RECORD OF BOREHOLE No BH15-22 1 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761194.5, Easting: 318237.6, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.12 - 2023.04.12 LATITUDE 42.990437 LONGITUDE -82.335214 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.7											
182.5 0.0	ASPHALT (152 mm)										
0.2	FILL - GRAVELLY SAND, some silt, trace clay Dense Grey to brown		1	SS	31		182		6		
181.9	Moist										
0.8	FILL - CLAYEY SILT, some sand, trace gravel Stiff to very stiff Brown to grey Moist		2	SS	14						
			3	SS	7		181		11		LL=29% PL=14% PI=15%
				VANE				>100 kPa			
			4	SS	13		180		12		
			5	SS	15		179		8		
			6	SS	17		178		9		
			7	SS	4		177		14		2 22 43 33 LL=29% PL=15% PI=14%
				VANE				× +			
175.8							176				
6.9	FILL - GRAVELLY SAND, trace fines Compact to loose Dark brown Moist to wet		8	SS	14				9		30 57 (13)
174.7			9A	SS	6		175		11		
8.0	FILL - CLAYEY SILT, some sand, trace gravel Very stiff Brown to grey Moist		9B	SS					17		
				VANE			174	>100 kPa			
173.6											
9.1	CLAYEY SILT, some sand, trace gravel Stiff Brown to grey Moist		10	SS	12		173		19		
172.7	Auger grinding at 9.8 m										

Continued Next Page

+ 3 Numbers refer to Sensitivity

Ministry of Transportation Ontario

GHD

RECORD OF BOREHOLE No BH15-22 2 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761194.5, Easting: 318237.6, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.12 - 2023.04.12 LATITUDE 42.990437 LONGITUDE -82.335214 CHECKED BY A.C

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
10.0	CLAYEY SILT, some sand, trace gravel Stiff Brown to grey Moist contains trace rootlets						172				
			11	SS	10				19		2 15 45 38 LL=32% PL=16% PI=16%
							171				
			12	SS	10				16		
169.9							170				
12.8	END OF BOREHOLE NOTE: 1. Open borehole was dry upon completion of drilling.										

+ 3 Numbers refer to Sensitivity

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Ministry of Transportation Ontario

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RECORD OF BOREHOLE No BH16-22

1 OF 2

METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761196.8, Easting: 318317.8, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.12 - 2023.04.12 LATITUDE 42.990457 LONGITUDE -82.334230 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.7											
0.0 / 182.5	ASPHALT (203 mm)										
0.2	FILL - GRAVELLY SAND, some silt, contains asphalt fragments Dense Grey to brown		1	SS	32				15		
181.9 / 0.8	Moist						182				
	FILL - CLAYEY SILT, some sand, trace gravel Stiff to very stiff Brown to grey Moist		2	SS	13						0 19 44 37 LL=31% PL=14% PI=17%
			3	SS	11		181		13		
			4	SS	11		180		15		LL=31% PL=14% PI=17%
	wood fragments		5	SS	14				12		
			6	SS	16		179		15		
			7	SS	21		178		11		
177.4											
5.3	CLAYEY SILT, some sand, trace gavel Stiff to very stiff Brown to grey Moist		8	SS	12				16		
			9	SS	8		177		18		3 17 44 36 LL=29% PL=14% PI=15%
				VANE			176	>100 kPa			
			10	SS	0		175		22		LL=31% PL=15% PI=16%
				VANE			174				
			11	SS	6		173		21		
172.7											

Continued Next Page

+ 3 Numbers refer to Sensitivity

Ministry of Transportation Ontario

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RECORD OF BOREHOLE No BH16-22 2 OF 2 METRIC

G.W.P. NO. 3105-18-00 LOCATION Hwy 402 / 40 Bridge (Northing: 4761196.8, Easting: 318317.8, MTM Zone 11) ORIGINATED BY S.H

DIST WEST HWY 402/40 BOREHOLE TYPE Hollow Stem Auger DRILLING RIG TYPE Track Mounted Drill Rig COMPILED BY A.W

DATUM Geodetic DATE 2023.04.12 - 2023.04.12 LATITUDE 42.990457 LONGITUDE -82.334230 CHECKED BY A.C

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × REMOULDED)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10.0	CLAYEY SILT, some sand, trace gavel Stiff to very stiff Brown to grey Moist			VANE				>100 kPa			
			12	SS	3		172		21		3 15 44 38 LL=30% PL=14% PI=16%
				VANE			171	>100 kPa			
169.9			13	SS	11		170		17		
12.8	END OF BOREHOLE										

NOTE:
1. Open borehole was dry upon completion of drilling.

+ 3 Numbers refer to Sensitivity

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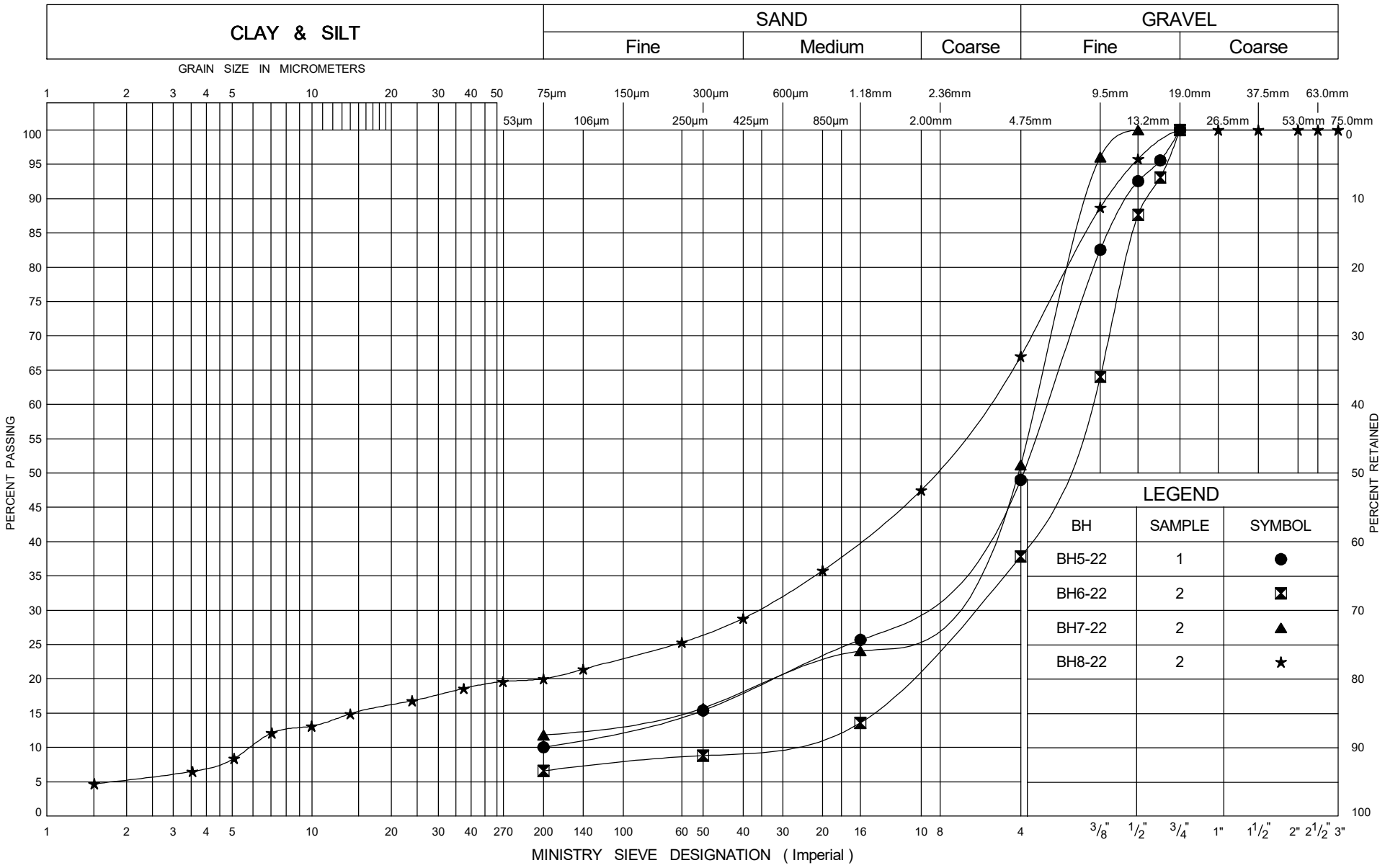
Appendix D

Geotechnical Laboratory Test Results

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of Transportation
Ontario

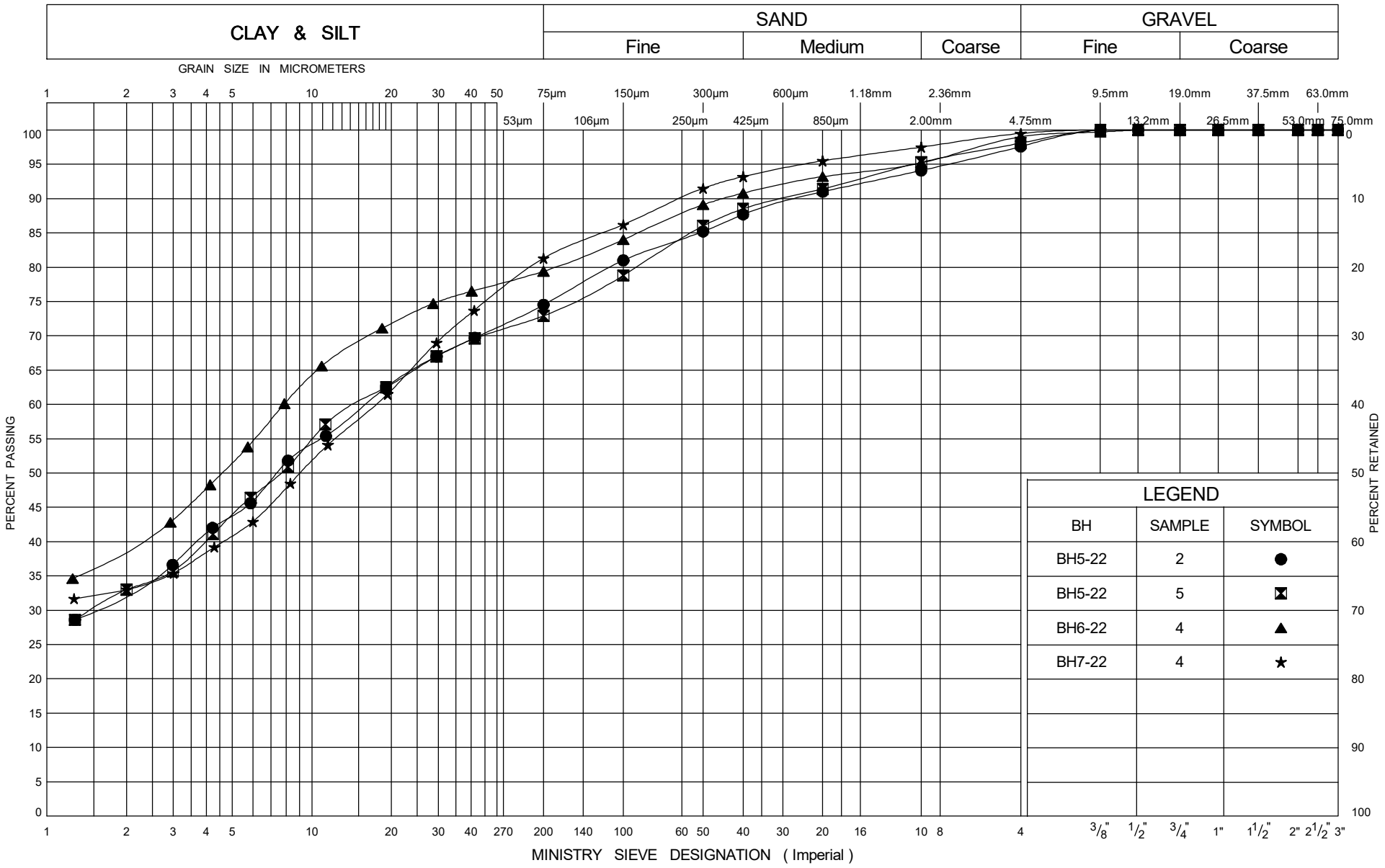
GRAIN SIZE DISTRIBUTION

Fill - Gravelly Sand to Gravel and Sand

Figure:	D-1
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052

ONTARIO MOT GRAIN SIZE (TITLE) 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23

UNIFIED SOIL CLASSIFICATION SYSTEM



ONTARIO MOT GRAIN SIZE (TITLE) 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23

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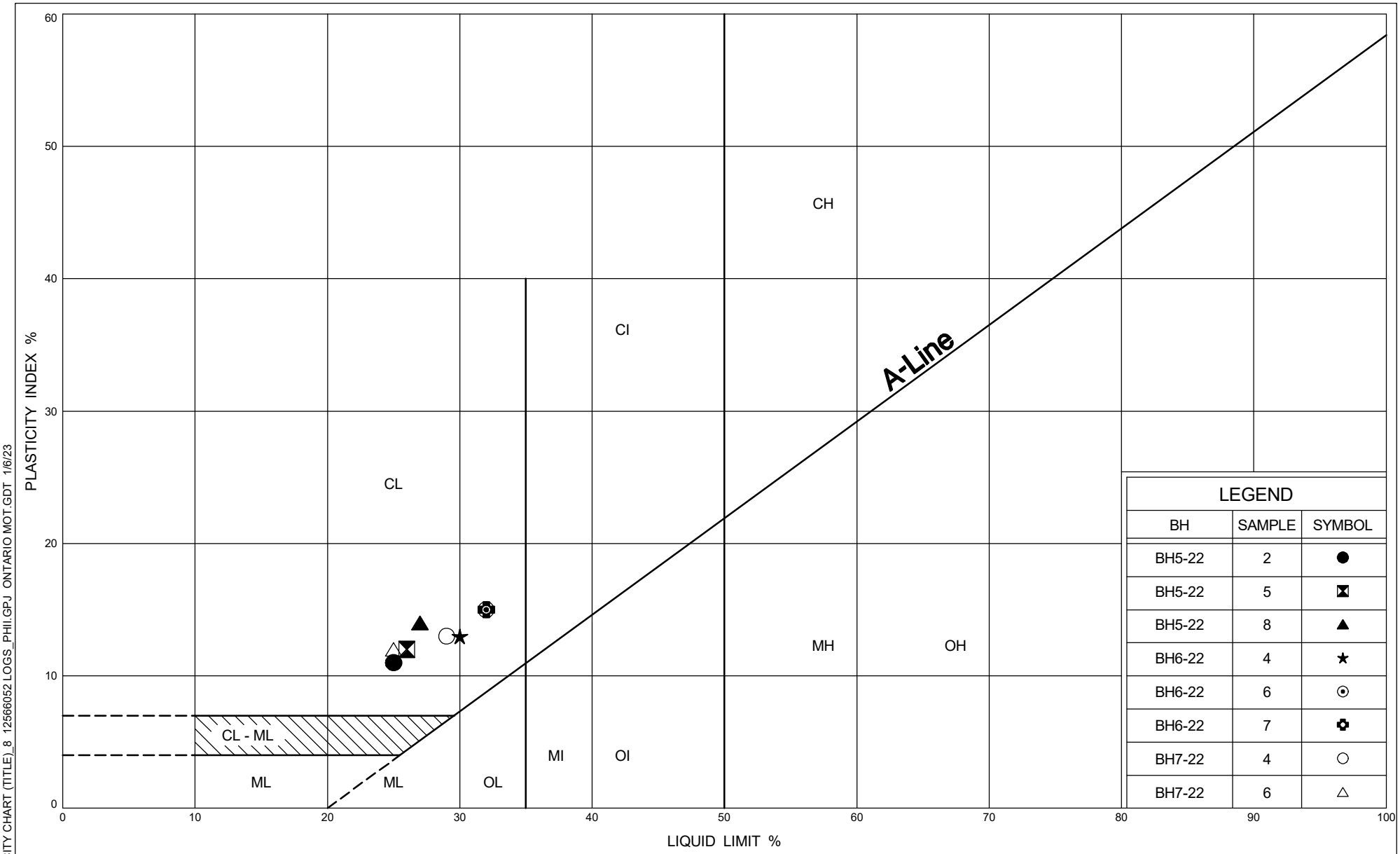
GRAIN SIZE DISTRIBUTION

Fill - Clayey Silt to Sandy Clayey Silt

Figure:	D-2
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052



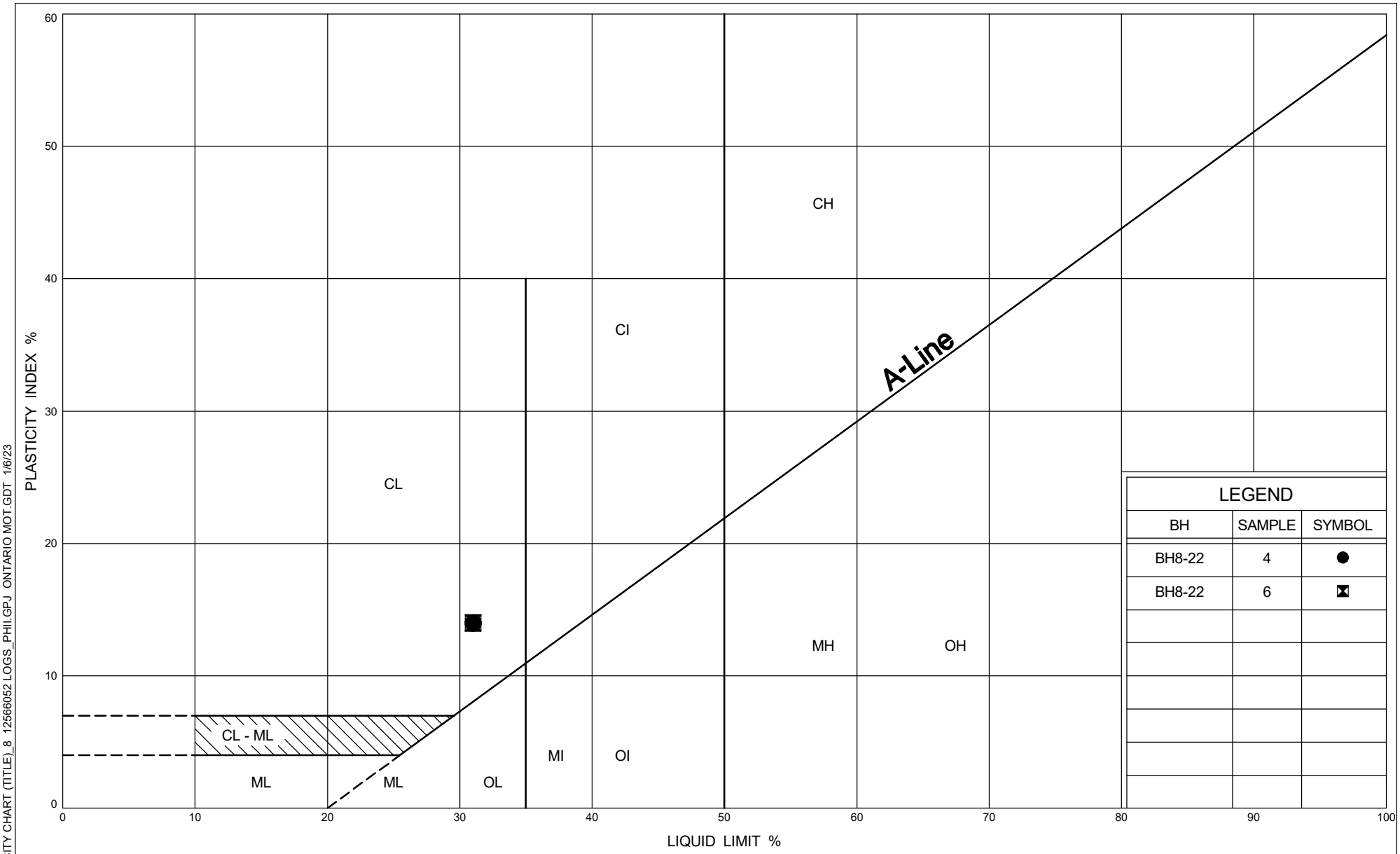
Ministry of Transportation
Ontario

PLASTICITY CHART

Fill - Clayey Silt to Sandy Clayey Silt

Figure:	D-3A
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052

ONTARIO MOT PLASTICITY CHART (TITLE)_8 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23



ONTARIO MOT PLASTICITY CHART (TITLE)_8 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23

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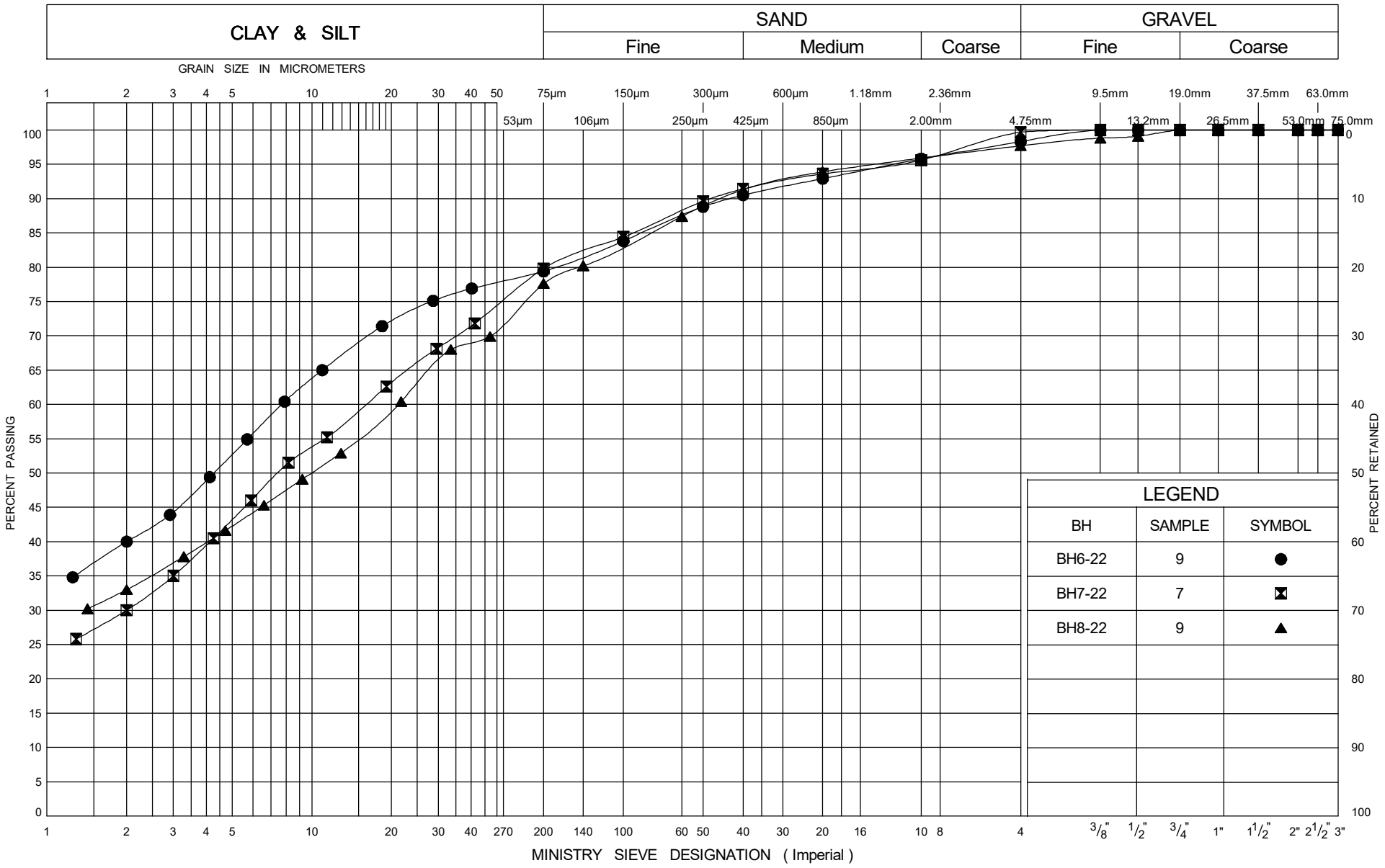
PLASTICITY CHART

Fill - Clayey Silt to Sandy Clayey Silt

Figure:	D-3B
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052

UNIFIED SOIL CLASSIFICATION SYSTEM



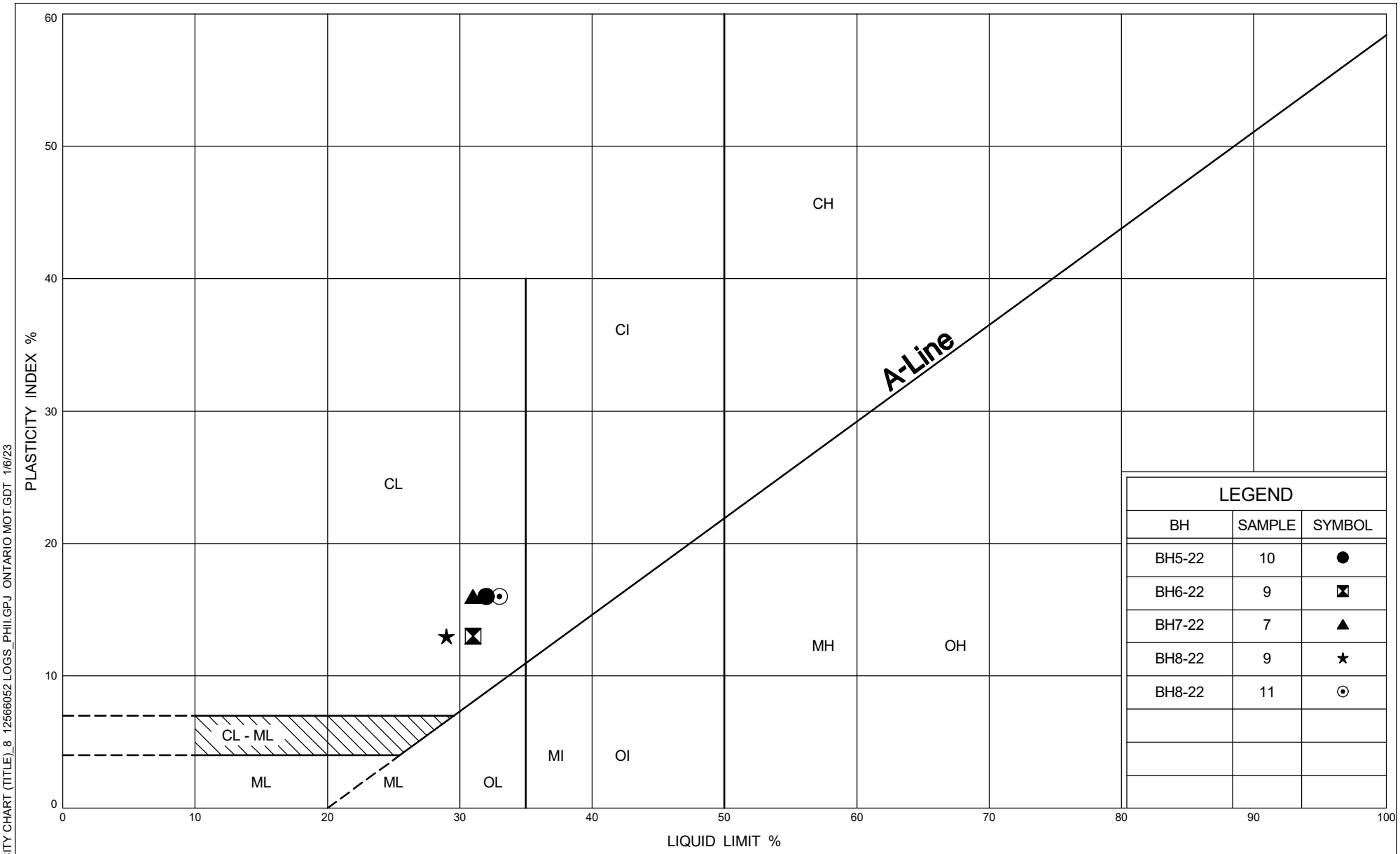
ONTARIO MOT GRAIN SIZE (TITLE) 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 2/8/23

Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION

Clayey Silt

Figure:	D-4
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052



ONTARIO MOT PLASTICITY CHART (TITLE)_8 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23

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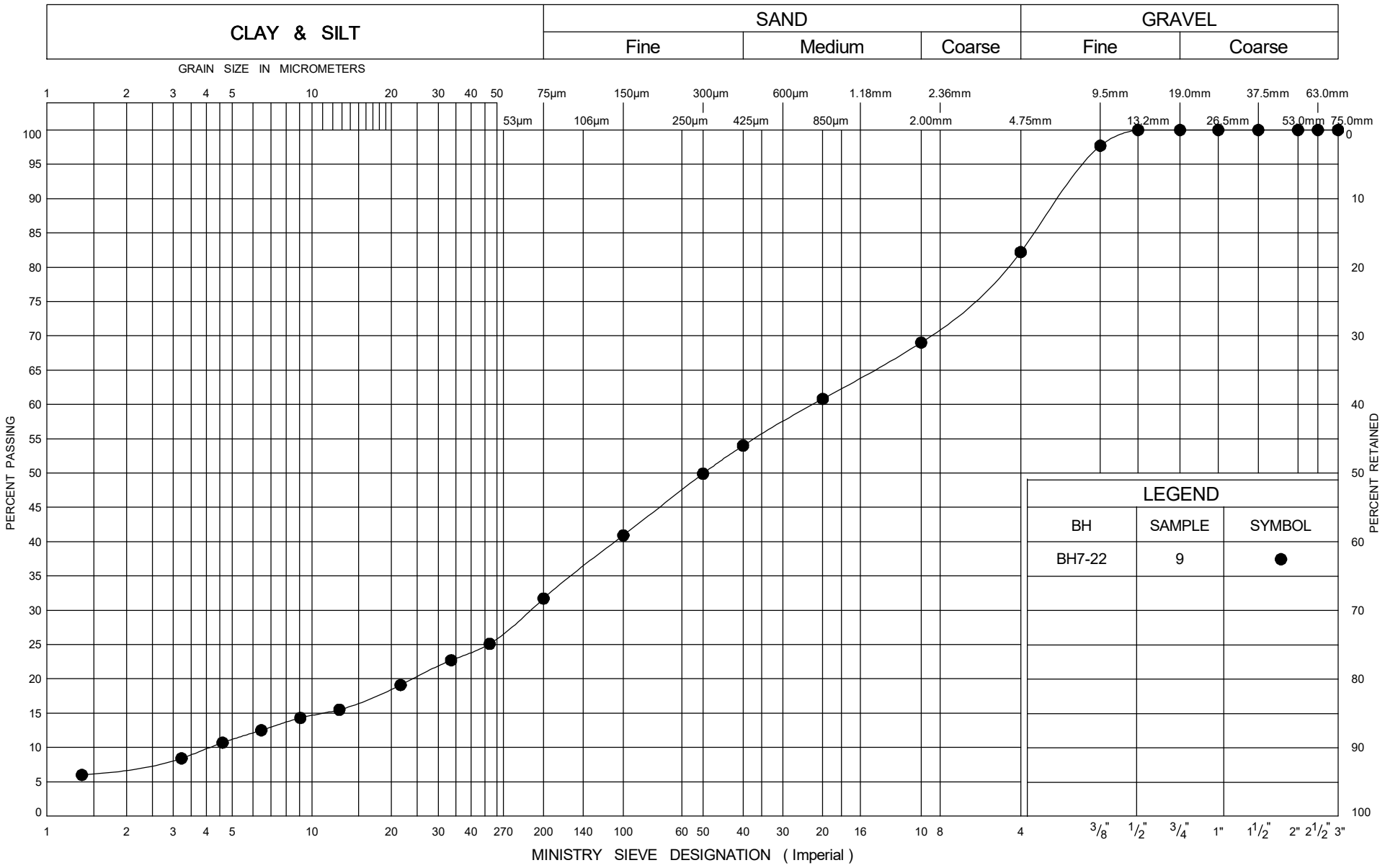
Ontario

PLASTICITY CHART

Clayey Silt

Figure:	D-5
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052

UNIFIED SOIL CLASSIFICATION SYSTEM



ONTARIO MOT GRAIN SIZE (TITLE) 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 2/8/23

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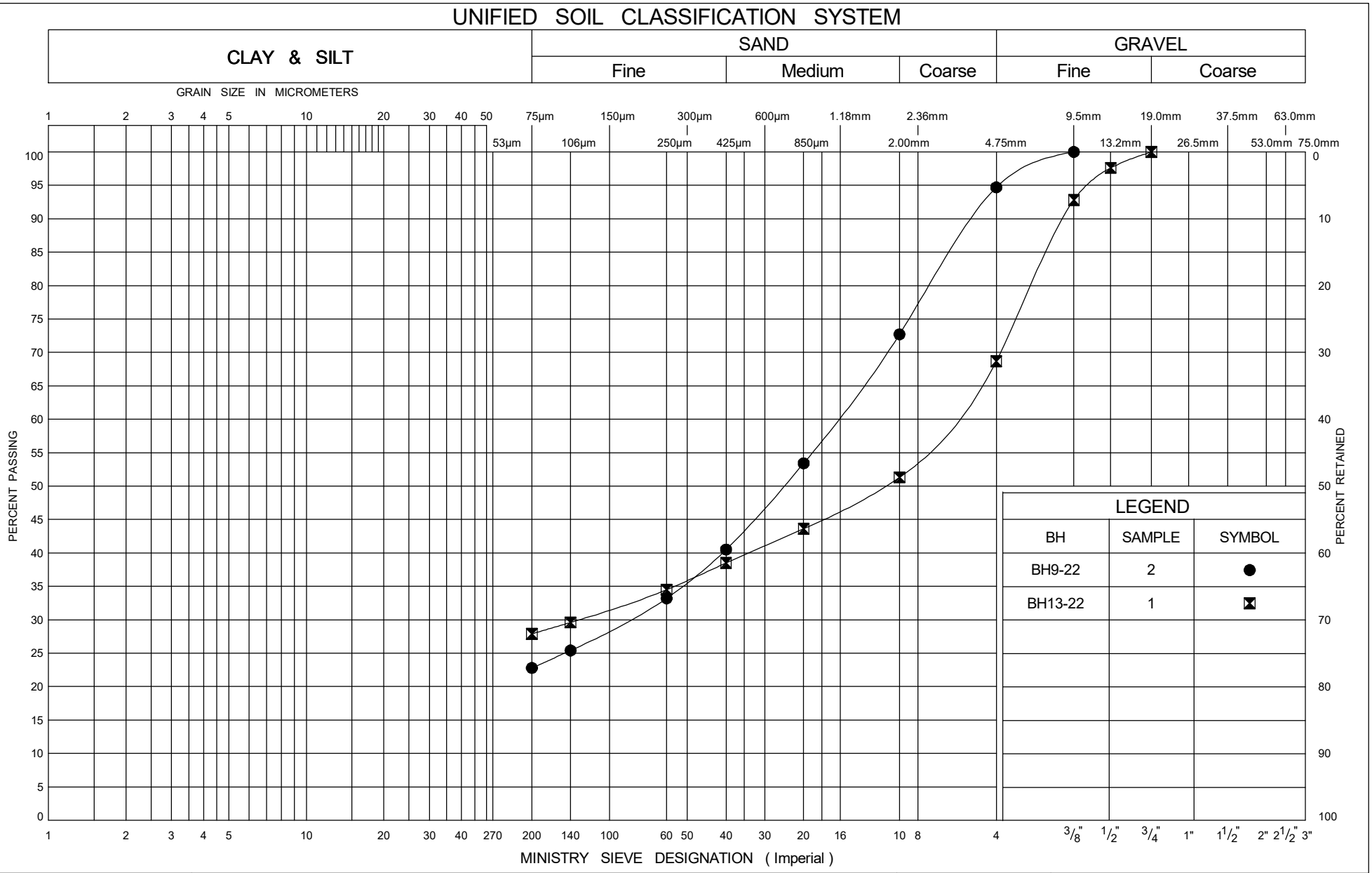
Ontario

GRAIN SIZE DISTRIBUTION

Silty Sand (Interlayer)

Figure:	D-6
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052



ONTARIO MOT GRAIN SIZE (TITLE) 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23

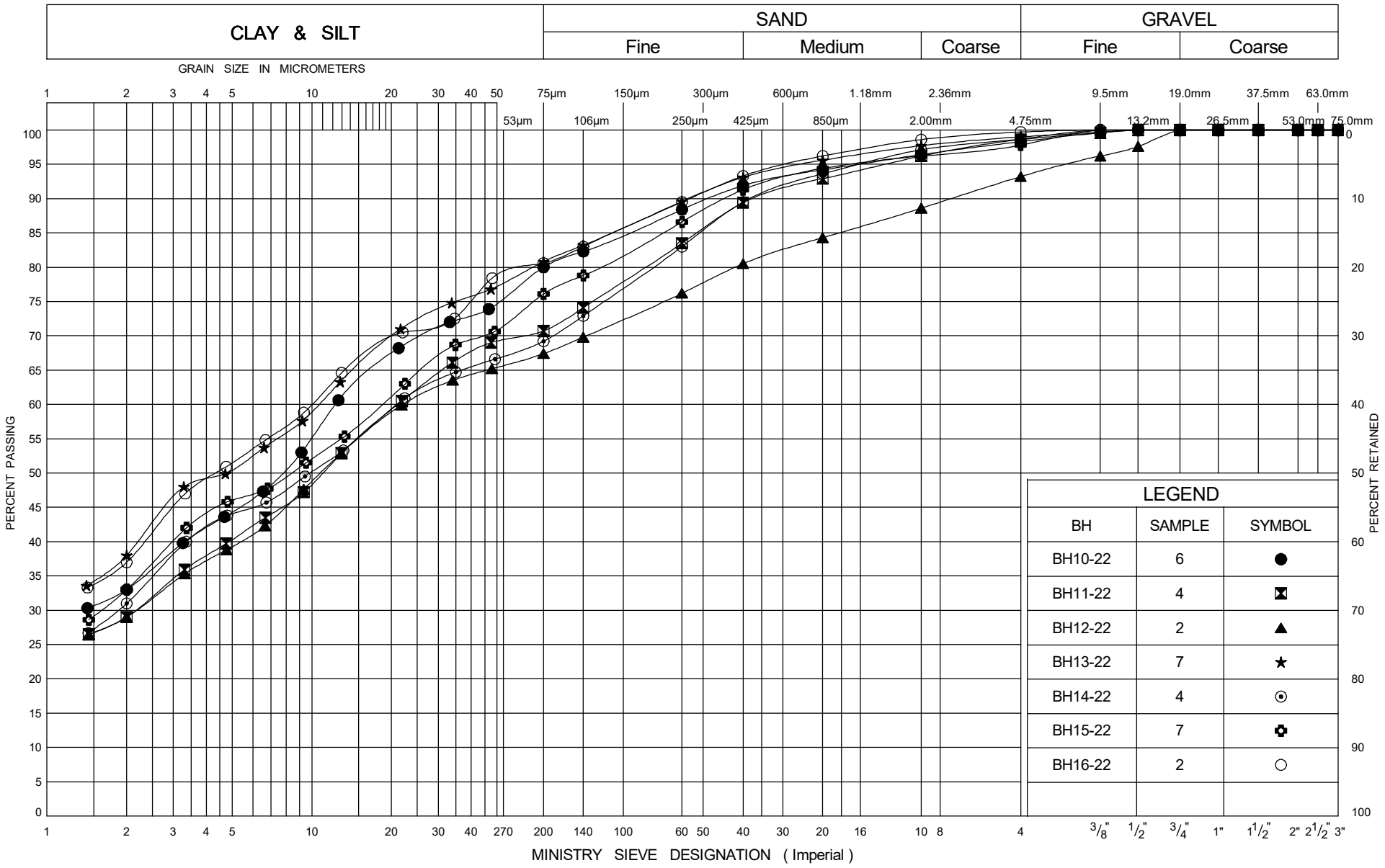
Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION

Fill - Sand, Gravelly Sand

Figure:	D-7
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052

UNIFIED SOIL CLASSIFICATION SYSTEM



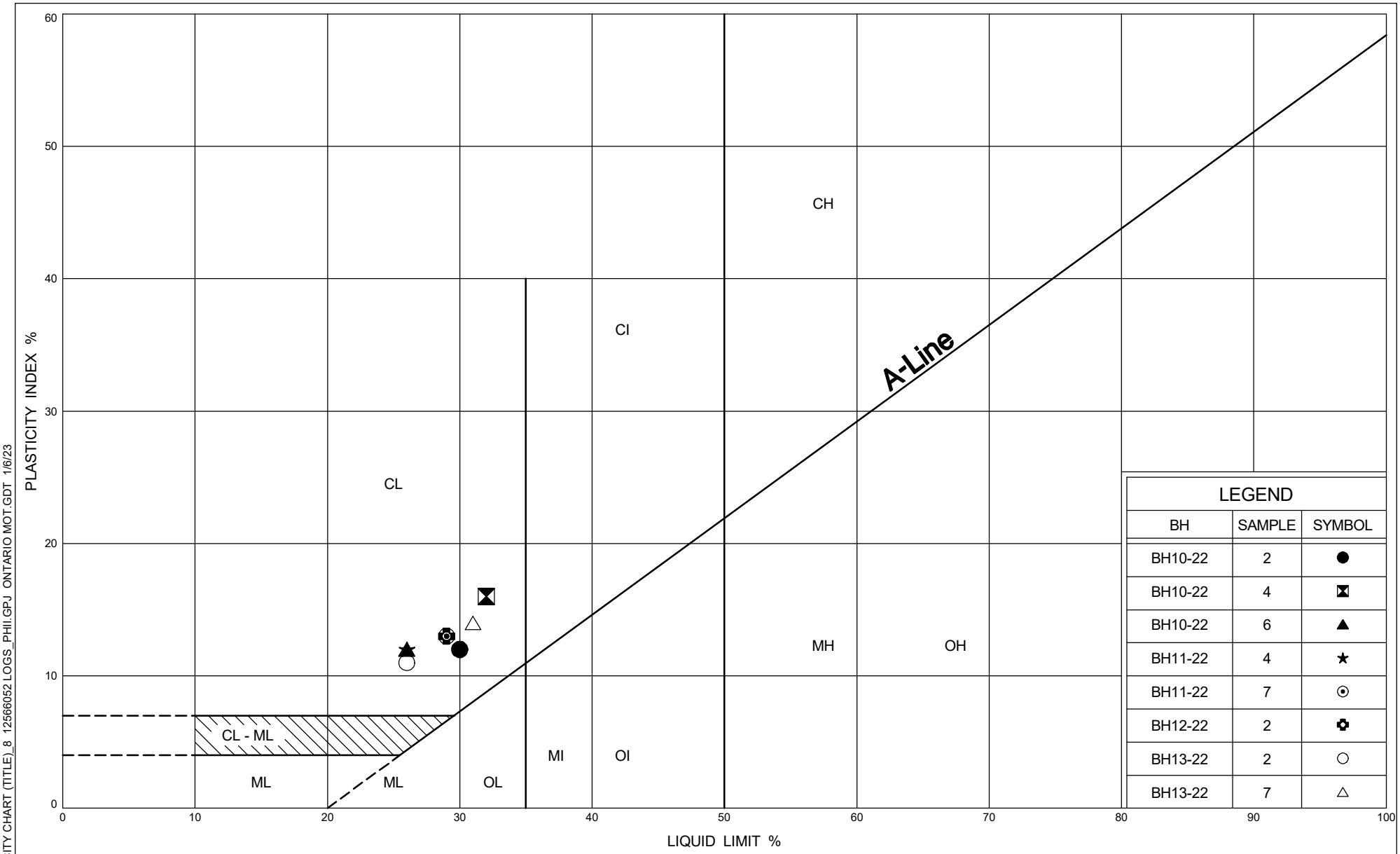
Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION

Fill - Clayey Silt to Sandy Clayey Silt

Figure:	D-8
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052

ONTARIO MOT GRAIN SIZE (TITLE) 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23



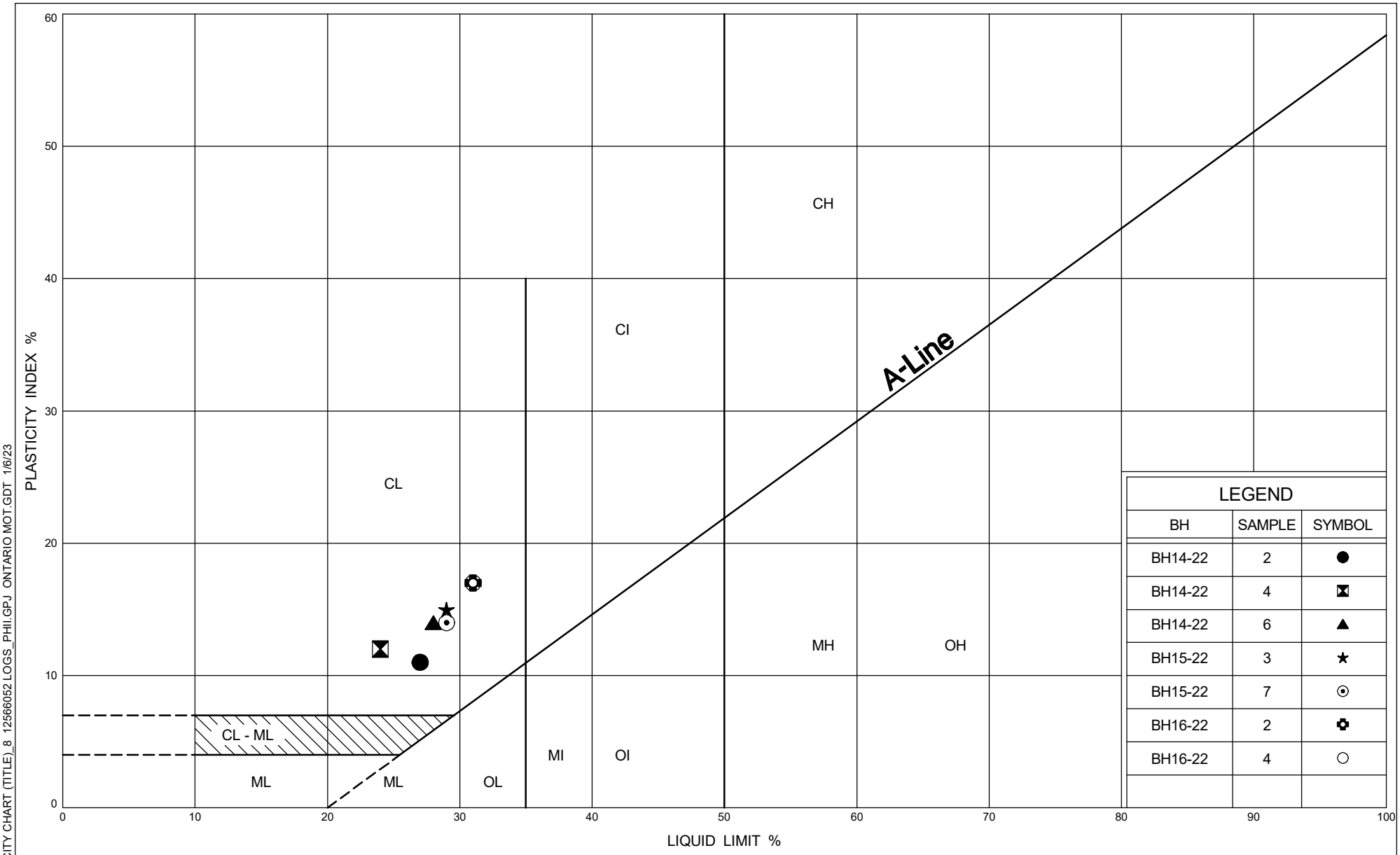
ONTARIO MOT PLASTICITY CHART (TITLE)_8 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23

Ministry of Transportation
Ontario

PLASTICITY CHART

Fill - Clayey Silt to Sandy Clayey Silt

Figure:	D-9A
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052



ONTARIO MOT PLASTICITY CHART (TITLE)_8 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23

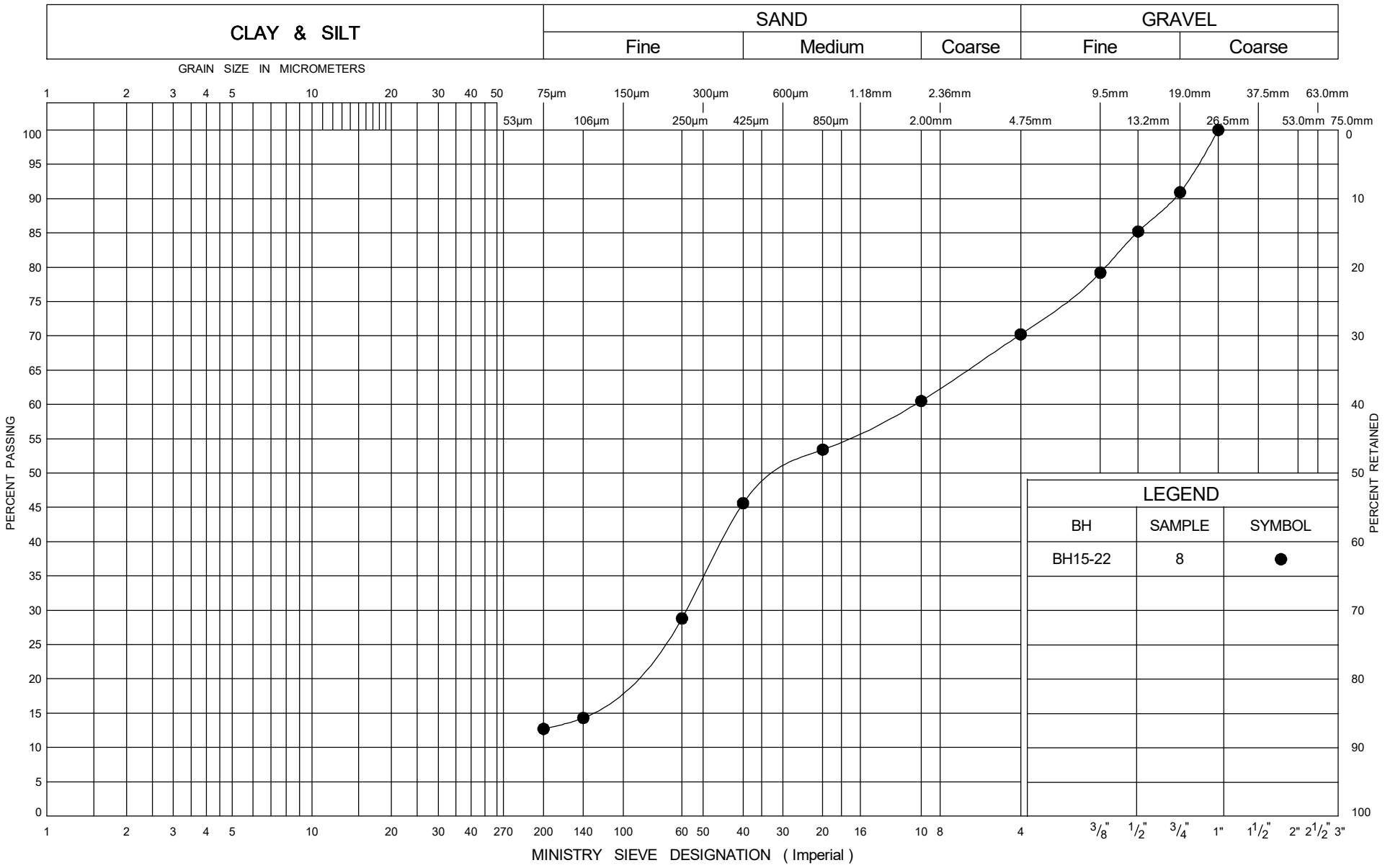
Ministry of Transportation
Ontario

PLASTICITY CHART

Fill - Clayey Silt to Sandy Clayey Silt

Figure:	D-9B
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052

UNIFIED SOIL CLASSIFICATION SYSTEM



ONTARIO MOT GRAIN SIZE (TITLE) 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23

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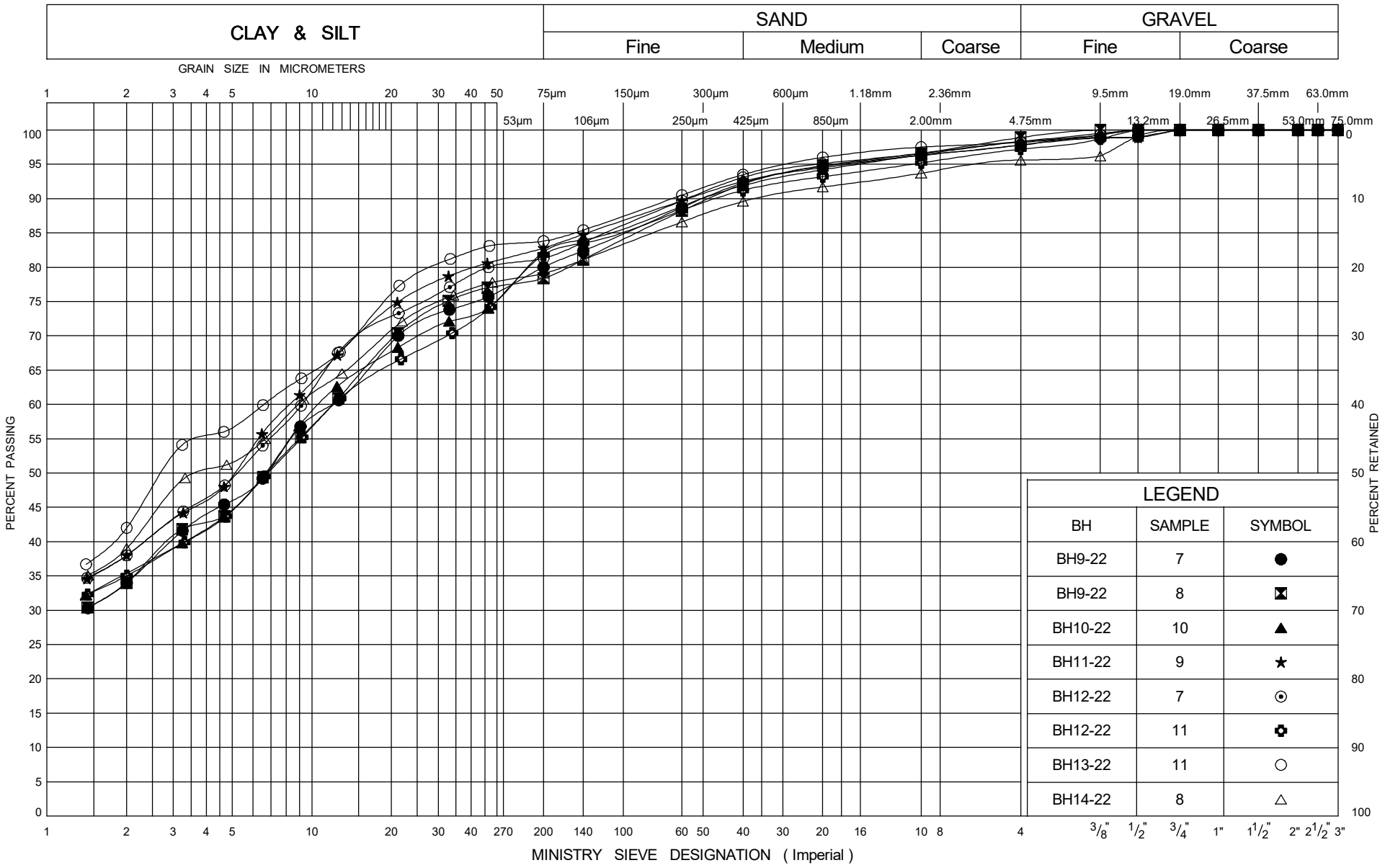
GRAIN SIZE DISTRIBUTION

Fill - Gravelly Sand

Figure:	D-10
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052

UNIFIED SOIL CLASSIFICATION SYSTEM



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GRAIN SIZE DISTRIBUTION

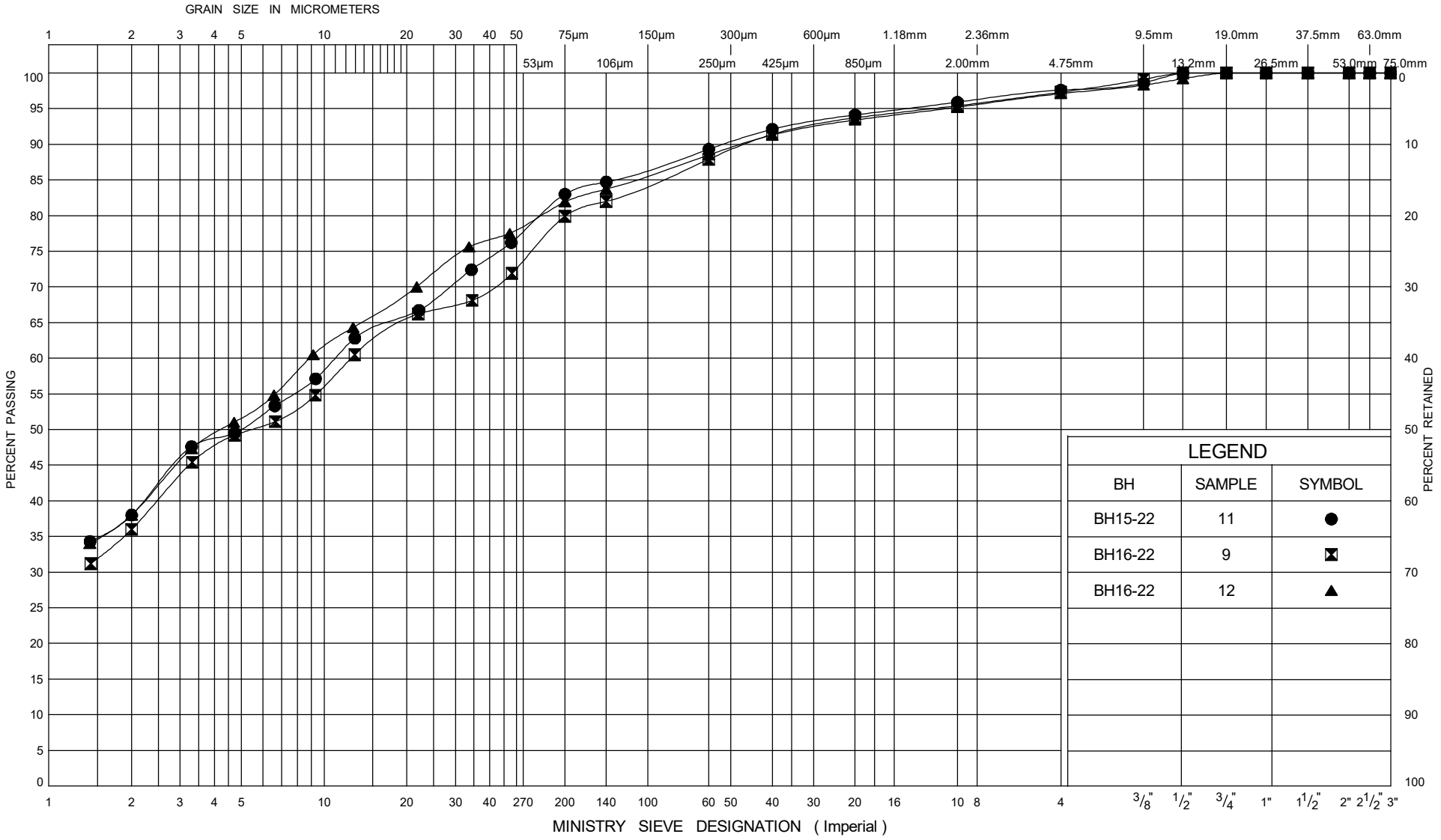
Clayey Silt

Figure:	D-11A
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052

ONTARIO MOT GRAIN SIZE (TITLE) 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY & SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



LEGEND		
BH	SAMPLE	SYMBOL
BH15-22	11	●
BH16-22	9	⊠
BH16-22	12	▲

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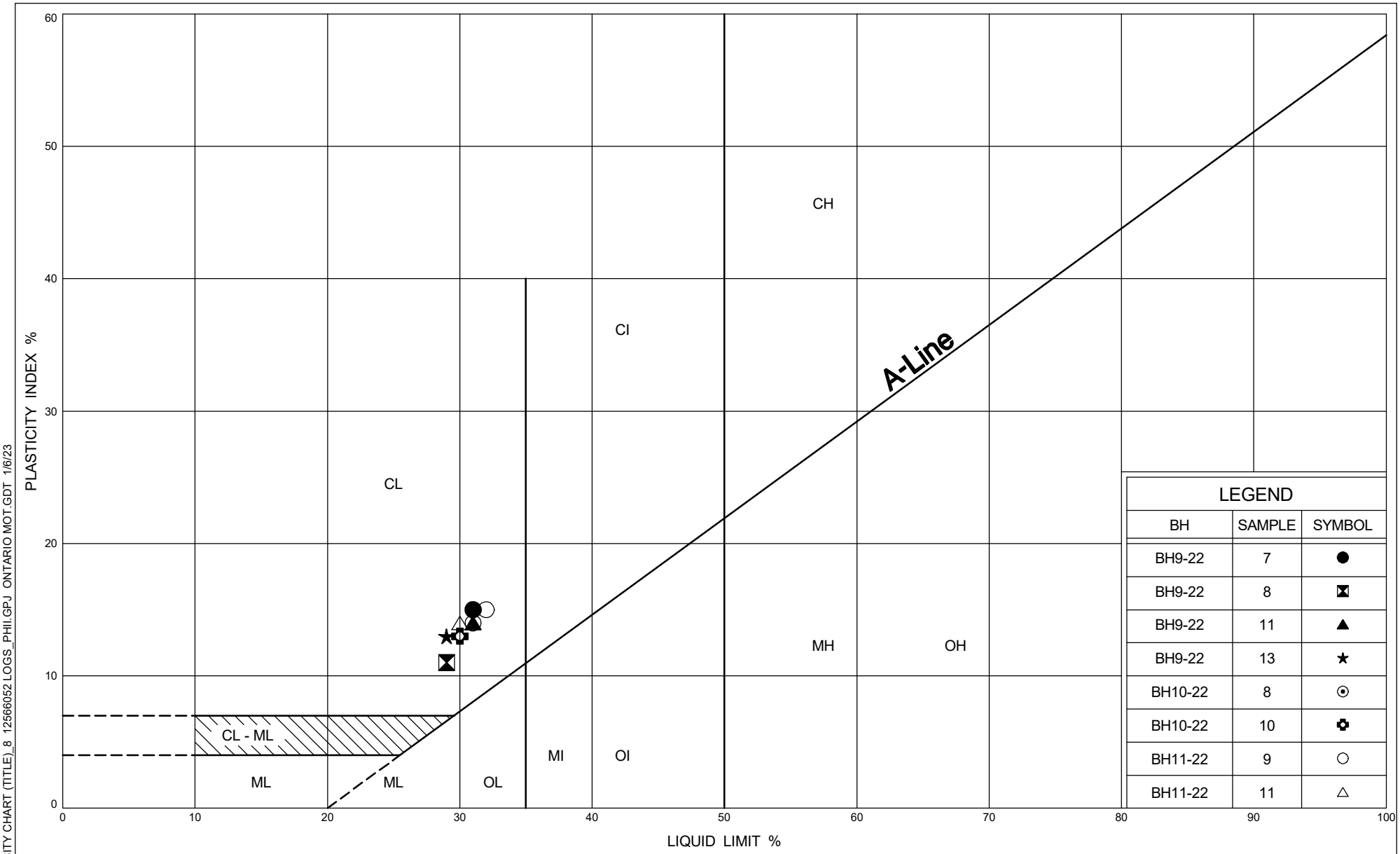
Ontario

GRAIN SIZE DISTRIBUTION

Clayey Silt

Figure:	D-11B
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052

ONTARIO MOT GRAIN SIZE (TITLE) 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23



ONTARIO MOT PLASTICITY CHART (TITLE)_8 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23

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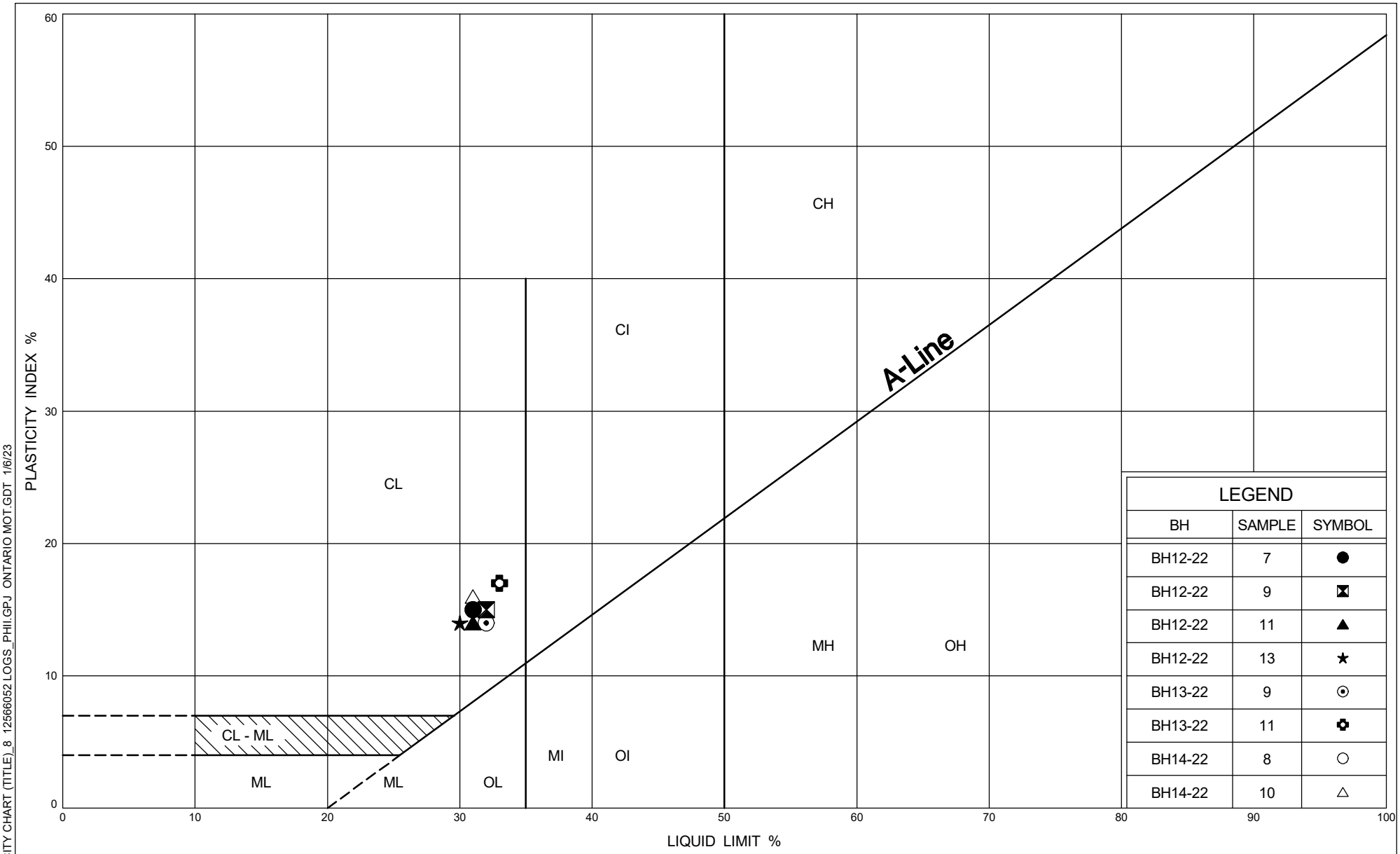
PLASTICITY CHART

Clayey Silt

Figure:	D-12A
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052



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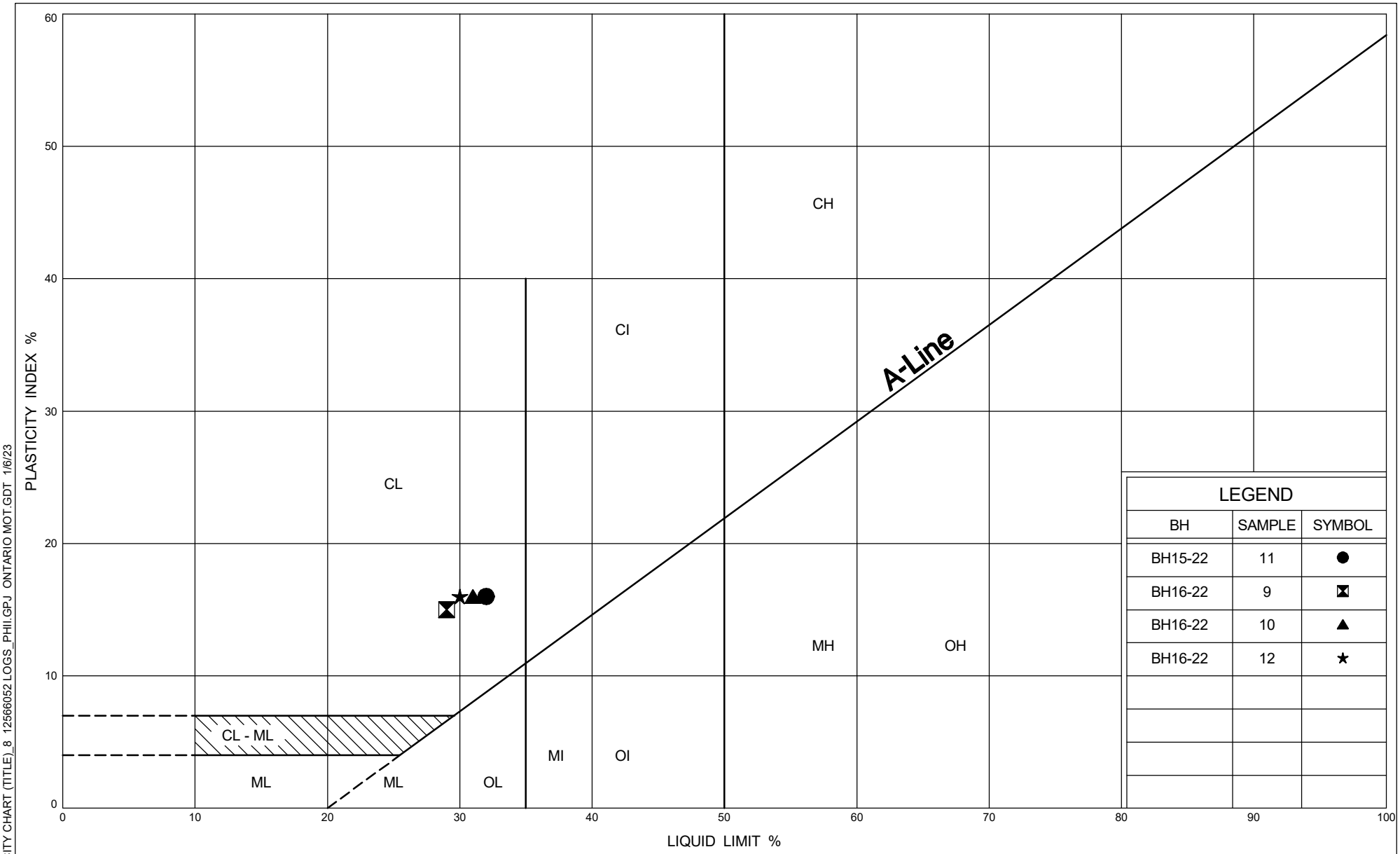
PLASTICITY CHART

Clayey Silt

Figure:	D-12B
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052

ONTARIO MOT PLASTICITY CHART (TITLE)_8 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23



ONTARIO MOT PLASTICITY CHART (TITLE)_8 12566052 LOGS_PHII.GPJ ONTARIO MOT.GDT 1/6/23

Ministry of Transportation
Ontario

PLASTICITY CHART

Clayey Silt

Figure:	D-12C
Project Name:	Highway 402/40 Bridge Rehabilitation
G.W.P. No.:	3105-18-00
GHD Project No.:	12566052