

FOUNDATION INVESTIGATION
AND DESIGN REPORT

PROPOSED TRUCK WIDENING LANE
THROUGH SWAMP AREA
HIGHWAY 26 FROM
FORMER ST. VINCENT/SYDENHAM
TOWNLINeline TO MEAFORD

G.W.P. 167-91-00
Agreement # 3006-E-0002



I.E.
Group

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May 17, 2010
07-6-IEG1-SWAMP

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TABLE OF CONTENTS

PART A – FOUNDATION INVESTIGATION	1
1.0 INTRODUCTION	1
2.0 SITE DESCRIPTION	1
2.1 Site Location.....	1
2.2 Physiography and Topography	2
3.0 INVESTIGATION PROCEDURES.....	3
3.1 Field Investigation	3
3.2 Laboratory Analysis	6
4.0 SUBSURFACE CONDITIONS	7
4.1 General Subsurface Conditions	7
4.2 Profiles A to D, Stations 11+750 to 11+825	8
4.2.1 Pavement, Fill, Topsoil & Peat.....	9
4.2.2 Sand.....	10
4.2.3 Clayey Silt to Silty Clay Till.....	10
4.2.4 Sand and Silt Till	11
4.3 Profiles E to L, Stations 11+850 to 12+000	12
4.3.1 Pavement, Fill, Topsoil & Peat.....	12
4.3.2 Sand to Sand and Gravel.....	14
4.3.3 Sandy Clayey Silt Till.....	14
4.3.4 Silty Clay	15
4.3.5 Sand and Silt Till	15
4.4 Profiles M to Q, Stations 12+025 to 12+100.....	17
4.4.1 Pavement, Fill, Topsoil & Peat.....	17
4.4.2 Clayey Silt to Silty Clay Till.....	19
4.5 Profiles R to T, Stations 12+125 to 12+175	20
4.5.1 Pavement, Fill and Topsoil	21
4.5.2 Clayey Silt Till.....	21
4.5.3 Sand and Silt Till	22
4.6 Profiles U to X, Stations 12+200 to 12+275	23
4.6.1 Fill Pavement and Topsoil	23
4.6.2 Clayey Silt to Silty Clay Till.....	24
4.7 Groundwater Conditions.....	25
PART B – FOUNDATION DESIGN.....	30
5.0 DISCUSSION AND RECOMMENDATIONS.....	30
5.1 General.....	30
5.2 Historical and Site Data.....	31
5.3 Design Considerations.....	32
5.3.1 Excavation on Widening and Replacement by Stable Fill.....	33
5.3.2 Full or Partial Reconstruction	34
5.3.3 Preloading	36
5.4 Embankment Widening	39

5.5	Excavation, Groundwater Control and Temporary Shoring.....	40
5.6	Frost Protection.....	42
6.0	STATEMENT OF LIMITATION	43

Drawings & Appendices

Drawings 1-9 Borehole Locations and Soil Strata

Appendix A Explanation of Terms Used in Report
Record of Borehole Sheets Boreholes SW-01 to 66

Appendix B Laboratory Test Results

Grain Size Distribution Figures	Atterberg Limits Figures
A1	A2
B1, B3	B2, B4
C1, C3	C2, C4
D1, D3, D5	D2, D4, D6
E1, E3	E2
F1, F3, F5, F7, F9	F2, F4, F6, F8
G1, G3	G2
H1, H2, H4	H3, H5
J1, J3	J2
K1, K2, K3, K5, K7	K4, K6
L1, L3, L5, L7	L2, L4, L6, L8
M1, M2, M4	M3, M5
N1, N3, N4	N2, N5
P1, P2	P3
Q1, Q2, Q4	Q3, Q5
R1, R3, R5, R7	R2, R4, R6, R8
S1, S3	S2, S4
T1, T3, T5	T2, T4, T6
U1, U3, U 4, U5	U2, U6
V1, V2	V3
W1, W2	W3
X1, X2	X3

Appendix C Limitations of Report

Appendix D Site Photographs

PART A – FOUNDATION INVESTIGATION

1.0 INTRODUCTION

This report presents the results of a foundation investigation carried out in July and August 2007 by Infrastructure Engineering Group Inc. (IEG) on behalf of Stantec Consulting Ltd. (Stantec).

This assignment involves the rehabilitation of the pavement structure on Highway 26 from 0.3 km west of the former St. Vincent/Sydenham Townline to 0.8 m west of the Town of Meaford west limit.

It includes the replacement/extension of a single existing structural culvert, as well as many non-structural culvert extensions and replacements. The project also includes intersection realignments, intersection improvements, construction of a new truck climbing lane, minor horizontal and vertical alignment improvements and electrical work.

Foundation investigation and recommendations are required for the design and construction of culvert replacements and extension as part of the improvement of Highway 26. A single structural culvert, nineteen (19) non-structural culverts, a swamp area, two high fill areas and a deep cut area are to be investigated. This report covers the site of the truck climbing lane through the swamp area, between approximately Station 11+841 to 12+279. The actual swamp area was located between Stations 11+750 and 12+275, based on visual observation of the ground features and vegetation.

The purpose of the investigation was to obtain information about the subsurface conditions at the site by means of boreholes and, based on the findings, to provide geotechnical recommendations for the proposed road widening for the truck climbing lane through the swamp area.

Authorization to complete this assignment was given by Mr. Dan Green, P. Eng., of Stantec Consulting Ltd., the TPM Consultant who is completing this assignment for MTO under Agreement # 3006-E-0002.

2.0 SITE DESCRIPTION

2.1 Site Location

The swamp area is located between Stations 11+750 and 12+275, approximately 1.45 and 1.98 km east of the west limit of this Contract (Station 10+300). The west limit of this Contract is located 0.3 km east of the former St. Vincent/Sydenham Township Boundary (Station 10+000). Photographs of this site are presented in Appendix D. The existing road platform consists of a two lane highway built on an approximate 1.0 m to 3.8 m high embankment. The Preliminary Design Report indicates addition of a truck climbing lane between Stations 11+255 and 14+980, with pavement and embankment widening on both sides of Highway 26.

The existing embankment slopes are typically 2.5H:1V to 3H:1V and are grass covered. No signs of embankment slope instability were observed at the time of this foundation investigation.

The groundwater condition was monitored during and upon completion of sampling.

2.2 Physiography and Topography

Physiography for the area includes from west to east, part of a limestone plain, a till plain and a clay plain. Drumlins occur throughout the region, but were not observed in the project corridor. The underlying bedrock geology is dominated by Silurian sandstone, shale, dolostone and siltstone for one-third of the project area. The remainder of the project area has Ordovician shale, limestone, dolostone and siltstone.

Overall, the physiographic regions include, from west to east, the Bruce Peninsula (i.e., part of the Niagara Escarpment with shallower soils, more irregular rock types, and more water bodies as compared to further south) and the northern tip of the Bighead Valley (i.e., an indentation in the Niagara Escarpment that only touches the east end of the project corridor).

For most of this region, soils are brunisols and podzols (i.e. brown forest soils and grey-brown podzols) that have formed on calcareous till. The pH is neutral to alkaline. Slopes tend to be moderate.

Only two of the Niagara Escarpment Plan zoning designations, Escarpment Natural and Escarpment Rural Area, are located within the project limits within a relatively short section adjacent to the highway right-of-way (ROW). This section of the ROW includes the area where the westbound truck climbing lane is proposed.

The project limit also encroaches onto the plains forest of the Bayview Escarpment Area of Natural and Scientific Interest (ANSI) which was expanded in 1998 to include sections of land adjacent to the north side of Highway 26 (i.e. approximately 1 km of ROW in total), located 1 km east of the Sydenham/St. Vincent Township Line, and falls within the area of the westbound truck Climbing Lane. Much of this area has been disturbed and it is possible that the ANSI boundary extends to the highway simply to act as a buffer to the more sensitive ANSI features that are located further north.

The asphalt pavement surface is between Elevations 332.80 m and 336.72 m while the ground surface at the base of the embankment and in the ditch area is between Elevations 331.07 and 336.05 m, with embankment heights of between 0.20 m and 3.86 m.

3.0 INVESTIGATION PROCEDURES

3.1 Field Investigation

Between August 1 and 26, 2007, a truck and a Diedrich track mounted drill rig and a CME 55 truck mounted drill rig were supplied by London Soil Test Limited and used on site for drilling and Standard Penetration Testing (SPT, following the procedures of ASTM D 1586). Additional testholes were put down by a track mounted Diedrich D-50 drill rig and hand drilling tools were supplied by Walker Drilling between July 6 and 9, 2009. A total of eighty-six (86) boreholes were drilled and sampled to obtain data for foundation design of the proposed rehabilitation work and potential culvert replacement. The locations of the boreholes are shown on Drawing 1.

The numbering system was originally established as groups of three (3) boreholes to establish twenty-two (22) profiles between Stations 11+750 and 12+275, at 25 m intervals. The groups of boreholes were laid out from the south pavement (eastbound), the north pavement (westbound), and the north ditch, with a preceding "SW-" to identify boreholes put down in the swamp section. Borehole SW-01, 02 and 03 were put down at Station 11+750 and Boreholes SW-64, 65, 66 were put down at Station 12+275. Borehole SW-31A, along with Boreholes SW-31, 32 and 33 were put down at the location of Culvert C5B which will also be included in the foundation report for the replacement/extension of non-structural culverts report. Nineteen (19) additional boreholes or dynamic cones were put down between Stations 11+800 and 12+275 and identified as SW-07A to SW-64A in the proximity of the south ditch line to provide additional geotechnical data. The chainages and depths of sampling of these boreholes are presented in the following table:

BOREHOLE	CHAINAGE (STATION)	PROFILE	GROUND SURFACE ELEVATION (m)	BOREHOLE DEPTH (m)
SW-01	11+750 Rt Pavement	A-A'	336.78	4.88
SW-02	11+750 Lt Pavement	A-A'	336.76	4.88
SW-03	11+750 Lt Ditch	A-A'	335.72	3.35
SW-04	11+775 Rt Pavement	B-B'	336.27	6.55
SW-05	11+775 Lt Pavement	B-B'	336.26	4.88
SW-06	11+775 Lt Ditch	B-B'	332.92	3.35
SW-07	11+800 Rt Pavement	C-C'	335.74	7.01
SW-07A	11+800 Rt Ditch	C-C'	332.34	4.72
SW-08	11+800 Lt Pavement	C-C'	335.76	7.32
SW-09	11+800 Lt Ditch	C-C'	331.06	3.20
SW-10	11+825 Rt Pavement	D-D'	335.24	7.77
SW-10A	11+825 Rt Ditch	D-D'	331.46	4.72
SW-11	11+825 Lt Pavement	D-D'	335.23	7.77
SW-12	11+825 Lt Ditch	D-D'	331.12	4.27

BOREHOLE	CHAINAGE (STATION)	PROFILE	GROUND SURFACE ELEVATION (m)	BOREHOLE DEPTH (m)
SW-13	11+850 Rt Pavement	E-E'	334.83	7.16
SW-13A	11+850 Rt Ditch	E-E'	331.40	4.57
SW-14	11+850 Lt Pavement	E-E'	334.80	7.01
SW-15	11+850 Lt Ditch	E-E'	331.07	2.74
SW-16	11+875 Rt Pavement	F-F'	334.47	7.32
SW-16A	11+875 Rt Ditch	F-F'	331.25	4.27
SW-17	11+875 Lt Pavement	F-F'	334.44	7.32
SW-18	11+875 Lt Ditch	F-F'	331.12	3.51
SW-19	11+900 Rt Ditch	G-G'	334.14	6.55
SW-19A	11+900 Rt Pavement	G-G'	331.21	3.51
SW-20	11+900 Lt Pavement	G-G'	334.12	6.55
SW-21	11+900 Lt Ditch	G-G'	331.17	3.51
SW-22	11+925 Rt Pavement	H-H'	333.80	6.55
SW-22A	11+925 Rt Ditch	H-H'	331.30	4.72
SW-23	11+925 Lt Pavement	H-H'	333.84	6.55
SW-24	11+925 Lt Ditch	H-H'	331.23	3.51
SW-25	11+950 Rt Pavement	J-J'	333.57	6.55
SW-25A	11+950 Rt Ditch	J-J'	331.36	3.95
SW-26	11+950 Lt Pavement	J-J'	333.57	5.79
SW-27	11+950 Lt Ditch	J-J'	331.18	4.27
SW-28	11+975 Rt Pavement	K-K'	333.28	7.32
SW-28A	11+975 Rt Ditch	K-K'	331.34	4.88
SW-29	11+975 Lt Pavement	K-K'	333.29	6.55
SW-30	11+975 Lt Ditch	K-K'	331.25	5.03
SW-31	12+000 Rt Pavement	L-L'	333.03	7.32
SW-31A	12+000 Rt Ditch	L-L'	331.35	3.05
SW-32	12+000 Lt Pavement	L-L'	333.07	7.01
SW-33	12+000 Lt Ditch	L-L'	331.17	4.27
SW-34	12+025 Rt Pavement	M-M'	332.88	6.25
SW-34A	12+025 Rt Ditch	M-M'	331.33	3.89
SW-35	12+025 Lt Pavement	M-M'	332.89	6.40
SW-36	12+025 Lt Ditch	M-M'	331.17	3.20
SW-37	12+050 Rt Pavement	N-N'	332.83	6.02
SW-37A	12+050 Rt Ditch	N-N'	331.30	4.11
SW-38	12+050 Lt Pavement	N-N'	332.81	6.71
SW-39	12+050 Lt Ditch	N-N'	331.23	3.05

BOREHOLE	CHAINAGE (STATION)	PROFILE	GROUND SURFACE ELEVATION (m)	BOREHOLE DEPTH (m)
SW-40	12+075 Rt Pavement	P-P'	332.78	6.10
SW-40A	12+075 Rt Ditch	P-P'	331.38	4.57
SW-41	12+075 Lt Pavement	P-P'	332.79	5.94
SW-42	12+075 Lt Ditch	P-P'	331.07	4.27
SW-43	12+100 Rt Pavement	Q-Q'	332.94	5.03
SW-43A	12+100 Rt Ditch	Q-Q'	331.94	4.27
SW-44	12+100 Lt Pavement	Q-Q'	332.97	4.27
SW-45	12+100 Lt Ditch	Q-Q'	331.84	3.51
SW-46	12+125 Rt Pavement	R-R'	333.04	4.27
SW-46A	12+125 Rt Ditch	R-R'	332.15	4.27
SW-47	12+125 Lt Pavement	R-R'	333.03	4.27
SW-48	12+125 Lt Ditch	R-R'	332.62	3.51
SW-49	12+150 Rt Pavement	S-S'	333.12	4.27
SW-49A	12+150 Rt Ditch	S-S'	332.37	4.19
SW-50	12+150 Lt Pavement	S-S'	333.13	4.27
SW-51	12+150 Lt Ditch	S-S'	332.44	3.51
SW-52	12+175 Rt Pavement	T-T'	333.22	3.20
SW-52A	12+175 Rt Ditch	T-T'	332.33	4.27
SW-53	12+175 Lt Pavement	T-T'	333.22	3.81
SW-54	12+175 Lt Ditch	T-T'	332.03	3.51
SW-55	12+200 Rt Pavement	U-U'	333.27	5.18
SW-55A	12+200 Rt Ditch	U-U'	332.24	3.96
SW-56	12+200 Lt Pavement	U-U'	333.30	4.27
SW-57	12+200 Lt Ditch	U-U'	331.75	3.20
SW-58	12+225 Rt Pavement	V-V'	333.39	4.11
SW-58A	12+225 Rt Ditch	V-V'	332.34	3.96
SW-59	12+225 Lt Pavement	V-V'	333.41	4.27
SW-60	12+225 Lt Ditch	V-V'	331.90	3.51
SW-61	12+250 Rt Pavement	W-W'	333.53	3.20
SW-61A	12+250 Rt Ditch	W-W'	332.35	3.05
SW-62	12+250 Lt Pavement	W-W'	333.57	4.11
SW-63	12+250 Lt Ditch	W-W'	332.37	2.90
SW-64	12+275 Rt Pavement	X-X'	333.63	4.11
SW-64A	12+275 Rt Ditch	X-X'	332.70	3.20
SW-65	12+275 Lt Pavement	X-X'	333.65	4.27
SW-66	12+275 Lt Ditch	X-X'	332.52	2.44

The boreholes put down using a drill rig were drilled using continuous flight solid or hollow stem augers. Soil samples were retrieved at selected intervals throughout the depths of the boreholes in conjunction with Standard Penetration Tests (SPT). Samples were generally taken at intervals of depth of 0.75 m to the maximum depth of exploration. The hand drilled boreholes were put down using a modified 31.75 kg (70 lb.) hand operated hammer block.

Field pocket penetrometer testing was conducted on the retrieved SPT samples, where applicable, to determine the undrained shear strength of the cohesive soil deposits. It is noted that the measured shear strength value would be slightly lower than the actual value due to sampling disturbance. Field vane tests were also carried out in accordance with ASTM 2573 in the near surface peat layers.

Seepage and water levels were noted in each borehole during and at the completion of drilling and sampling. All boreholes were grouted with a bentonite/cement mix at completion of sampling in accordance with Ontario Regulation 903.

Our field engineer, Mr. Ralph Billings, P. Eng., supervised the fieldwork and worked under the direction of the project engineer, Mr. Eric Chung, P. Eng. Our field staff cleared the location of buried utilities and logged the boreholes. The soil samples obtained were placed in labeled containers and transported to IEG's London laboratory for further examination and laboratory testing.

The stations, offsets and ground surface elevations at the borehole locations were surveyed by Stantec or its sub-consultant AGM and provided to IEG for the purpose of this report.

The results of the drilling, sampling, in-situ testing and groundwater observations are summarized on the Record of Borehole sheets and enclosed in Appendix A.

3.2 Laboratory Analysis

Geotechnical laboratory testing consisted of natural moisture content determinations and visual classifications of all retrieved soil samples. In addition, grain size analyses, Atterberg Limit tests and unit weight tests were performed on selected samples.

The results of the laboratory testing are presented on the Record of Borehole sheets and Laboratory Test Results (Appendix A).

4.0 SUBSURFACE CONDITIONS

4.1 General Subsurface Conditions

Reference is made to the Record of Borehole sheets and Laboratory Test Results (Appendix A) for detailed subsurface soil and groundwater conditions encountered in the boreholes. The stratigraphic boundaries shown on the Record of Borehole sheets are inferred from non-continuous sampling and, consequently, represent transitions between soil types rather than exact planes of geological change. The soil profiles depicting the subsurface conditions on Drawings 2 to 9 will vary between and beyond the borehole locations. The Record of Borehole sheets and Laboratory Test Results in Appendix A are grouped for each profile for ease of reviewing and interpretation.

In general, the boreholes put down at the locations of the existing pavement consist of 150 mm to 230 mm of asphalt underlain by 130 mm to 920 mm of granular fill. The granular fill could be silty at times and underlain locally by a 0.15 m to 4.35 m thick layer of mixed fill. A 150 mm to 260 mm thick layer of buried asphalt is encountered in most of the pavement boreholes, underlain by a 300 mm to 920 mm thick layer of granular fill and/or 0.61 m to 2.6 m of mixed fill. The buried asphalt and the underlying granular to mixed fill are underlain by a 0.15 m to 1.68 m of buried topsoil, peat or marl.

The ground surface of the boreholes put down near the existing ditches is covered with a 50 mm to 300 mm thick layer of topsoil, a 0.76 m to 3.05 m thick layer of peat, and/or a 0.15 m to 1.07 m thick layer of mixed fill.

The pavement structure, topsoil, peat, fill, buried pavement structure and underlying fill are in turn underlain by a major deposit of clayey silt to silty clay till, or sand and silt till extending beyond the vertical limit of most of the boreholes. Bedrock was encountered near the bottom of Boreholes SW-31, 34, 35, 38, 40 and 58 as evidenced by the auger cuttings. The boreholes were terminated on cobbles, boulders, clayey silt to silty clay till, sand and silt till or bedrock. The following is a summary of the soil profiles, chainages, Record of Borehole sheets, and laboratory test results:

Station	Drawing	Profile	Record of Borehole Sheets	Laboratory Reports, Figures	
				Grain Size Distribution	Atterberg Limits
11+750	2	A-A'	SW-01, 02 and 03	A1	A2
11+775		B-B'	SW-04, 05 and 06	B1, B3	B2, B4
11+800		C-C'	SW-07A, 07, 08 and 09	C1, C3, C5	C2, C4, C6
11+825	3	D-D'	SW-10A, 10, 11 and 12	D1, D3	D2, D4
11+850		E-E'	SW-13A, 13, 14 and 15	E1, E3	E2
11+875	4	F-F'	SW-16A, 16, 17 and 18	F1, F3, F5, F7, F9	F2, F4, F6, F8, F10
11+900		G-G'	SW-19A, 19, 20 and 21	G1, G3	G2
11+925		H-H'	SW-22A, 22, 23 and 24	H1, H2, H4	H3, H5

Station	Drawing	Profile	Record of Borehole Sheets	Laboratory Reports, Figures	
				Grain Size Distribution	Atterberg Limits
11+950	5	J-J'	SW-25A, 25, 26 and 27	J1, J3	J2
11+975		K-K'	SW-28A, 28, 29 and 30	K1, K2, K3, K5, K7	K4, K6
12+000		L-L'	SW-31A, 31, 32 and 33	L1, L3, L5, L7	L2, L4, L6, L8
12+025	6	M-M'	SW-34A, 34, 35 and 36	M1, M2, M4, M6	M3, M5, M7
12+050		N-N'	SW-37, 37A, 38 and 39	N1, N3, N4	N2, N5
12+075		P-P'	SW-40A, 40, 41 and 42	P1, P2	P3
12+100	7	Q-Q'	SW-43A, 43, 44 and 45	Q1, Q2, Q4, Q6	Q3, Q5, Q7
12+125		R-R'	SW-46A, 46, 47 and 48	R1, R3, R5, R7	R2, R4, R6, R8
12+150		S-S'	SW-49A, 49, 50 and 51	S1, S3	S2, S4
12+175	8	T-T'	SW-52A, 52, 53 and 54	T1, T3, T5	T2, T4, T6
12+200		U-U'	SW-55A, 55, 56 and 57	U1, U3, U4, U5	U2, U6
12+225		V-V'	SW-58A, 58, 59 and 60	V1, V2	V3
12+250	9	W-W'	SW-61A, 61, 62 and 63	W1, W2	W3
12+275		X-X'	SW-64A, 64, 65 and 66	X1, X2	X3

For the purpose of detailed stratigraphic descriptions, the swamp alignment was separated into the following 4 sections based on transition between the major underlying soil types:

Section	Chainage	Profiles	Boreholes	Major Underlying Soil Type
4.2	11+750 to 11+825	A to D	SW-01 to 12	Clayey Silt to Silty Clay Till
4.3	11+850 to 12+000	E to L	SW-13 to 33	Sand & Silt Till
4.4	12+025 to 12+100	M to Q	SW-34 to 45	Clayey Silt to Silty Clay Till
4.5	12+125 to 12+175	R to T	SW-46 to 54	Sand & Silt Till
4.6	12+200 to 12+275	U to X	SW-55 to 66	Silty Clay Till with localized Clayey Silt Till

4.2 Profiles A to D, Stations 11+750 to 11+825

Boreholes SW-01 to 12 were put down from the west limit of the Swamp Section between Stations 11+750 to 11+825.

Boreholes SW-07A, and 10A were put down south of the existing south ditch of Highway 26. Boreholes SW-01, 04, 07 and 10 were put down on the south side of the existing pavement of Highway 26. Boreholes SW-02, 05, 08 and 11 were put down on the north side of the existing pavement of Highway 26. Boreholes SW-03, 06, 09 and 12 were put down north of the existing north ditch of Highway 26.

The following is a detailed description of the soil stratigraphy encountered in the boreholes.

4.2.1 Pavement, Fill, Topsoil & Peat

Boreholes SW-01, 02, 04, 05, 07, 08, 10 and 11 put down on the existing pavement encountered a 150 mm to 230 mm thick layer of asphalt underlain by a 180 mm to 920 mm thick layer of granular fill. The pavement components in Boreholes SW-01, 02, 04 and 05 are underlain by a 150 mm thick layer of buried asphalt. Although buried asphalt was not encountered in the soil samples of Boreholes SW-07, 08, 10 and 11, it could be present between the sampling intervals.

The asphalt, granular fill and buried asphalt layers are underlain by a 0.61 m to 2.44 m thick layer of mixed fill consisting of gravel, sand, silt and clay. Granular fill was not evident beneath the buried asphalt along this stretch of Highway 26, and could have been contaminated with silt and clay lumps making it difficult for the purpose of soil classification.

Boreholes SW-03 and 06, put down at or near the north ditch of Highway 26 encountered a 50 mm to 300 mm thick layer of organic topsoil.

The ground surface of Borehole SW-09, put down near the north ditch of Highway 26, is covered with a 1.07 m thick layer of mixed fill consisting of gravel, sand, silt, clay and organics.

Boreholes SW-07A, 10A and 12, put down near the north and south ditches of Highway 26, penetrated a 0.91 m, 0.76 m and 1.68 m thick layer of peat, with bottom Elevations of 331.43, 330.70 and 329.44 m. The peat is considered fully decomposed in Boreholes SW-07A and 10A and is partially to fully decomposed in Borehole 12.

Organic content determinations were carried out on four (4) samples which yielded the following results:

Borehole	Sample	Depth, m	Organic Content, %	Peat Organic Content, %	Soil Organic Content, %
SW07	5	3.81	7.2		7.2
SW10	6	4.57	16.3	16.3	
SW11	7	4.57	19.9	19.9	
SW12	1	0.76	33.4	33.4	
			Minimum	16.3	7.2
			Maximum	33.4	7.2
			Average	23.86	7.20

Two (2) field vane results carried out within the near surface peat layer measured shear strengths of 28.5 and 29 kPa, with sensitivities of 1.8 and 2.9, respectively.

The organic contents and field vane results, along with a visual and tactile examination of the soil samples indicate that the peat is classified as amorphous to fibrous.

Eight (8) grain size distribution analyses were carried out on the embankment fill and organics, and the results are shown on Figures B1, C1 and D1 of Appendix A.

Atterberg limits determinations were carried out on five (5) samples. The results are shown in Figures B2, C 2 and D2 of Appendix A and summarized in the following table:

	Minimum	Maximum	Average
Liquid Limit (W_L)	18	34	24.0
Plastic Limit (W_P)	14	26	17.8
Plasticity Index (I_P)	3	8	6.2

Unit weight of the fill was not determined due to the disturbance of the soil samples during sampling and sample retrieval.

Standard penetration tests yielded “N”-values generally from 2 to over 100 blows per 0.3 m. This fill and organic soil is brown, dark brown to grey in colour and the measured natural moisture contents range from 6 to 95%.

Based on the above field and laboratory test results, together with a visual and tactile examination, the fill and organic materials exhibited a loose to very dense compactness condition.

4.2.2 Sand

The fill in Borehole SW-09 is underlain by a 1.37 m thick layer of sand. The sand material has a grey colour, with moisture contents of 14 and 24%.

Standard penetration tests yielded “N”-values of 8 and 9 blows per 0.3 m.

Unit weight of the sand layer was not determined due to the disturbance of the soil samples during sampling and sample retrieval.

Based on the above field and laboratory test results, together with a visual and tactile examination, the sand layer exhibited a loose compactness condition.

4.2.3 Clayey Silt to Silty Clay Till

The pavement, buried pavement, fill and organic soil layers are underlain by a major stratum of brown to reddish brown clayey silt to silty clay till, with embedded sand and gravel. With the exception of Borehole SW-12, the clayey silt to silty clay till extends to or beyond the vertical limit of the boreholes at a maximum depth of 3.2 m and 7.77 m below the existing ground surface, between Elevations 331.06 m and 336.78 m. The clayey silt to silty clay till in Borehole SW-12 is 1.22 m thick and with a bottom Elevation of 328.22 m.

Eighteen (18) grain size analyses were performed on the clayey silt to silty clay till deposit and the results are presented on Figures A1, B3, C3 and D3 of Appendix A. The deposit contained predominantly clayey silt to silty clay with embedded sand and gravel, with sandy to gravelly layers.

Atterberg limits determinations were carried out on seventeen (17) samples of the clayey silt and silty clay layers. The results are shown in Figures A2, B4, C4 and D4 of Appendix A and summarized below:

	Minimum	Maximum	Average
Liquid Limit (W_L)	17	36	20.6
Plastic Limit (W_P)	12	19	13.9
Plasticity Index (I_P)	4	17	6.6

Unit weight determination carried out on the clayey silt to silty clay till yielded results of between 21.1 to 22.1 kN/m³.

The natural moisture contents were in the range of 7 to 27%. These results are characteristic of clayey silt to silty clay soils of low plasticity (CL-ML to CL) with localized silty clay layers of intermediate plasticity (CI) layers.

Standard penetration tests yielded “N”-values from 7 to over 100 blows per 0.3 m. Generally, the clayey silt to silty clay deposit has a stiff to very hard consistency with localized near surface firm zones.

4.2.4 Sand and Silt Till

The clayey silt to silty clay till in Borehole SW-12 is underlain by a reddish brown sand and silt till with embedded gravel. Large gravel pieces are present within the sand and silt till.

Two (2) grain size analyses were performed on the sand and silt till deposit and the results are presented on Figures D4 of Appendix A. The deposit contained predominantly sand and silt with embedded gravel and gravelly layers.

Atterberg limits determinations were carried out on two (2) samples of the sand and silt till. The results are shown in Figure D5 of Appendix A and summarized below:

	Minimum	Maximum	Average
Liquid Limit (W_L)	15	17	16.0
Plastic Limit (W_P)	14	14	14.0
Plasticity Index (I_P)	1	3	2.0

Unit weight of this layer was not determined due to the disturbance of the soil samples during sampling and sample retrieval.

The natural moisture contents were in the range of 8 to 10%. These results are characteristic of sand and silt soils (SM-ML) with very low plasticity.

Standard penetration tests yielded “N”-values of 39 and over 100 blows per 0.3 m, indicating a dense to very dense compactness condition.

4.3 Profiles E to L, Stations 11+850 to 12+000

Boreholes SW-13 to 33 were put down between Stations 11+850 and 12+000 of the swamp alignment.

Boreholes SW-13A, 16A, 19A, 22A, 25A, 28A and 31A were put down south of the existing south ditch of Highway 26. Boreholes SW-13, 16, 19, 22, 25, 28 and 31 were put down on the south side of the existing pavement of Highway 26. Boreholes SW-14, 17, 20, 23, 26, 29 and 32 were put down on the north side of the existing pavement of Highway 26. Boreholes SW-15, 18, 21, 24, 27, 30 and 33 were put down near or north of the existing north ditch of Highway 26.

4.3.1 Pavement, Fill, Topsoil & Peat

Boreholes SW-13, 14, 16, 17, 19, 20, 22, 23, 25, 26, 28, 29, 31 and 32 put down on the existing pavement encountered a 150 mm to 200 mm thick layer of asphalt underlain by a 130 mm to 760 mm thick layer of granular fill. The pavement components in Boreholes SW-13, 14, 19, 20, 22, 23, 25, 26, 31 and 32 are underlain by a 0.52 m and 3.20 m thick layer of mixed fill. The granular components of Boreholes SW-16, 17, 28 and 29, and the mixed fill layer of Boreholes SW-19, 20, 22, 23, 25, 26, 31 and 32 are underlain by a 150 mm thick layer of buried asphalt.

Although buried asphalt was not encountered in the soil samples of Boreholes SW-13 and 14, it could be present between the sampling intervals. The buried asphalt layers are underlain by a 0.48 m to 2.60 m thick lower layer of mixed fill consisting of gravel, sand, silt and clay. Granular fill was not evident beneath the buried asphalt along this stretch of Highway 26, and could have been contaminated with silt and clay lumps making it difficult for the purpose of soil classification.

Boreholes SW-18, 21, 24, 27 and 30 put down at or near the north ditch of Highway 26 encountered a 150 mm to 300 mm thick layer of organic topsoil.

The ground surface of Borehole SW-15, put down near the north ditch of Highway 26, is covered with a 0.76 m thick layer of topsoil fill consisting of mixed silty clay, sand and organics.

Boreholes SW-13A, 16A, 19A, 22A, 25A, 28A and 31A put down near the south ditch of Highway 26, penetrated a 0.76 m to 3.05 m thick layer of peat. The upper and lower mixed fill layers of all of the pavement boreholes in this section are underlain by a 0.15 to 1.52 m thick layer of buried marl, peat or topsoil.

The organic soil layers range from topsoil, marl, fully to partially decomposed peat, with intermittent layers of organic silt, and sand to sand and gravel, with bottom Elevations of between 328.12 and 331.13 m.

Organic content determinations were carried out on eight (8) samples which yielded the following results:

Borehole	Sample	Depth, m	Organic Content, %	Peat Organic Content, %	Soil Organic Content, %
SW13	5	3.81	19.5	19.5	
SW20	4	3.05	26.8	26.8	
SW23	3	2.29	4.9		4.9
SW28	3	2.29	11.3		11.3
SW31A	2	0.61	45.9	45.9	
SW31	4	3.05	60.1	60.1	
SW32	5	3.81	23.5	23.5	
SW33	3	1.22	15.9	15.9	
			Minimum	15.9	4.9
			Maximum	60.1	11.3
			Average	33.46	8.08

Field vane results carried out on the peat measured shear strengths of between 12 kPa and 65 kPa, with sensitivities of between 1.0 and 8.6.

A single unit weight carried out on the peat material yielded a result of 13.4 kN/m³.

The organic contents and field vane results, along with a visual and tactile examination of the soil samples indicate that the peat is classified as amorphous-granular to fibrous.

Twenty-one (21) grain size distribution analyses of the embankment fill were performed and the results are shown on Figures E1, F1, G1, H1, J1, K1 and L1 of Appendix A.

Atterberg limits determinations were carried out on twelve (12) samples of the sand and silt till. The results are shown in Figures E2, F2, G2, H2, J2, K2 and L2 of Appendix A and summarized below:

	Minimum	Maximum	Average
Liquid Limit (W_L)	19	55	26.8
Plastic Limit (W_P)	15	31	19.3
Plasticity Index (I_p)	2	24	7.5

Two (2) unit weights carried out on the fill layer yielded results of 20.5 and 22.4 kN/m³.

Standard penetration tests yielded “N”-values ranging from 0 to over 100 blows per 0.3 m. This fill and organic soil is brown, dark brown to grey in colour and the measured natural moisture contents range from 5 to 658%.

Based on the above field and laboratory test results, together and tactile examination, the fill exhibited a loose to very dense compactness condition and the organic layers exhibited a very soft to very stiff consistency.

4.3.2 Sand to Sand and Gravel

The peat in Borehole SW-16A is underlain by a 0.76 m thick layer of sand and gravel with some silt. The sand material has a brown colour, with a single moisture content of 9%.

A single standard penetration test yielded a single “N”-value of 15 blows per 0.3 m.

Unit weight of this layer was not determined due to the disturbance of the soil samples during sampling and sample retrieval.

A single grain size distribution analysis was carried out on the sand and gravel layer and the results are presented on Figure F3 of Appendix A. These results are characteristic of sand and gravel soils (SM-GM) with very low plasticity.

Based on the above field and laboratory test results, together with a visual and tactile examination, the sand layer exhibited a compact compactness condition.

4.3.3 Sandy Clayey Silt Till

The sand layer in Borehole SW-16A is underlain by a 0.61 m thick layer of reddish brown sandy clayey silt till with embedded sand and gravel, and a single moisture content of 12%.

A single standard penetration test yielded a single “N”-value of 55 blows per 0.3 m.

A single grain size distribution analysis was carried out on the sandy clayey silt till layer and the results are presented on Figure F7 of Appendix A.

A single Atterberg limits determination yielded a liquid limit, plastic limit and plasticity index of 18%, 12% and 6%, respectively. These results are characteristic of sandy clayey silt with low plasticity (CL-ML).

Unit weight of this layer was not determined due to the disturbance of the soil samples during sampling and sample retrieval.

Based on the above field and laboratory test results, together with a visual and tactile examination, the sandy clayey silt layer exhibited a hard consistency.

4.3.4 Silty Clay

The peat layer in Boreholes SW-31A, 31 and 32 is underlain by a 0.31 to 0.46 m thick layer of silty clay. The silty clay has a grey colour. The silty clay layer in Borehole SW-31A is considered sandy and till-like.

Standard penetration tests yielded “N”-values of between 5 and 11 blows per 0.3 m.

Two (2) grain size analyses were performed on the silty clay layer and the results are presented on Figures L5 of Appendix A. The deposit contained predominantly silty clay with a trace of gravel and some sand to sandy.

Atterberg limits determinations were carried out on two (2) samples of the silty clay. The results are shown in Figure L6 of Appendix A and summarized below:

	Minimum	Maximum	Average
Liquid Limit (W_L)	27	43	35.0
Plastic Limit (W_P)	18	26	22.0
Plasticity Index (I_P)	9	17	13.0

The natural moisture contents were in the range of 13 to 34%. These results are characteristic of silty clay of low to intermediate plasticity (CL to CI).

Based on the above field and laboratory test results, together with visual and tactile examination, the silty clay exhibited firm to stiff consistency.

4.3.5 Sand and Silt Till

The organic, sand and gravel, clayey silt and silty clay layers are underlain by a major deposit of sand and silt till with embedded gravel. Frequent large diameter gravel pieces of up to 26.5 mm were observed in the soil samples indicating gravelly zones. Occasional to frequent cobbles were encountered within the sand and silt till. Occasional sand and gravel, sand, clayey silt, and silty clay seams, layers and pockets are also present within the sand and silt till.

Two (2) unit weight determinations carried out on the sand and silt till yielded results of 21.7 and 22.0 kN/m³.

Twenty-two (22) grain size analyses were performed on the sand and silt till deposit and the results are presented on Figures E2, F9, G3, H4, J3, K3 and L7 of Appendix A. The deposit contained predominantly sand and silt with embedded gravel and gravelly layers.

Atterberg limits determinations were carried out on six (5) samples of the sand and silt till. The results are shown in Figures H5 and K3 of Appendix A and summarized in the following table:

	Minimum	Maximum	Average
Liquid Limit (W_L)	13	26	18.8
Plastic Limit (W_P)	12	23	16.2
Plasticity Index (I_P)	0	4	2.6

The natural moisture contents were in the range of 7 to 38%. These results are characteristic of sand and silt till (SM-ML) with very low plasticity.

Standard penetration tests yielded “N”-values of 3 and over 100 blows per 0.3 m, indicating a very loose to very dense compactness condition.

A single grain size analysis was performed on the sand and gravel pockets or layers in Borehole SW-28A and the results are presented on Figure H4 of Appendix A. The deposit contains predominantly silty sand and gravel with some clay (SM-GM).

Two (2) grain size analyses were performed on the clayey silt till pockets or layers in Boreholes SW-32 and 33 and the results are presented on Figure L7 of Appendix A. These results indicate the pockets or layers contain predominantly clayey silt with some sand to sandy, and some gravel to gravelly.

Atterberg limits determinations were carried out on two (2) samples of the clayey silt pocket or layer within the sand and silt till. The results are shown in Figure L8 of Appendix A and summarized below:

	Minimum	Maximum	Average
Liquid Limit (W_L)	21	21	21.0
Plastic Limit (W_P)	15	15	15.0
Plasticity Index (I_P)	6	6	6.0

The natural moisture contents of the clayey silt were 10 and 16%. These results are characteristic of clayey silt soils with low plasticity (CL-ML). Standard penetration tests yielded “N”-values of 11 and 18 blows per 0.3 m, indicating a stiff to very stiff consistency.

Two (2) grain size analyses were performed on the silty clay pockets or layers in Boreholes SW-16 and 28A and the results are presented on Figures F5 and K4 of Appendix A. These results indicate the pockets or layers contain predominantly silty clay with some sand to sandy, and a trace of gravel.

Atterberg limits determinations were carried out on two (2) samples of the silty clay pocket or layer within the sand and silt till of Boreholes SW-32 and 33. The results are shown in Figures F6 and K5 of Appendix A and summarized in the following table:

	Minimum	Maximum	Average
Liquid Limit (W_L)	27	29	28.0
Plastic Limit (W_P)	16	17	16.5
Plasticity Index (I_P)	11	12	11.5

The natural moisture content of a single sample of the silty clay was 10%. These results are characteristic of silty clay soils with low plasticity (CL). Standard penetration tests yielded “N”-values of 3 and 32 blows per 0.3 m, indicating a stiff to very stiff consistency.

Borehole SW-31 was terminated after augering 0.36 m into shale bedrock as evidenced by the shale fragments from the auger cuttings.

The remaining boreholes in this section were terminated mostly due to auger and/or sampler refusal on presumed cobbles, boulders or bedrock, between Elevations 325.71 and 328.33 m.

4.4 Profiles M to Q, Stations 12+025 to 12+100

Boreholes SW-34 to 45 were put down between Stations 12+025 and 12+100 of the swamp alignment.

Boreholes SW-34A, 37A, 40A and 43A were put down south of the existing south ditch of Highway 26. Boreholes SW-34, 37, 40 and 43 were put down on the south side of the existing pavement of Highway 26. Boreholes SW-35, 38, 41 and 44 were put down on the north side of the existing pavement of Highway 26. Boreholes SW-36, 39, 42 and 45 were put down near or north of the existing north ditch of Highway 26.

4.4.1 Pavement, Fill, Topsoil & Peat

Boreholes SW-34, 35, 37, 38, 40, 41, 43 and 44 put down on the existing pavement encountered a 150 mm to 200 mm thick layer of asphalt underlain by a 180 mm to 920 mm thick layer of granular fill. The granular fill in Borehole SW-40 is underlain by a 0.58 m thick upper layer of mixed fill. The granular and upper mixed fill in all of the boreholes in this section are underlain by a 150 mm thick layer of buried asphalt. The buried asphalt in Boreholes SW-43 and 45 is underlain by a 300 to 310 mm thick layer of granular fill. The buried asphalt in Boreholes SW-34, 35, 37, 38 and 40 is underlain by a 0.92 m to 1.53 m thick lower layer of mixed fill consisting of gravel, sand, silt and clay. Granular fill was not evident beneath the buried asphalt in Boreholes SW-34, 35, 37, 38 and 40, and could have been contaminated with silt and clay lumps making it difficult for the purpose of soil classification.

Boreholes SW-43A and 45 put down north of the north ditch of Highway 26 encountered a 150 mm and 75 mm thick layer of organic topsoil, respectively.

Boreholes SW-34A, 36, 37A, 39, 40A and 42, put down near the north and south ditches of Highway 26, penetrated a 1.68 m to 2.74 m thick layer of peat. With the exception of Borehole SW-44, the upper and lower mixed fill layers of all of the pavement boreholes in this section is underlain by a 0.46 to 1.68 m thick layer of buried marl, peat or topsoil.

The organic soil layers ranges from topsoil, marl, fully to partially decomposed peat, with intermittent layers of organic silt, and sand to sand and gravel, and bottom Elevations of between 328.56 and 331.79 m.

Organic content determinations were carried out on eight (8) samples which yielded the following results:

Borehole	Sample	Depth, m	Organic Content, %	Peat Organic Content, %	Soil Organic Content, %
SW34	3	2.29	23.7	23.7	
SW35	3	2.29	7.8		7.8
SW36	4	1.83	22.3	22.3	
SW37	4	3.05	10.8		10.8
SW38	3	2.29	66.9	66.9	
SW40	3	2.29	39.6	39.6	
SW41	3	2.29	47.3	47.3	
SW42	6	3.81	6.5		6.5
			Minimum	22.3	6.5
			Maximum	66.9	10.8
			Average	41.29	8.47

Field vane results carried out on the peat measured shear strengths of between 11.5 kPa and 75 kPa, with sensitivities of between 1.3 and 4.6.

The organic contents and field vane results, along with a visual and tactile examination of the soil samples indicate that the peat is classified as amorphous-granular to fibrous.

Unit weight of the fill and organic layers were not determined due to the disturbance of the soil samples during sampling and sample retrieval.

Eight (8) grain size distribution analyses of the embankment fill are shown on Figures M1, M2, N1, N3, P1 and Q1 of Appendix A.

Atterberg limits determinations were carried out on three (3) samples of the fill and organic layers. The results are shown in Figures M3 and N2 of Appendix A and summarized below:

	Minimum	Maximum	Average
Liquid Limit (W_L)	25	43	31.3
Plastic Limit (W_P)	16	35	22.3
Plasticity Index (I_P)	8	10	9.0

Standard penetration tests yielded “N”-values generally from 1 to over 100 blows per 0.3 m. This fill and organic soil is brown, dark brown to grey in colour and the measured natural moisture contents range from 3 to 899%.

Based on the above field and laboratory test results, together with a visual and tactile examination, the fill and organic materials exhibited a very loose to very dense compactness condition.

4.4.2 Clayey Silt to Silty Clay Till

The pavement, buried pavement, fill and organic soil layers are underlain by a major deposit of brown to reddish brown clayey silt to silty clay till, with embedded sand and gravel. The upper 0.5 m of the silt to clay till in Boreholes SW-34 and 43A is organic stained.

Unit weight determinations carried out on the clayey silt to silty clay yielded results of 17.9 to 22.9 kN/m³. In general the unit weight varies from 20.7 kN/m³ to 22.9 kN/m³, with a single value of 17.9 kN/m³ reported for the organic stained clayey silt to silty clay in Borehole SW-43A at a depth of 0.76 m below the ground surface.

Twenty (20) grain size analyses were performed on the clayey silt to silty clay till deposit and the results are presented on Figures M4, N4, P2, and Q2 of Appendix A. The deposit contained predominantly clayey silt to silty clay with embedded sand and gravel, with sandy to gravelly, and sand to sand and gravel layers.

Atterberg limits determinations were carried out on twenty (20) samples of the clayey silt and silty clay till. The results are shown in Figures M5, N5, P3 and Q3 of Appendix A and summarized below:

	Minimum	Maximum	Average
Liquid Limit (W_L)	20	30	23.4
Plastic Limit (W_P)	12	19	15.8
Plasticity Index (I_P)	5	11	7.7

The natural moisture contents were in the range of 7 to 38%. These results are characteristic of clayey silt to silty clay soils of low plasticity (CL-ML to CL).

Standard penetration tests yielded “N”-values from 8 to over 100 blows per 0.3 m. Generally, the clayey silt to silty clay deposit has a stiff to very hard consistency with localized near surface firm zones.

Sample 5 (3.81 m depth) of Boreholes SW-34 and Sample 2 (0.76 m depth) of Borehole SW-43A were organic stained. Two grain size distribution analyses were carried out on these two samples and results are presented in Figure M4 and Q2. Atterberg limits determinations were also carried out on both samples which yielded liquid limits, plastic limits and plasticity indices of 35 and 23%, 26 and 15%, and 9 and 8%, respectively. Atterberg limits results are presented in Figures M5 and Q3. The results indicate that the organic stained material in Borehole SW-34 is highly organic (OL to OI), and is of low plasticity (CL) in Borehole SW-43A. Standard penetration tests yielded “N”-values of 13 and 17 blows per 0.3 m indicating a stiff to very stiff consistency.

Sand to sand and gravel pockets and layers are present within the clayey silt to silty clay till. Three grain size distribution analyses were carried out on the sand to sand and gravel materials, and test results are presented in Figure Q4. The grain size distribution analyses results confirmed that the sand to sand and gravel materials are generally silty, with a trace of to some clay.

Atterberg determinations carried out on the same samples yielded liquid limits of between 14 and 20%, plastic limits of between 14 and 23%, and plasticity indices of between 2 and 5. The Atterberg results, together with a visual and tactile examination of the soil samples indicate that the materials consist of silty to clayey sand, and silty to clayey sand and gravel (SM-SC to GM-GC).

Borehole SW-34, 35, 38 and 40 were terminated after augering between 0.30 and 1.07 m into shale bedrock as evidenced by the shale fragments from the auger cuttings.

The remaining boreholes in this section were terminated mostly due to auger and/or sampler refusal on presumed bedrock, between Elevations 326.10 to 328.70 m.

4.5 Profiles R to T, Stations 12+125 to 12+175

Boreholes SW-46 to 54 were put down between Stations 12+125 and 12+175 of the swamp alignment.

Boreholes SW-46A, 49A and 52A were put down south of the existing south ditch of Highway 26. Boreholes SW-46, 49 and 52 were put down on the south side of the existing pavement of Highway 26. Boreholes SW-47, 50 and 53 were put down on the north side of the existing pavement of Highway 26. Boreholes SW-48, 51 and 54 were put down near or north of the existing north ditch of Highway 26.

4.5.1 Pavement, Fill and Topsoil

Boreholes SW-46, 47, 49, 50, 52 and 53 put down on the existing pavement encountered a 150 mm to 230 mm thick layer of asphalt underlain by a 230 to 760 mm thick layer of granular fill. The granular fill in all of the boreholes in this section is underlain by a 150 mm thick layer of buried asphalt. The buried asphalt in Boreholes SW- 46, 49 and 52 (south side only) is underlain by a 460 mm to 760 mm thick layer of silty granular fill. Granular fill was not evident beneath the buried asphalt in Boreholes SW- 47, 50 and 53, and could have been contaminated with silt and clay lumps making it difficult for the purpose of soil classification.

Boreholes SW-48, 52A, and 54, put down at or near the north and south ditches of Highway 26 encountered a 75 mm to 200 mm thick layer of organic topsoil.

The ground surface of Borehole SW- 46A, 49A and 51, put down near the north and south ditches of Highway 26, is covered with a 0.15 m to 0.30 m thick layer of granular fill. The granular fill at the location of Borehole SW-49A contains organics.

A single grain size distribution analyses was conducted on a sample of the embankment fill, and the results are shown on Figure R1 of Appendix A.

Atterberg limits determinations were carried out on a single sample and yielded a liquid limit of 23%, a plastic limit of 18% and a plasticity index of 5%. The Atterberg limits test results are plotted on Figure R2.

Unit weight of the fill was not determined due to the disturbance of the soil samples during sampling and sample retrieval.

Standard penetration tests yielded “N”-values generally from 4 to over 100 blows per 0.3 m. This fill and organic soil is brown, dark brown to grey in colour and the measured natural moisture contents range from 3 to 20%.

Based on the above field and laboratory test results, together with visual and tactile examination, the fill and organic materials exhibited a loose to very dense compactness condition.

4.5.2 Clayey Silt Till

The fill layer in Borehole SW-46A is underlain by a 1.83 m thick layer of reddish brown sandy clayey silt till with embedded gravel, and a moisture contents of between 10 and 12%. The bottom of the sandy clayey silt layer was found at Elevation 330.02 m.

Unit weight determinations were not carried out on the clayey silt till layer.

Standard penetration tests yielded “N”-values of between 6 and 20 blows per 0.3 m.

A single grain size distribution analysis was carried out on the sandy clayey silt till layer and the results are presented on Figure R3 of Appendix A.

A single Atterberg limits determination yielded a liquid limit, plastic limit and plasticity index of 21%, 14% and 7%, respectively. These results are characteristic of sandy clayey silt with low plasticity (CL-ML).

Based on the above field and laboratory test results, together with visual and tactile examination, the sandy clayey silt layer exhibited a firm to hard consistency.

4.5.3 Sand and Silt Till

The topsoil, fill and buried asphalt is underlain by a major deposit of sand and silt till with embedded gravel. Frequent large diameter gravel pieces of up to 26.5 mm were observed in the soil samples indicating gravelly zones. Some of the sand and silt till is considered slightly plastic and considered clayey. Occasional to frequent cobbles were encountered within the sand and silt till. Occasional sand and gravel, sand, clayey silt, and silty clay seams, layers and pockets are also present within the sand and silt till.

Unit weight determinations carried out on the sand and silt till yielded results of between 20.5 to 24.6 kN/m³.

Twenty (20) grain size analyses were performed on the sand and silt till deposit and the results are presented on Figures R6, S3 and T1 of Appendix A. The deposit contained predominantly sand and silt with embedded gravel and gravelly layers.

Atterberg limits determinations were carried out on fourteen (14) samples of the sand and silt till. The results are shown in Figures R7, S4 and T1 of Appendix A and summarized below:

	Minimum	Maximum	Average
Liquid Limit (W_L)	13	21	17.9
Plastic Limit (W_P)	10	17	14.0
Plasticity Index (I_P)	1	7	3.9

The natural moisture contents were in the range of 2 to 17%. These results are characteristic of sand and silt till (SM-ML) with layers of low plasticity (CL-ML).

Standard penetration tests yielded “N”-values of between 8 and over 100 blows per 0.3 m.

These results together with a visual and tactile examination of the soil samples indicate that the sand and silt till is generally in a loose to very dense compactness condition.

Gravelly sand to gravel layers are present within the sand and silt till. Three (3) grain size distribution analyses were carried out on the soil samples and the results are presented in Figures

R7, S1 and T3. Three (3) Atterberg limits determinations were carried out on the gravelly sand to gravel layers and test results provided in Figures R8, S2 and T4 confirmed the low plasticity indices of less than 4%. The results indicate that the material is predominantly silty sand to sand and gravel with a trace of to some clay (SM-GM).

A silty clay pocket was encountered at a depth of 0.76 m in Borehole SW-54. A single grain size distribution analysis was carried out and the results are presented on Figure T5. Atterberg limits determinations were carried out on the same sample and yielded a liquid limit, a plastic limit and a plasticity index of 26%, 17% and 9%, respectively. These results indicate that the silty clay pocket is silty clay of low plasticity (CL).

All of the boreholes were terminated at depths of between 3.2 and 4.27 m, on either a sand and silt till, or auger and/or sampler refusal on cobbles, boulder or bedrock between Elevations 327.88 and 330.02 m.

4.6 Profiles U to X, Stations 12+200 to 12+275

Boreholes SW-55 to 66 were put down between Stations 12+200 and 12+275 of the swamp alignment.

Boreholes SW-55A, 58A, 61A and 64A were put down south of the existing south ditch of Highway 26. Boreholes SW-55, 58, 61 and 64 were put down on the south side of the existing pavement of Highway 26. Boreholes SW-56, 59, 62 and 65 were put down on the north side of the existing pavement of Highway 26. Boreholes SW-57, 60, 63 and 66 were put down near or north of the existing north ditch of Highway 26.

4.6.1 Fill Pavement and Topsoil

Boreholes SW-55, 56, 58, 59, 61, 62, 64 and 65 put down on the existing pavement encountered a 150 mm to 180 mm thick layer of asphalt underlain by a 360 to 610 mm thick layer of granular fill. The granular fill in all of the boreholes in this section is underlain by a 150 mm thick layer of buried asphalt. The buried asphalt in Boreholes SW-55, 61, 62, 64 and 65 is underlain by a 300 mm to 920 mm thick layer of silty granular fill. Granular fill was not evident beneath the buried asphalt in Boreholes SW-56, 58, and 59, and could have been contaminated with silt and clay lumps making it difficult for the purpose of soil classification. The buried asphalt in Borehole SW-58 is underlain by a 1.07 m thick layer of mixed fill consisting of gravel, sand, silt and clay.

Boreholes SW-57, 60, 61A, 63, 64A and 66, put down at or near the north and south ditches of Highway 26 encountered a 150 mm thick layer of organic topsoil.

Borehole SW-55A and 58A penetrated a 0.76 m and 0.91 m thick layer of topsoil fill, respectively.

Eight (8) grain size distribution analyses were carried out on the embankment fill and organics, and the results are shown on Figures U1, U3, V1 and W1 of Appendix A.

Atterberg limits determinations were carried out on a single sample and yielded a liquid limit of 53%, a plastic limit of 29%, and a plasticity index of 24%. The Atterberg limits test results are plotted on Figure U2, which indicate that the topsoil fill is an organic silt with high plasticity (OH).

Unit weight of the fill was not determined due to the disturbance of the soil samples during sampling and sample retrieval.

Standard penetration tests yielded “N”-values generally from 2 to over 100 blows per 0.3 m. This fill and organic soil is brown, dark brown to grey in colour and the measured natural moisture contents range from 5 to 49%.

Based on the above field and laboratory test results, together with visual and tactile examination, the fill and organic materials exhibited a loose to very dense compactness condition.

4.6.2 Clayey Silt to Silty Clay Till

The pavement, buried pavement, fill and organic soil layers are underlain by a major deposit of brown to reddish brown clayey silt to silty clay till, with embedded sand and gravel. The till material consists of mostly silty clay till from Station 12+229 and easterly (Borehole SW-58 easterly).

Twenty-eight (28) grain size analyses were performed on the clayey silt to silty clay till deposit and the results are presented on Figures U 3 and U4, V2, W 2 and X1 of Appendix A. The deposit contained predominantly clayey silt to silty clay with embedded sand and gravel, with sandy to gravelly layers.

Atterberg limits determinations were carried out on twenty-four (24) samples of the clayey silt and silty clay till. The results are shown in Figures U5, V3, W3 and X2 of Appendix A and summarized below:

	Minimum	Maximum	Average
Liquid Limit (W_L)	21	33	25.5
Plastic Limit (W_P)	13	18	16.4
Plasticity Index (I_P)	5	16	9.1

These results are characteristic of clayey silt to silty clay soils of low plasticity (CL-ML to CL). The natural moisture contents were in the range of 6 to 59%.

Standard penetration tests yielded “N”-values from 5 to over 100 blows per 0.3 m. Generally, the clayey silt to silty clay deposit has a stiff to very hard consistency with localized near surface firm zones.

Borehole SW-58 was terminated after augering 0.3 m into shale bedrock as evidenced by the shale fragments from the auger cuttings.

The remaining boreholes in this section were terminated mostly due to auger and/or sampler refusal on presumed bedrock, between Elevations 328.09 m and 330.33 m.

4.7 Groundwater Conditions

The groundwater condition was monitored during and upon completion of sampling. There was approximately 0.8 m of water running in the creek, located at STA 12+004 (Culvert 05B), at the time of our field work between August 20 and 27, 2007 (Summer). This recorded water level is considered to be of a dry season condition.

On completion of drilling, free groundwater was observed in the boreholes and is summarized below:

Borehole	Chainage (Station)	Ground Surface Elevation (m)	Groundwater Level (m)		Remarks
			Depth	Elevation	
SW-01	11+750 Rt Pavement	336.78			Borehole Dry and Open
SW-02	11+750 Lt Pavement	336.76			Borehole Dry and Open
SW-03	11+750 Lt Ditch	335.72			Borehole Dry and Open
SW-04	11+775 Rt Pavement	336.27			Borehole Dry and Open
SW-05	11+775 Lt Pavement	336.26			Borehole Dry and Open
SW-06	11+775 Lt Ditch	332.92			Borehole Dry and Open
SW-07	11+800 Rt Pavement	335.74			Borehole Dry and Open
SW-07A	11+800 Rt Ditch	332.34	0.91	331.43	
SW-08	11+800 Lt Pavement	335.76			Borehole Dry and Open
SW-09	11+800 Lt Ditch	331.06	0.60	330.46	

Borehole	Chainage (Station)	Ground Surface Elevation (m)	Groundwater Level (m)		Remarks
			Depth	Elevation	
SW-10	11+825 Rt Pavement	335.24	3.50	331.74	
SW-10A	11+825 Rt Ditch	331.46	0.00	331.46	
SW-11	11+825 Lt Pavement	335.23	5.20	330.03	
SW-12	11+825 Lt Ditch	331.12	1.70	329.42	
SW-13	11+850 Rt Pavement	334.83	4.90	329.93	
SW-13A	11+850 Rt Ditch	331.40	0.00	331.40	
SW-14	11+850 Lt Pavement	334.80	5.30	329.50	
SW-15	11+850 Lt Ditch	331.07	0.00	331.07	
SW-16	11+875 Rt Pavement	334.47	4.60	329.87	
SW-16A	11+875 Rt Ditch	331.25	0.00	331.25	
SW-17	11+875 Lt Pavement	334.44	4.40	330.04	
SW-18	11+875 Lt Ditch	331.12	1.50	329.62	
SW-19	11+900 Rt Ditch	334.14	4.15	329.99	
SW-19A	11+900 Rt Pavement	331.21	-0.15	331.36	Groundwater 0.15 m above ground surface
SW-20	11+900 Lt Pavement	334.12	3.80	330.32	
SW-21	11+900 Lt Ditch	331.17	0.75	330.42	
SW-22	11+925 Rt Pavement	333.80	3.80	330.00	
SW-22A	11+925 Rt Ditch	331.30	0.00	331.30	
SW-23	11+925 Lt Pavement	333.84	3.50	330.34	wet cave-in
SW-24	11+925 Lt Ditch	331.23	1.7	329.53	
SW-25	11+950 Rt Pavement	333.57	4.25	329.32	wet cave-in
SW-25A	11+950 Rt Ditch	331.36	0.00	331.36	
SW-26	11+950 Lt Pavement	333.57			Borehole Dry and Open
SW-27	11+950 Lt Ditch	331.18	1.80	329.38	wet cave-in
SW-28	11+975 Rt Pavement	333.28	3.75	329.53	

Borehole	Chainage (Station)	Ground Surface Elevation (m)	Groundwater Level (m)		Remarks
			Depth	Elevation	
SW-28A	11+975 Rt Ditch	331.34	0.00	331.34	
SW-29	11+975 Lt Pavement	333.29	3.35	329.94	
SW-30	11+975 Lt Ditch	331.25	1.05	330.20	
SW-31	12+000 Rt Pavement	333.03	2.50	330.53	
SW-31A	12+000 Rt Ditch	331.35	0.30	331.05	
SW-32	12+000 Lt Pavement	333.07	2.60	330.47	
SW-33	12+000 Lt Ditch	331.17	0.60	330.57	
SW-34	12+025 Rt Pavement	332.88	2.20	330.68	
SW-34A	12+025 Rt Ditch	331.33	0.00	331.33	
SW-35	12+025 Lt Pavement	332.89	2.60	330.29	
SW-36	12+025 Lt Ditch	331.17	0.00	331.17	
SW-37	12+050 Rt Pavement	332.83	2.29	330.54	
SW-37A	12+050 Rt Ditch	331.30	0.00	331.30	
SW-38	12+050 Lt Pavement	332.81	3.30	329.51	
SW-39	12+050 Lt Ditch	331.23	0.60	330.63	
SW-40	12+075 Rt Pavement	332.78	5.30	327.48	
SW-40A	12+075 Rt Ditch	331.38	0.00	331.38	
SW-41	12+075 Lt Pavement	332.79	5.60	327.19	
SW-42	12+075 Lt Ditch	331.07			Borehole Dry and Open
SW-43	12+100 Rt Pavement	332.94			Borehole Dry and Open
SW-43A	12+100 Rt Ditch	331.94			Borehole Dry and Open
SW-44	12+100 Lt Pavement	332.97			Borehole Dry and Open
SW-45	12+100 Lt Ditch	331.84			Borehole Dry and Open
SW-46	12+125 Rt Pavement	333.04	3.50	329.54	
SW-46A	12+125 Rt Ditch	332.15	0.46	331.69	

Borehole	Chainage (Station)	Ground Surface Elevation (m)	Groundwater Level (m)		Remarks
			Depth	Elevation	
SW-47	12+125 Lt Pavement	333.03			Borehole Dry and Open
SW-48	12+125 Lt Ditch	332.62			Borehole Dry and Open
SW-49	12+150 Rt Pavement	333.12			Borehole Dry and Open
SW-49A	12+150 Rt Ditch	332.37	0.10	332.27	
SW-50	12+150 Lt Pavement	333.13			Borehole Dry and Open
SW-51	12+150 Lt Ditch	332.44			Borehole Dry and Open
SW-52	12+175 Rt Pavement	333.22			Borehole Dry and Open
SW-52A	12+175 Rt Ditch	332.33	0.00	332.33	
SW-53	12+175 Lt Pavement	333.22			Borehole Dry and Open
SW-54	12+175 Lt Ditch	332.03			Borehole Dry and Open
SW-55	12+200 Rt Pavement	333.27			Borehole Dry and Open
SW-55A	12+200 Rt Ditch	332.24	0.00	332.24	
SW-56	12+200 Lt Pavement	333.30			Borehole Dry and Open
SW-57	12+200 Lt Ditch	331.75			Borehole Dry and Open
SW-58	12+225 Rt Pavement	333.39			Borehole Dry and Open
SW-58A	12+225 Rt Ditch	332.34	0.00	332.34	
SW-59	12+225 Lt Pavement	333.41			Borehole Dry and Open
SW-60	12+225 Lt Ditch	331.90			Borehole Dry and Open
SW-61	12+250 Rt Pavement	333.53			Borehole Dry and Open
SW-61A	12+250 Rt Ditch	332.35			Borehole Dry and Open

Borehole	Chainage (Station)	Ground Surface Elevation (m)	Groundwater Level (m)		Remarks
			Depth	Elevation	
SW-62	12+250 Lt Pavement	333.57			Borehole Dry and Open
SW-63	12+250 Lt Ditch	332.37			Borehole Dry and Open
SW-64	12+275 Rt Pavement	333.63			Borehole Dry and Open
SW-64A	12+275 Rt Ditch	332.70			Borehole Dry and Open
SW-65	12+275 Lt Pavement	333.65			Borehole Dry and Open
SW-66	12+275 Lt Ditch	332.52			Borehole Dry and Open

It should be noted that the groundwater level will fluctuate seasonally and in response to weather events. Under adverse conditions, water could be perched within the embankment fill. It is reasonable to assume that groundwater could be similar to the water level in the creek during high flow conditions.

PART B – FOUNDATION DESIGN

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 General

This section of the report provides our recommendations on the geotechnical aspects of foundation design of the proposed widening of the truck climbing lane within the swamp section between Stations 11+750 and 12+275. It should be noted that the interpretation and recommendations are intended for use only by the design engineer. Where comments are made on construction, they are provided only to highlight those aspects which could affect the design of the project. Those requiring information on aspects of construction should make their own interpretation of the factual information provided as it may affect equipment selection, proposed construction method and scheduling.

This report covers the site of the truck climbing lane through the swamp area, approximately between Stations 11+841 to 12+279. Actual swamp area was located between Stations 11+750 and 12+275, based on visual observation of the ground features and vegetation.

Photographs of this area are presented in Appendix D. The existing road platform consists of two 3.35 m driving lanes, with 2.5 m wide shoulders. The embankment slopes are typically 2.5H to 3H:1V and are grass covered. No signs of embankment slope instability were observed at the time of this foundation investigation.

The groundwater condition was monitored during and upon completion of sampling. Some of the boreholes put down on the eastern portion of the swamp alignment were dry and open at the time of the investigation with water levels recorded in Section 4.7.

In general, the subsurface deposits at the pavement components of existing road is underlain by buried asphalt resting on loose to compact embankment fill placed on buried peat, marl, compact to very dense sand and silt till, or stiff to hard clayey silt to silty clay till. The boreholes put down near the existing ditch is covered with topsoil, peat or fill layers underlain by sand and silt till, or clayey silt to silty clay till.

Groundwater was generally encountered at or near the surface where peat is encountered and summarized in Section 4.7.

The proposed truck climbing lane widening will be constructed on both the north and south sides, with a crown shift. The existing pavement will be raised by approximately 0.05 to 0.15 m based on the rehabilitation strategy provided by Stantec.

Preliminary evaluation using end area calculation method indicated that there are no geotechnical (foundation) advantages in constructing the road and embankment widening on either the north side or both sides of Highway 26.

5.2 Historical and Site Data

Highway 26 in the Municipality of Meaford was originally constructed in 1955 to 1956 and was last resurfaced in 1972 from Meaford West Limit to St. Vincent Townline Road. The following maintenance history was provided in the 2004 Preliminary Design Report (PDR):

- 1972 Contract 72-504 - Resurfacing with 20 mm sand asphalt leveling course, followed by 40 mm HL3 surface course.
- 1993 Maintenance over culvert immediately west of St. Vincent Concession 12 and hot mix placed full shoulder width on the grade west of St. Vincent Concession 11.
- 1995 Maintenance patches and partially paved shoulder retrofit throughout in 1995.

The maintenance history provided in the 2006 Pavement Condition Report is also presented below:

- 1993 Hot mix patch over culvert at St. Vincent Concession 12.
FPS at St. Vincent Concession 11. Two short full width hot mix patches at west end.
- 1995 PPS retro fit
- 1996 200 meters hot mix patches at St. Vincent Concession 12, full depth removal and ditch and subdrain.
- 2003 HMP ruts at Grey Rd. 112 (450 and 1200 m west) 1 lift
Mill 50 mm, pave 50 mm at 11th Line (100 m West)
- 2005 Centre-line micro strip for 5.6 km.
- 2006 Extensive berm removal

A layer of buried asphalt was observed in most of the boreholes put down on the existing pavement of Highway 26 within the swamp area. Granular base is not evident beneath the buried asphalt. Based on the construction and maintenance history provided in the 2004 PDR and the 2006 Pavement Condition Report, together with the buried asphalt observed, it is reasonable to assume that the buried asphalt constitutes the original pavement constructed between 1955 and 1956. Based on the soil stratigraphy encountered between the pavement and ditch boreholes, the original pavement and embankments were constructed directly on the swamp, with original embankment heights of between $1.2\pm$ m and $2.8\pm$ m, with an average of $1.76\pm$ m. The existing pavement was likely constructed in 1972 under Contract 72-504 or earlier, with the embankment raised between $0.3\pm$ m and $1.5\pm$ m, with an average of $0.7\pm$ m.

The field investigation determined that peat is present between Stations 11+800 and 12+100. Peat was encountered in the north ditch boreholes from Station 11+825 to 11+875, and from Station 12+000 to 12+075, between $0.4\pm$ m and $3.3\pm$ m thick, averaging $1.86\pm$ m; from Station 11+800 and 12+075 in the south ditch, between $0.8\pm$ m and $2.8\pm$ m thick, averaging $1.49\pm$ metres.

Buried peat under the existing pavement is between $0.2\pm$ m and $1.7\pm$ m thick, averaged $0.89\pm$ m. The original peat thicknesses beneath the pavement are estimated to be similar to those encountered in the ditch boreholes. A comparison of the peat thicknesses on the ditch boreholes and the pavement boreholes are presented below:

Drawing	Section	Chainage	Thickness of Topsoil/Organic Soil/Peat, m			
			Left Ditch (north)	Left Side of Highway 26	Right Side of Highway 26	Right Ditch (south)
2	B-B'	11+775	0.30	0.00	----	----
	C-C'	11+800	1.07	0.46	0.61	0.91
3	D-D'	11+825	1.68	0.77	0.92	0.76
	E-E'	11+850	0.76	0.15	0.6	1.22
4	F-F'	11+875	0.44	0.91	0.3	1.07
	G-G'	11+900	0.15	0.92	0.3	1.22
	H-H'	11+925	0.15	0.76	0.3	0.76
5	J-J'	11+950	0.15	0.76	0.31	0.91
	K-K'	11+975	0.30	0.91	0.38	0.91
	L-L'	12+000	3.05	1.52	1.21	2.74
6	M-M'	12+025	2.29	1.37	1.37	2.13
	N-N'	12+050	2.29	1.52	1.37	2.74
	P-P'	12+075	1.68	1.38	1.68	2.29
7	Q-Q'	12+100	0	0	0.46	0.91

The peat material is classified as amorphous to fibrous based on visual and tactile examination of the soil samples, along with observation made on the ground surface and the auger cuttings in the swamp area.

5.3 Design Considerations

The existing road platform consists of two 3.35 m driving lanes, with 2.5 m wide shoulders. Embankment heights of approximately between 0.7 m and 3.86 m are present on the north and south sides of Highway 26. The embankment slopes are typically 2.5H to 3H:1V and are grass covered. No signs of embankment slope instability were observed at the time of this foundation investigation.

The proposed truck climbing lane widening will be constructed on both the north and south sides, with a crown shift in this area. The existing pavement will be raised by approximately 0.05 m to 0.15 m based on the rehabilitation strategy provided by Stantec. The following options were considered for the proposed embankment widening:

- A. Excavation on widening and replacement by stable fill
- B. Reconstruction or partial reconstruction
- C. Preloading, incorporated with lightweight fill

5.3.1 Excavation on Widening and Replacement by Stable Fill

Swamp excavation is anticipated between west of Station 11+800 and east of Station 12+075, approximately 300 m. Given the history of construction and maintenance, this is the most cost effective option based on the swamp and site conditions. The following is a summary of the swamp excavation required:

Drawing	Section	Chainage	Swamp Excavation			
			Depth, m Left Ditch	Bottom Elevation, m	Depth, m Right Ditch	Bottom Elevation, m
2	B-B'	11+775	0.30	332.62	----	----
	C-C'	11+800	1.07	329.99	0.91	331.43
3	D-D'	11+825	1.68	329.44	0.76	330.70
	E-E'	11+850	0.76	330.31	1.22	330.18
4	F-F'	11+875	0.15	330.81	1.07	330.18
	G-G'	11+900	0.15	331.02	1.22	328.99
	H-H'	11+925	0.15	331.08	0.76	330.54
5	J-J'	11+950	0.15	331.03	0.91	330.45
	K-K'	11+975	0.30	330.95	0.91	330.43
	L-L'	12+000	3.05	328.12	2.74	328.61
6	M-M'	12+025	2.29	328.88	2.13	329.20
	N-N'	12+050	2.29	328.94	2.74	328.56
	P-P'	12+075	1.68	329.39	2.29	329.09
7	Q-Q'	12+100	0.08	331.75	0.91	331.03

The original road was constructed directly on the swamp over 50 years ago, with the site grades likely raised some 27 years ago in 1972. Although the finished road grades will be raised between 0.05 m and 0.15 m, the surcharge will induce limited settlement of 25 mm or less over time. The estimated settlement of the rehabilitated pavement is similar to that of the widened embankment, and considered manageable from the geotechnical and pavement management perspectives. The buried asphalt pavement could vary between 0.3 m and 1.5 m in depth below the existing pavement surface, and pavement reconstruction is recommended in the swamp area

to ensure adequate subgrade drainage is provided. The pavement design group should review the requirements for pavement reconstruction for this option.

This option is the most common practice being used on embankment widenings for swamp areas having relatively limited thicknesses of peat deposit as described above.

5.3.2 Full or Partial Reconstruction

The thicknesses of the peat layer beneath the existing ditches and the existing embankment are presented in the following Table:

Drawing	Section	Chainage	Thickness of Topsoil/Organic Soil/Peat, m			
			Left Ditch	Left Side of Highway 26	Right Side of Highway 26	Right Ditch
2	B-B'	11+775	0.30	0.00	----	----
	C-C'	11+800	1.07	0.46	0.61	0.91
3	D-D'	11+825	1.68	0.77	0.92	0.76
	E-E'	11+850	0.76	0.15	0.6	1.22
4	F-F'	11+875	0.44	0.91	0.3	1.07
	G-G'	11+900	0.15	0.92	0.3	1.22
	H-H'	11+925	0.15	0.76	0.3	0.76
5	J-J'	11+950	0.15	0.76	0.31	0.91
	K-K'	11+975	0.30	0.91	0.38	0.91
	L-L'	12+000	3.05	1.52	1.21	2.74
6	M-M'	12+025	2.29	1.37	1.37	2.13
	N-N'	12+050	2.29	1.52	1.37	2.74
	P-P'	12+075	1.68	1.38	1.68	2.29
7	Q-Q'	12+100	0	0	0.46	0.91

The bottom elevations of the peat and organic layers are presented in the following table for detailed estimate of quantities and defining limit of excavation:

Drawing	Section	Chainage	Bottom Elevation of Topsoil/Organic Soil/Peat, m			
			Left Ditch	Left Side of Highway 26	Right Side of Highway 26	Right Ditch
2	B-B'	11+775	332.62	----	----	----
	C-C'	11+800	329.99	331.19	331.02	331.43
3	D-D'	11+825	329.44	329.74	329.75	330.70
	E-E'	11+850	330.31	330.84	330.72	330.18

Drawing	Section	Chainage	Bottom Elevation of Topsoil/Organic Soil/Peat, m			
			Left Ditch	Left Side of Highway 26	Right Side of Highway 26	Right Ditch
4	F-F'	11+875	330.81	330.33	330.51	330.18
	G-G'	11+900	331.02	330.61	330.33	328.99
	H-H'	11+925	331.08	330.64	330.45	330.54
5	J-J'	11+950	331.03	331.13	330.52	330.45
	K-K'	11+975	330.95	330.09	330.61	330.43
	L-L'	12+000	328.12	328.65	328.92	328.61
6	M-M'	12+025	328.88	328.93	329.22	329.20
	N-N'	12+050	328.94	329.00	329.17	328.56
	P-P'	12+075	329.39	329.28	328.97	329.09
7	Q-Q'	12+100	331.75	331.60	330.96	331.03

With the exception of the asphalt and highly organic materials, most of the existing embankment materials could be re-used for embankment re-construction. However, most of these existing materials do not conform to OPSS 1010 SSM and consist of predominantly sand and silt, clayey silt and silty clay. It should be pointed out that even well-compacted clayey soils could settle in the order of 2 to 5% of the height of fill placed for up to a period of 2 years after construction. Full reconstruction will also allow replacement of Culvert 05B located at Station 12+004, if required.

On-site detours with roadway protection will also be required based on the anticipated excavation depth of up to 5.5 m in height, based on the requirement of maintaining a single-lane of traffic during construction. Alternatively, local detour could be evaluated for re-construction of the swamp embankment with temporary road closure.

The following table provides the existing embankment height and the approximate anticipated excavation depth.

Drawing	Section	Chainage	Existing Embankment Height and Anticipated Excavation Depth, m			
			Left Side of Highway 26		Right Side of Highway 26	
			Existing Height	Excavation Depth	Existing Height	Excavation Depth
2	B-B'	11+775	2.8	3.1	0.2	CUT
	C-C'	11+800	3.9	4.6	3.2	4.7

Drawing	Section	Chainage	Existing Embankment Height and Anticipated Excavation Depth, m			
			Left Side of Highway 26		Right Side of Highway 26	
			Existing Height	Excavation Depth	Existing Height	Excavation Depth
3	D-D'	11+825	3.8	5.5	3.7	5.5
	E-E'	11+850	3.3	4.0	3.3	3.8
4	F-F'	11+875	3.0	3.8	3.0	3.9
	G-G'	11+900	3.0	3.5	2.9	3.8
	H-H'	11+925	1.7	3.0	2.5	3.4
5	J-J'	11+950	1.9	2.4	2.3	3.0
	K-K'	11+975	1.6	3.2	1.9	2.7
	L-L'	12+000	1.6	4.4	1.8	4.1
6	M-M'	12+025	1.6	4.0	1.6	3.7
	N-N'	12+050	1.5	3.8	1.4	3.6
	P-P'	12+075	1.6	3.5	1.5	3.8
7	Q-Q'	12+100	1.1	1.2	1.3	2.0

Considerations were given to partial reconstruction between west of Station 12+000 to east of Station 12+075, i.e., areas with peat thickness. There is no cost/benefit to partial reconstruction since it defeats the purpose of controlling post-construction settlement.

5.3.3 Preloading

It is assumed that the existing road platform was constructed directly on the peat bog, with original peat thicknesses similar to those found on the existing ditches. Comparison between the peat and buried peat thicknesses was carried out to provide a rough estimate of settlement that had occurred beneath the existing road platform. The results of this comparison are presented in the following table:

Settlement Estimate - Left Side						
Drawing	Section	Chainage	Peat Thickness, m		Difference m	% of Ditch Peat Thickness
			Ditch Boreholes	Pavement Boreholes		
2	B-B'	11+775	----	----	----	----
	C-C'	11+800	----	0.5	----	----

Settlement Estimate - Left Side						
Drawing	Section	Chainage	Peat Thickness, m		Difference m	% of Ditch Peat Thickness
			Ditch Boreholes	Pavement Boreholes		
3	D-D'	11+825	1.7	0.8	0.9	54
	E-E'	11+850	0.8	0.2	0.6	80
4	F-F'	11+875	0.4	0.9	----	----
	G-G'	11+900	----	0.9	----	----
	H-H'	11+925	----	0.8	----	----
5	J-J'	11+950	----	0.8	----	----
	K-K'	11+975	----	0.9	----	----
	L-L'	12+000	3.1	1.5	1.6	52
6	M-M'	12+025	2.3	1.4	0.9	40
	N-N'	12+050	2.3	1.5	0.8	34
	P-P'	12+075	1.7	1.4	0.3	18
7	Q-Q'	12+100	----	----	----	----
		Minimum	0.4	0.2	0.3	18
		Maximum	3.1	1.5	1.6	80
		Average	1.74	0.95	0.85	46.0
		Std. Dev.	0.911	0.426	0.433	21.15

Settlement Estimate - Right Side						
Drawing	Section	Chainage	Peat Thickness, m		Difference m	% of Ditch Peat Thickness
			Ditch Boreholes	Pavement Boreholes		
2	B-B'	11+775	----	----	----	----
	C-C'	11+800	0.9	0.6	0.3	33
3	D-D'	11+825	0.8	0.9	----	----
	E-E'	11+850	1.1	0.6	0.5	44
4	F-F'	11+875	1.1	0.3	0.8	74
	G-G'	11+900	1.2	0.3	0.9	75
	H-H'	11+925	0.8	0.3	0.5	61
5	J-J'	11+950	0.9	0.3	0.6	66
	K-K'	11+975	0.9	0.4	0.5	58
	L-L'	12+000	2.7	1.2	1.5	56

Settlement Estimate - Right Side						
Drawing	Section	Chainage	Peat Thickness, m		Difference m	% of Ditch Peat Thickness
			Ditch Boreholes	Pavement Boreholes		
6	M-M'	12+025	2.1	1.4	0.7	33
	N-N'	12+050	2.7	1.4	1.3	47
	P-P'	12+075	2.3	1.7	0.6	27
7	Q-Q'	12+100	----	0.5	----	----
		Minimum	0.8	0.3	0.3	27
		Maximum	2.7	1.7	1.5	75
		Average	1.46	0.75	0.75	52.1
		Std. Dev.	0.776	0.495	0.375	16.71

The statistical data for the combined left and right sides are presented in the following table:

Combined Statistics	Peat Thickness, m		Difference m	% of Ditch Peat Thickness
	Ditch Boreholes	Pavement Boreholes		
Minimum	0.4	0.2	0.3	18
Maximum	3.1	1.7	1.6	80
Average	1.57	0.85	0.79	50.1
Std. Dev.	0.814	0.465	0.386	17.99

Based on the statistical analyses, settlement of the existing road embankment in the swamp area is in the order of 50±35% of the original peat thicknesses, with 90% confidence. The statistical analysis indicates the estimated settlement of the existing embankment is highly scattered and very unpredictable, likely due to high variations in the texture, organics and inorganic soil contents, and engineering properties of the peat material within the swamp area.

Detailed design of pre-loading will have to be carried out if this option is selected. For the purpose of preliminary cost evaluation, it could be assumed that a fill surcharge of 1.0 to 1.5 m will be used.

Temporary pavement may also have to be provided since preloading will take more than 6 months for the secondary consolidation of peat to be essentially completed under the surcharge load. Considerations could be given to the use of lightweight fill in conjunction with preloading to provide equalization of the overburden pressure on the raised pavement.

This option requires extensive characterization of the peat material in order to provide sufficient details for design of preloading. Extensive monitoring during preloading will have to be carried out, and the time could be variable and unpredictable. Based on the relatively short distance of highway involved, together with an anticipated limited saving in cost, and the peat material being variable, it is not considered a viable option at this time. Detailed cost analyses would have to be carried out prior to considering this option.

The following is a summary of the evaluation for feasibility of the 3 options presented above:

Option	Description	Advantage	Disadvantage
A	Excavation on widening and replacement by stable fill	<ul style="list-style-type: none"> • Most common approach • Most constructible • Predictable performance • Allow one lane traffic flow during construction 	<ul style="list-style-type: none"> • Some maintenance required • May require pavement reconstruction
B	Full or partial reconstruction	<ul style="list-style-type: none"> • Most predictable performance • Least maintenance cost 	<ul style="list-style-type: none"> • Longer construction period • Requires detour or roadway protection • Most costly
C	Preloading, incorporated with lightweight fill	<ul style="list-style-type: none"> • Least costly 	<ul style="list-style-type: none"> • Most Un-predictable performance • Most maintenance cost • Most Time Consuming • Temporary Pavement Required

Option A, swamp excavation on embankment widening and replacement with stable fill, is the recommended method of construction for this project.

5.4 Embankment Widening

The existing embankments are up to 4.1 m high. For the widening of the embankment, the surficial topsoil, peat and organic deposits, and any deleterious materials should be stripped or excavated prior to placing fill materials. The embankment widening should then be constructed as per OPSD-203.020, 203.030 and 208.010, with emphasis on adequate benching of the subgrade for receiving the embankment fill. The fill to be used for embankment construction can either be imported silty clay or granular materials, but granular materials are preferred for compaction and drainage.

Organic soil and peat are present beneath the existing pavement and are assumed to be consolidated or compressed based on the results of the field investigation. Embankment widening that is less than 1 m in height within the swamp section could be carried out using the existing embankment slope as per OPSD 203.030. Embankment widening that is more than 1 m in height within the swamp section should be carried out by stripping the existing embankment to a 1H:1V slope and widening as per OPSD 203.020.

Based on the findings of the field investigation, no foundation stability or settlement problems should occur due to widening the embankments on the inorganic native soils for embankment slopes of 2.5H:1V and up to 5 m high. The fill placement should begin at the toe of the embankment, in leveled lifts and each lift compacted to at least 98% SPMDD. Benching into the existing embankment slope at 1 m high steps is recommended as per OPSD 208.010.

Swamp excavation will be required between Station 11+800 and 12+075 which is discussed in Section 5.3 of this report. Actual limits of the swamp excavation should be extrapolated from these chainages.

After stripping, the exposed subgrade should be inspected and approved by the geotechnical engineer. The approved subgrade should then be proof-rolled using a heavy compactor, as directed by the engineer. Unless the excavation is carried out in wet weather conditions, no unusual dewatering is anticipated during stripping and preparation of the subgrade to receive the embankment fills. Where necessary, dewatering can be carried out using gravity drainage and pumping from open filtered sumps in accordance with OPSS 517 and 902, and SSP902S01, with emphasis on the requirements of OPSS 518.

Measures should be incorporated into the design and staging to ensure that the slope surfaces are protected from surface erosion with adequate sediment control in accordance with the requirements of OPSS 577. Proper sediment control measures should be implemented both during construction of the embankment fills and permanently. Sediment control during construction should be carried out by installing silt fences. Properly designed erosion control blankets should also be placed on any new embankments and adjacent disturbed embankments after completion of fill placement. A vegetative cover should be established as soon as practical upon completion of fill placement to minimize the chances of surface erosion.

5.5 Excavation, Groundwater Control and Temporary Shoring

Excavation for this project will involve normal excavation and swamp excavation within the swamp section covered in this report.

Swamp excavation is anticipated west of Station 11+800 and east of Station 12+075. The following is a summary of the swamp excavation required:

Drawing	Section	Chainage	Swamp Excavation			
			Depth, m Left Ditch	Bottom Elevation, m	Depth, m Right Ditch	Bottom Elevation, m
2	B-B'	11+775	0.30	332.62	----	----
	C-C'	11+800	1.07	329.99	0.91	331.43
3	D-D'	11+825	1.68	329.44	0.76	330.70
	E-E'	11+850	0.76	330.31	1.22	330.18
4	F-F'	11+875	0.15	330.81	1.07	330.18
	G-G'	11+900	0.15	331.02	1.22	328.99
	H-H'	11+925	0.15	331.08	0.76	330.54
5	J-J'	11+950	0.15	331.03	0.91	330.45
	K-K'	11+975	0.30	330.95	0.91	330.43
	L-L'	12+000	3.05	328.12	2.74	328.61
6	M-M'	12+025	2.29	328.88	2.13	329.20
	N-N'	12+050	2.29	328.94	2.74	328.56
	P-P'	12+075	1.68	329.39	2.29	329.09
7	Q-Q'	12+100	0.08	331.75	0.91	331.03

Swamp excavation to depths of up to 3.3 m should not present any special difficulties using heavy excavation equipment, provided it is constructed in accordance with OPSS 201, 206, 209, 501, 518, 539 and 577, SSP105S19 and OPSD-203.020, 203.030, and 208.010. However, the buried utilities alongside the embankments will likely be in conflict with the excavation. Excavation and protection procedures shall conform to OPSS 539 and should be reviewed with the utility companies or authorities prior to construction.

Based on the subsurface soil and groundwater conditions encountered at this site, excavation through the swamp will encounter a large quantity of inflow from the peat layer. Consequently, a Permit to Take Water (PTTW) in accordance with Ontario Regulation 387/04 will be required for the purpose of excavation. It is noted that a "Permit To Take Water" (PTTW, Regulation 387/04) will be required from the MOE (Ministry of Environment) when the total quantity of water to be handled exceeds 50,000 litres/day while employing temporary pumping of water, flow passages through culverts, stream diversion or dam and pump method as groundwater control measures (unwatering). It may take up to 90 days for MOE to review an application and issue a permit.

It should be pointed out that if the founding soil is disturbed, excessive settlements could occur after structural loads are applied.

All excavation must be carried out in compliance with the requirements of the Occupational Health and Safety Act (OHSA). For this purpose, the unsaturated upper fill and compact sand and silt till, and the sand and gravel deposits encountered at this site are classified as Type 3 soils. The dense to very dense sand and silt till, and the clayey silt to silty clay soils are classified as Type 2 soils. Saturated cohesionless soils are classified as Type 4 soils.

For the Type 2 soils, the excavation shall be cut to near vertical in the bottom 1.2 m and then trimmed back to 1H:1V. Within the Type 3 soils and above the water table, the excavation shall be cut to no steeper than 1H : 1V throughout. Side slopes of 3H:1V or flatter shall be used for excavation within Type 4 soils.

Temporary support within the overfill of the existing and the new partially constructed embankment may be required to maintain access for construction and local traffic, and emergency vehicles. The staging of different phases of this work should be examined to determine if roadway protection is required. Roadway protection is generally a contractor design/build item in accordance with SSP105S19 and current MTO practices. A performance level 2 and a maximum allowable lateral movement of 25 mm should be specified in accordance with the requirements of SSP105S19.

Geotechnical parameters for the design of temporary support structures, a unit weight of 20 kN/m³ and an internal friction angle (ϕ) of 29° for the embankment fill can be used for design if the existing embankment is to be supported. Further, the toe support of the temporary support system will be generated in the underlying compact to very dense cohesionless till soils or stiff to hard clayey silt to silty clay till soils. A unit weight of 22 kN/m³ and a cohesion of 100 kPa can be used for cohesive soils. A unit weight of 22 kN/m³ and an internal friction angle (ϕ) of 32° can be use for the cohesionless till soils.

5.6 Frost Protection

This project is located in the Owen Sound Operations District. The design frost penetration depth for this project is 1.4 m in accordance with OPSD 3090.101.

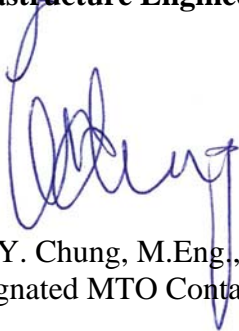
6.0 STATEMENT OF LIMITATION

We recommend that once the details of the proposed structure are finalized, our recommendations should be reviewed for their specific applicability.

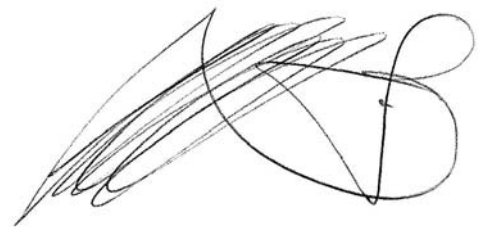
The Limitations of Report, as Quoted in Appendix C, is an integral part of this report.

We trust that we have completed the assignment within the Terms of Reference for this project. If there are any questions concerning this report, please do not hesitate to contact our office.

Yours truly,
Infrastructure Engineering Group Inc.



Eric Y. Chung, M.Eng., P.Eng.
Designated MTO Contact



Joseph Law, P.Eng.
Project Manager



Tom O'Dwyer, P. Eng.
Quality Review Engineer



Ministry of Transportation/Stantec Consulting Ltd.
G.W.P. 167-91-00 - Rehabilitation of Highway 26
From Former St. Vincent/Sydenham Townline to Meaford
Agreement # 3006-E-0002

07-6-IEG1-SWAMP
Final Report
Drawings 1 to 9
May 17, 2010

Drawings 1 to 9
Borehole Locations
And
Soil Strata

BOREHOLE NO.	ELEV.	UTM CO-ORDINATES		BOREHOLE NO.	ELEV.	UTM CO-ORDINATES		BOREHOLE NO.	ELEV.	UTM CO-ORDINATES		BOREHOLE NO.	ELEV.	UTM CO-ORDINATES		BOREHOLE NO.	ELEV.	UTM CO-ORDINATES	
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SW02	336.76	4940513	209227	SW05	336.26	4940520	209251	SW07	335.74	4940524	209278	SW10	335.24	4940529	209301	SW13	334.83	4940536	209324
SW03	335.72	4940520	209225	SW06	332.92	4940537	209243	SW08	335.76	4940527	209274	SW11	335.23	4940533	209299	SW14	334.80	4940540	209323
								SW09	331.06	4940543	209275	SW12	331.12	4940545	209295	SW15	331.07	4940551	209317

NOTES
1. THE COMPLETE FOUNDATION INVESTIGATION AND DESIGN REPORT FOR THIS PROJECT AND OTHER RELATED DOCUMENTS MAY BE EXAMINED AT THE ENGINEERING MATERIALS OFFICE, DOWNSVIEW.
INFORMATION CONTAINED IN THIS REPORT AND RELATED DOCUMENTS ARE SPECIFICALLY EXCLUDED IN ACCORDANCE WITH THE CONDITIONS OF SECTION GC2.01 of OPS GEN. COND.
2. THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES AND BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE.
3. BURIED ASPHALT LAYERS WERE ONLY SHOWN AS OBSERVED IN THE BOREHOLES AND GENERALIZED TO BE 150 MM THICK.
4. STATISTICALLY, BURIED ASPHALT PAVEMENT COULD BE PRESENT BENEATH THE EXISTING PAVEMENT WITHIN THE SWAMP ALIGNMENT EVEN IF IT IS NOT EVIDENT IN THE BOREHOLES.
5. THICKNESSES OF GRANULAR FILL BENEATH THE ASPHALT AND BURIED ASPHALT COULD BE VARIABLE AND REPORTED ON THE PROFILES AS RECORDED FROM FIELD MEASUREMENTS.
6. THIS DRAWING IS FOR SUBSURFACE INFORMATION ONLY. SURFACE DETAILS AND FEATURES ARE FOR CONCEPTUAL ILLUSTRATION.

METRIC

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UNLESS OTHERWISE SHOWN

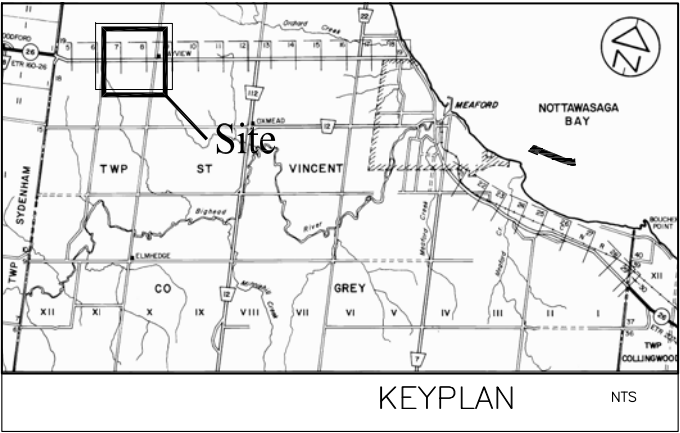
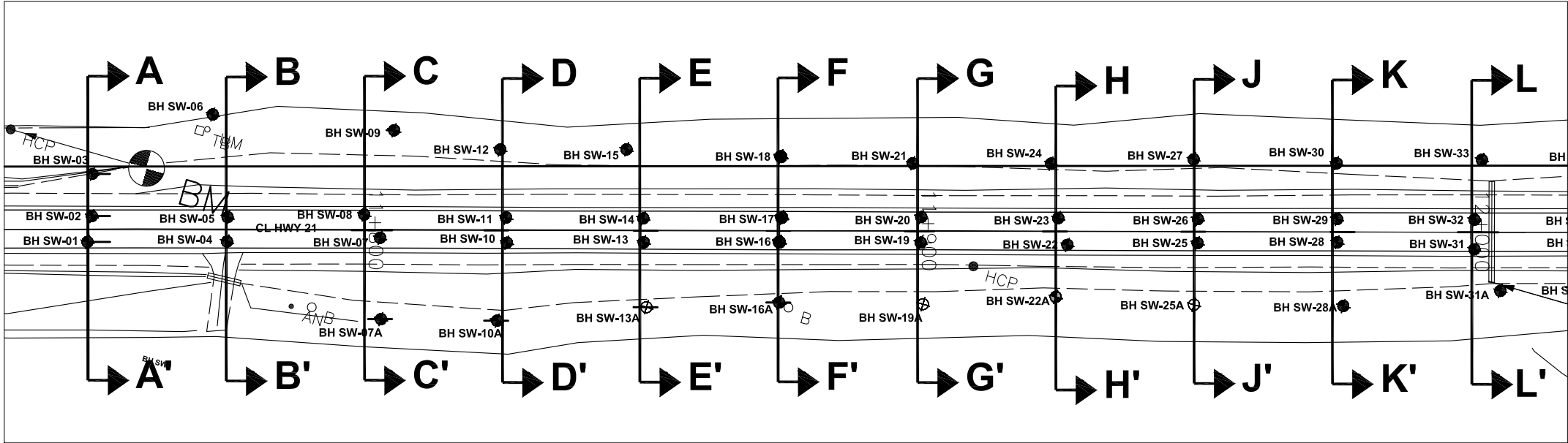
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WP No GWP 167-91-00



SWAMP
Highway 26 - Part B
BOREHOLE LOCATION PLAN

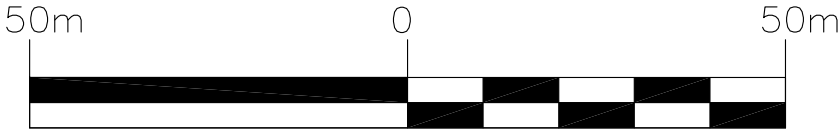
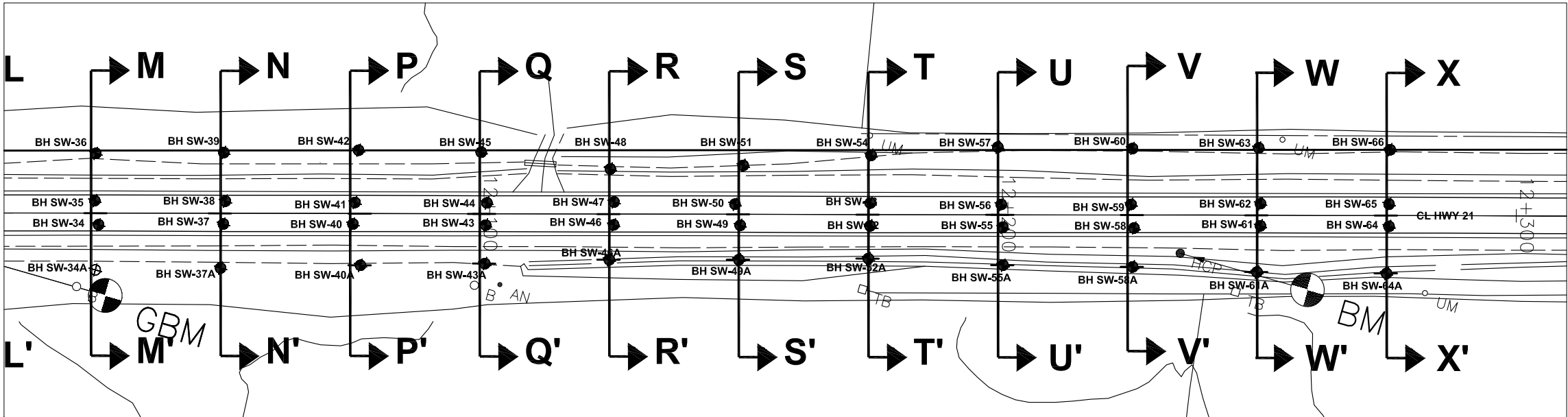
SHEET
1

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LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- Blows/0.3m (Std Pen Test, 475 J/blow)
- Blows/0.3m (60° Cone, 475 J/blow)
- W L at time of investigation
- Standpipe



SCALE

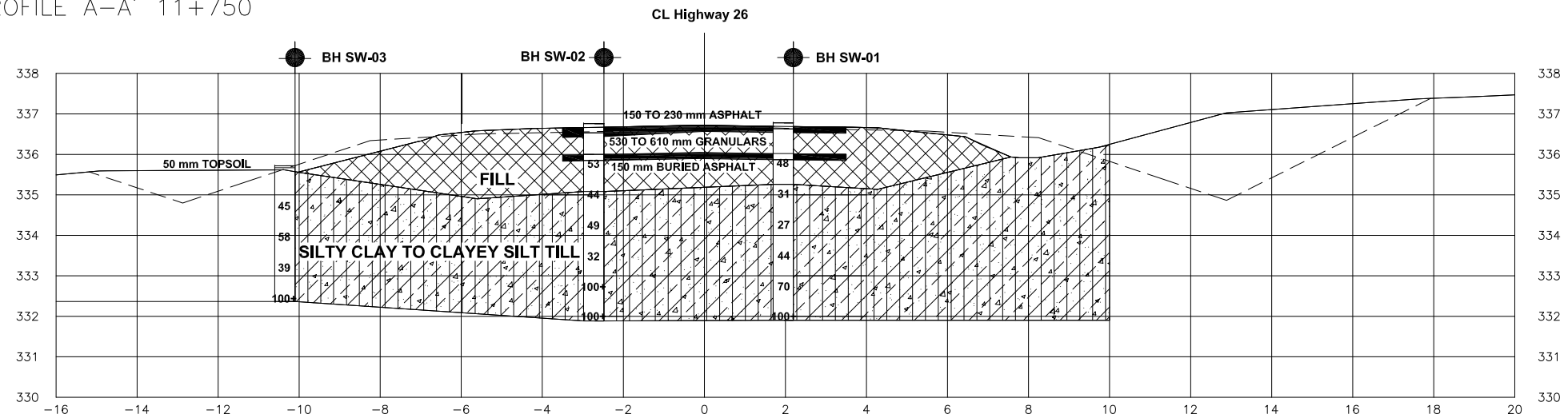
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		NORTH	EAST			NORTH	EAST			NORTH	EAST			NORTH	EAST			NORTH	EAST
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SW16	334.47	4940543	209348	SW25	333.57	4940563	209421	SW34	332.88	4940584	209494	SW43	332.94	4940604	209566	SW52	333.22	4940625	209637
SW17	334.44	4940547	209347	SW26	333.57	4940568	209420	SW35	332.89	4940588	209492	SW44	332.97	4940609	209565	SW53	333.22	4940629	209636
SW18	331.12	4940558	209344	SW27	331.18	4940578	209416	SW36	331.17	4940597	209489	SW45	331.84	4940618	209561	SW54	332.03	4940638	209633
SW19A	331.21	4940539	209376	SW28A	331.34	4940560	209449	SW37A	331.30	4940582	209519	SW46A	332.15	4940605	209590	SW55A	332.24	4940625	209664
SW19	334.14	4940550	209373	SW28	333.28	4940570	209445	SW37	332.83	4940591	209517	SW46	333.04	4940611	209589	SW55	333.27	4940632	209662
SW20	334.12	4940554	209371	SW29	333.29	4940574	209444	SW38	332.81	4940595	209516	SW47	333.03	4940616	209588	SW56	333.30	4940636	209660
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SW23	333.84	4940561	209395	SW32	333.07	4940581	209468	SW41	332.79	4940602	209540	SW50	333.13	4940622	209611	SW59	333.41	4940643	209684
SW24	331.23	4940570	209391	SW33	331.17	4940591	209466	SW42	331.07	4940612	209538	SW51	332.44	4940629	209610	SW60	331.90	4940653	209681

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	21/09/09	J.L.	Draft
	DATE	BY	DISCRIPTION

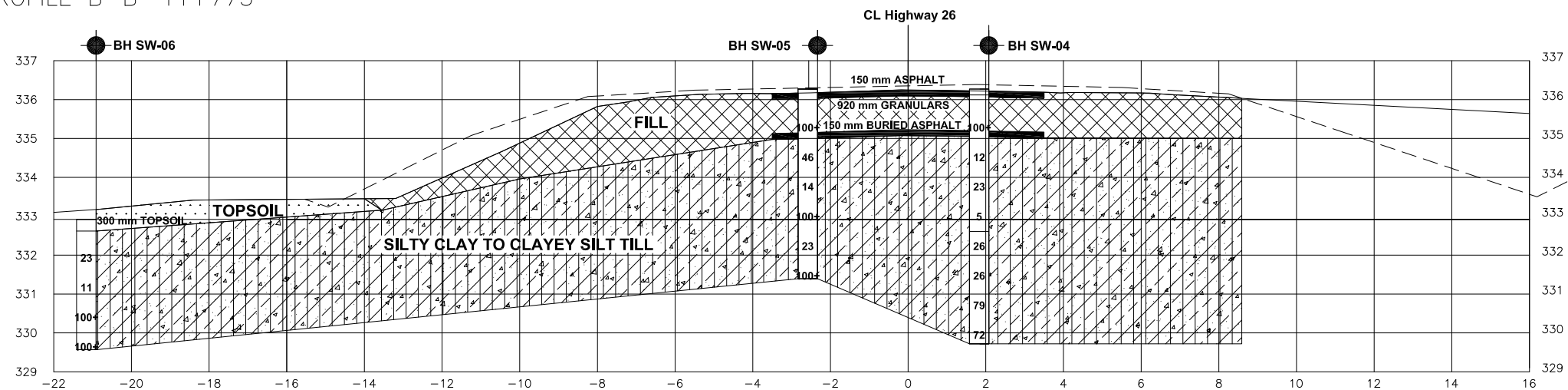
MTO GEOCRES No. 41A-217

HWY No.	HWY 26		DIST	Owen Sound
SUBM'D	J.L.	CHECKED E.C.	DATE 24/08/08	SITE SWAMP
DRAWN	J.L.	CHECKED J.L.	APPROVED E.C.	DWG 1

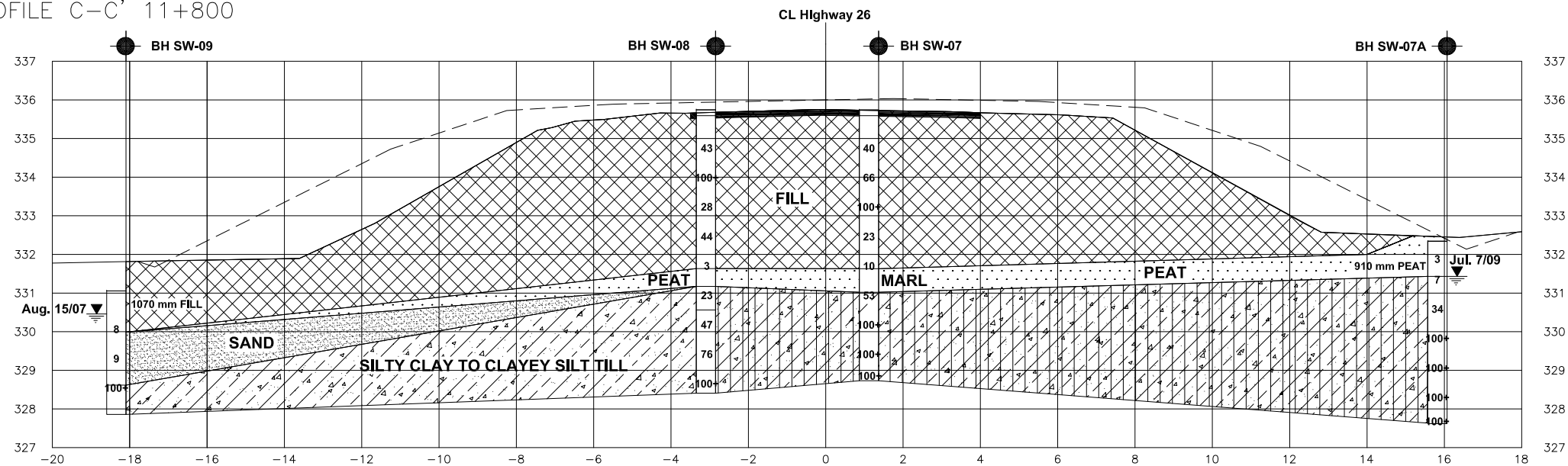
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PROFILE B-B' 11+775



PROFILE C-C' 11+800



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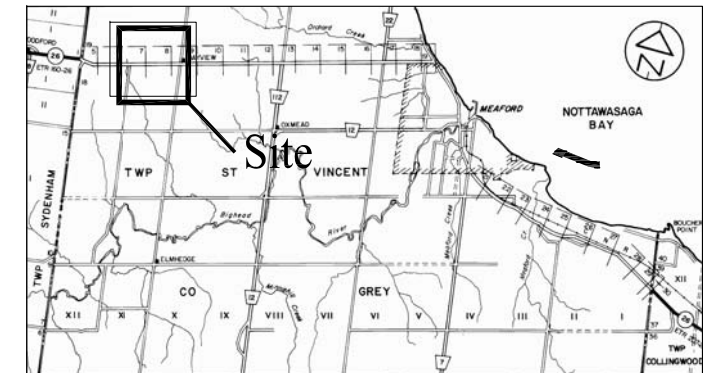
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WP No GWP 167-91-00

SWAMP
Highway 26 - Part B
PROFILE

SHEET
2

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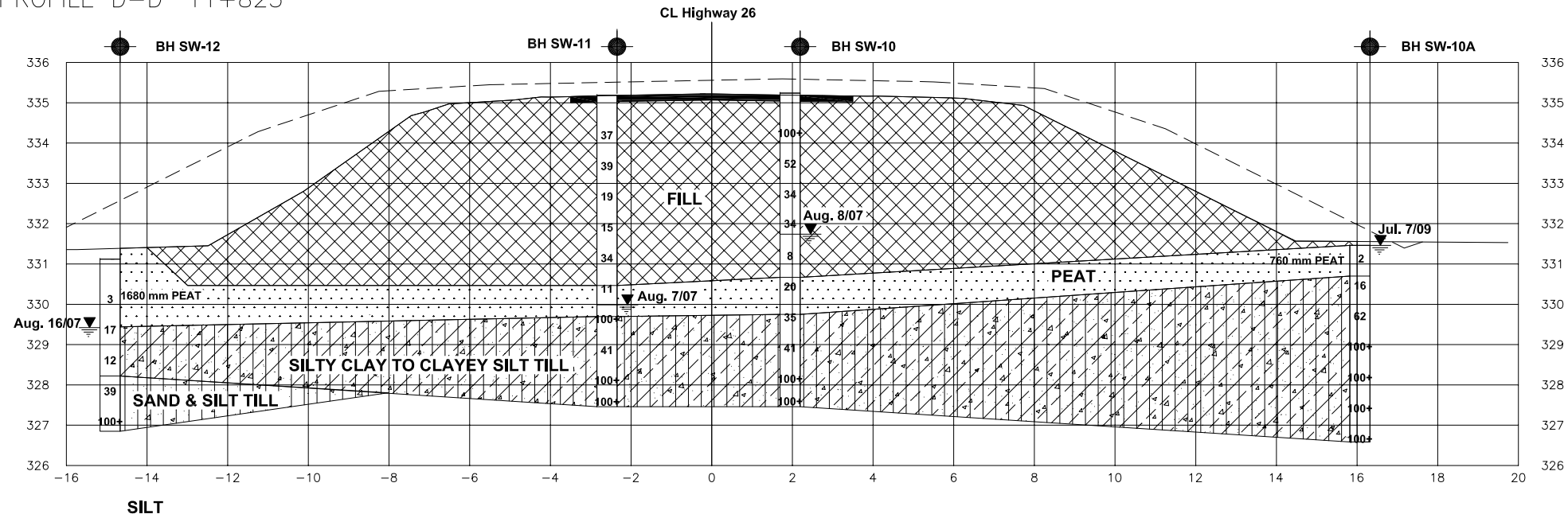


LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- Blows/0.3m (Std Pen Test, 475 J/blow)
- Blows/0.3m (60° Cone, 475 J/blow)
- W L at time of investigation
- Standpipe

REVISIONS	31/03/10	J.L.	Final	MTO GEOCRES No. 41A-217
	21/10/09	J.L.	Draft	
	DATE	BY	DISCUSSION	
HWY No.	HWY 26		DIST	Owen Sound
SUBM'D	J.L.	CHECKED E.C.	DATE 24/08/08	SITE SWAMP
DRAWN	J.L.	CHECKED J.L.	APPROVED E.C.	DWG 2

PROFILE D-D' 11+825



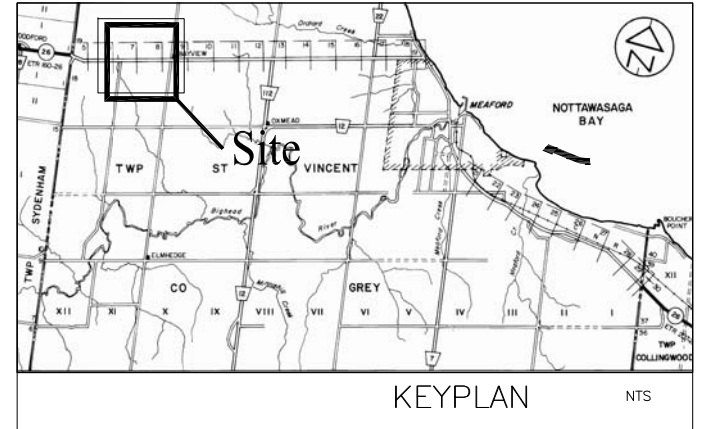
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AND/OR MILLIMETRES
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WP No GWP 167-91-00

SWAMP
Highway 26 - Part B
PROFILE

SHEET
3

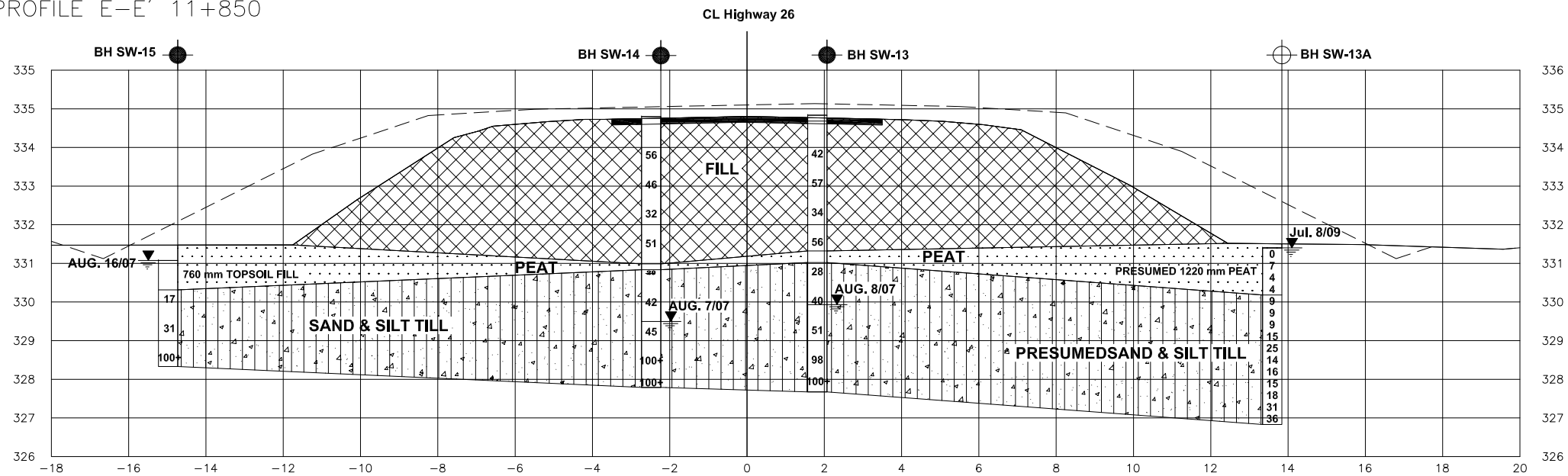
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KEYPLAN

NTS

PROFILE E-E' 11+850



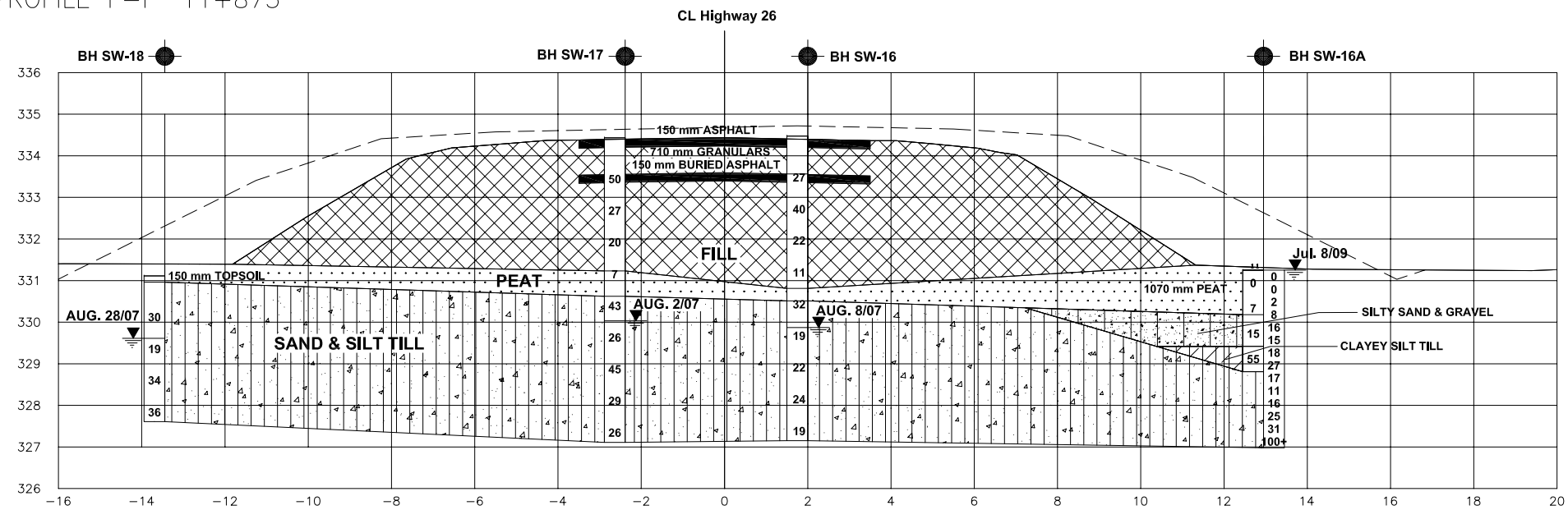
LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- Blows/0.3m (Std Pen Test, 475 J/blow)
- Blows/0.3m (60° Cone, 475 J/blow)
- W L at time of investigation
- Standpipe

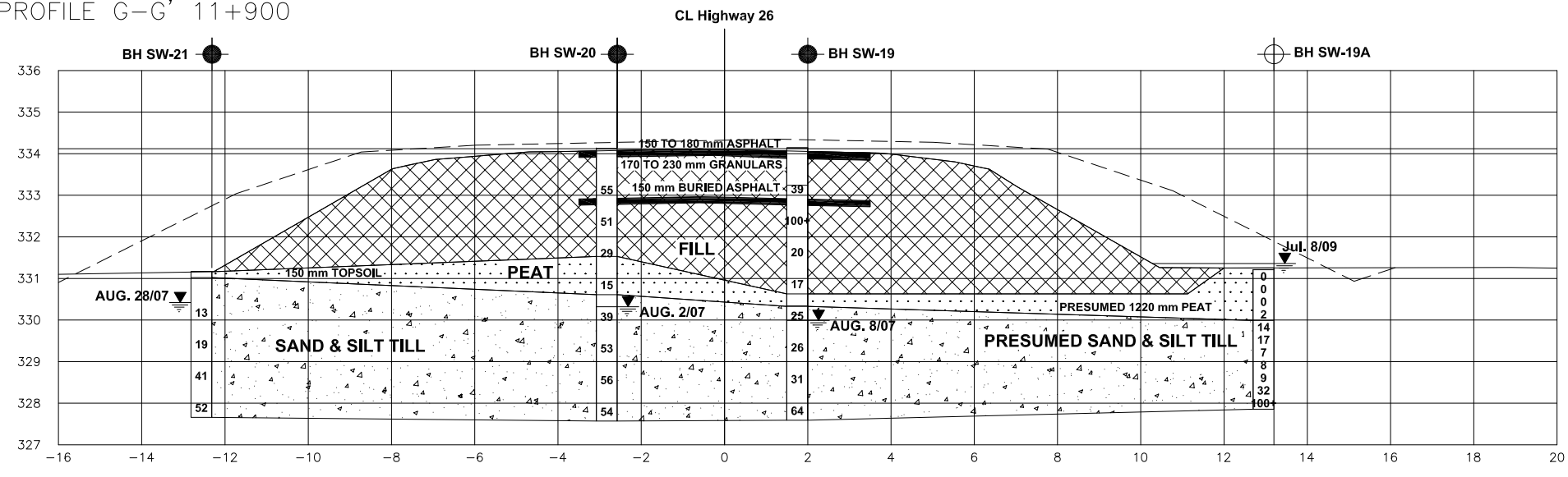
REVISIONS				DISCRPTION
	31/03/10	J.L.	Final	
	21/10/09	J.L.	Draft	
	DATE	BY		
MTO GEOCRES No. 41A-217				
HWY No.		HWY 26		DIST Owen Sound
SUBM'D	J.L.	CHECKED E.C.	DATE 24/08/08	SITE SWAMP
DRAWN	J.L.	CHECKED J.L.	APPROVED E.C.	DWG 3

MINISTRY OF TRANSPORTATION, ONTARIO

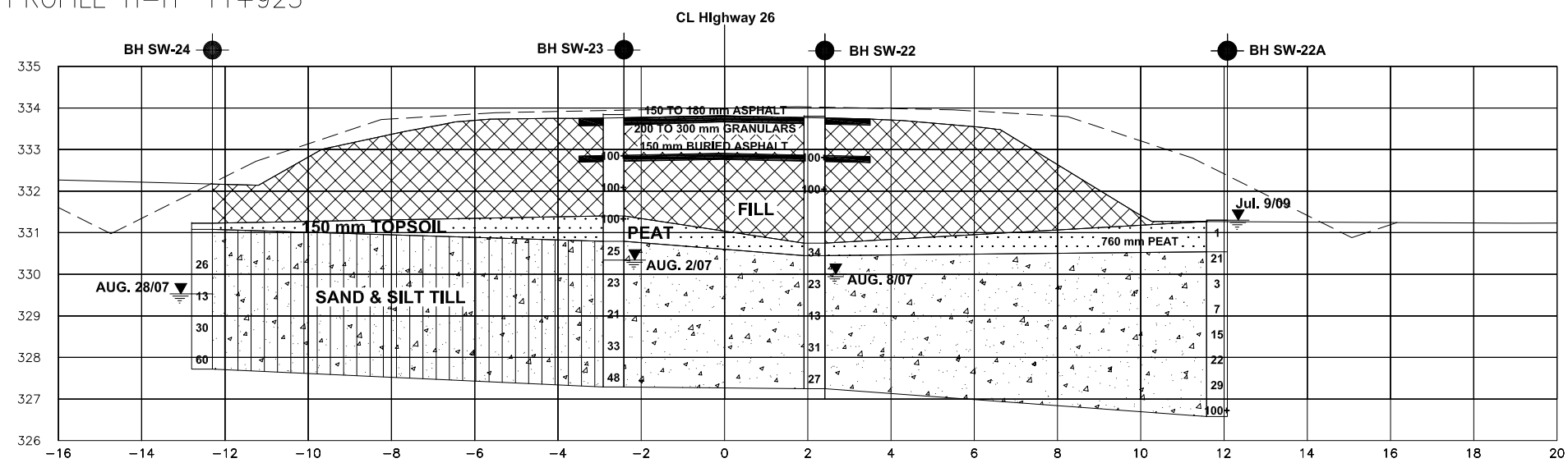
PROFILE F-F' 11+875



PROFILE G-G' 11+900



PROFILE H-H' 11+925



METRIC

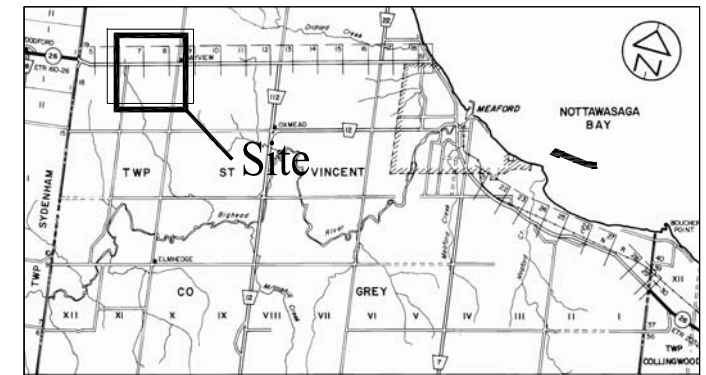
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No xxxx-xxxx
WP No GWP 167-91-00

SWAMP
Highway 26 - Part B
PROFILE

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SHEET
4



LEGEND

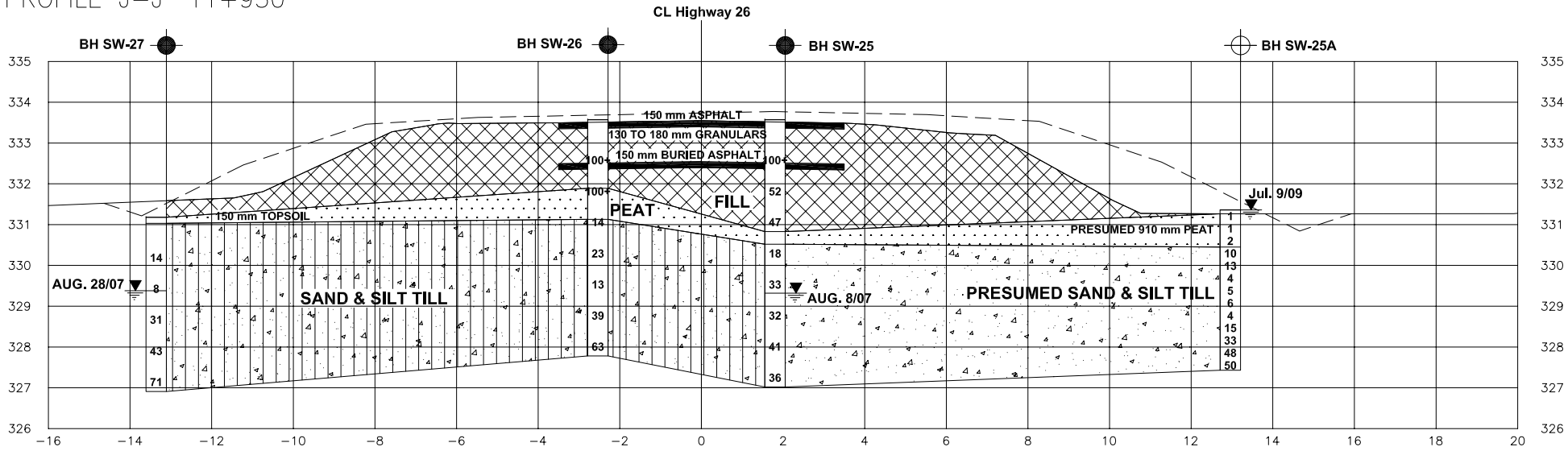
- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W L at time of investigation
- Standpipe

REVISIONS			
	31/03/10	J.L.	Final
	21/10/09	J.L.	Draft
	DATE	BY	DISCRPTION

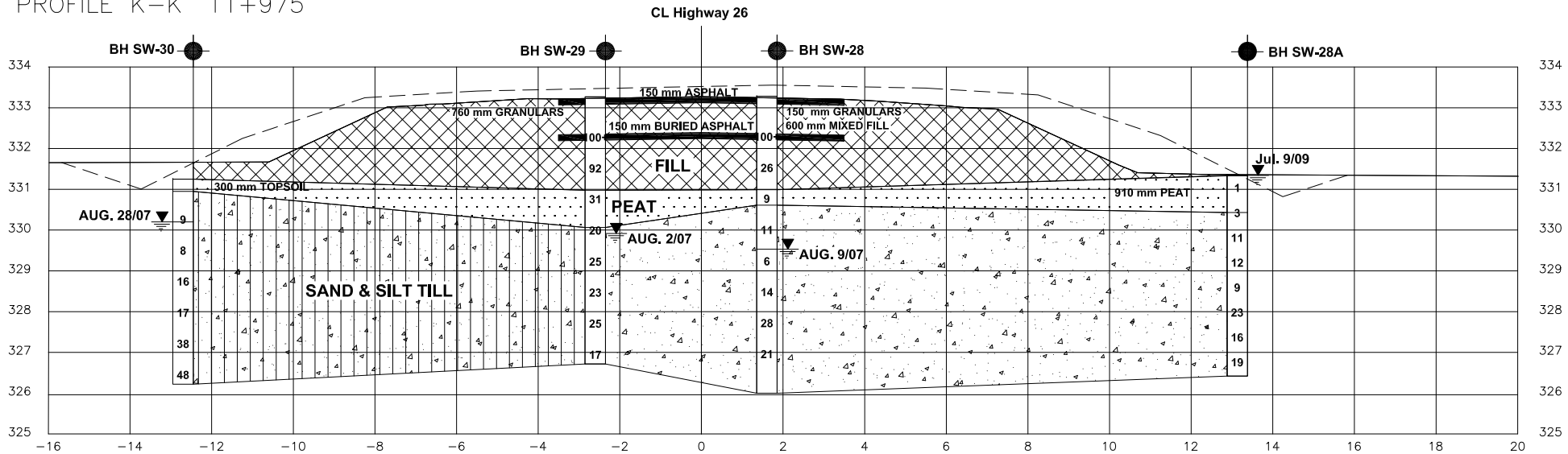
MTO GEOCRES No. 41A-217

HWY No.	HWY 26		DIST	Owen Sound
SUBM'D J.L.	CHECKED E.C.	DATE 24/08/08	SITE	SWAMP
DRAWN J.L.	CHECKED J.L.	APPROVED E.C.	DWG	4

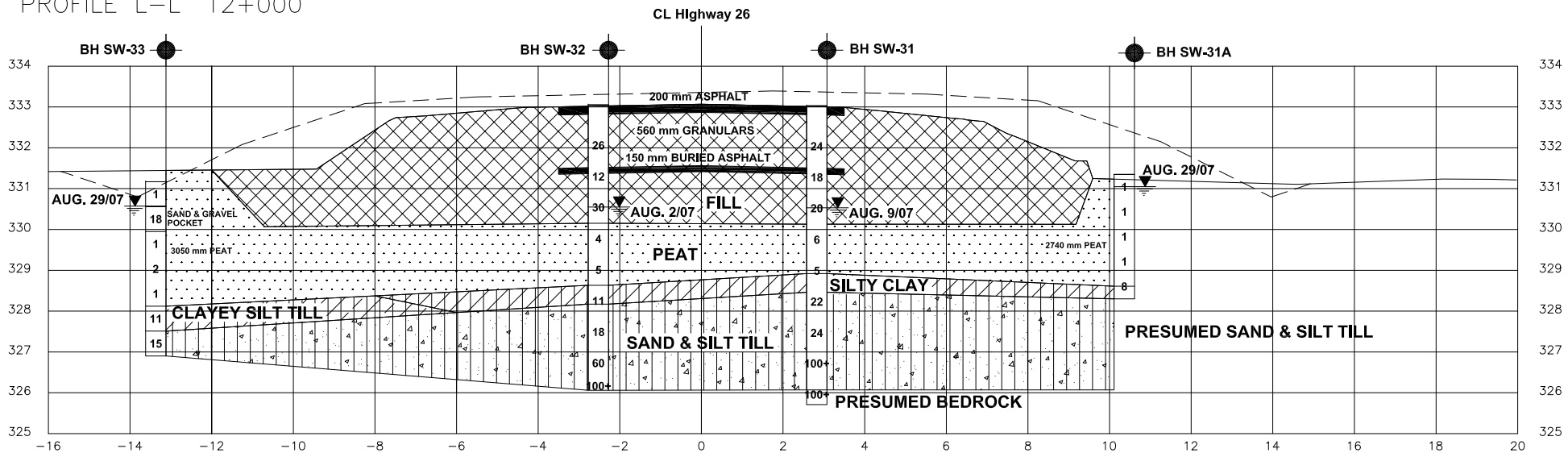
PROFILE J-J' 11+950



PROFILE K-K' 11+975



PROFILE L-L' 12+000



METRIC

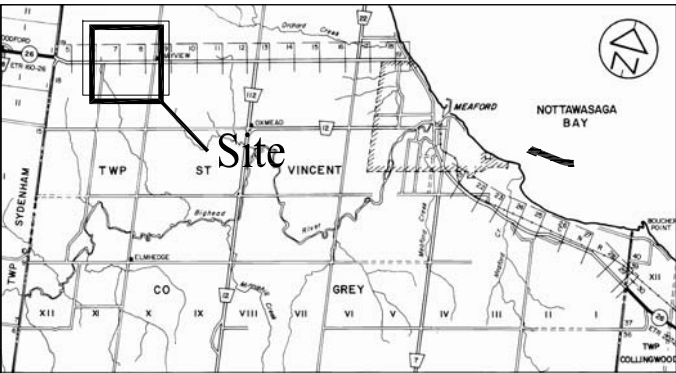
DIMENSIONS ARE IN METRES
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UNLESS OTHERWISE SHOWN

CONT No xxxx-xxxx
WP No GWP 167-91-00

SWAMP
Highway 26 - Part B
PROFILE

SHEET
5

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KEYPLAN

NTS

LEGEND

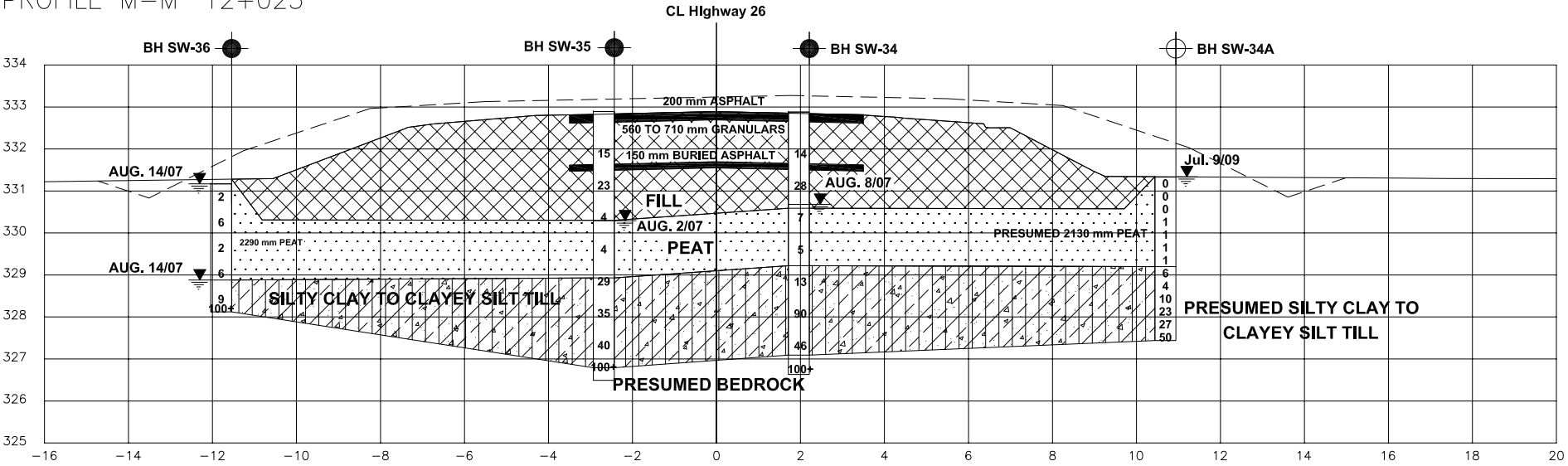
- Bore Hole
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- Bore Hole & Cone
- N
- Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE
- Blows/0.3m (60° Cone, 475 J/blow)
- W L at time of investigation
- Standpipe

REVISIONS	31/03/10	J.L.	Final
	21/10/09	J.L.	Draft
	DATE	BY	DISCUSSION

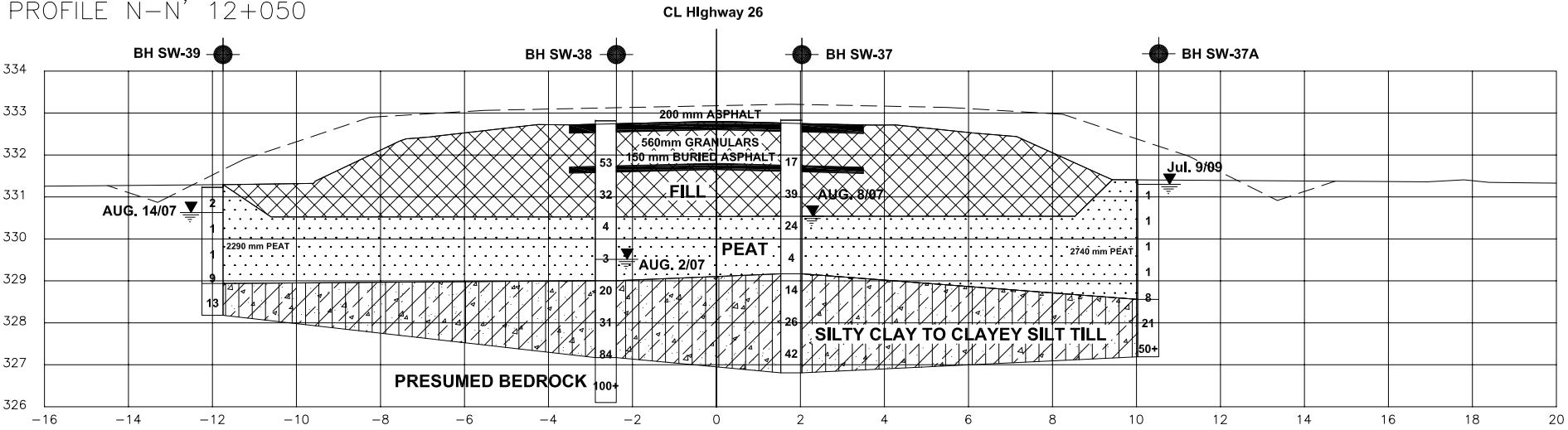
MTO GEORES No. 41A-217

HWY No.	HWY 26	DIST	Owen Sound
SUBM'D	J.L.	CHECKED E.C.	DATE 24/08/08
DRAWN	J.L.	CHECKED J.L.	APPROVED E.C.
DWG	5	SITE	SWAMP

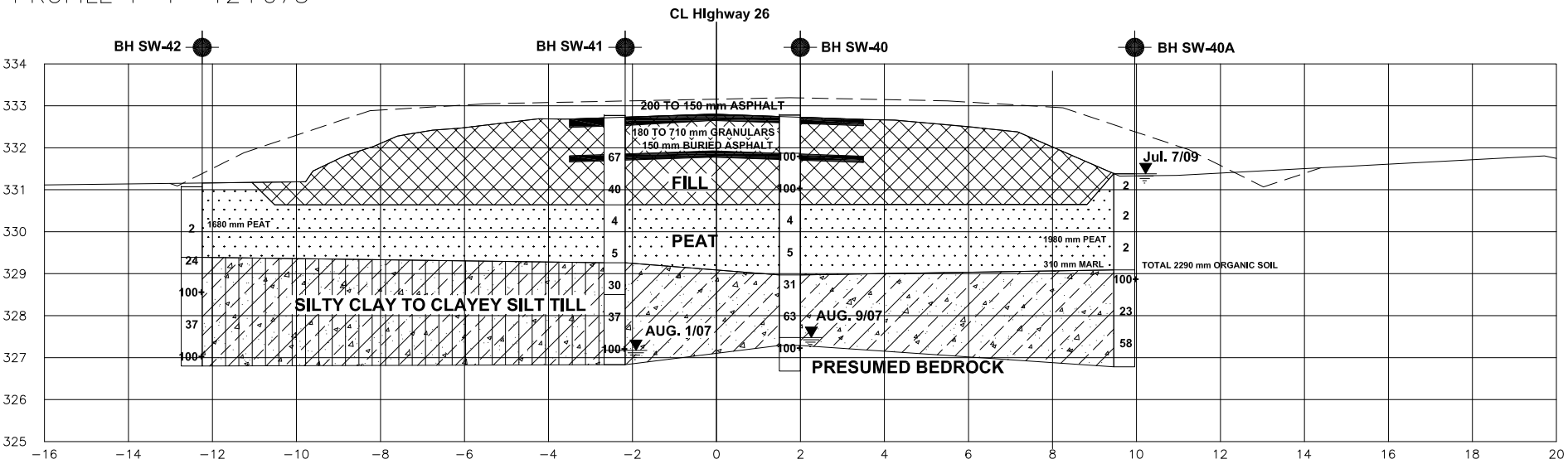
PROFILE M-M' 12+025



PROFILE N-N' 12+050



PROFILE P-P' 12+075



METRIC

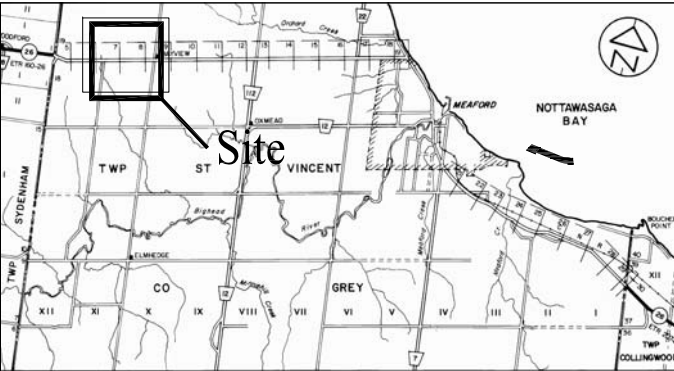
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No xxxx-xxxx
WP No GWP 167-91-00

SWAMP
Highway 26 - Part B
PROFILE

SHEET
6

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KEYPLAN

NTS

LEGEND

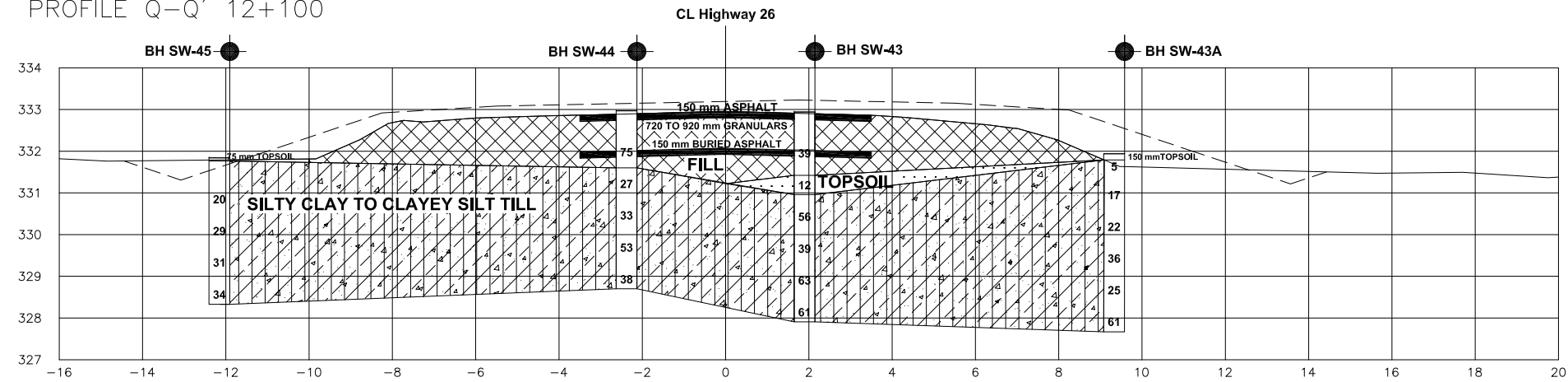
- Bore Hole
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REVISIONS	31/03/10	J.L.	Final
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DATE	BY	DISCUSSION	

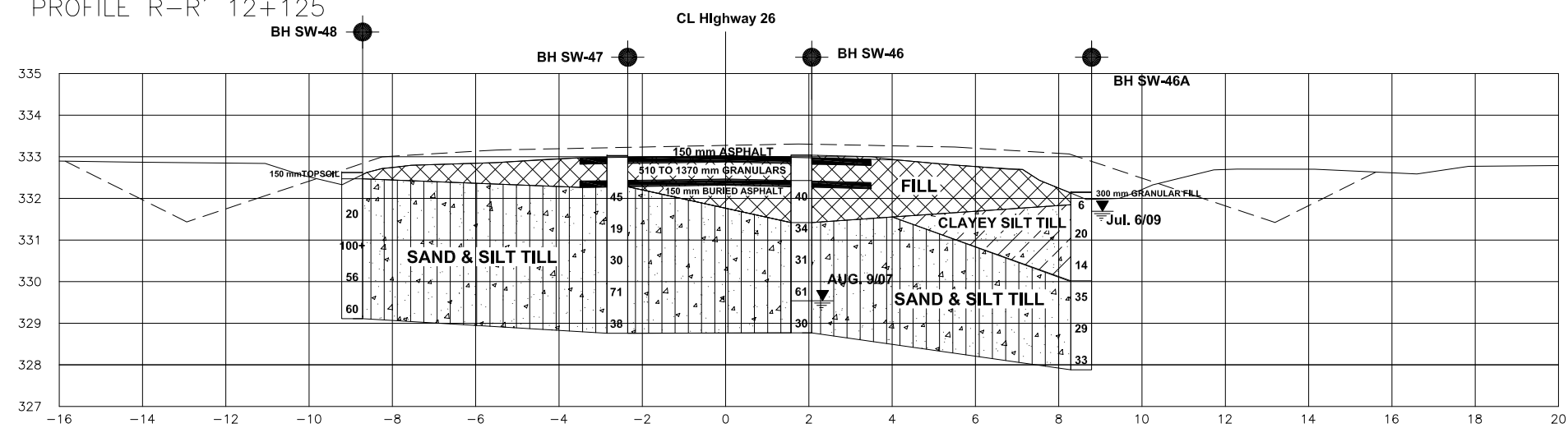
MTO GEOCRES No. 41A-217

HWY No.	HWY 26			DIST	Owen Sound
SUBM'D	J.L.	CHECKED E.C.	DATE 24/08/08	SITE	SWAMP
DRAWN	J.L.	CHECKED J.L.	APPROVED E.C.	DWG	6

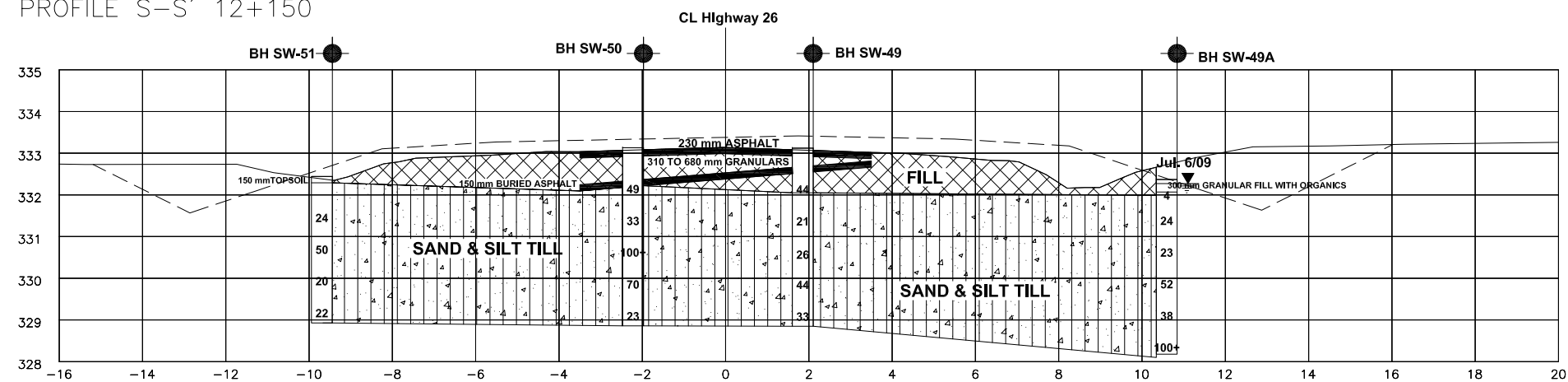
PROFILE Q-Q' 12+100



PROFILE R-R' 12+125



PROFILE S-S' 12+150



METRIC

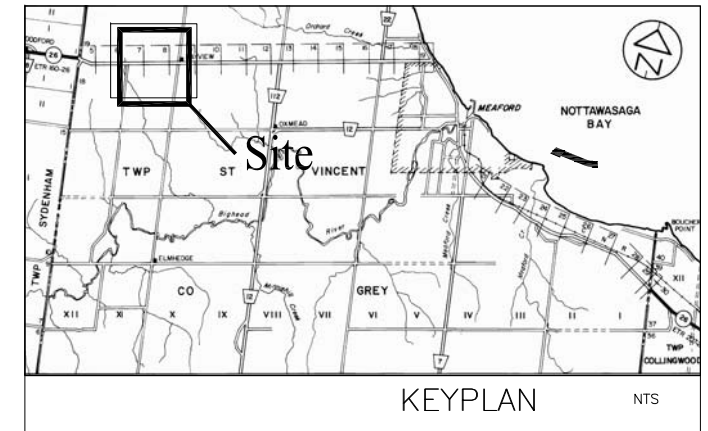
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No xxxx-xxxx
WP No GWP 167-91-00

SWAMP
Highway 26 - Part B
PROFILE

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SHEET
7



LEGEND

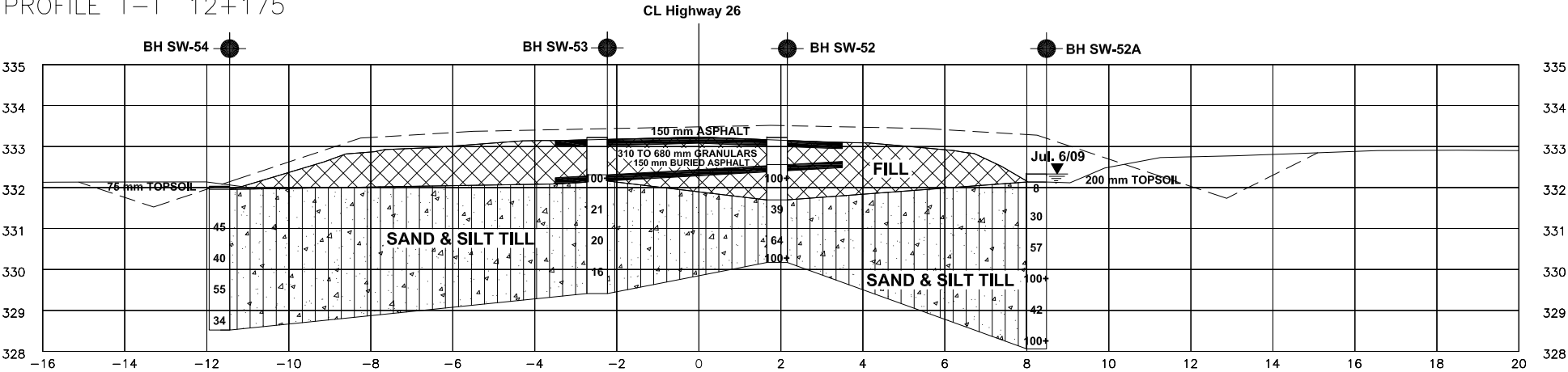
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REVISIONS	31/03/10	J.L.	Final
	21/10/09	J.L.	Draft
	DATE	BY	DISCUSSION

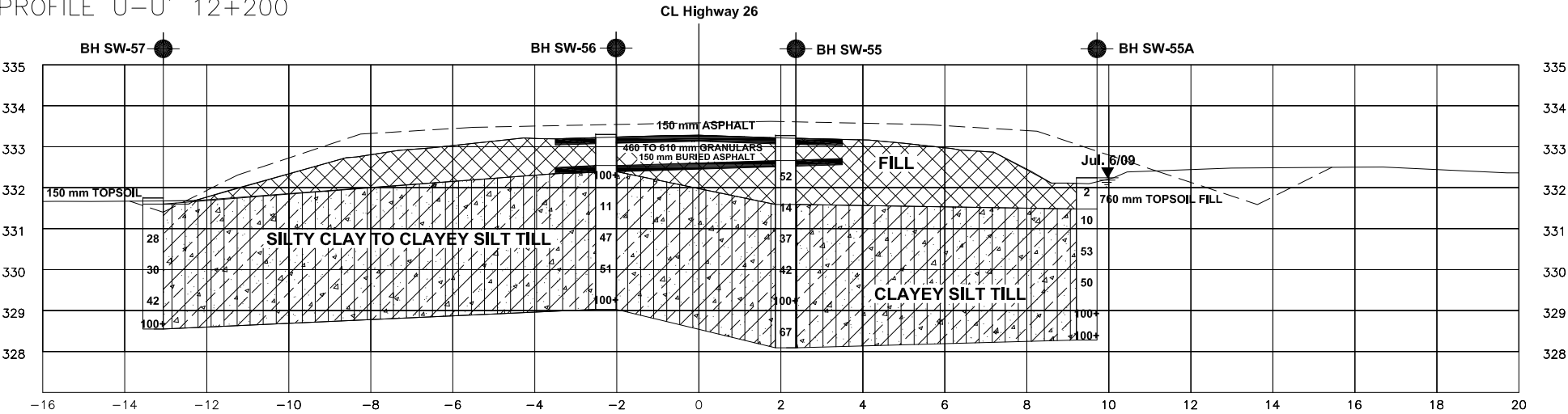
MTO GEOCREs No. 41A-217

HWY No.	HWY 26		DIST	Owen Sound
SUBM'D	J.L.	CHECKED E.C.	DATE 24/08/08	SITE SWAMP
DRAWN	J.L.	CHECKED J.L.	APPROVED E.C.	DWG 7

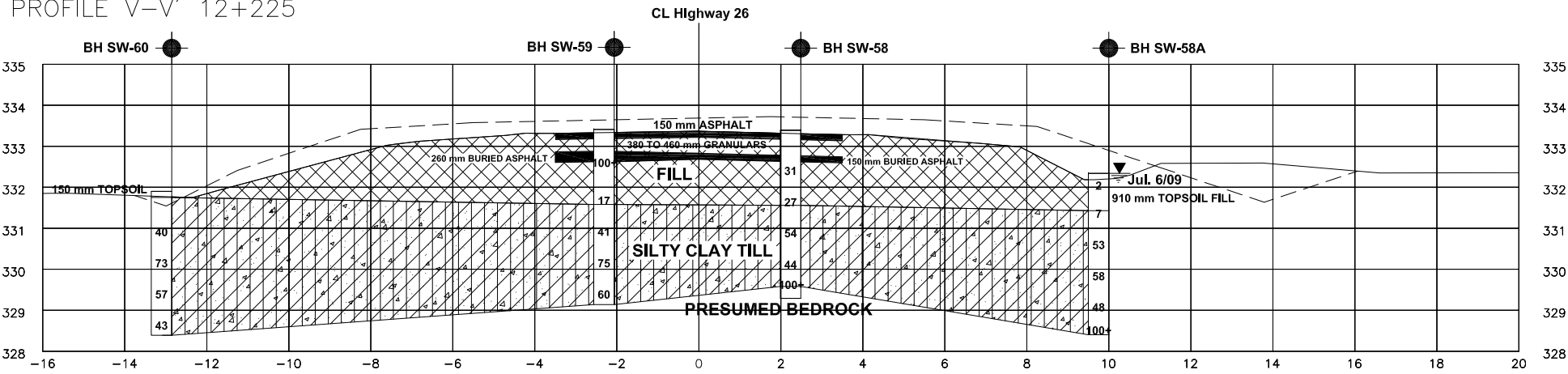
PROFILE T-T' 12+175



PROFILE U-U' 12+200



PROFILE V-V' 12+225



METRIC

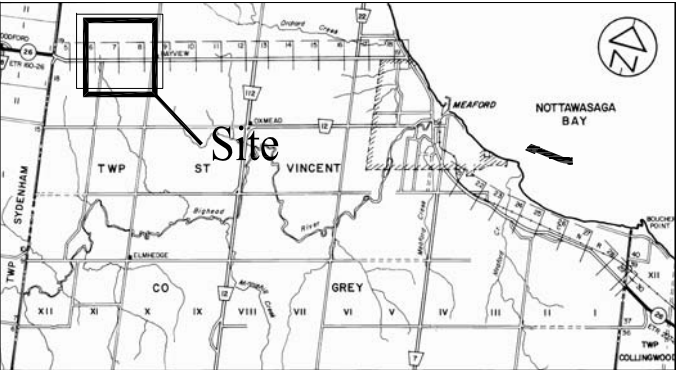
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No xxxx-xxxx
WP No GWP 167-91-00

SWAMP
Highway 26 - Part B
PROFILE

SHEET
8

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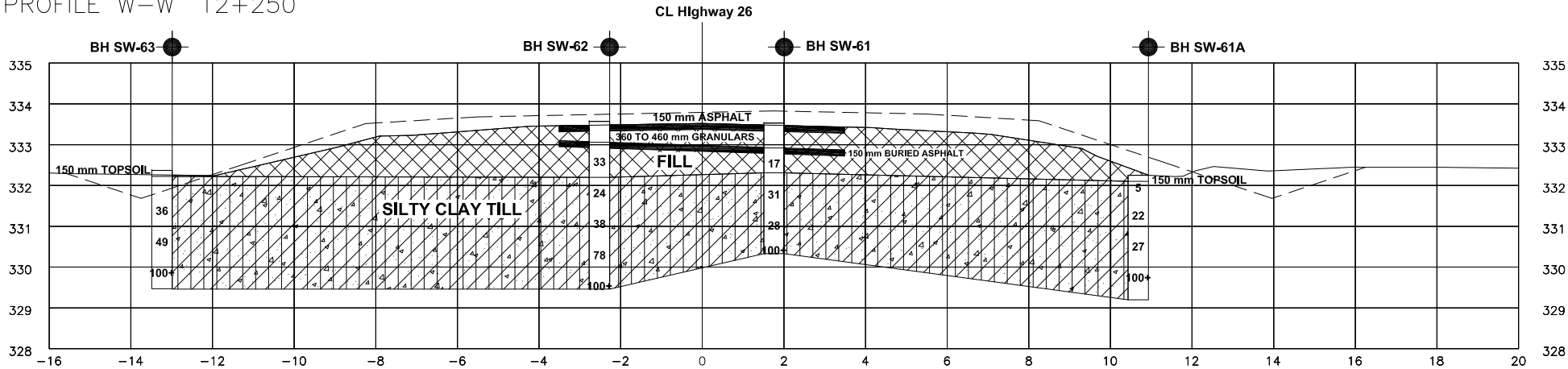


LEGEND

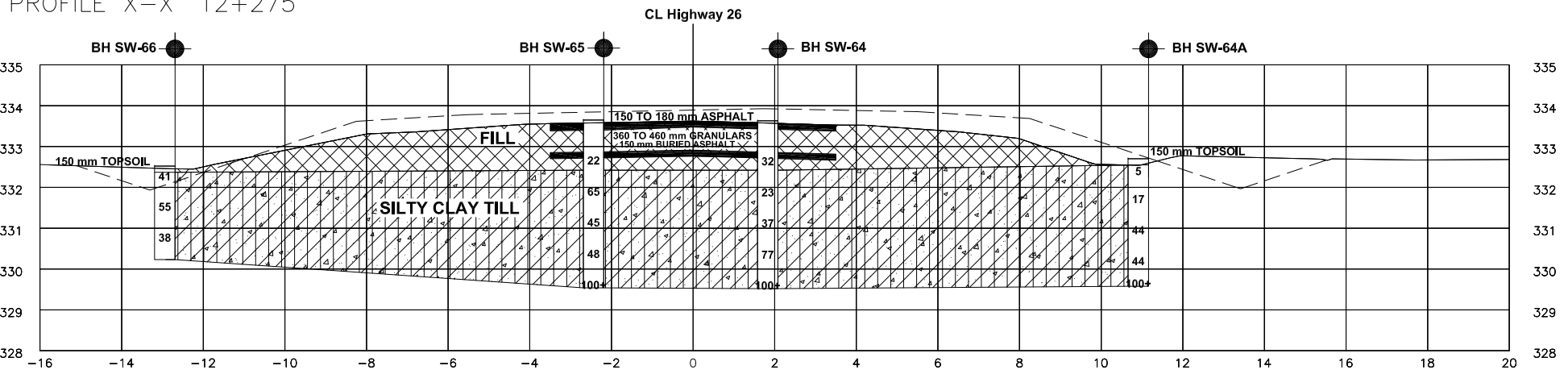
- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- N
- CONE
- W L at time of investigation
- Standpipe

REVISIONS	31/03/10	J.L.	Final
	21/10/09	J.L.	Draft
	DATE	BY	DISCRIPTION
MTO GEOCRES No. 41A-217			
HWY No.	HWY 26		DIST Owen Sound
SUBM'D J.L.	CHECKED E.C.	DATE 24/08/08	SITE SWAMP
DRAWN J.L.	CHECKED J.L.	APPROVED E.C.	DWG 8

PROFILE W-W' 12+250



PROFILE X-X' 12+275



METRIC

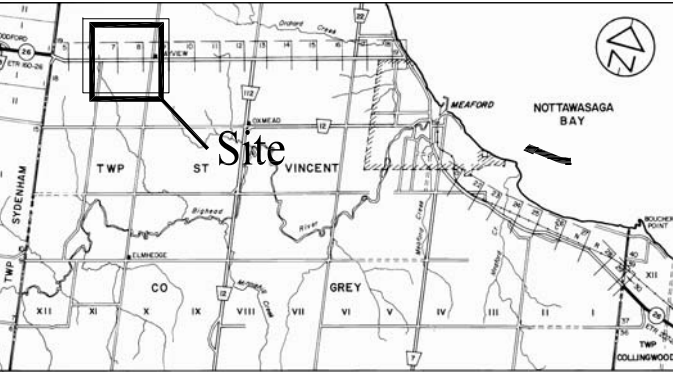
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No xxxx-xxxx
WP No GWP 167-91-00

SWAMP
Highway 26 - Part B
PROFILE

SHEET
9

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LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- N
- Blows/0.3m (Std Pen Test, 475 J/blow)
- Blows/0.3m (60° Cone, 475 J/blow)
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REVISIONS	31/03/10	J.L.	Final
	21/10/09	J.L.	Draft
	DATE	BY	DISCRIPTION
MTO GEOCRES No. 41A-217			
HWY No.	HWY 26		DIST Owen Sound
SUBM'D J.L.	CHECKED E.C.	DATE 24/08/08	SITE SWAMP
DRAWN J.L.	CHECKED J.L.	APPROVED E.C.	DWG 9

Ministry of Transportation/Stantec Consulting Ltd.
G.W.P. 167-91-00 - Rehabilitation of Highway 26
From Former St. Vincent/Sydenham Townline to Meaford
Agreement # 3006-E-0002

07-6-IEG1-SWAMP
Final Report
Appendix A
May 17, 2010

Appendix A

Explanation of Terms Used in Report

Record of Borehole Sheet

Boreholes SW-01 to 66

EXPLANATION OF TERMS USED IN REPORT

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

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 1" SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

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

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

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

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

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

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

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

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

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

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

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

STRESS AND STRAIN

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

MECHANICAL PROPERTIES OF SOIL

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

PHYSICAL PROPERTIES OF SOIL

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

RECORD OF BOREHOLE No SW-01

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940508, Easting - 209228 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 13.8.07 - 13.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								○ UNCONFINED	+ FIELD VANE							
						● QUICK TRIAXIAL	× LAB VANE									
336.78 0.00	Ground							20	40	60	80	100				
	150 mm ASPHALT.															
	610mm Granular FILL.															
336.02 0.76	150 mm ASPHALT.		1	SPT	48		336									
	FILL Brown, moist, dense, consisting of silty sand , trace to some gravel.															
335.26 1.52			2	SPT	31		335									
			3	SPT	27		334									
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Brown to reddish brown, moist, very stiff to hard, with embedded sand and gravel.		4	SPT	44		333									
			5	SPT	70		332							9 31 43 18 (60)		
331.90 4.88	End of borehole.		6	SPT	100+		332							Borehole dry and open @ completion.		

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-02

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940513, Easting - 209227 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 13.8.07 - 13.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
								● QUICK TRIAXIAL	× LAB VANE						
336.76 0.00	Ground														
	230 mm ASPHALT.														
	530 mm Granular FILL.														
336.00 0.76	150 mm ASPHALT.		1	SPT	53		336								
	FILL Brown, moist, very dense to dense, consisting of mixed sand and silt, trace to some gravel.														
335.08 1.68			2	SPT	44		335							20 25 36 19 (55)	
			3	SPT	49		334								
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Brown to reddish brown, moist, hard, with embedded sand and gravel.		4	SPT	32		333								
			5	SPT	100+										
331.88 4.88			6	SPT	100+		332							17 31 40 12 (52)	
	End of borehole.													Borehole dry and open @ completion.	

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

1 OF 1

METRIC

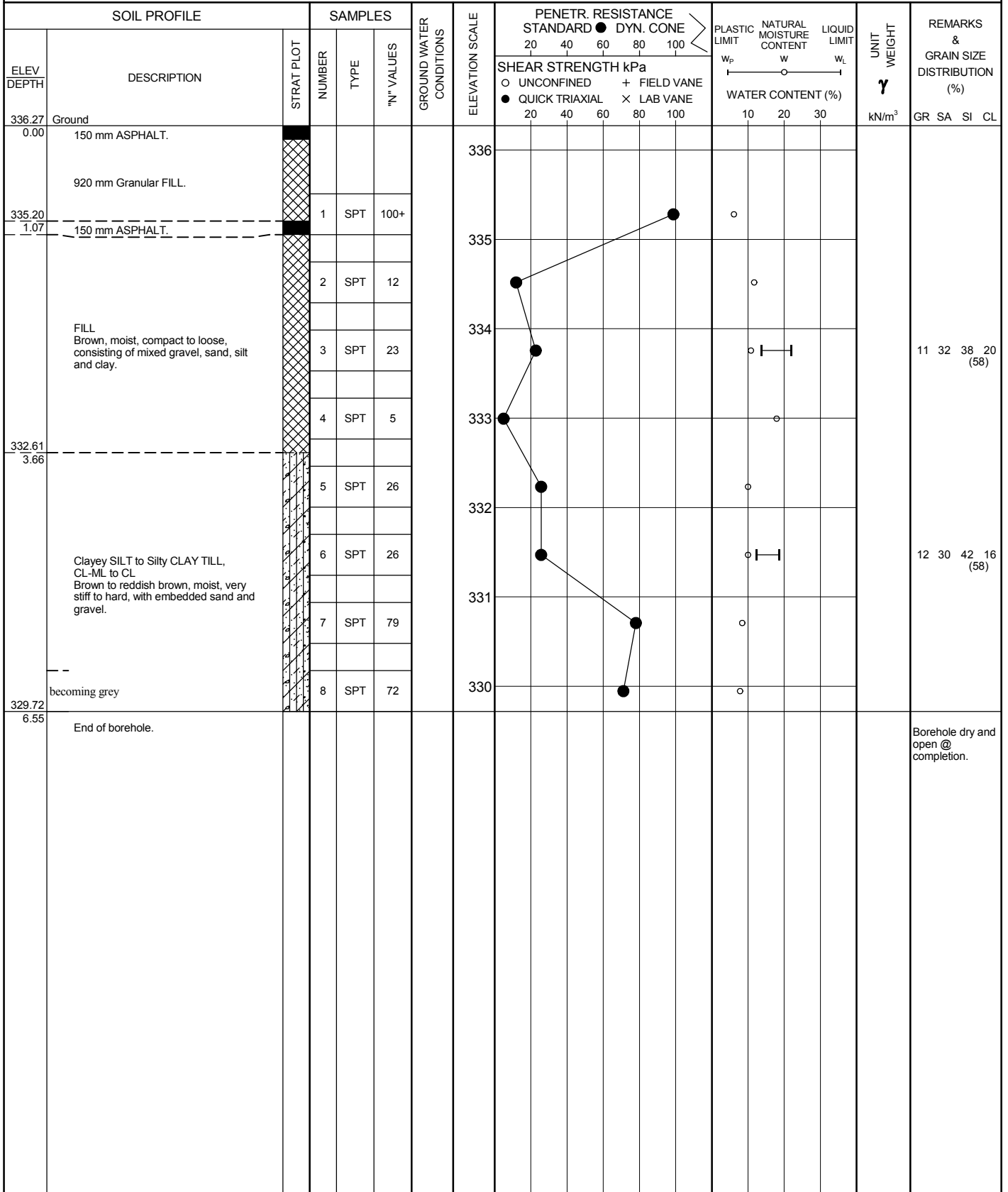
SOIL PROFILE						SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD DYN. CONE		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	SHEAR STRENGTH kPa	WATER CONTENT (%)								
335.72 0.00	Ground 50 mm TOPSOIL.														
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Brown to reddish brown, moist, hard, with embedded sand and gravel.		1	SPT	45										
			2	SPT	58										
			3	SPT	39										
332.37 3.35	End of borehole.		4	SPT	100+									Borehole dry and open @ completion.	

RECORD OF BOREHOLE No SW-04

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northring - 4940515, Easting - 209252 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 9.8.07 - 9.8.07 CHECKED BY JL



JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

+ 3, X 3: Numbers refer to Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-05

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940520, Easting - 209251 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 13.8.07 - 13.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
							● QUICK TRIAXIAL	× LAB VANE							
336.26 0.00	Ground														
	150 mm ASPHALT.														
	920 mm Granular FILL.														
335.19 1.07	150 mm ASPHALT.		1	SPT	100+										
			2	SPT	46										
			3	SPT	14										
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Brown to reddish brown, moist to wet, stiff to hard, with embedded sand and gravel.		4	SPT	100+									8 32 42 18 (61)	
			5	SPT	23										
			6	SPT	100+										
331.38 4.88	End of borehole.													Sample and auger refusal @ 4.88 m on presumed cobble. Borehole dry and open @ completion.	

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-06

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940537, Easting - 209243 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 13.8.07 - 13.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
						● QUICK TRIAXIAL	× LAB VANE								
332.92	Ground							20 40 60 80 100							
0.00	300 mm TOPSOIL.														
332.62															
0.30															
			1	SPT	23		332								
			2	SPT	11		331								
			3	SPT	100+										
			4	SPT	100+										
329.57	End of borehole.														
3.35															

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

RECORD OF BOREHOLE No SW-07

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northring - 4940524, Easting - 209278 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 7.8.07 - 7.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE						
335.74 0.00	Ground														
	150 mm ASPHALT. 180 mm Granular FILL.														
	FILL Brown, moist, compact to very dense, consisting of a mixture of gravel, sand and silt, trace clay, occasional cobbles.		1	SPT	40									39 26 29 7 (35)	
			2	SPT	68										
			3	SPT	100+										
			4	SPT	23										
331.63 4.11	MARL Greenish grey to black, stiff, consisting of partially decomposed peat, topsoil and organic silt. Organic Content - 7.24%		5	SPT	10									7 39 46 9 (55) hit cobble	
331.02 4.72	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown, moist, hard, with embedded sand and gravel, frequent cobbles, silt pockets.		6	SPT	53									24 28 35 12 sample not (48) enough for Atterberg Limit determinations	
			7	SPT	100+										
			8	SPT	100+										
328.73 7.01	End of borehole.		9	SPT	100+									sampler and auger refusal @ 7.01 m on presumed cobbles. Borehole dry and open @ completion.	

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

+ 3, X 3: Numbers refer to
Sensitivity

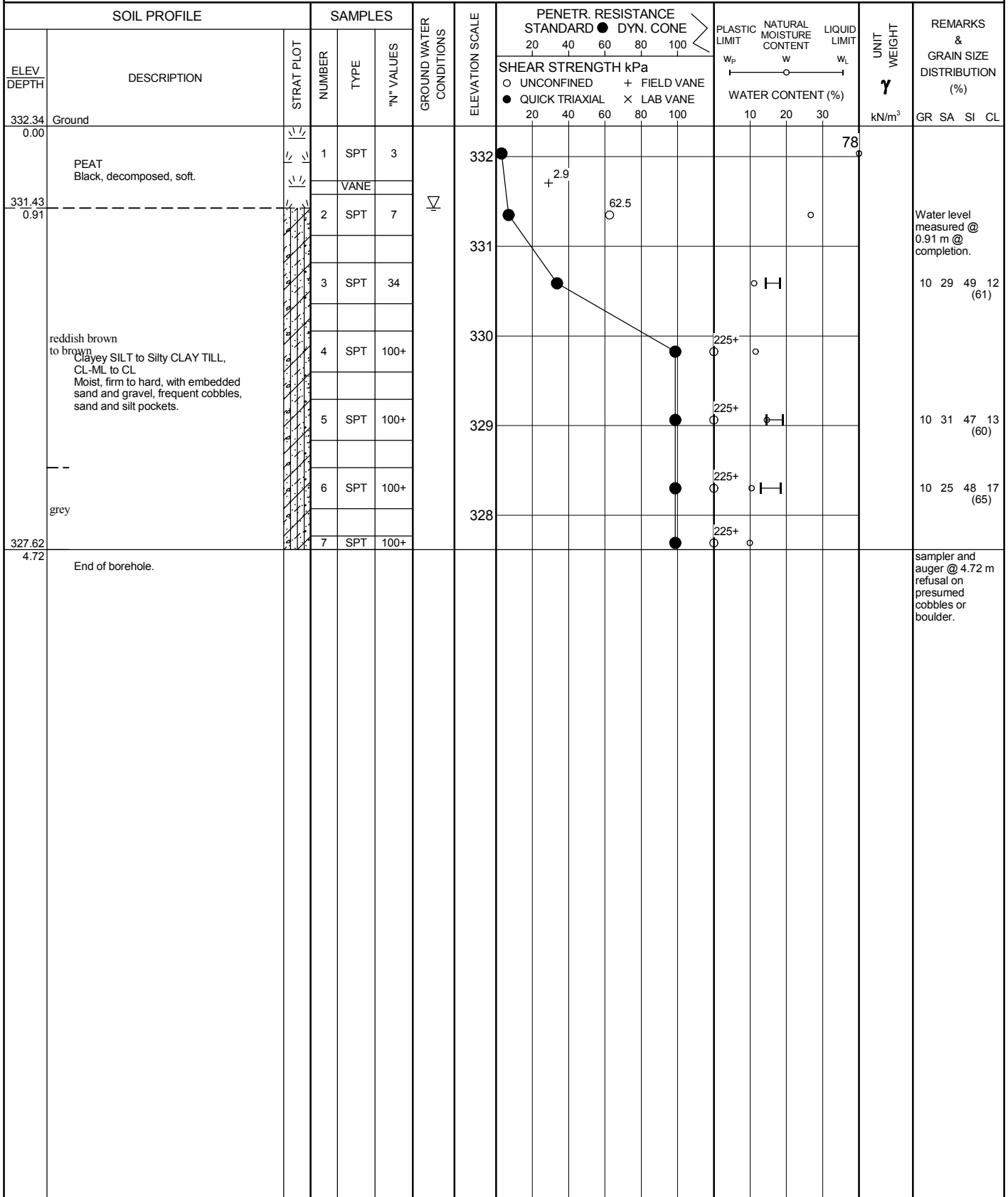
○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-07A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940509, Easting - 209283 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm COMPILED BY JL
 DATUM Geodetic DATE 7.7.09 - 7.7.09 CHECKED BY EC



RECORD OF BOREHOLE No SW-08

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940527, Easting - 209274 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 7.8.07 - 7.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE						
335.76 0.00	Ground							20 40 60 80 100	10 20 30					GR SA SI CL	
	150 mm ASPHALT.														
	610 mm Granular FILL.														
335.00 0.76			1	SPT	43		335			○	H			21 38 32 9 (41)	
			2	SPT	100+		334			○					
	FILL Brown, moist, very dense to very loose, consisting of mixed gravel, sand and silt, trace clay.		3	SPT	28		333			○	H			11 36 43 9 (53)	
			4	SPT	44		332			○					
331.65 4.11			5	SPT	3		331			○					
331.19 4.57	PEAT, Dark brown, partially decomposed.		6	SPT	23		330			○				3 20 50 27 (77)	
			7	SPT	47		329			○					
	Clayey SILT to Silty CLAY TILL, CL-ML to CI Reddish brown, moist, very stiff to hard, with embedded sand and gravel, frequent cobbles, sand and silt pockets.		8	SPT	76					○					
			9	SPT	100+					○					
328.44 7.32														Auger and sampler refusal on presumed cobbles or boulder. Borehole dry and open @ completion.	

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

+³, ×³: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-09

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940543, Easting - 209275 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 15.8.07 - 15.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE							
331.06 0.00	Ground					▽	331							Water level measured @ 0.6 m @ completion of drilling. 23 29 39 9 (47)		
329.99 1.07	FILL Dark brown, moist, loose, consisting of mixed gravel, sand, silt, clay and organics.		1	SPT	8		330			○						
	SAND, SP Grey, saturated, loose.		2	SPT	9		329				○					
328.62 2.44	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown, moist, hard, with embedded sand and gravel, frequent cobbles, sand, silt and silty clay pockets.		3	SPT	100+					○						
327.86 3.20	End of borehole.						328							Sampler and auger refusal @ 3.2 m on presumed cobbles or boulder.		

+ 3, X 3: Numbers refer to
Sensitivity

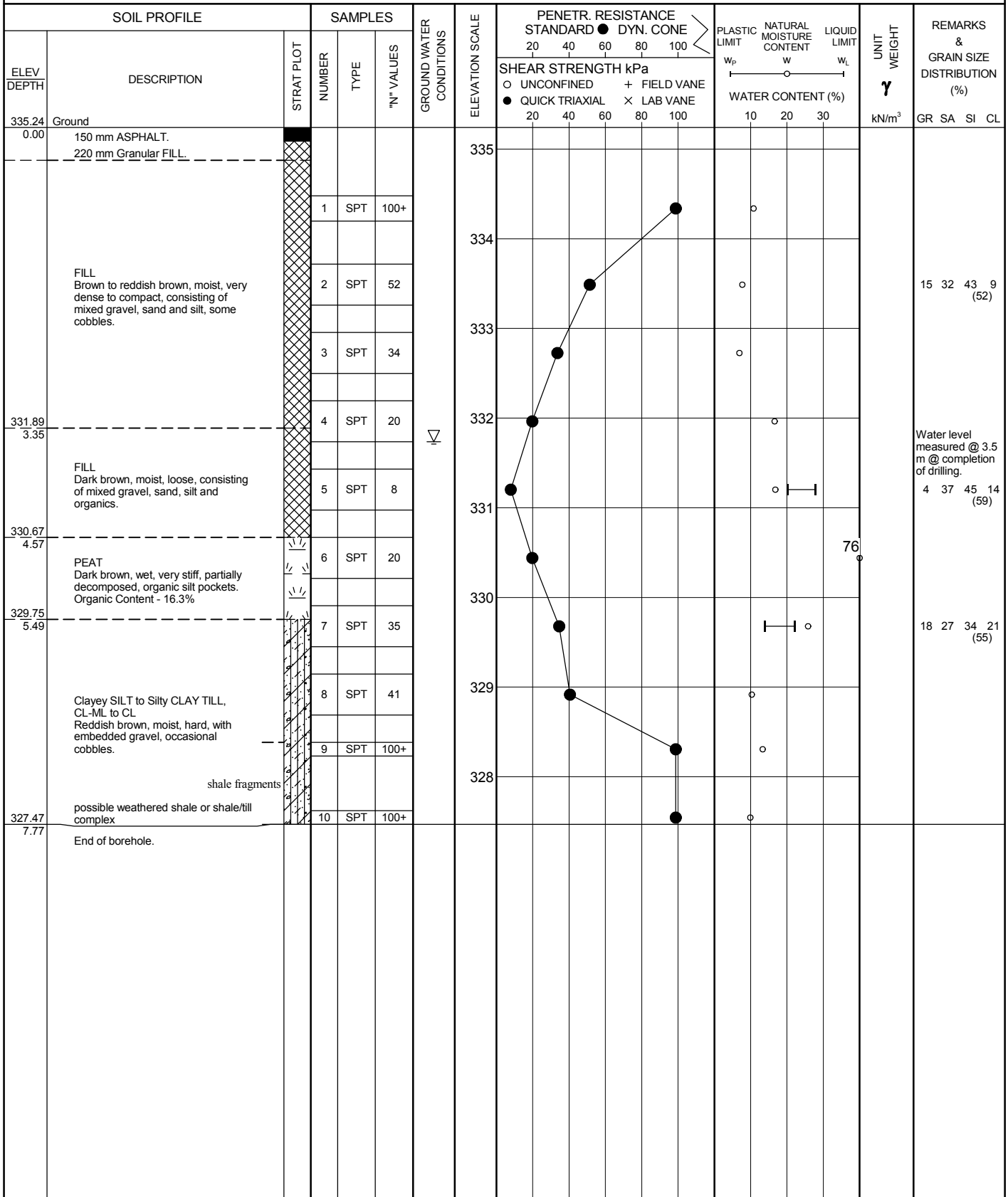
○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-10

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940529, Easting - 209301 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 8.8.07 - 8.8.07 CHECKED BY JL



JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

+ 3, X 3: Numbers refer to Sensitivity

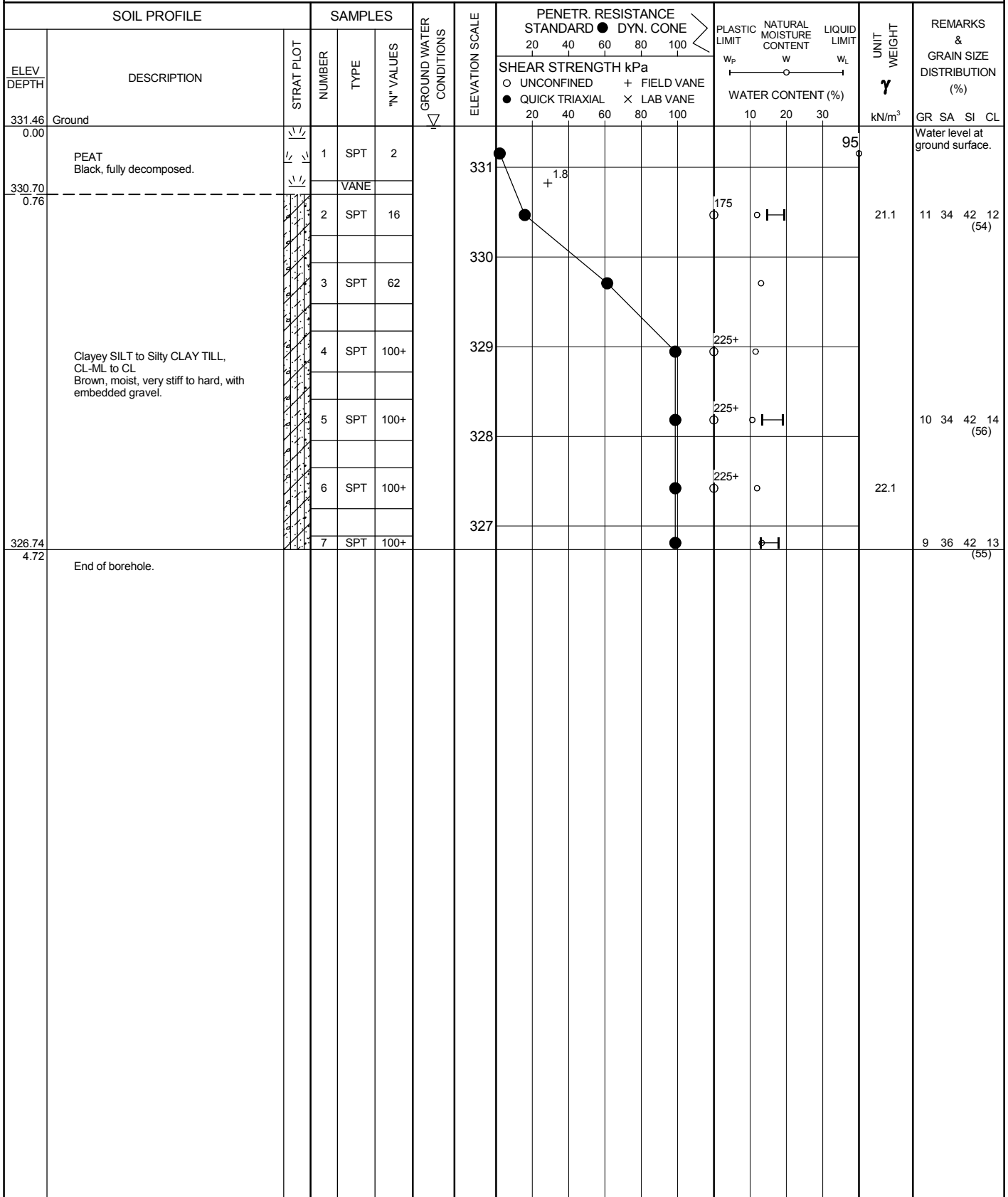
○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-10A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940515, Easting - 209303 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm COMPILED BY JL
 DATUM Geodetic DATE 7.7.09 - 7.7.09 CHECKED BY EC



+ 3, × 3: Numbers refer to
Sensitivity

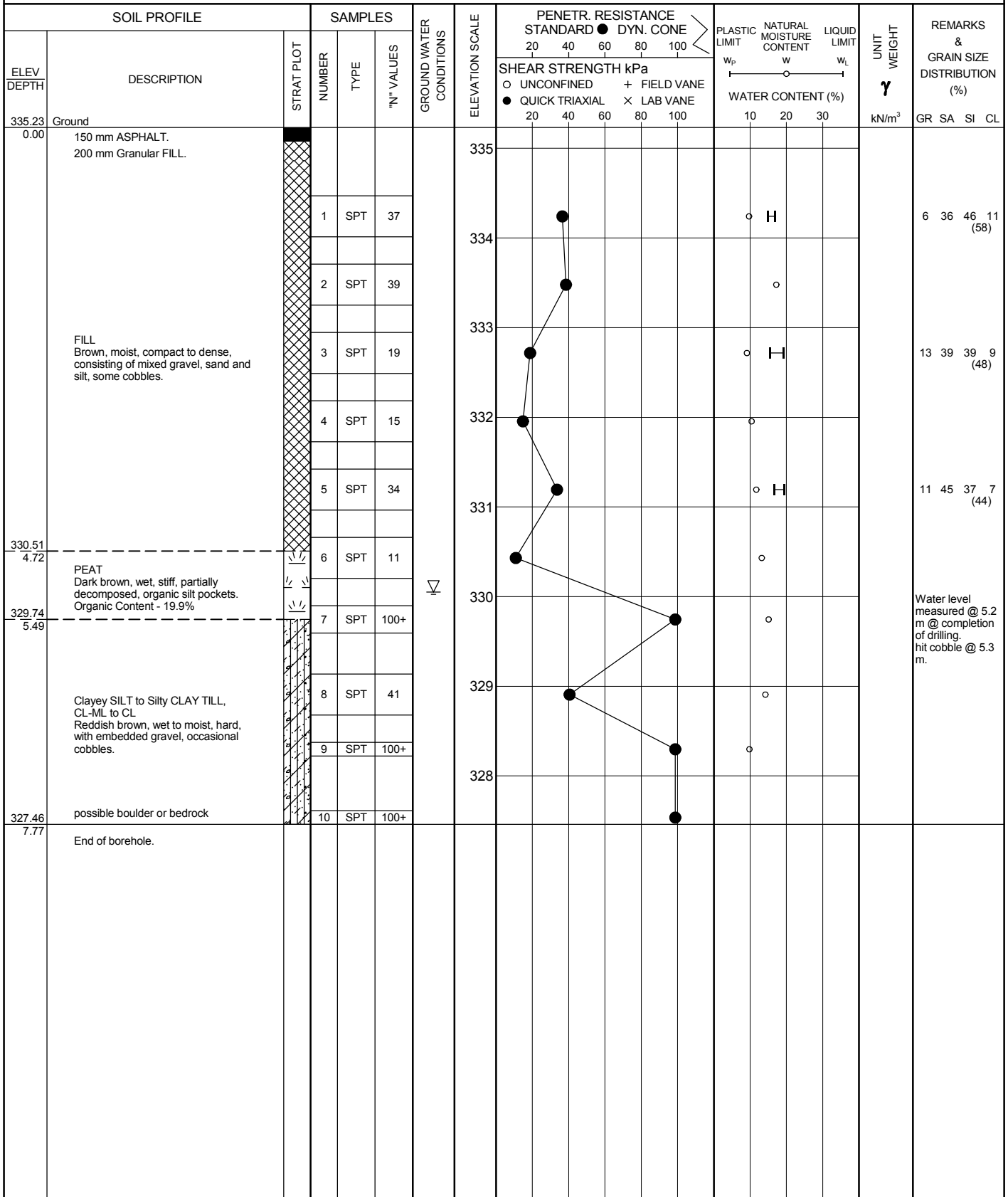
○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-11

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940533, Easting - 209299 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 7.8.07 - 7.8.07 CHECKED BY JL



METRIC

[illegible]

RECORD OF BOREHOLE No SW-13

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940536, Easting - 209324 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 8.8.07 - 8.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								○ UNCONFINED	+ FIELD VANE					
								● QUICK TRIAXIAL	× LAB VANE					
							20	40	60	80	100	WATER CONTENT (%)		
334.83	Ground													
0.00	150 mm ASPHALT.													
334.22	460 mm Granular FILL.													
0.61			1	SPT	42		334							14 33 42 12 (53)
			2	SPT	57		333							
	FILL Brown to reddish brown, moist, dense to very dense, consisting of mixed sand and silt, some gravel and cobbles.		3	SPT	34		332							
			4	SPT	56		331							16 41 33 9 (43)
331.32	PEAT Black to dark brown, very stiff, fully to partially decomposed, wood pieces. Organic Content - 19.5%		5	SPT	28		330							
330.72	grey		6	SPT	40		329							28 36 30 6 (36) Water level measured @ 4.9 m @ completion of drilling.
4.11			7	SPT	51		328							
	SAND & SILT TILL, SM-ML Reddish brown, moist, dense to very dense, with embedded gravel, occasional cobbles.		8	SPT	98									
			9	SPT	100+									
327.67	End of borehole.													Sampler refusal @ 7.16 m on presumed boulder.
7.16														

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-13A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940525, Easting - 209328 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE Dynamic Cone, Hand Drilling COMPILED BY NN
 DATUM Geodetic DATE 8.7.09 - 8.7.09 CHECKED BY JL

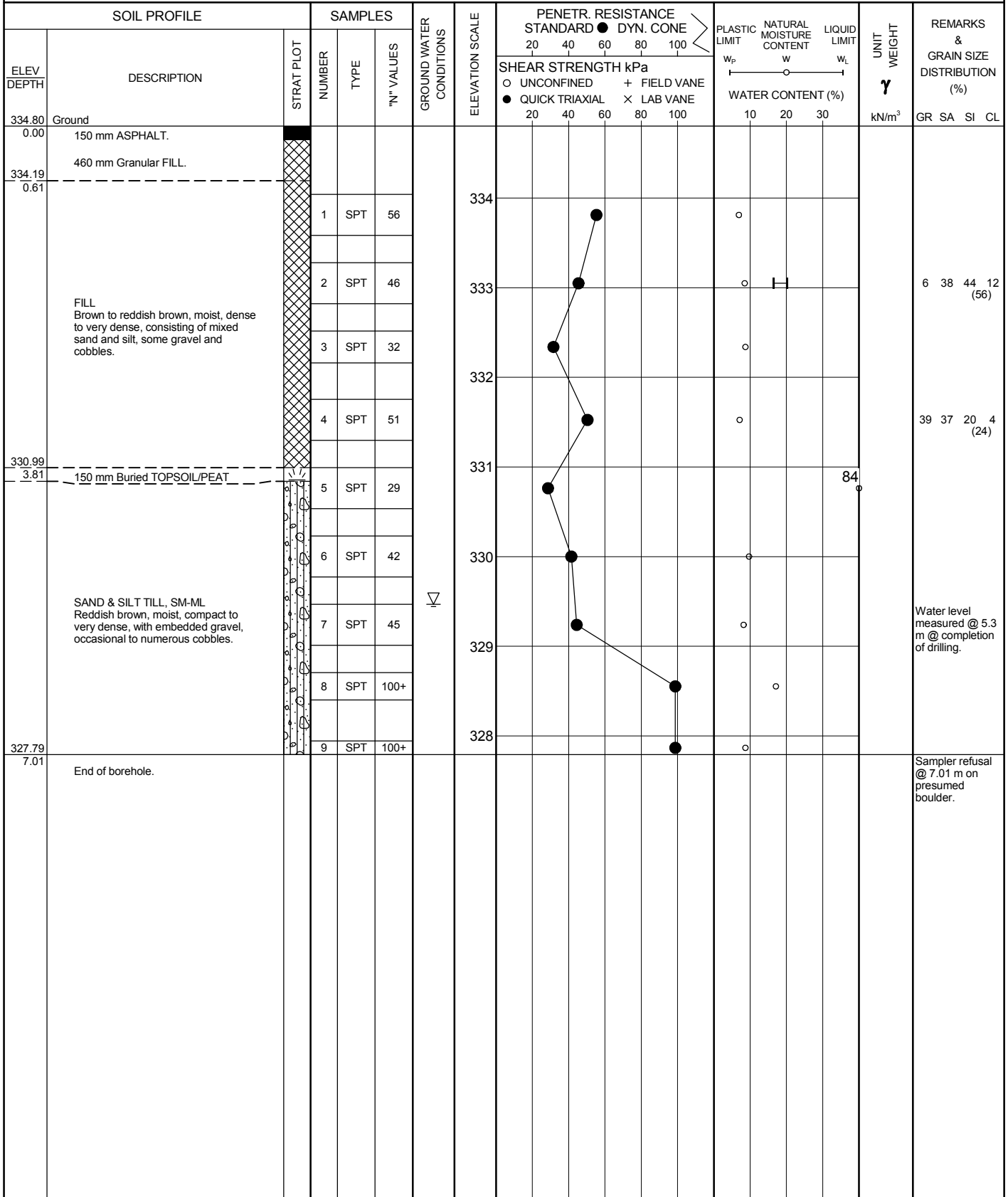
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	+ FIELD VANE							● QUICK TRIAXIAL	× LAB VANE	
331.40 0.00	Ground														Water level at ground surface. Hand Drilling with 31.5 kg (70 lb.) hammer. Nc results adjusted for standard 63.5 kg (140 lb.) hammer.			
	Presumed PEAT.			VANE														
330.18 1.22																		
326.83 4.57	End of dynamic cone.																	

RECORD OF BOREHOLE No SW-14

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northring - 4940540, Easting - 209323 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 7.8.07 - 7.8.07 CHECKED BY JL



RECORD OF BOREHOLE No SW-15

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940551, Easting - 209317 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 16.8.07 - 16.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
331.07 0.00	Ground						331							GR SA SI CL
330.31 0.76	FILL/TOPSOIL Dark brown, wet, consisting of mixed silty clay, sand and organics.		1	SPT	17		330							11 41 38 10 (48)
	SAND & SILT TILL, SM-ML Brown, saturated to moist, compact to very dense, some gravel, numerous cobbles below 2.3 m.		2	SPT	31		329							
328.33 2.74	End of borehole.		3	SPT	100+									Auger refusal @ 2.74m on boulder.

RECORD OF BOREHOLE No SW-16

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940543, Easting - 209348 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 7.8.07 - 8.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			STANDARD	● DYN. CONE						
								SHEAR STRENGTH kPa							
							○ UNCONFINED	+ FIELD VANE							
							● QUICK TRIAXIAL	× LAB VANE							
									WATER CONTENT (%)						
							20	40	60	80	100	10	20	30	

334.47	Ground														
0.00	200 mm ASPHALT.														
	710 Granular FILL.						334								
333.56	150 mm ASPHALT.		1	SPT	27										
0.91							333								
	FILL Brown to reddish brown, moist to wet, dense to compact, consisting of mixed sand and silt, trace to some gravel and clay.		2	SPT	40										
			3	SPT	22		332								20 32 26 22 (49)
			4	SPT	11		331						21.2		
330.81	PEAT/TOPSOIL														
3.66	Black to dark brown, stiff, fully to														
330.51	partially decomposed wood pieces.		5	SPT	32									6 37 46 11 (57)	
3.96	silty clay pocket						330								Spoon and auger wet @ 4.6 m.
330.05			6	SPT	19		329								
4.42	SAND & SILT TILL, SM-ML		7	SPT	22		328								4 66 24 6 (30)
	Reddish brown to brown, moist to wet, compact to dense, with embedded gravel, silty clay to clayey silt pockets.		8	SPT	24										
			9	SPT	19										
327.15	End of borehole.														
7.32															

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-16A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940532, Easting - 209351 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE Hand Drilling COMPILED BY NN
 DATUM Geodetic DATE 8.7.09 - 8.7.09 CHECKED BY JL

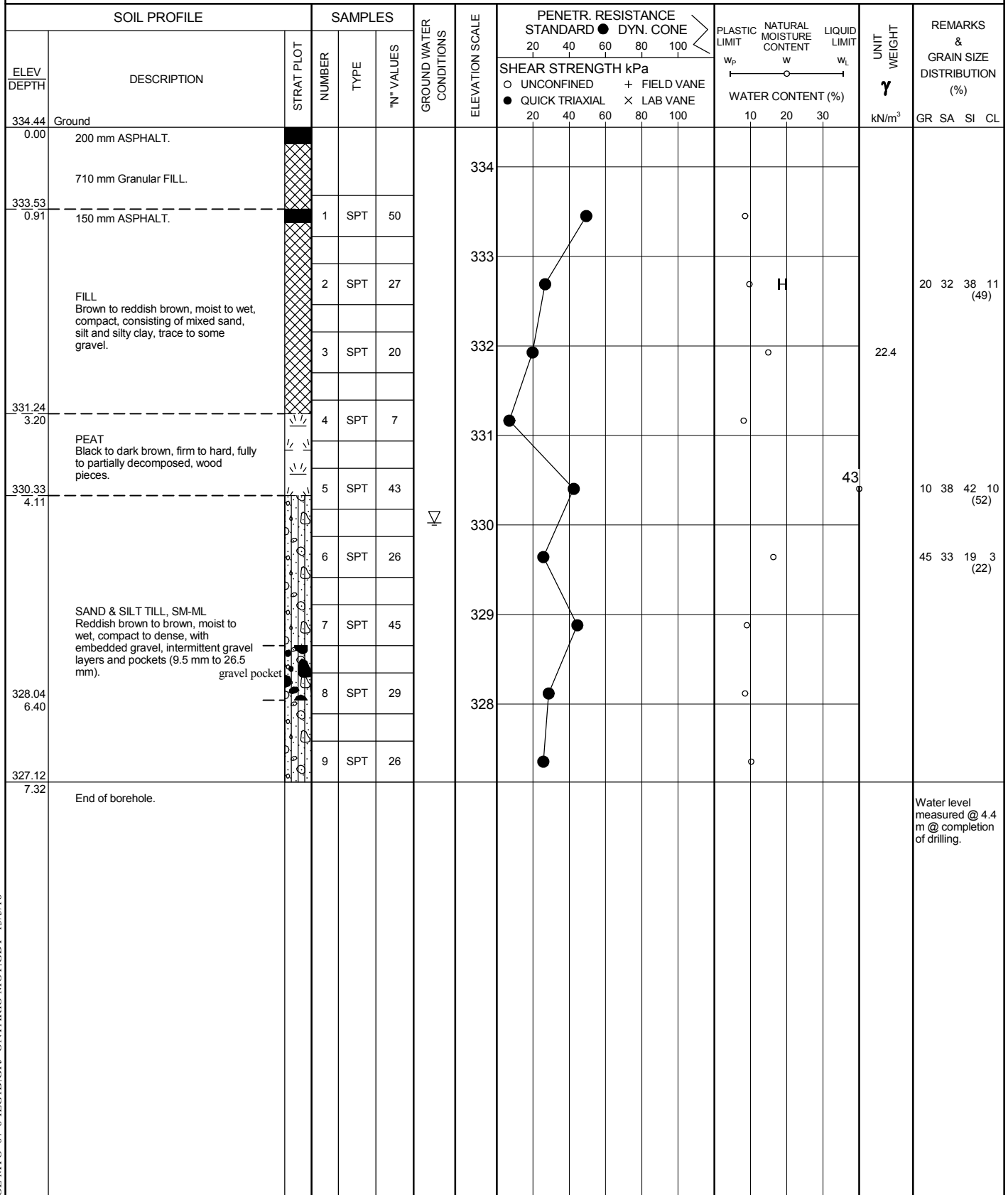
SOIL PROFILE				SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
331.25 0.00	Ground													
	PEAT Black, partially to fully decomposed.		1	SPT	0		331	●	4.5					Water level at ground surface. No sample in spoon.
330.18 1.07			2	SPT	7		330	●						
329.42 1.83	SAND & GRAVEL SM-GM Brown, moist, compact, some silt, trace clay, till like.		3	SPT	15		329	●		○ H				36 43 17 4 (21)
328.81 2.44	Clayey SILT TILL, CL-ML Brown to reddish brown, wet, hard, with embedded sand and gravel.		4	SPT	55		329	●		○ H				6 34 47 13 (61)
	End of sampling due to excessive wet cave-in. Moved 1.5 m and put down dynamic cone.						328							
326.98 4.27	End of dynamic cone.						327							Hand Drilling with 31.5 kg (70 lb.) hammer. N and Nc results adjusted for standard 63.5 kg (140 lb.) hammer. Dynamic Cone Refusal @ 4.27 m.

RECORD OF BOREHOLE No SW-17

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940547, Easting - 209347 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 2.8.07 - 2.8.07 CHECKED BY JL



JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

+ 3, X 3: Numbers refer to Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-18

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940558, Easting - 209344 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 28.8.07 - 28.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	○ FIELD VANE	○ QUICK TRIAXIAL						○ LAB VANE		
331.12 0.00	Ground 150 mm TOPSOIL.																	

Water level
measured @ 1.5
m @ completion
of drilling.
25 37 34 4
(38)

RECORD OF BOREHOLE No SW-19

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940550, Easting - 209373 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 8.8.07 - 8.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE						× LAB VANE		
334.14 0.00	Ground						20	40	60	80	100	10	20	30				
	180 mm ASPHALT. 170 mm Granular FILL.																	
			1	SPT	39													
			2	SPT	100+													
	FILL Brown, moist to wet, very dense to compact, consisting of mixed sand and silt, trace to some gravel and clay, with asphalt pieces and organic silt.		3	SPT	20													
	150 mm asphalt		4	SPT	17													
330.63 3.51	PEAT/TOPSOIL																	
330.33 3.81	Black to dark brown, stiff, fully decomposed.		5	SPT	25													
			6	SPT	26													
	SAND & SILT TILL, SM-ML Reddish brown to brown, moist to wet, compact to very dense, with embedded gravel.		7	SPT	31													
			8	SPT	64													
327.59 6.55	End of borehole.																	

+ 3, X 3: Numbers refer to Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-19A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940539, Easting - 209376 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE Dynamic Cone, Hand Drilling COMPILED BY NN
 DATUM Geodetic DATE 8.7.09 - 8.7.09 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE								WATER CONTENT (%)			
331.21	Water							20	40	60	80	100	10	20	30	GR	SA	SI	CL
0.00	Ground Surface																		
	Presumed PEAT			VANE			331												Hand Drilling with 31.5 kg (70 lb.) hammer. Nc results adjusted for standard 63.5 kg (140 lb.) hammer. Water level approximately 0.15 m above ground surface.
329.99				VANE			330												
1.22																			
327.70	End of Dynamic Cone																		
3.51																			

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

RECORD OF BOREHOLE No SW-20

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940554, Easting - 209371 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 2.8.07 - 2.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE							
								● QUICK TRIAXIAL	× LAB VANE							
334.12 0.00	Ground														GR SA SI CL	
	150 mm ASPHALT. 230 mm Granular FILL.															
332.90 1.22	FILL Brown, moist to wet, dense to compact, consisting of mixed sand and silt, trace to some gravel and clay.		1	SPT	55										34 45 15 6 (21)	
	150 mm asphalt														Possible buried asphalt pavement @ 1.2 m as observed with asphalt pieces from auger cuttings.	
			2	SPT	51											
331.53 2.59			3	SPT	29											
	PEAT/TOPSOIL Black to dark brown, very stiff to stiff, partially decomposed, wood and reed pieces. Organic Content - 26.8%		4	SPT	15											
330.61 3.51			5	SPT	39										20 36 37 7 (44)	
	SAND & SILT TILL, SM-ML Reddish brown to brown, moist to wet, dense to very dense, with embedded gravel.		6	SPT	53											
			7	SPT	56											
327.57 6.55			8	SPT	54											
	End of borehole.														Water level measured @ 3.8 m @ completion of drilling.	

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

+ 3, × 3: Numbers refer to Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-21

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940563, Easting - 209367 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 28.8.07 - 28.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE						× LAB VANE		
331.17 0.00	Ground 150 mm TOPSOIL. 																	

RECORD OF BOREHOLE No SW-22

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940557, Easting - 209398 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 8.8.07 - 8.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE							
333.80 0.00	Ground 150 mm ASPHALT. 300 mm Granular FILL						20 40 60 80 100									
		150 mm asphalt	1	SPT	100+		333			○				possible asphalt at 0.9 m.		
	FILL Brown, moist to wet, dense to compact, consisting of mixed sand and silt, trace to some gravel and clay.		2	SPT	100+		332			○				Augered through cobbles between 2.3 m and 2.9 m. No sample taken.		
330.75 3.05	PEAT/TOPSOIL		3	SPT	34		331				○	┌───┐		3 24 56 17 (73)		
330.45 3.35	Black to dark brown, hard, fully decomposed.															
330.14 3.66	stilt clay seams		4	SPT	23		330				○			Water level measured @ 3.8 m @ completion of drilling.		
			5	SPT	13		329				○			6 56 31 7 (38)		
	SAND & SILT TILL, SM-ML Reddish brown to brown, moist to wet, compact to dense, with embedded gravel, occasional silty clay seams.		6	SPT	31		328				○					
			7	SPT	27						○					
327.25 6.55	End of borehole.															

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-22A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940547, Easting - 209399 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE Hand Drilling COMPILED BY JL
 DATUM Geodetic DATE 9.7.09 - 9.7.09 CHECKED BY EC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
								● QUICK TRIAXIAL	× LAB VANE						
331.30 0.00	Ground														
330.54 0.76	PEAT Dark brown to black, very soft, saturated, partially decomposed, sandy.		1	SPT	1		331						523	Water level at ground surface.	
			2	VANE											
			2	SPT	21									31 31 32 5 (38)	
			3	SPT	3		330								
			4	SPT	7										
			4	SPT	7		329							19 39 36 7 (42)	
			5	SPT	15										
			5	SPT	15		328								
			6	SPT	22										
			6	SPT	22		328							38 41 17 3 (21)	
			7	SPT	29										
			7	SPT	29		327								
			8	SPT	100+										
			8	SPT	100+									38 50 9 2 (11)	
326.58 4.72	End of Borehole							Hit cobbles, no further advance						Hand Drilling with 31.5 kg (70 lb.) hammer. N results adjusted for standard 63.5 kg (140 lb.) hammer.	

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

METRIC

[illegible]

RECORD OF BOREHOLE No SW-24

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940570, Easting - 209391 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 28.8.07 - 28.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	+	● QUICK TRIAXIAL						×		
331.23 0.00	Ground 150 mm TOPSOIL.																	

RECORD OF BOREHOLE No SW-25

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940563, Easting - 209421 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 8.8.07 - 8.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
								● QUICK TRIAXIAL	× LAB VANE						
						20 40 60 80 100	20 40 60 80 100								
333.57 0.00	Ground 150 mm ASPHALT. 180 mm Granular FILL.														
			1	SPT	100+										
			2	SPT	52										
			3	SPT	47										
330.83 2.74 330.52 3.05	PEAT/TOPSOIL Black to dark brown, fully decomposed.		4	SPT	18										
			5	SPT	33										
			6	SPT	32										
			7	SPT	41										
			8	SPT	36										
327.02 6.55	End of borehole.														

+ 3, x 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-25A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940552, Easting - 209423 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE Dynamic Cone, Hand Drilling COMPILED BY JL
 DATUM Geodetic DATE 9.7.09 - 9.7.09 CHECKED BY EC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
331.36 0.00	Ground							20 40 60 80 100						Water level at ground surface. Hand Drilling with 31.5 kg (70 lb.) hammer. Nc results adjusted for standard 63.5 kg (140 lb.) hammer.
	Presumed PEAT			VANE			331	3						
330.45 0.91							330							
							329							
							328							
327.41 3.95	End of Dynamic Cone													

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-26

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940568, Easting - 209420 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 2.8.07 - 2.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								○ UNCONFINED	+ FIELD VANE							
								● QUICK TRIAXIAL	× LAB VANE							
333.57 0.00	Ground							20	40	60	80	100	10	20	30	GR SA SI CL
332.52 1.05	150 mm ASPHALT. 130 mm Granular FILL. FILL Brown, moist to wet, very dense, consisting of mixed sand and silt, trace to some gravel and clay, occasional cobbles.		1	SPT	100+		333						○	11		10 37 39 15 (53) possible asphalt at 1.05 m.
331.89 1.68	PEAT/TOPSOIL Black to dark brown, stiff, fully decomposed.		2	SPT	100+		332						○			
331.13 2.44			3	SPT	14		331						○			
			4	SPT	23		330						○			16 35 42 7 (49)
	SAND & SILT TILL, SM-ML Reddish brown to brown, moist to wet, compact to very dense, some gravel, trace clay, with embedded gravel.		5	SPT	13		329						○			
			6	SPT	39								○			
			7	SPT	63		328						○			
327.78 5.79	End of borehole.															Borehole dry and open @ completion of drilling.

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

+ 3, X 3: Numbers refer to
Sensitivity


○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-27

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940578, Easting - 209416 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 28.8.07 - 28.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	+	● QUICK TRIAXIAL						×		
331.18 0.00	Ground 150 mm TOPSOIL.					▽	331								Wet cave-in @ 1.8 m @ completion of drilling. 19 33 42 7 (49)			
	SAND & SILT TILL, SM-ML Reddish brown to brown, moist to wet, loose to very dense, with embedded gravel.		1	SPT	14		330											
			2	SPT	8		329											
			3	SPT	31		328											
			4	SPT	43		327											
			5	SPT	71													
326.91 4.27	End of borehole.													16 34 44 6 (50)				

RECORD OF BOREHOLE No SW-28

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940570, Easting - 209445 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 9.8.07 - 9.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
								● QUICK TRIAXIAL	× LAB VANE						
333.28 0.00	Ground						20 40 60 80 100		10 20 30						
	150 mm ASPHALT.														
	760 mm Granular FILL Brown, moist, loose to compact.														
332.37 0.91	150 mm Asphalt.		1	SPT	100+										
	FILL Brown, moist to wet, compact, consisting of mixed gravel, sand, and silt, trace clay.		2	SPT	26										
330.99 2.29	PEAT/TOPSOIL Black to dark brown, stiff, fully decomposed, with greenish grey sandy silty clay seams and pockets. Organic Content - 11.3%		3	SPT	9								3 30 47 20 (67)		
330.61 2.67			4	SPT	11								22 38 32 8 (40)		
			5	SPT	6								Water level measured @ 3.75 m @ completion of drilling.		
	SAND & SILT TILL, SM-ML Reddish brown to brown, moist to wet, loose to compact, with embedded gravel.		6	SPT	14								22 33 39 7 (46)		
			7	SPT	28										
			8	SPT	21										
325.96 7.32	End of borehole.												Auger refusal @ 7.32 m.		

+ 3, × 3: Numbers refer to
Sensitivity

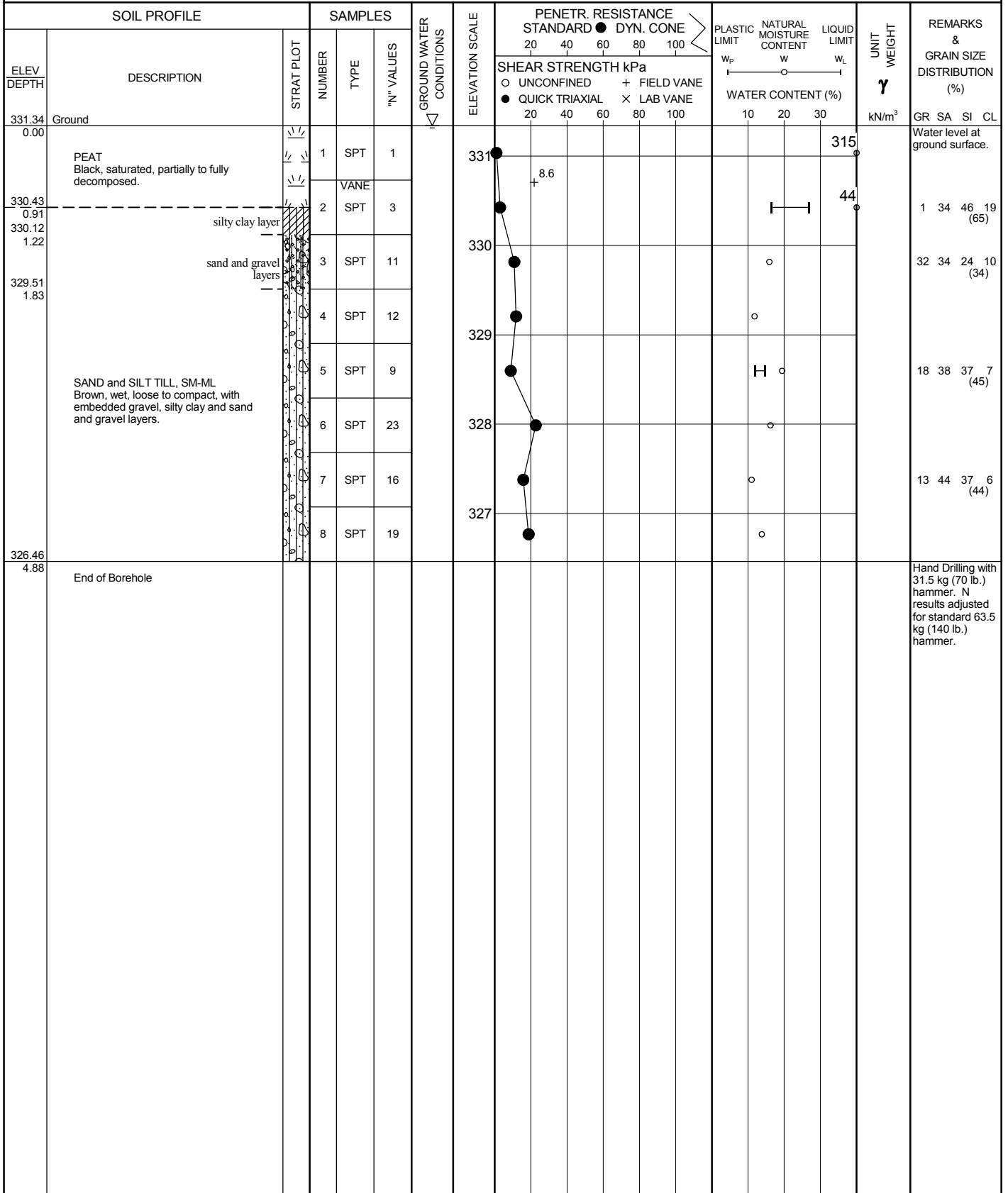
○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-28A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940560, Easting - 209449 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE Hand Drilling COMPILED BY JL
 DATUM Geodetic DATE 9.7.09 - 9.7.09 CHECKED BY EC



+ 3, X 3: Numbers refer to Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-29

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940574, Easting - 209444 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 2.8.07 - 2.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
								● QUICK TRIAXIAL	× LAB VANE						
333.29 0.00	Ground						20 40 60 80 100								
	150 mm ASPHALT.														
	760 mm Granular FILL.														
332.38 0.91	150 mm Asphalt.		1	SPT	100+										
	FILL Brown, moist to wet, dense to compact, consisting of mixed gravel, sand and silt, trace clay		2	SPT	92									46 33 17 4 (21)	
331.00 2.29	PEAT/TOPSOIL Black to dark brown, dense, fully decomposed, with greenish grey silt seams and pockets.		3	SPT	31										
330.09 3.20			4	SPT	20									Water level measured @ 3.35 m @ completion of drilling. 16 36 42 6 (48)	
			5	SPT	25										
	SAND & SILT TILL, SM-ML Reddish brown to brown, moist to wet, compact, with embedded gravel.		6	SPT	23									26 29 39 6 (45)	
			7	SPT	25										
			8	SPT	17										
326.74 6.55	End of borehole.														

+ 3, × 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-30

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940584, Easting - 209441 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 28.8.07 - 28.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
						● QUICK TRIAXIAL	× LAB VANE								
331.25	Ground							20	40	60	80	100			
0.00	300 mm TOPSOIL.							20	40	60	80	100			
330.95															
0.30															
			1	SPT	9										
			2	SPT	8										
			3	SPT	16										
			4	SPT	17										
			5	SPT	38										
			6	SPT	48										
326.22															
5.03															
	End of borehole.														
						</									

RECORD OF BOREHOLE No SW-31

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940576, Easting - 209469 ORIGINATED BY RB
DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
DATUM Geodetic DATE 9.8.07 - 9.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL						× LAB VANE	W _P	W
333.03	Ground						20	40	60	80	100	10	20	30	GR SA SI CL			
0.00	200 mm Asphalt.														Culvert 5B-1A			
	560 mm Granular FILL.																	
332.27			1	SPT	24		332											
0.76	Brown, moist to wet, compact, consisting of mixed gravel, sand and silt, trace clay.																	
331.51			2	SPT	18		331								asphalt or granular seal surface treatment			
1.52	FILL Brown, moist to wet, compact, consisting of mixed gravel, sand and silt, trace clay.		3	SPT	20													
330.13			4	SPT	6		330								27 30 30 13 (43)			
2.90	PEAT/TOPSOIL Black to dark brown, firm, fully decomposed, with greenish grey silt seams and pockets. Organic Content - 60.1%.														Water level measured @ 2.5 m @ completion of drilling.			
			5	SPT	5		329											
328.92																		
4.11	Silty CLAY, CL Grey, moist, firm.																	
328.46			6	SPT	22		328											
4.57			7	SPT	24		327											
	SAND & SILT TILL, SM-ML Reddish brown to brown, moist to wet, compact to very dense, with embedded gravel, shale fragments.		8	SPT	100+										Sampler refusal.			
326.07			9	SPT	100+		326								Sampler refusal.			
6.96	SHALE Grey, weathered.																	
325.71																		
7.32	End of borehole.														Auger refusal @ 7.47 m.			

+ 3, X 3: Numbers refer to Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-31A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940570, Easting - 209476 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE Hand Drilling COMPILED BY NN
 DATUM Geodetic DATE 29.8.07 - 29.8.07 CHECKED BY JL

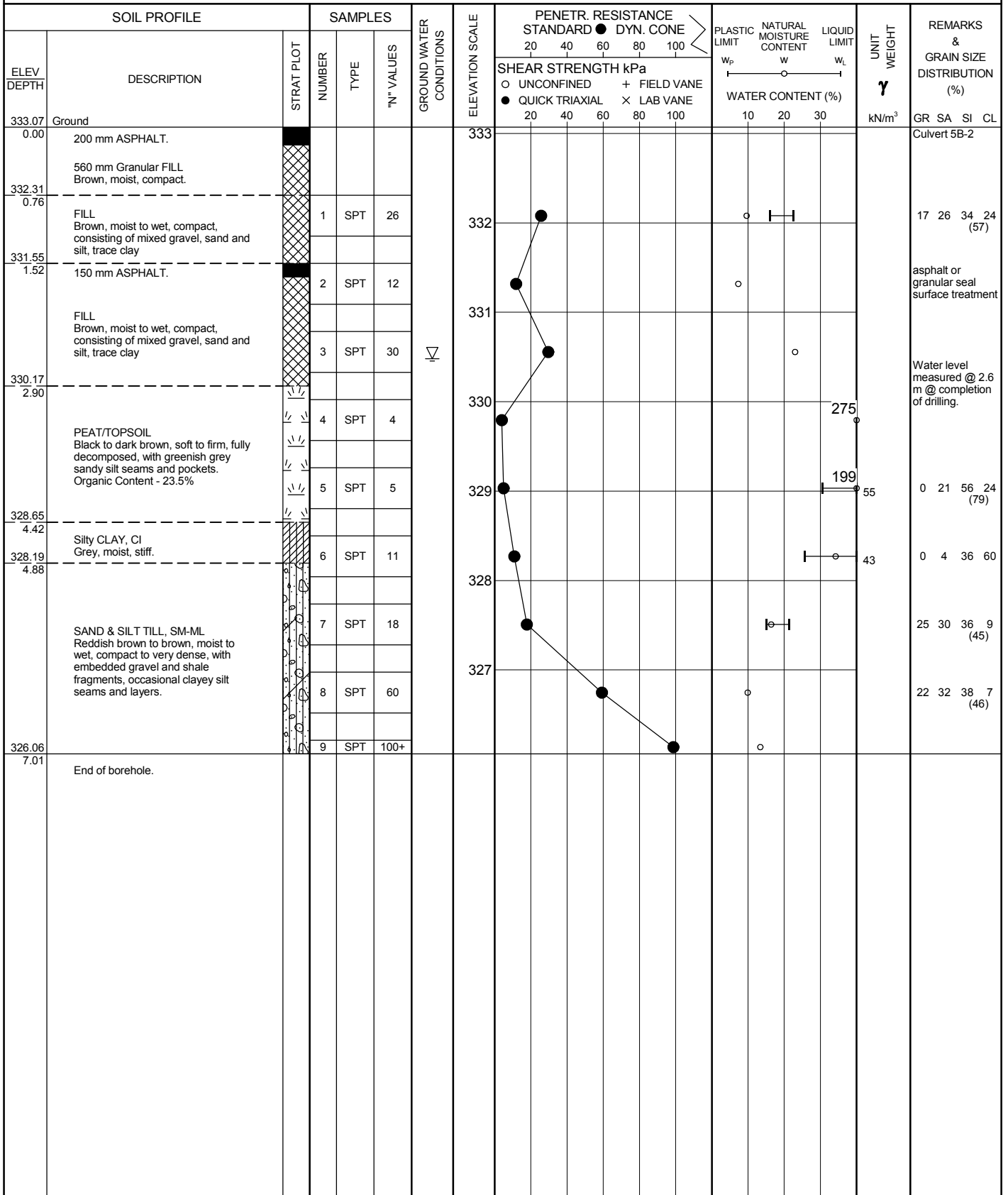
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL	× LAB VANE				
331.35	Ground														
0.00			1	SPT	1									133	Culvert 5B-1
				VANE			3.7							415	Water level measured @ 0.3 m @ completion of drilling.
			2	SPT	1		2.6								
	PEAT Black, very soft, partially decomposed, wood pieces, interbedded with greenish grey organic silt, and sand and gravel layers. Organic Content - 45.9%		3	SPT	1		2.3								
				VANE											
			4	SPT	1		1.8							658	40 47 10 3 (13)
				VANE											
			5	VANE	8		1								8 27 44 22 (66)
328.61				SPT											
2.74	Silty CLAY, CL														
328.30	Grey, moist, stiff, with embedded sand and gravel.														
3.05	End of borehole due to excessive cave-in.														Hand drilling terminated due to excessive cave-in. 31.75 Kg (70 lb.) hammer used for driving sampler. N-values corrected for standard 63 kg (140 lb.) hammer.

RECORD OF BOREHOLE No SW-32

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940581, Easting - 209468 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 2.8.07 - 2.8.07 CHECKED BY JL



JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

+ 3, X 3: Numbers refer to
Sensitivity





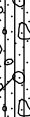
○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-33

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940591, Easting - 209466 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE Hand Drilling COMPILED BY NN
 DATUM Geodetic DATE 29.8.07 - 29.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL	× LAB VANE	20						40	60	80
331.17 0.00	Ground						331										Culvert 5B-3			
330.56 0.61	sand and gravel layer		1	SPT	1													○		
			2	SPT	18														50	
329.95 1.22			3	SPT	1														205	
			4	SPT	2															
			5	SPT	1														○	
328.12 3.05	PEAT Black, very soft, partially decomposed, wood pieces, interbedded with greenish grey organic sand and silt, and gravel layers. Organic Content - 15.9%																		10 45 (46)	
	SAND & SILT TILL, SM-ML Grey, moist, compact, shale fragments, with clayey silt seams and layers.		6	SPT	11												15 38 36 11 (47)			
			7	SPT	15															
326.90 4.27	End of borehole due to excessive cave-in.						327										Hand drilling terminated due to excessive cave-in. 31.75 Kg (70 lb.) hammer used for driving sampler. N-values corrected for standard 63.5 Kg (140 lb.) hammer.			

+ 3, X 3: Numbers refer to Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-34

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940584, Easting - 209494 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 8.8.07 - 8.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE						
332.88 0.00	Ground						20	40	60	80	100	10	20	30	
	200 mm ASPHALT.														
	560 mm Granular FILL Brown, moist, compact.														
332.12 0.76			1	SPT	14		332								
	FILL Brown, moist to wet, compact, consisting of mixed gravel, sand and silt, some clay	150 mm asphalt	2	SPT	28		331								
330.59 2.29			3	SPT	7		330								
	PEAT/TOPSOIL Black to dark brown, firm, partially decomposed. Organic Content - 23.7%		4	SPT	5		329								
329.22 3.66		organic stained	5	SPT	13		329								
	Clayey SILT TILL to Silty CLAY, CL-ML to CL Reddish brown to brown, moist to wet, STIFF TO hard, with embedded sand and gravel, shale fragments.		6	SPT	90		328								
327.09 5.79			7	SPT	46		327								
326.63 6.25	SHALE Grey, weathered.		8	SPT	100+										
	End of borehole.														

+ 3, × 3: Numbers refer to
Sensitivity





○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-34A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940575, Easting - 209496 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE Dynamic Cone, Hand Drilling COMPILED BY JL
 DATUM Geodetic DATE 9.7.09 - 9.7.09 CHECKED BY EC

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					WATER CONTENT (%)			
						20	40	60	80	100	W _p	W	W _L			
331.33 0.00	Ground															
	Presumed PEAT			VANE		331	4.6									Water level at ground surface. Hand Drilling with 31.5 kg (70 lb.) hammer. Nc results adjusted for standard 63.5 kg (140 lb.) hammer.
				VANE			2.9									
				VANE		330	2.8									
				VANE			1.5									
329.20 2.13						329										
327.44 3.89	End of Dynamic Cone															

METRIC

SOIL PROFILE			SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa						
								○ UNCONFINED						+ FIELD VANE
332.89 0.00	Ground												GR SA SI CL	
	200 mm ASPHALT.													
	710 mm Granular FILL Brown, moist, compact.													
331.98 0.91			1	SPT	15								Asphalt or granular seal surface treated with sealant	
	150 mm asphalt													
	FILL Brown, moist to wet, compact, consisting of mixed gravel, sand and silt, some clay		2	SPT	23									
330.30 2.59			3	SPT	4								Water level measured @ 2.6 m.	
	PEAT Black to dark brown, moist to wet, soft, partially decomposed, with silt seams. Organic Content - 7.76%		4	SPT	4							43	28 35 27 10 (38)	
328.93 3.96			5	SPT	29									
328.32 4.57			6	SPT	35								Limestone and shale fragments.	
327.86 5.03	gravelly layer												40 22 29 9 (38)	
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown to brown, moist to wet, very stiff to hard, with embedded sand and gravel, shale fragments.		7	SPT	40								14 30 40 17 (56)	
326.79 6.10	SHALE		8	SPT	100+								Spoon refusal.	
326.49 6.40	Grey, weathered. End of borehole.												Borehole terminated due to auger refusal @ 6.4 m.	

RECORD OF BOREHOLE No SW-36

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940597, Easting - 209489 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE Hand Drilling - 70lb hammer COMPILED BY NN
 DATUM Geodetic DATE 14.8.07 - 14.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL						× LAB VANE		
331.17 0.00	Ground																	
	PEAT Black to dark brown, very soft to firm, partially decomposed, interbedded with sand and silt layers. Organic Content - 22.3%		1	SPT	2		331							65	Water level near ground surface @ the time of drilling. Hand drilling terminated due to spoon refusal. 31.75 Kg (70 lb.) hammer used for driving sampler. N-values corrected for standard 63.5 Kg (140 lb.) hammer.			
			2	SPT	6		330											
			3	SPT	2									58				
			4	SPT	6		329							408				
328.88 2.29	Clayey SILT TILL to Silty CLAY, CL-ML to CL Grey, wet, firm to hard, with embedded sand and gravel, trace organics.		5	SPT	9													
327.97 3.20			6	SPT	100+		328								14 26 41 19 (60) sampler refusal @ 3.20 m.			
	End of borehole.																	

RECORD OF BOREHOLE No SW-37

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northring - 4940591, Easting - 209517 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 8.8.07 - 8.8.07 CHECKED BY JL

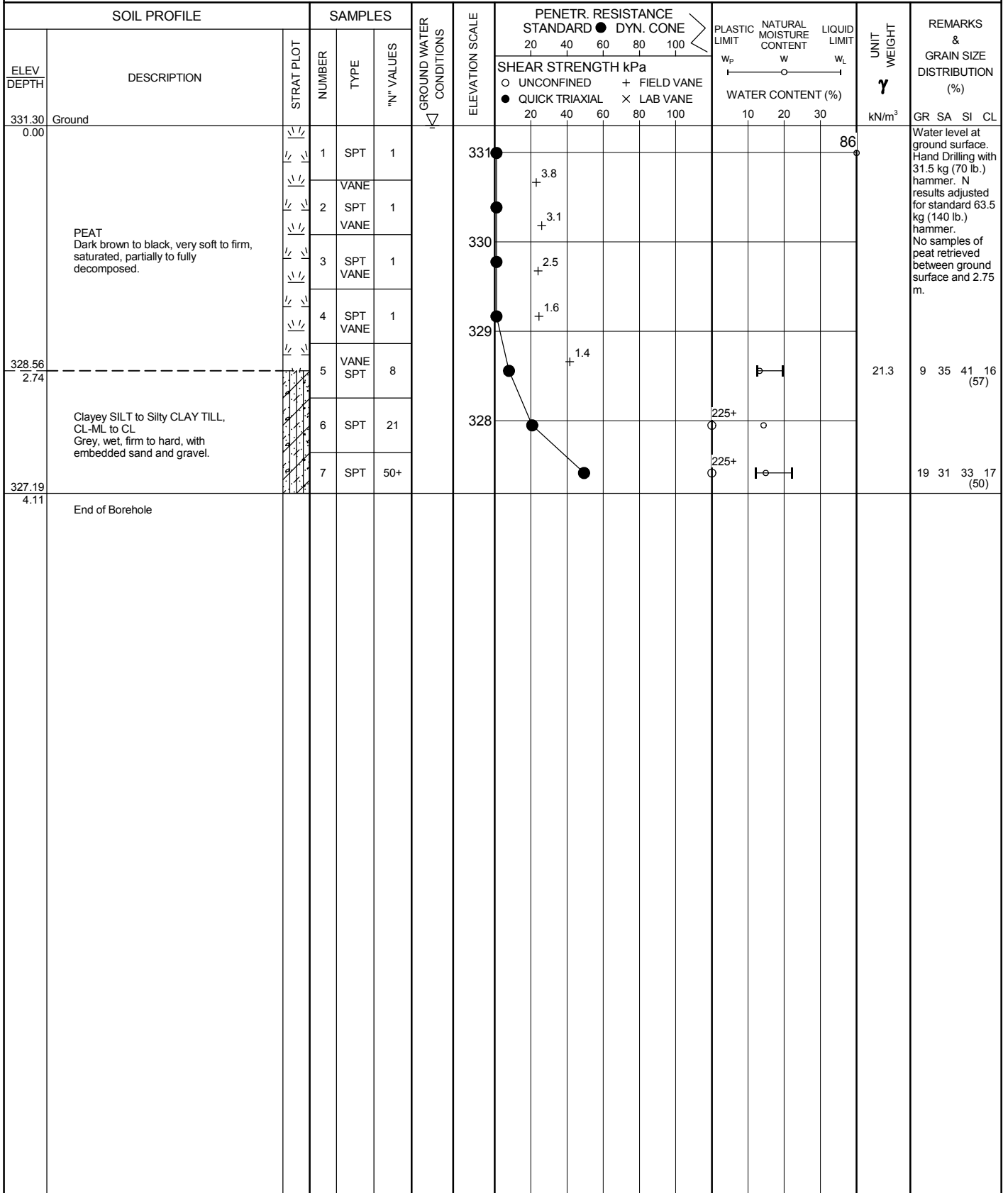
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
								○ UNCONFINED	+ FIELD VANE						
						● QUICK TRIAXIAL	× LAB VANE								
332.83 0.00	Ground						20 40 60 80 100	WATER CONTENT (%)							
	200 mm ASPHALT.														
	560 mm Granular FILL.														
332.07 0.76			1	SPT	17		332								13 23 36 28 (64)
	FILL Brown, moist to wet, compact, consisting of mixed gravel, sand and silt, some clay	asphalt	2	SPT	39		331								Water level measured @ 2.29 m @ completion of drilling. 2 31 42 26 (68)
330.54 2.29			3	SPT	24		330							90	
	PEAT/TOPSOIL Black to dark brown, very stiff to soft, partially decomposed. Organic Content - 10.8%		4	SPT	4		329							434	
329.17 3.66			5	SPT	14		329								19 34 32 16 (48)
	Clayey SILT TILL to Silty CLAY, CL-ML to CL Reddish brown to brown, moist to wet, stiff to hard, with embedded sand and gravel, shale fragments.		6	SPT	26		328								
			7	SPT	42		327								
326.81 6.02	End of borehole.														Borehole terminated due to auger refusal @ 6.02 m.

RECORD OF BOREHOLE No SW-37A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940582, Easting - 209519 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE Hand Drilling COMPILED BY JL
 DATUM Geodetic DATE 9.7.09 - 9.7.09 CHECKED BY EC



+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-38

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940595, Easting - 209516 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 2.8.07 - 2.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
								○ UNCONFINED	+ FIELD VANE						
						● QUICK TRIAXIAL	× LAB VANE			WATER CONTENT (%)					
						20	40	60	80	100	10	20	30		
332.81	Ground														
0.00	200 mm ASPHALT.														
	560 mm Granular FILL Brown, moist, compact.														
332.05			1	SPT	53		332								
0.76	150 mm asphalt														
	FILL Brown, moist to wet, very dense to dense, consisting of mixed sand and gravel and silt, some clay.		2	SPT	32		331							28 30 28 14 (42)	
330.52			3	SPT	4		330								
2.29	PEAT/TOPSOIL Black to dark brown, soft, partially decomposed. Organic Content - 66.9%		4	SPT	3		329							Water level measured @ 3.3 m @ completion of drilling.	
329.00			5	SPT	20		328							28 16 36 19 (56)	
3.81	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown to brown, moist to wet, very stiff to hard, with embedded sand and gravel.		6	SPT	31		327							Spoon refusal. Auger to 6.71 m until auger refusal.	
327.17			7	SPT	100+										
5.64	SHALE Reddish brown, weathered.		8	AUGER										Borehole terminated due to auger refusal @ 6.71 m.	
326.10	End of borehole.														
6.71															

+ 3, × 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-39

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940604, Easting - 209513 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE Hand Drilling - 70lb hammer COMPILED BY NN
 DATUM Geodetic DATE 14.8.07 - 14.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE							× LAB VANE	
331.23 0.00	Ground																	
	PEAT Black to dark brown, very soft to soft, partially decomposed, interbedded with sand and silt layers.		1	SPT	2		331								Water level measured @ 0.6 m @ completion of drilling.			
			2	SPT	1													
			3	SPT	1													
			4	SPT	9													
			5	SPT	13													
328.94 2.29	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown to brown, moist to wet, stiff, with embedded sand and gravel.														36 26 26 12 (38)			
328.18 3.05	End of borehole.														Hand drilling terminated due to spoon refusal. 31.75 Kg (70 lb.) hammer used for driving sampler. N-values corrected for standard 63.5 Kg (140 lb.) hammer.			

RECORD OF BOREHOLE No SW-40

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940598, Easting - 209541 ORIGINATED BY RB
DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
DATUM Geodetic DATE 9.8.07 - 9.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
						● QUICK TRIAXIAL	× LAB VANE								
332.78	Ground							20 40 60 80 100							
0.00	150 mm ASPHALT. 180 mm Granular FILL														
	FILL Brown, moist, compact, consisting of sandy silt.		1	SPT	100+										
331.87	150 mm Buried ASPHALT.														
0.91			2	SPT	100+										
	FILL Brown, loose, moist, very dense, consisting of sandy silt, some gravel, occasional cobbles.													Hit cobble.	
330.65			3	SPT	4										
2.13	PEAT/TOPSOIL Black to dark brown, soft to firm, partially decomposed. Organic Content - 39.6%		4	SPT	5										
328.97			5	SPT	31										
3.81	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown to brown, moist to wet, hard, with embedded sand and gravel, occasional cobbles.		6	SPT	63									12 38 33 14 (47)	
327.29			7	SPT	100+										
5.49	PRESUMED BEDROCK - SHALE Reddish brown, consisting of shale fragments.													14 32 31 14 (46)	
														Water level measured @ 5.3 m @ completion of drilling.	
326.68															
6.10	End of borehole.														

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-40A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northring - 4940590, Easting - 209544 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY JL
 DATUM Geodetic DATE 7.7.09 - 7.7.09 CHECKED BY EC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								○ UNCONFINED	+ FIELD VANE							
331.38 0.00	Ground		1	SPT	2		20	40	60	80	100	10	20	30	GR SA SI CL	
				VANE											Water level at ground surface.	
			2	SPT	2		331									
				VANE												
			2	SPT	2											
				VANE												
			3	VANE			330									
				SPT	2											
329.40				VANE												
1.98				SPT												
329.09	310mm Organic SILT layer, OL			VANE												
2.29	Greenish grey, wet															
328.79			4A	SPT												
2.59	300mm cobbles		4	SPT	100+											
			5	SPT	23		329								4 29 47 20 (67)	
			5	SPT	23		328								16 23 40 21 (61)	
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown to brown, moist to wet, very stiff to hard, with embedded sand and gravel, occasional cobbles.															
			6	SPT	58											
326.81 4.57	End of borehole.						327								borehole terminated due to auger and sampler refusal @ 4.57 m on presumed bedrock.	

RECORD OF BOREHOLE No SW-41

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northring - 4940602, Easting - 209540 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 1.8.07 - 1.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED	+ FIELD VANE								
						● QUICK TRIAXIAL	× LAB VANE			WATER CONTENT (%)							
						20	40	60	80	100							
332.79 0.00	Ground																
	200 mm ASPHALT.																
	710 mm Granular FILL																
331.88 0.91	150 mm Buried ASPHALT.		1	SPT	67		332										
	FILL Brown, dense, consisting of sandy silt, some gravel, occasional cobbles.		2	SPT	40		331										
330.66 2.13	PEAT/TOPSOIL Black to dark brown, firm, partially decomposed. Organic Content - 47.3%		3	SPT	4		330						899				
			4	SPT	5		329						152				
329.28 3.51	gravelly layer		5	SPT	30		328										
328.52 4.27	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown to brown, moist, hard, with embedded sand and gravel.		6	SPT	37		327										
			7	SPT	100+												
326.85 5.94	End of borehole.													hard augering			
														Auger refusal on presumed bedrock @ 5.94 m. Water level measured @ 5.6 m @ completion of drilling.			

+³, ×³: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-42

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940612, Easting - 209538 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 14.8.07 - 14.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
								● QUICK TRIAXIAL	× LAB VANE						
331.07 0.00	Ground						331								
	PEAT Black, soft, wet, fully decomposed. Organic Content - 6.5%		1	SPT	2		330						435		
329.39 1.68			2	SPT	24		329						211	23 26 33 18 (51)	
	reddish brown		3	SPT	100+		328								
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Moist, very stiff to hard, with embedded sand and gravel.		4	SPT	37		327							35 20 28 17 (45)	
	grey		5	SPT	100+										
326.80 4.27	End of borehole.													auger refusal due to presumed bedrock. Borehole dry and open @ completion.	

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-43

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940604, Easting - 209566 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 9.8.07 - 9.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
							● QUICK TRIAXIAL	× LAB VANE							
332.94 0.00	Ground														
	150 mm ASPHALT.														
	920 mm Silty Granular FILL														
331.87 1.07	150 mm ASPHALT.		1	SPT	39									24 46 24 7 (31)	
331.42 1.52	300 mm Silty Granular FILL.														
330.96 1.98	460 mm Buried TOPSOIL.		2	SPT	12										
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown, moist, hard, with embedded sand and gravel, occasional cobbles.		3	SPT	56					225+				37 26 25 13 (38)	
			4	SPT	39					225+					
			5	SPT	63					225+					
			6	SPT	61					225+					
327.91 5.03	End of borehole.													Borehole dry and open @ completion.	

RECORD OF BOREHOLE No SW-43A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940598, Easting - 209567 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY JL
 DATUM Geodetic DATE 6.7.09 - 6.7.09 CHECKED BY EC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED	+	FIELD VANE								
								● QUICK TRIAXIAL	×	LAB VANE								
331.94 0.00	Ground						20	40	60	80	100	10	20	30		GR SA SI CL		
331.03 0.91	150mm Organic TOPSOIL	—	1	SPT	5		331								53	18 34 33 14 (48)		
	organic inclusions	—	2	SPT	17		330											
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown, wet to moist, firm to hard, with embedded sand and gravel, occasional cobbles and gravelly silty sand layers. Organic inclusions up to 0.9 m below ground surface.		3	SPT	22		329										12 28 41 20 (61)	
			4	SPT	36													
			5	SPT	25													
328.28 3.66		—					328										20.7	23 43 28 6 (34)
327.67 4.27	gravelly silty sand layer	—	6	SPT	61													
	End of Borehole.																Borehole dry and open @ completion.	

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

RECORD OF BOREHOLE No SW-44

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940609, Easting - 209565 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 1.8.07 - 1.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
							● QUICK TRIAXIAL	× LAB VANE							
332.97 0.00	Ground														
	150 mm ASPHALT.														
	760 Silty Granular FILL.														
332.06 0.91	150 mm ASPHALT.		1	SPT	75										
331.60 1.37	310 mm Mixed FILL.														
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Brown, moist, very stiff to hard, with embedded sand and gravel.		2	SPT	27									7 28 42 23 (65)	
			3	SPT	33										
			4	SPT	53									16 33 35 16 (51)	
			5	SPT	38										
328.70 4.27	End of Borehole.													Borehole dry and open @ completion.	

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-45

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940618, Easting - 209561 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 14.8.07 - 14.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)			
								○ UNCONFINED	+ FIELD VANE							● QUICK TRIAXIAL	× LAB VANE	
331.84 0.00	Ground							20	40	60	80	100						
	75 mm TOPSOIL																	
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown, moist, very stiff to hard, with embedded sand and gravel, silty sand and gravel layers.						331											
330.62 1.22			1	SPT	20													
	—																	
	silty sand and gravel layers		2	SPT	29		330										27	27 32 14 (46)
329.71 2.13																		
	—																	
			3	SPT	31													
328.94 2.90							329											
	—																	
	silty sandy gravel layer		4	SPT	34												49	23 20 7 (27)
328.33 3.51	End of Borehole.																	Borehole dry and open @ completion.

RECORD OF BOREHOLE No SW-46

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940611, Easting - 209589 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 9.8.07 - 9.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE						
333.04 0.00	Ground							20 40 60 80 100							
	150 mm ASPHALT														
332.43 0.61	460 mm Silty Granular FILL.														
	150 mm ASPHALT														
	FILL Brown, moist, compact, consisting of silty sand and gravel, trace clay.		1	SPT	40		332							37 32 23 8 (31)	
331.52 1.52			2	SPT	34		331								
			3	SPT	31										
	SAND & SILT TILL, SM-ML Reddish brown, moist, dense to very dense, with embedded gravel, occasional cobbles.		4	SPT	61		330							29 34 31 7 (37)	
			5	SPT	30		329							Water level measured @ 3.5 m @ completion of drilling.	
328.77 4.27	End of Borehole.														

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-46A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940605, Easting - 209590 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY JL
 DATUM Geodetic DATE 6.7.09 - 6.7.09 CHECKED BY EC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)		
								○ UNCONFINED	+ FIELD VANE	○ QUICK TRIAXIAL	× LAB VANE	W _p			W	W _L	GR
332.15	Ground																
0.00	300 mm Granular FILL		1	SPT	6		332										
331.85																	
0.30	Clayey SILT TILL, CL-ML Reddish brown, moist, stiff to very stiff, sandy, some gravel.		2	SPT	20		331							Water level measured @ 0.46 m @ completion. 20 27 38 14 (53)			
			3	SPT	14												
330.02																	
2.13	SAND & SILT TILL, SM-ML Reddish brown, moist, compact to dense, with embedded gravel, occasional gravelly sand layers.		4	SPT	35		330							11 44 38 7 (45)			
			5	SPT	29												
328.34			6	SPT	33		329										
3.81																	
327.88	gravelly sand layers						328							31 49 16 4 (20)			
4.27	End of borehole.																

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+³, ×³: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

METRIC

SOIL PROFILE			SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	STANDARD					
333.03	Ground												
0.00	150 mm ASPHALT.												
	610 mm Silty Granular FILL.												
332.27	150 mm ASPHALT		1	SPT	45								
331.51			2	SPT	19								
1.52	gravel layer		3	SPT	30								
331.05			4	SPT	71								
1.98	SAND & SILT TILL, SM-ML Brown, moist, compact to very dense, with embedded gravel, occasional gravel layers.		5	SPT	38								
328.76													
4.27	End of Borehole.												Borehole dry and open @ completion.

RECORD OF BOREHOLE No SW-48

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940622, Easting - 209586 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 26.8.07 - 26.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								○ UNCONFINED	+ FIELD VANE							
						● QUICK TRIAXIAL	× LAB VANE									
332.62 0.00	Ground 150 mm TOPSOIL															

METRIC

SOIL PROFILE				SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			STANDARD	DYN. CONE					
333.12 0.00	Ground													
332.66 0.46	230 mm ASPHALT.													
	230 mm Crushed Granular FILL.													
	150 mm ASPHALT.													
332.05 1.07	460 mm silty granular FILL.		1	SPT	44									
331.60 1.52														
331.14 1.98	gravel layer		2	SPT	21									57 20 16 8 (24)
			3	SPT	26									
	SAND & SILT TILL, SM-ML Reddish brown, moist, compact to dense, some gravel, trace clay, occasional gravel layers.		4	SPT	44									18 41 32 9 (41)
			5	SPT	33									
328.85 4.27	End of Borehole													Borehole dry and open @ completion.

RECORD OF BOREHOLE No SW-49A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940612, Easting - 209614 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY JL
 DATUM Geodetic DATE 6.7.09 - 6.7.09 CHECKED BY EC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE						
332.37	Ground														
0.00	300 mm Granular FILL, with organics.		1	SPT	4		332						21.7	Water level measured @ 0.1 m @ completion.	
332.07	SAND & SILT TILL, SM-ML Reddish brown, moist, compact to very dense, some gravel.		2	SPT	24		331							13 41 37 10 (47)	
0.30			3	SPT	23		330								
			4	SPT	52		329							16 41 36 8 (43)	
			5	SPT	38										
			6	SPT	100+								24.6	22 35 36 7 (43)	
328.18	End of borehole.													Borehole terminated due to auger and sampler refusal @ 4.19 m.	
4.19															

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

RECORD OF BOREHOLE No SW-50

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940622, Easting - 209611 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 1.8.07 - 1.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE							
333.13 0.00	Ground							20 40 60 80 100								
	230 mm ASPHALT.						333									
	680 mm Crushed Granular FILL.															
332.22 0.91	150 mm ASPHALT.		1	SPT	49		332									
331.61 1.52	Gravelly SAND & SILT TILL, SM-ML Reddish brown, moist, compact to very dense, occasional cobbles, slightly plastic.	gravelly layer	2	SPT	33		331							35 24 28 13 (41)		
331.15 1.98			3	SPT	100+									Hit cobble with refusal.		
			4	SPT	70		330							29 34 30 7 (37)		
					5	SPT	23		329							
328.86 4.27	End of Borehole.													Borehole dry and open @ completion.		

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-51

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940629, Easting - 209610 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 14.8.07 - 14.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
						● QUICK TRIAXIAL	× LAB VANE								
332.44 0.00	Ground							20 40 60 80 100		10 20 30				GR SA SI CL	
	150 mm Granular FILL														
	SAND & SILT TILL, SM-ML Reddish brown, moist, compact to dense, with embedded gravel, occasional gravel layers.		1	SPT	24										
330.92 1.52															
		gravelly layer	2	SPT	50									37 27 27 8 (36)	
330.46 1.98			3	SPT	20										
			4	SPT	22									15 47 32 7 (39)	
328.93 3.51	End of Borehole.													Borehole dry and open @ completion.	

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

RECORD OF BOREHOLE No SW-52

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940625, Easting - 209637 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 9.8.07 - 9.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
333.22 0.00	Ground							20 40 60 80 100							
	150 mm ASPHALT.														
	510 mm Granular FILL.														
332.56 0.66	150 mm asphalt		1	SPT	100+									high N value due to buried asphalt.	
	710 mm Granular FILL.														
331.70 1.52			2	SPT	39									20 37 30 13 (44)	
	SAND & SILT TILL, SM-ML Reddish brown, moist, dense to very dense, with embedded gravel, some clay to clayey.		3	SPT	64									20 37 32 12 (44)	
330.02 3.20	End of Borehole.		4	SPT	100+									Sampler refusal @ 3.05 m. Borehole dry and open @ completion.	

RECORD OF BOREHOLE No SW-52A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940619, Easting - 209638 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY JL
 DATUM Geodetic DATE 6.7.09 - 6.7.09 CHECKED BY EC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
								○ UNCONFINED	+ FIELD VANE						
332.33	Ground						● QUICK TRIAXIAL	× LAB VANE	WATER CONTENT (%)						
0.00	200 mm Sandy TOPSOIL.						20	40	60	80	100	10	20	30	GR SA SI CL
	SAND & SILT TILL, SM-ML Reddish brown, wet to moist, loose to very dense, clayey, with embedded gravel (up to 30 mm diameter), frequent cobbles.		1	SPT	8		332								Water level at ground surface caused by surface run-off.
			2	SPT	30										hit cobbles
			3	SPT	57										28 29 31 11 (43)
			4	SPT	100+										Spoon refusal on cobbles, drilled through cobbles.
			5	SPT	42										19 32 36 13 (49)
			6	SPT	100+										
328.06	End of borehole.													Auger and sampler refusal on presumed cobbles or boulder. Borehole terminated due to auger and sampler refusal. Grain size distribution results may not be representative due to presence of coarse gravel pieces.	
4.27															

RECORD OF BOREHOLE No SW-53

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940629, Easting - 209636 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 1.8.07 - 1.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
						● QUICK TRIAXIAL	× LAB VANE								
333.22 0.00	Ground							20 40 60 80 100							
	150 mm ASPHALT.						333								
	760 mm Granular FILL.														
332.31 0.91	150 mm ASPHALT.		1	SPT	100+										
331.70 1.52	gravelly layer		2	SPT	21									40 26 24 9 (34)	
331.24 1.98	SAND & SILT TILL, CL-ML Reddish brown, moist, compact, with embedded gravel, trace clay to clayey, occasional silty sand and gravel layers.		3	SPT	20										
			4	SPT	16										
329.41 3.81	End of Borehole.													Sampler refusal @ 3.8 m. Borehole dry and open @ completion.	

RECORD OF BOREHOLE No SW-54

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940638, Easting - 209633 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 14.8.07 - 14.8.07 CHECKED BY JL

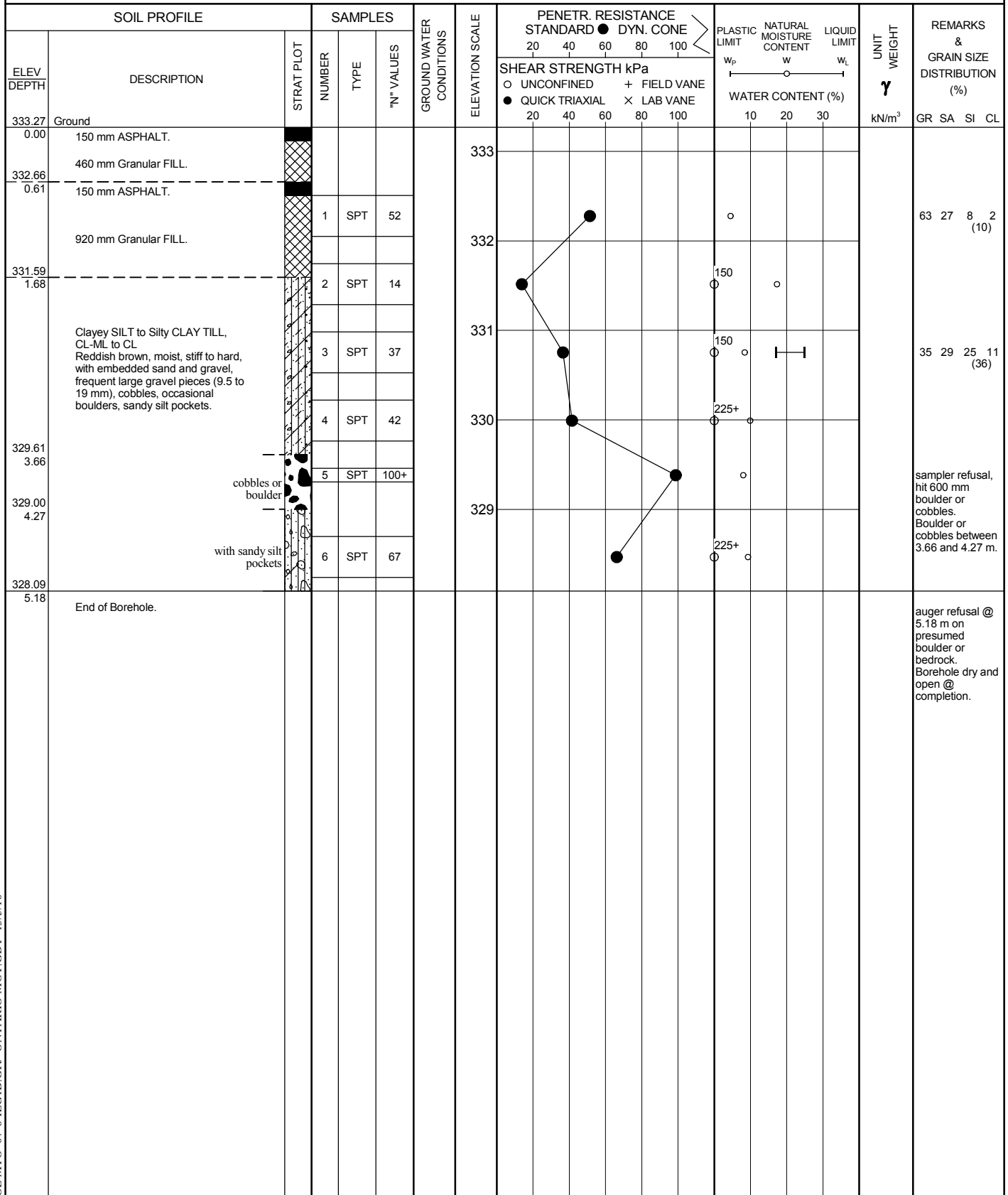
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
332.03 0.00	Ground							20 40 60 80 100							
331.27 0.76	75 mm TOPSOIL <														

RECORD OF BOREHOLE No SW-55

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northring - 4940632, Easting - 209662 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 13.8.07 - 13.8.07 CHECKED BY JL



+ 3, X 3: Numbers refer to Sensitivity

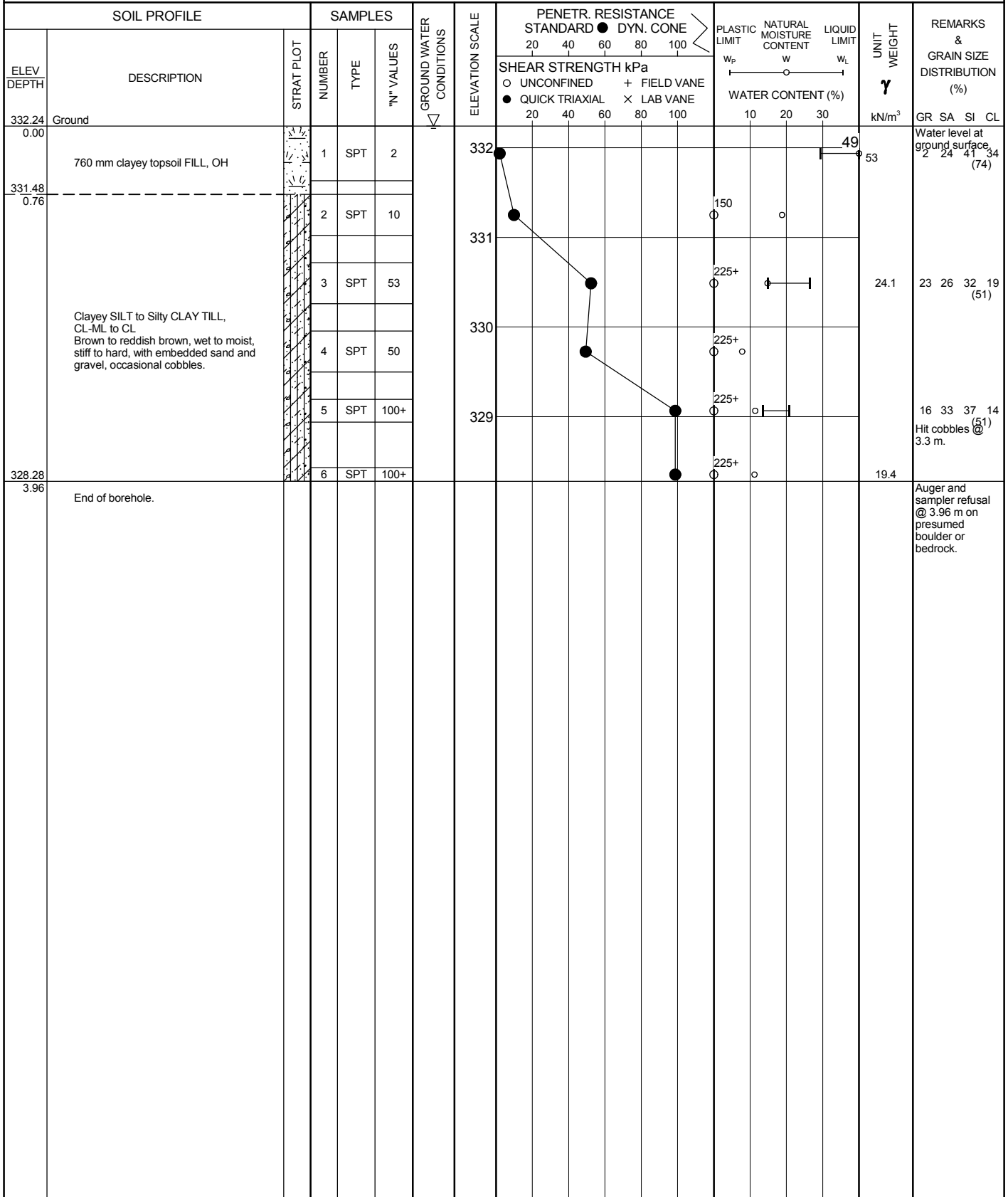
○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-55A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940625, Easting - 209664 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY JL
 DATUM Geodetic DATE 6.7.09 - 6.7.09 CHECKED BY EC



+ 3, × 3: Numbers refer to Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-56

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940636, Easting - 209660 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 1.8.07 - 1.8.07 CHECKED BY JL

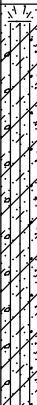
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE						
333.30 0.00	Ground														
	150 mm ASPHALT.														
	610 mm Granular FILL.														
332.54 0.76	150 mm ASPHALT.		1	SPT	100+										
			2	SPT	11										
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown, moist, very stiff to hard, with embedded sand and gravel, frequent large pieces of gravel (9.5 to 19 mm), occasional cobbles and boulders		3	SPT	47									12 27 33 27 sample not (61) enough for Atterberg Limit determinations	
			4	SPT	51									25 25 35 15 (50)	
			5	SPT	100+									23 27 35 15 (50)	
329.03 4.27	End of Borehole.													Auger refusal @ 4.27 m on presumed boulder or bedrock. Borehole dry and open @ completion.	

RECORD OF BOREHOLE No SW-57

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940646, Easting - 209656 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 14.8.07 - 14.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE						
331.75 0.00	Ground							20 40 60 80 100	10 20 30					GR SA SI CL	
	150 mm TOPSOIL														
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown, moist, very stiff to hard, with embedded sand and gravel.		1	SPT	28		331							30 19 31 20 sample not (51) enough for Atterberg Limit determinations 10 23 41 26 (68) 15 31 39 15 (54)	
			2	SPT	30		330								
			3	SPT	42		329								
			4	SPT	100+										
328.55 3.20	End of Borehole.													Sampler and auger refusal @ 3.2 m on presumed boulder or bedrock. Borehole dry and open @ completion.	

RECORD OF BOREHOLE No SW-58

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940638, Easting - 209686 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 13.8.07 - 13.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
						● QUICK TRIAXIAL	× LAB VANE								
333.39	Ground							20 40 60 80 100							
0.00	150 mm ASPHALT.														
332.78	460 mm Granular FILL.						333								
0.61	150 mm ASPHALT.														
	FILL Brown, moist, dense, consisting of sand and gravel, some silt, trace clay and organics.		1	SPT	31									45 35 16 5 (21)	
331.56			2	SPT	27										
1.83			3	SPT	54									14 25 37 23 (61)	
	Silty CLAY TILL, CL Reddish brown, moist, very stiff to hard, with embedded sand and gravel.		4	SPT	44										
329.58			5	SPT	100+									sampler refusal @ 3.8 m. shale pieces in auger cuttings.	
3.81	SHALE BEDROCK													auger refusal @ 4.11 m on shale bedrock as evidenced by shale fragment from auger cuttings. Borehole dry and open @ completion.	
329.28	shale fragments from auger cuttings only														
4.11	End of Borehole														

JOE MTO 07-6-IEGIB.GPJ ONTARIO MOT.GDT 13/5/10

+ 3, × 3: Numbers refer to
Sensitivity

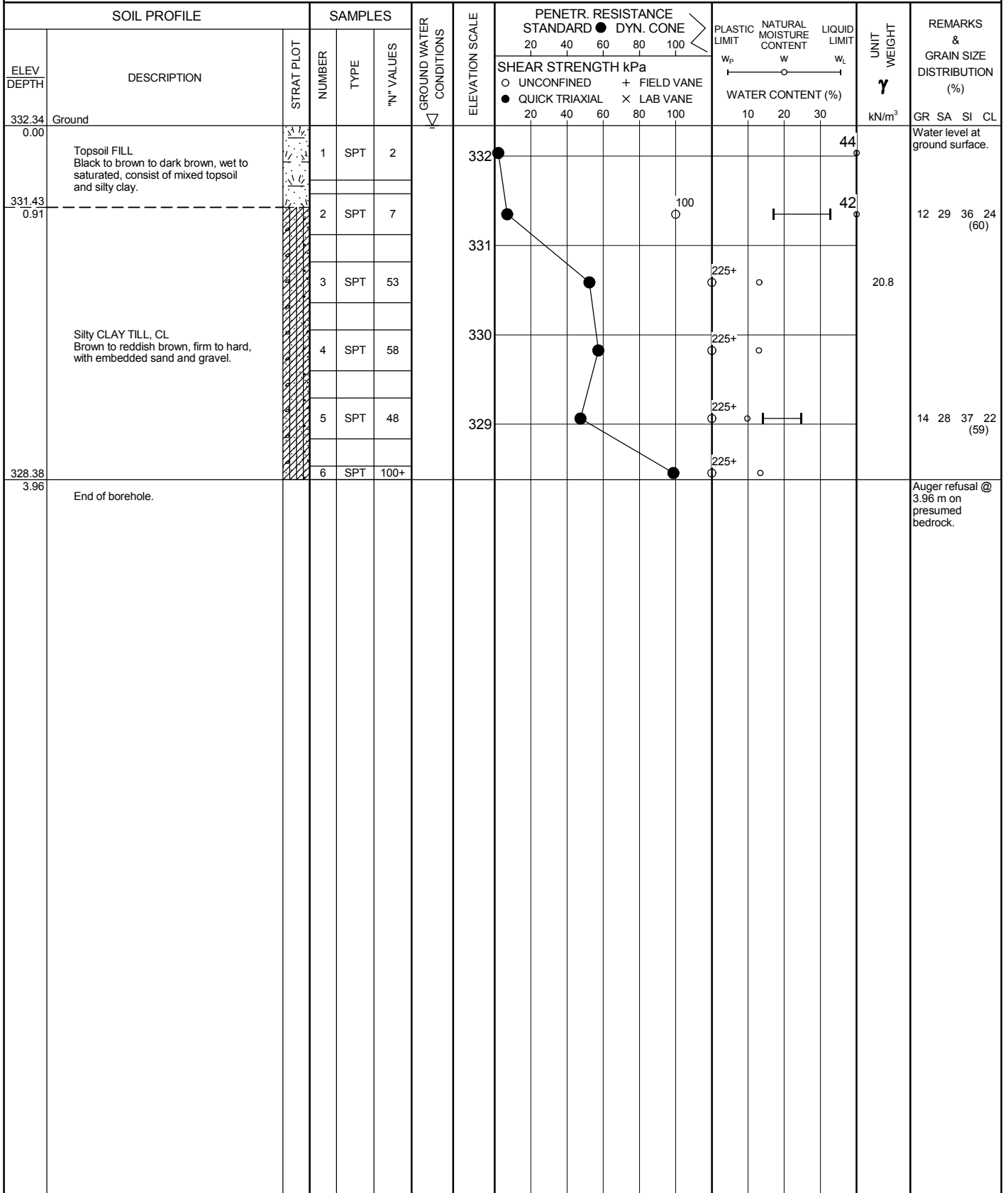
○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-58A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940631, Easting - 209688 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY JL
 DATUM Geodetic DATE 6.7.09 - 6.7.09 CHECKED BY EC



+ 3, × 3: Numbers refer to Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-59

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940643, Easting - 209684 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 1.8.07 - 1.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
						● QUICK TRIAXIAL	× LAB VANE								
333.41	Ground							20 40 60 80 100	20 40 60 80 100	10 20 30					
0.00	150 mm ASPHALT.														
332.88	380 mm Granular FILL.						333								
0.53	260 mm ASPHALT.														
332.62			1	SPT	100+			driving stones							
0.79															
		organic inclusions					332						52		
			2	SPT	17										
							331								
			3	SPT	41										
			4	SPT	75		330								
			5	SPT	60										
329.14															
4.27	End of Borehole.														
														Borehole dry and open @ completion.	

+ 3, × 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-60

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940653, Easting - 209681 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 14.8.07 - 14.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE						
								● QUICK TRIAXIAL	× LAB VANE						
331.90 0.00	Ground														
	150 mm TOPSOIL.		1	SPT	40		331			225+				21 24 35 20 (55) sample not enough for Atterberg Limit determinations	
	Silty CLAY TILL, CL Brown, moist, hard, with embedded sand and gravel.		2	SPT	73		330			225+					
			3	SPT	57					225+				19 24 35 22 (57)	
			4	SPT	43		329			225+					
328.39 3.51	End of Borehole.													Borehole dry and open @ completion.	

RECORD OF BOREHOLE No SW-61

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940646, Easting - 209709 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 13.8.07 - 13.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE								
333.53	Ground						20 40 60 80 100									
0.00	150 mm ASPHALT.															
332.92	460 mm Crushed Granular FILL.															
0.61	150 mm ASPHALT.															
332.31	460 mm silty granular FILL.		1	SPT	17									29 38 24 10 (34)		
1.22	Silty CLAY TILL, CL Reddish brown, moist, very stiff to hard, with embedded sand and gravel.		2	SPT	31									10 24 40 26 (66)		
				3	SPT	28										
330.33			4	SPT	100+											
3.20	End of Borehole.													Sampler and auger refusal @ 3.2 m on presumed bedrock. Borehole dry and open @ completion.		

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-61A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940637, Easting - 209711 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY JL
 DATUM Geodetic DATE 6.7.09 - 6.7.09 CHECKED BY EC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE						
332.35 0.00	Ground														
	150 mm TOPSOIL.		1	SPT	5		332								
			2	SPT	22										
			3	SPT	27		331								
			4	SPT	100+		330								
329.30 3.05	End of borehole.														
														Sampler and auger refusal @ 3.05 m on presumed bedrock. Borehole dry and open @ completion.	

+ 3, × 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-62

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940650, Easting - 209708 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 1.8.07 - 1.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED	+ FIELD VANE						● QUICK TRIAXIAL	× LAB VANE	
333.57 0.00	Ground																
	150 mm ASPHALT.																
333.06 0.51	360 Crushed Granular FILL.																
	150 mm ASPHALT.																
	710 mm silty granular FILL.		1	SPT	33									61 24 11 5 (15)			
332.20 1.37																	
			2	SPT	24												
			3	SPT	38									16 23 38 23 (61)			
			4	SPT	78									driving stone and cobbles			
			5	SPT	100+									driving bedrock			
329.46 4.11	End of Borehole.													Sampler and auger refusal @ 4.11 m on presumed bedrock. Borehole dry and open @ completion.			

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

METRIC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			STANDARD ● DYN. CONE						
								SHEAR STRENGTH kPa						
332.37 0.00	Ground													
	150 mm TOPSOIL.													
	Silty CLAY TILL, CL Reddish brown, moist, hard, with embedded sand and gravel, occasional cobbles.		1	SPT	36									17 20 37 25 (63)
			2	SPT	49									
			3	SPT	100+									15 25 38 22 (60)
329.47 2.90	End of Borehole.													Auger refusal @ 2.9 m on presumed bedrock. Borehole dry and open @ completion.

RECORD OF BOREHOLE No SW-64

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940652, Easting - 209733 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 13.8.07 - 13.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED	● QUICK TRIAXIAL						+ FIELD VANE	× LAB VANE	WATER CONTENT (%)
333.63 0.00	Ground						20	40	60	80	100	10	20	30			
	150 mm ASPHALT.																
	610 mm crushed Granular FILL.																
332.87 0.76	150 mm ASPHALT.		1	SPT	32										67 25 7 1 (9)		
332.41 1.22	300 mm Granular FILL.																
	Clayey SILT to Silty CLAY TILL, CL-ML to CL Reddish brown, moist, very stiff to hard, with embedded sand and gravel, occasional cobbles.		2	SPT	23												
			3	SPT	37										10 29 41 21 (62)		
			4	SPT	77										driving stone		
			5	SPT	100+												
329.52 4.11	End of Borehole.															Sampler and auger refusal @ 4.11 m on presumed bedrock. Borehole dry and open @ completion.	

RECORD OF BOREHOLE No SW-64A

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940643, Easting - 209735 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY JL
 DATUM Geodetic DATE 6.7.09 - 6.7.09 CHECKED BY EC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								○ UNCONFINED	+ FIELD VANE					
							● QUICK TRIAXIAL	× LAB VANE						
332.70 0.00	Ground													
	150 mm TOPSOIL.		1	SPT	5									
			2	SPT	17								23.8	15 30 37 17 (55)
	Silty CLAY TILL, CL Reddish brown, moist, firm to hard, with embedded sand and gravel.		3	SPT	44									
			4	SPT	44									20 24 35 21 (56)
329.50 3.20	End of borehole.		5	SPT	100+									Sampler and auger refusal @ 3.20 m on presumed bedrock. Borehole dry and open @ completion.

RECORD OF BOREHOLE No SW-65

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940656, Easting - 209732 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 1.8.07 - 1.8.07 CHECKED BY JL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa											
								○ UNCONFINED	+ FIELD VANE						● QUICK TRIAXIAL	× LAB VANE			
333.65	Ground							20	40	60	80	100							
0.00	180 mm ASPHALT.																		
333.04	430 mm crushed Granular FILL.																		
0.61	150 mm silty clay FILL. 150 mm ASPHALT.																		
332.43	300 mm Granular FILL.		1	SPT	22		333	●					○					62 29 6 2 (9)	
1.22	Silty CLAY TILL, CL Reddish brown, moist, hard, with embedded sand and gravel, occasional cobbles.		2	SPT	65		332	●						○				19 31 32 18 (50)	
			3	SPT	45		331	●						○					
			4	SPT	48		330	●						○					
			5	SPT	100+									○					
329.38	End of Borehole.																	sampler refusal @ 4.1 m. Borehole dry and open @ completion.	
4.27																			

+ 3, X 3: Numbers refer to
Sensitivity

○ 150 UNCONFINED SHEAR STRENGTH INFERRED FROM POCKET PENETROMETER READINGS

RECORD OF BOREHOLE No SW-66

1 OF 1

METRIC

W.P. GWP 167-91-00 LOCATION Northing - 4940667, Easting - 209729 ORIGINATED BY RB
 DIST Owen Sound HWY 26 BOREHOLE TYPE S/S Augering, 110 mm dia. COMPILED BY NN
 DATUM Geodetic DATE 14.8.07 - 14.8.07 CHECKED BY JL

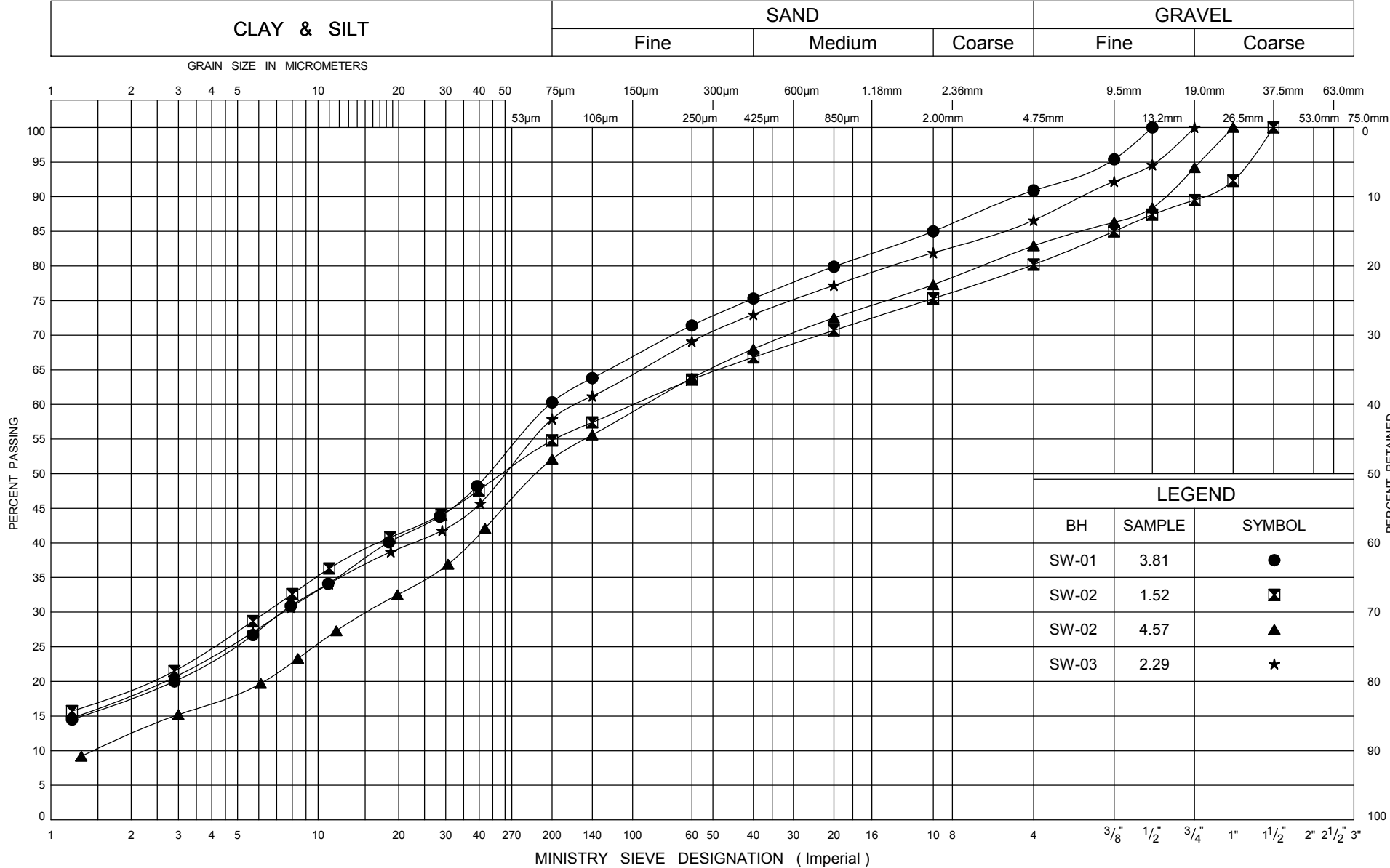
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	PENETR. RESISTANCE STANDARD ● DYN. CONE			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa													
								○ UNCONFINED	● QUICK TRIAXIAL	+ FIELD VANE						× LAB VANE	WATER CONTENT (%)				
332.52 0.00	Ground						20	40	60	80	100	10	20	30	GR	SA	SI	CL			
	150 mm TOPSOIL.		1	SPT	41		332	●								3	29	42	26 (68)		
	2		SPT	55																	
	3		SPT	38																	
330.08 2.44	End of Borehole.																				

Appendix B

Laboratory Test Results

Grain Size Distribution Figures	Atterberg Limits Figures
A1	A2
B1, B3	B2, B4
C1, C3	C2, C4
D1, D3, D5	D2, D4, D6
E1, E3	E2
F1, F3, F5, F7, F9	F2, F4, F6, F8
G1, G3	G2
H1, H2, H4	H3, H5
J1, J3	J2
K1, K2, K3, K5, K7	K4, K6
L1, L3, L5, L7	L2, L4, L6, L8
M1, M2, M4	M3, M5
N1, N3, N4	N2, N5
P1, P2	P3
Q1, Q2, Q4	Q3, Q5
R1, R3, R5, R7	R2, R4, R6, R8
S1, S3	S2, S4
T1, T3, T5	T2, T4, T6
U1, U3, U 4, U5	U2, U6
V1, V2	V3
W1, W2	W3
X1, X2	X3

UNIFIED SOIL CLASSIFICATION SYSTEM



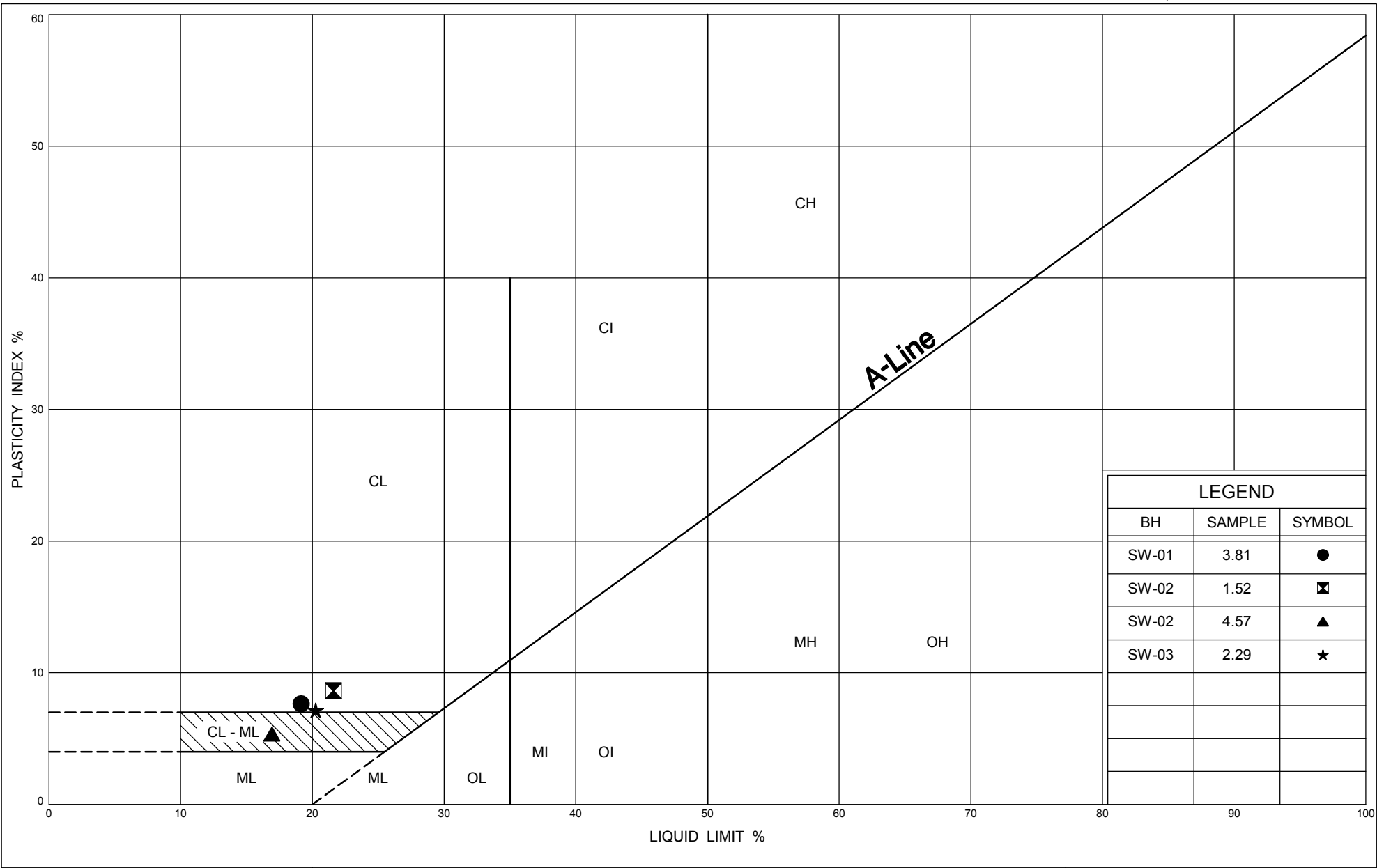
LEGEND		
BH	SAMPLE	SYMBOL
SW-01	3.81	●
SW-02	1.52	■
SW-02	4.57	▲
SW-03	2.29	★

ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 27/10/09



GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No A1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



Ministry of
Transportation

Ontario

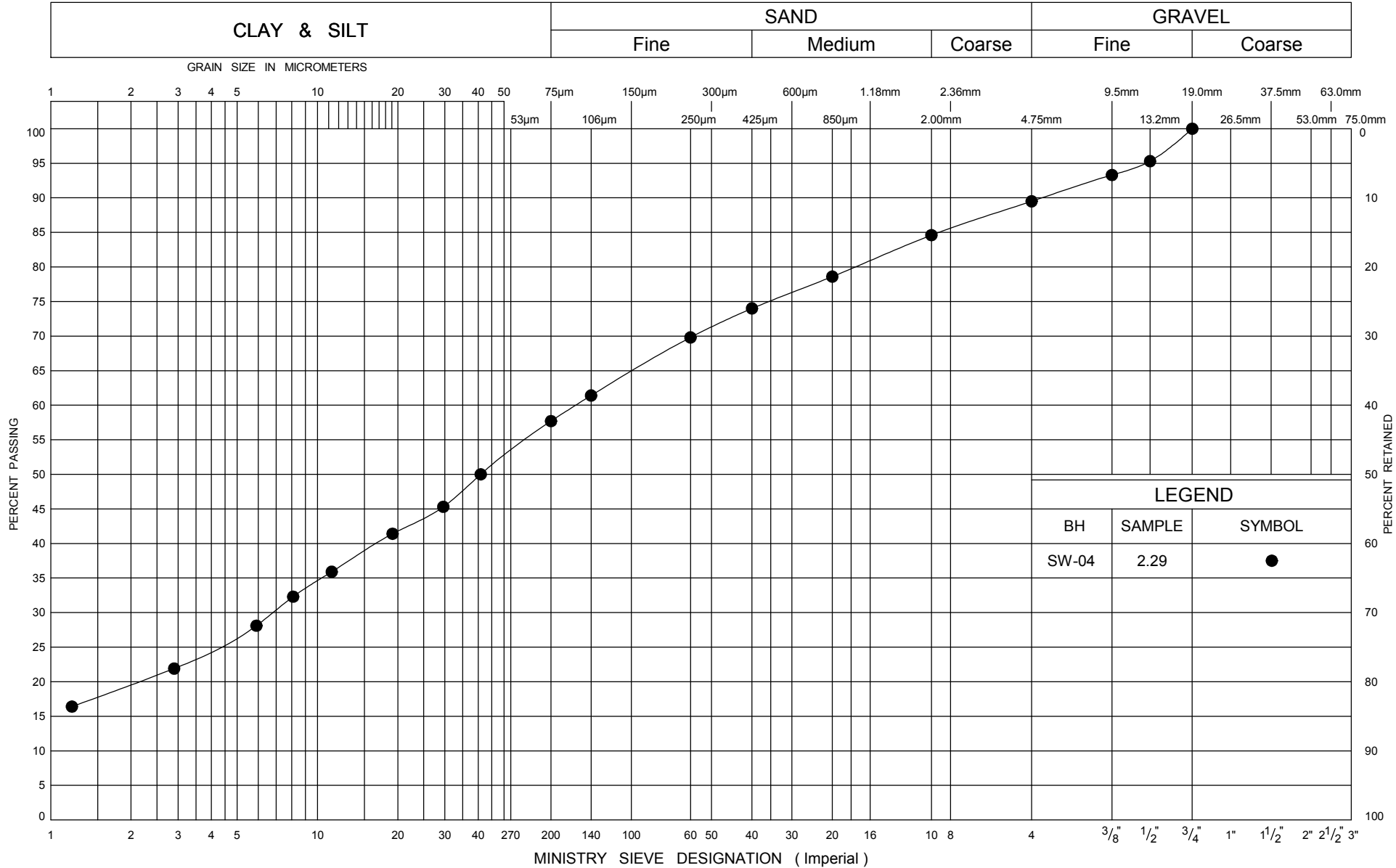
PLASTICITY CHART
CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No A2

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

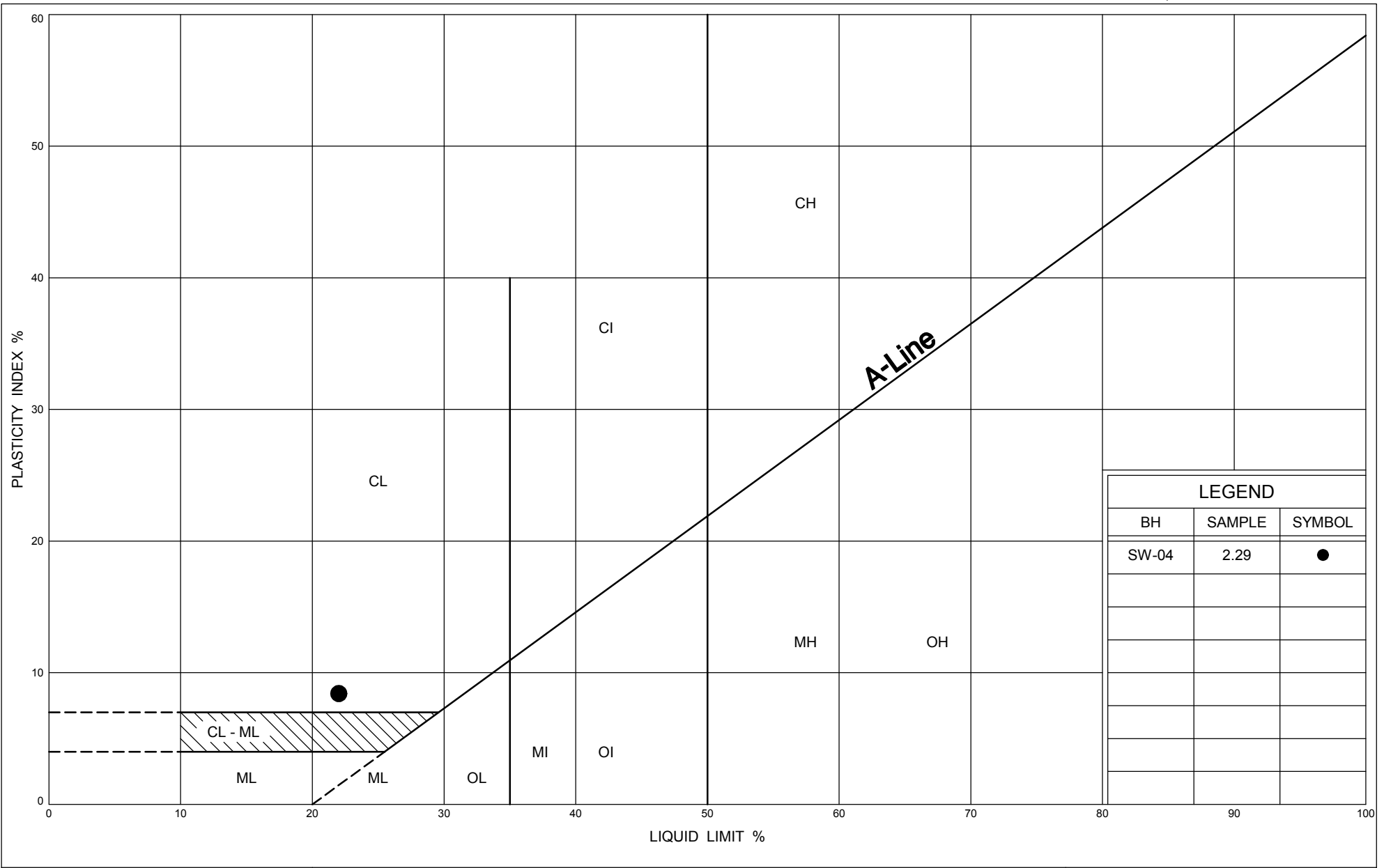
UNIFIED SOIL CLASSIFICATION SYSTEM



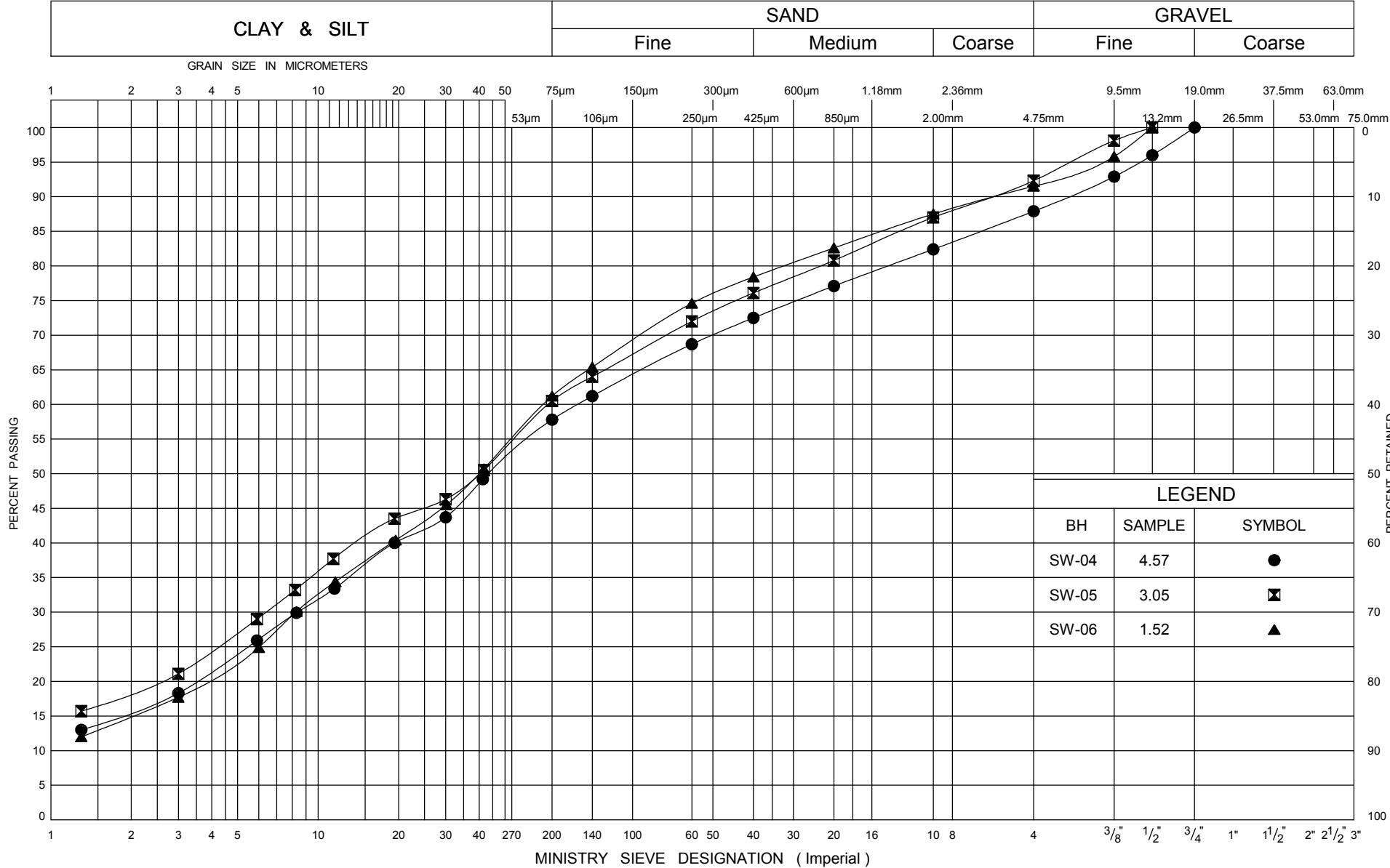
GRAIN SIZE DISTRIBUTION
FILL

FIG No B1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford





UNIFIED SOIL CLASSIFICATION SYSTEM



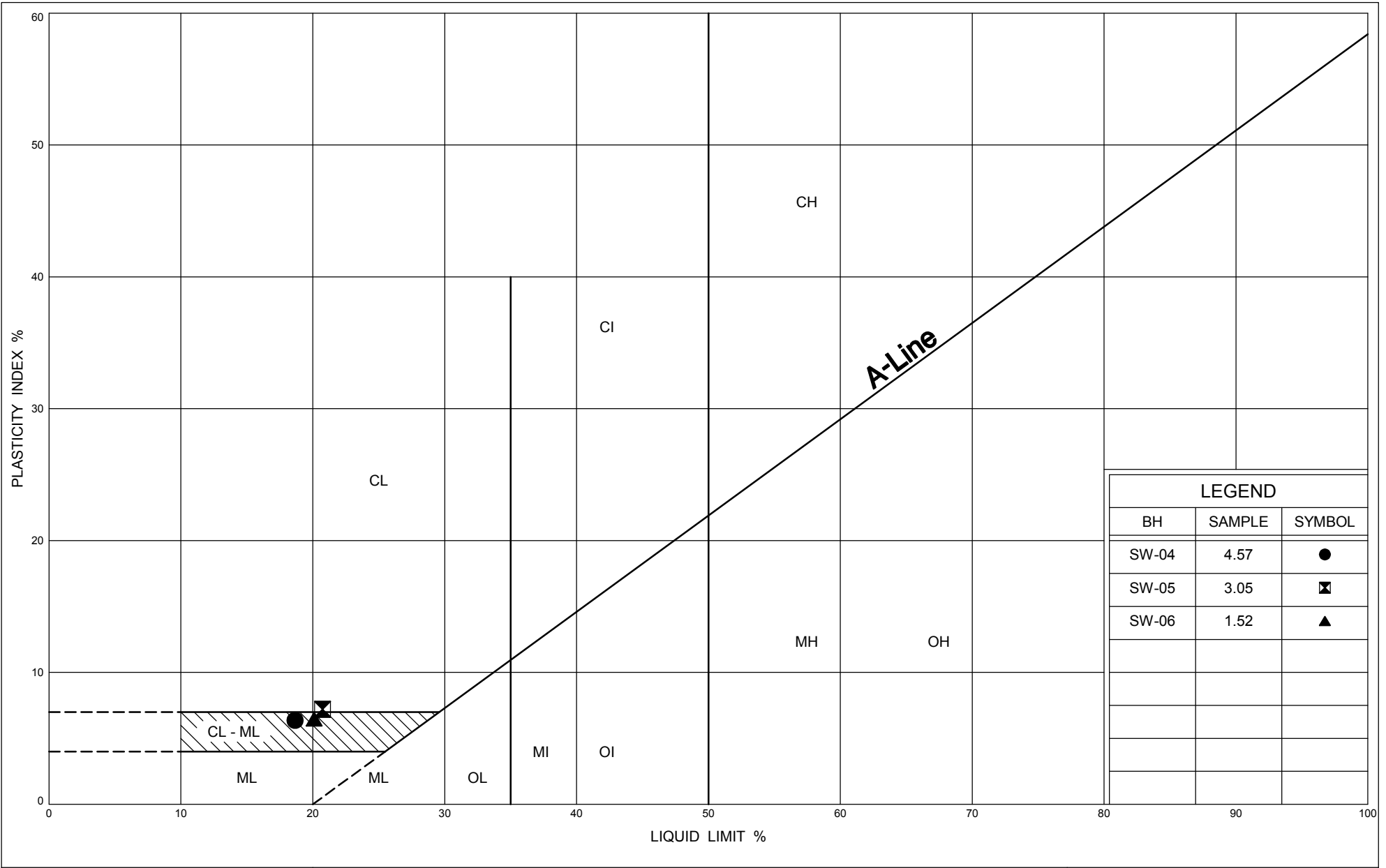
LEGEND		
BH	SAMPLE	SYMBOL
SW-04	4.57	●
SW-05	3.05	■
SW-06	1.52	▲

ONTARIO MOT GRAN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 27/10/09

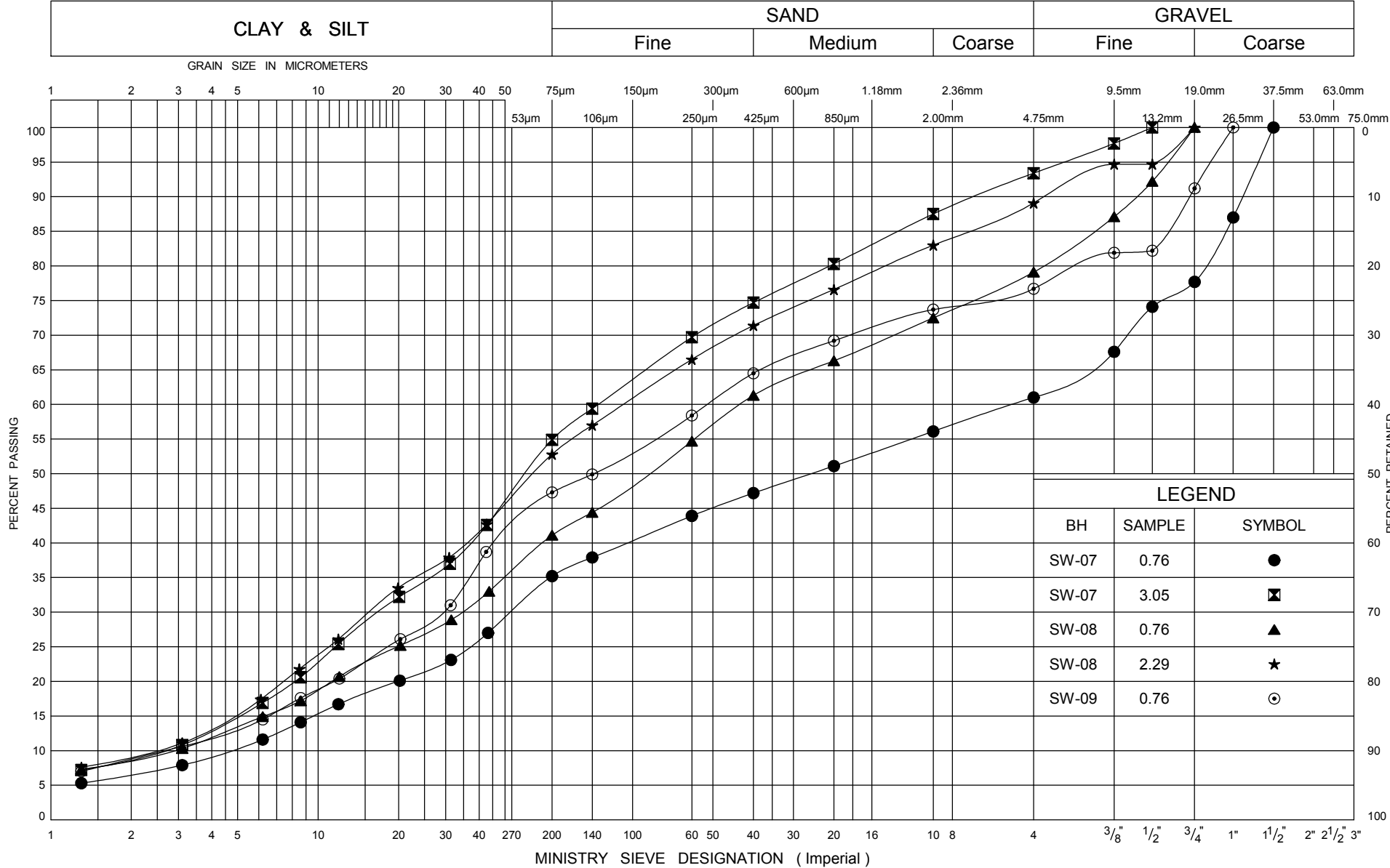


GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No B3
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



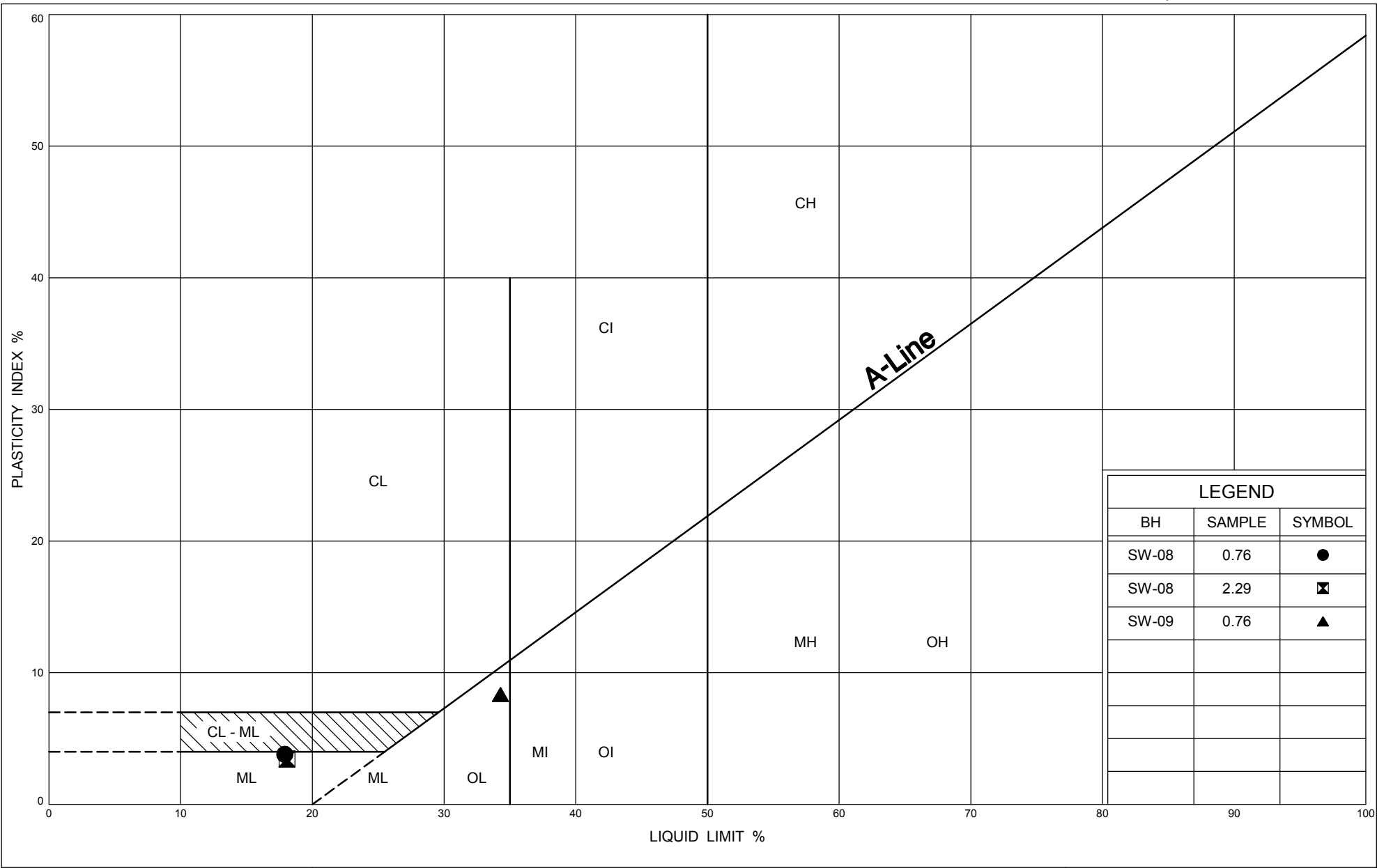
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GRAIN SIZE DISTRIBUTION
FILL

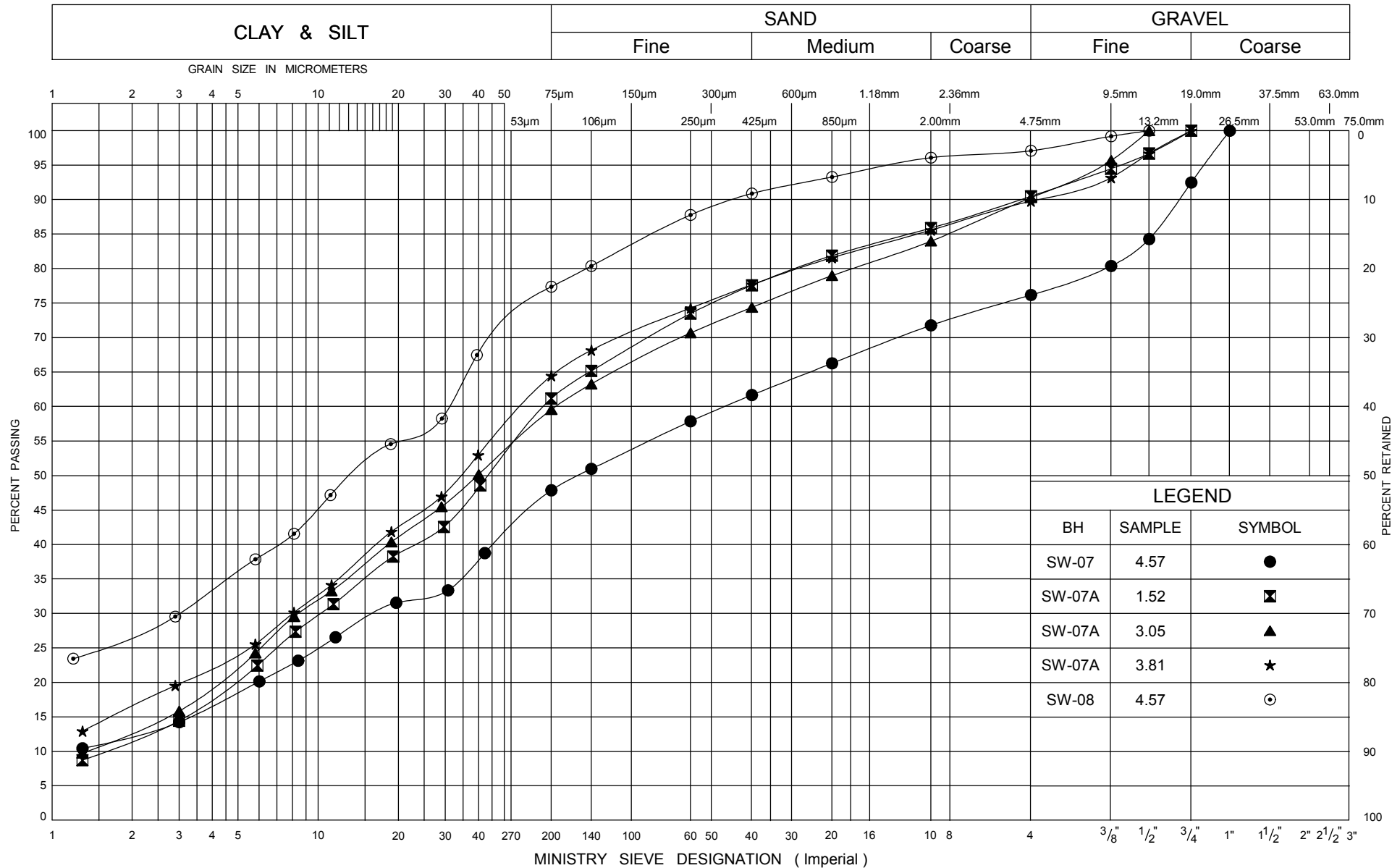
FIG No C1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford





LEGEND		
BH	SAMPLE	SYMBOL
SW-08	0.76	●
SW-08	2.29	⊠
SW-09	0.76	▲

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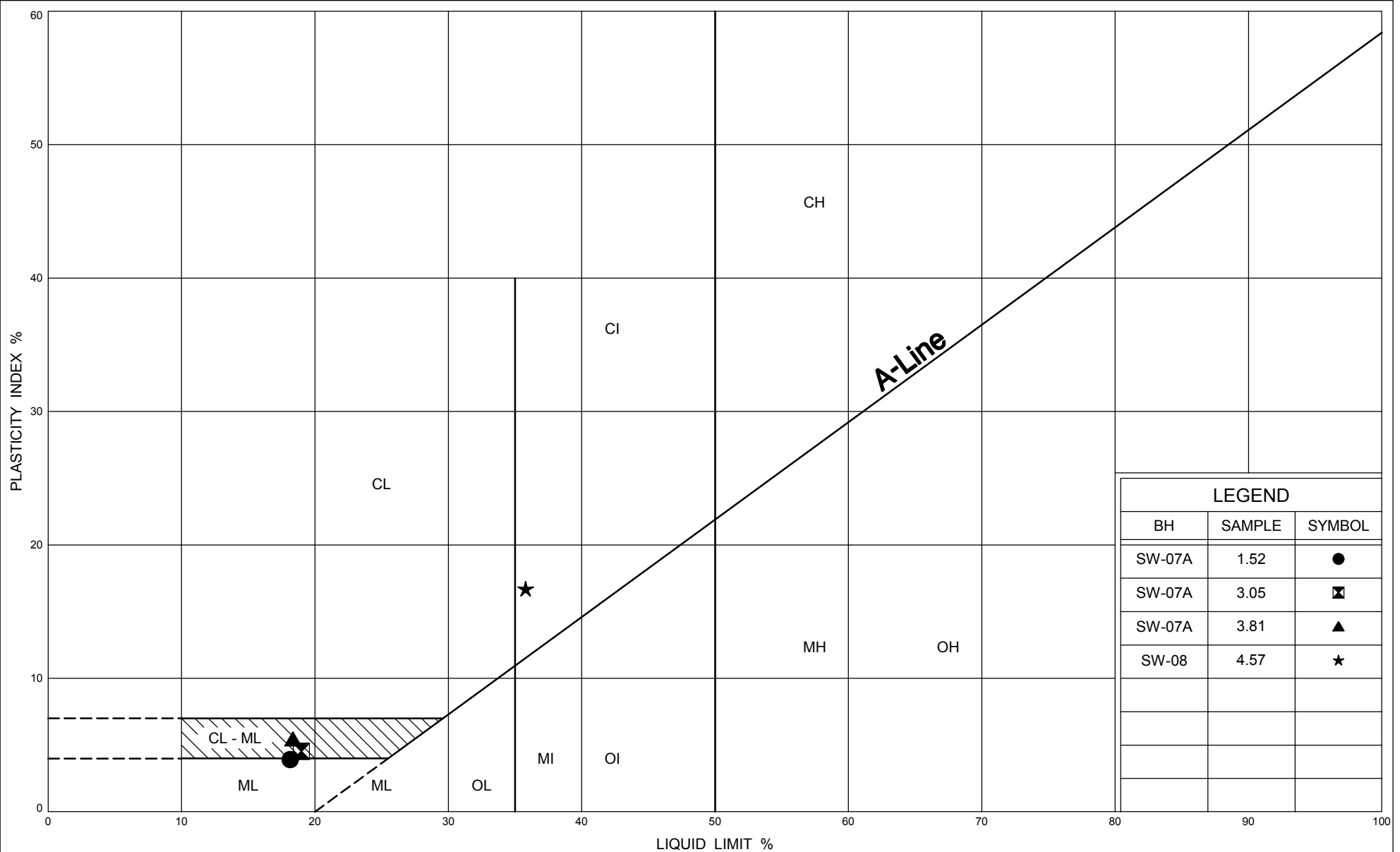
GRAIN SIZE DISTRIBUTION

CLAYEY SILT TO SILTY CLAY, CL-ML, CL TO CI

FIG No C3

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford



PLASTICITY CHART

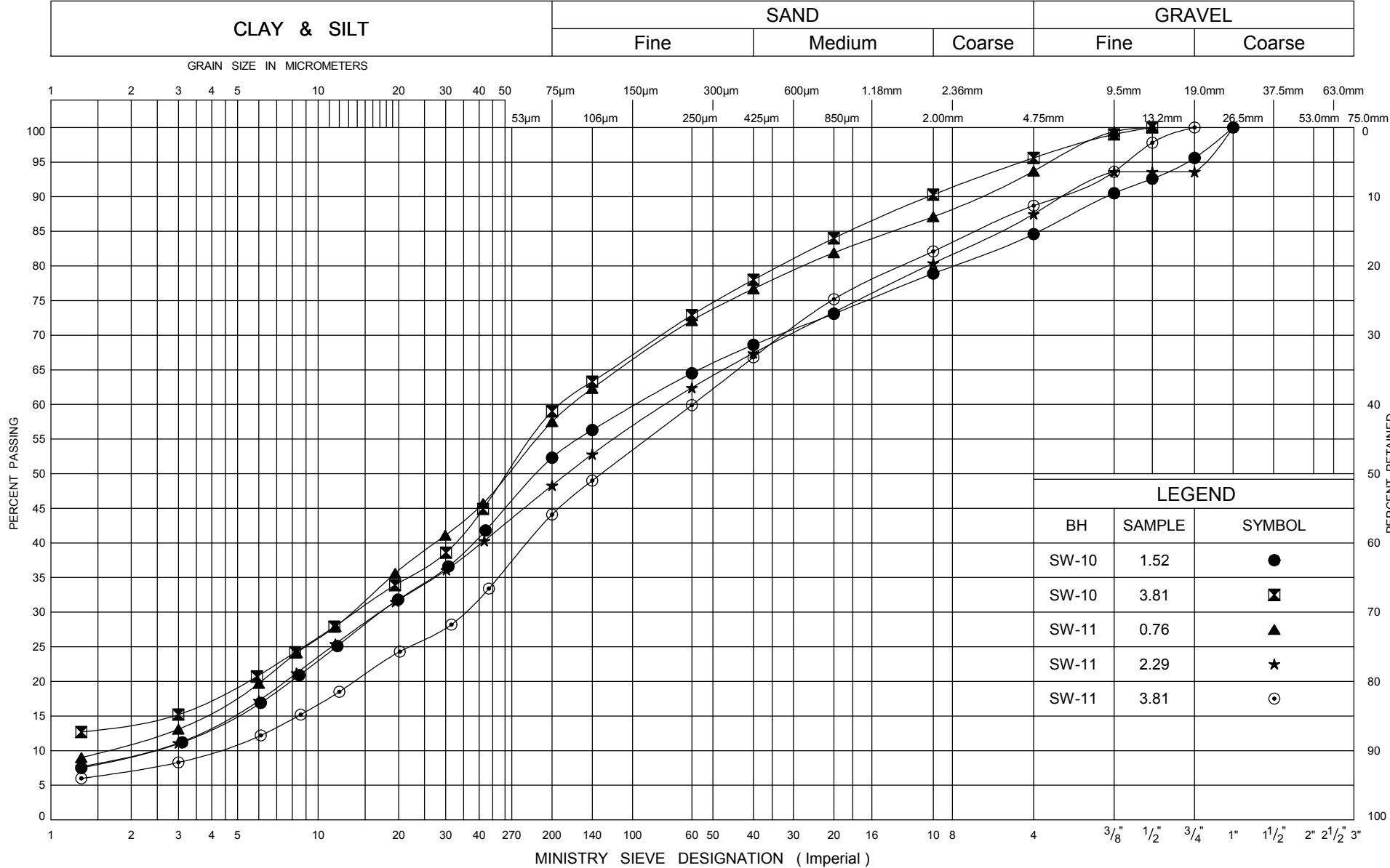
CLAYEY SILT TO SILTY CLAY, CL-ML, CL TO CI

FIG No C4

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

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GRAIN SIZE DISTRIBUTION

FILL

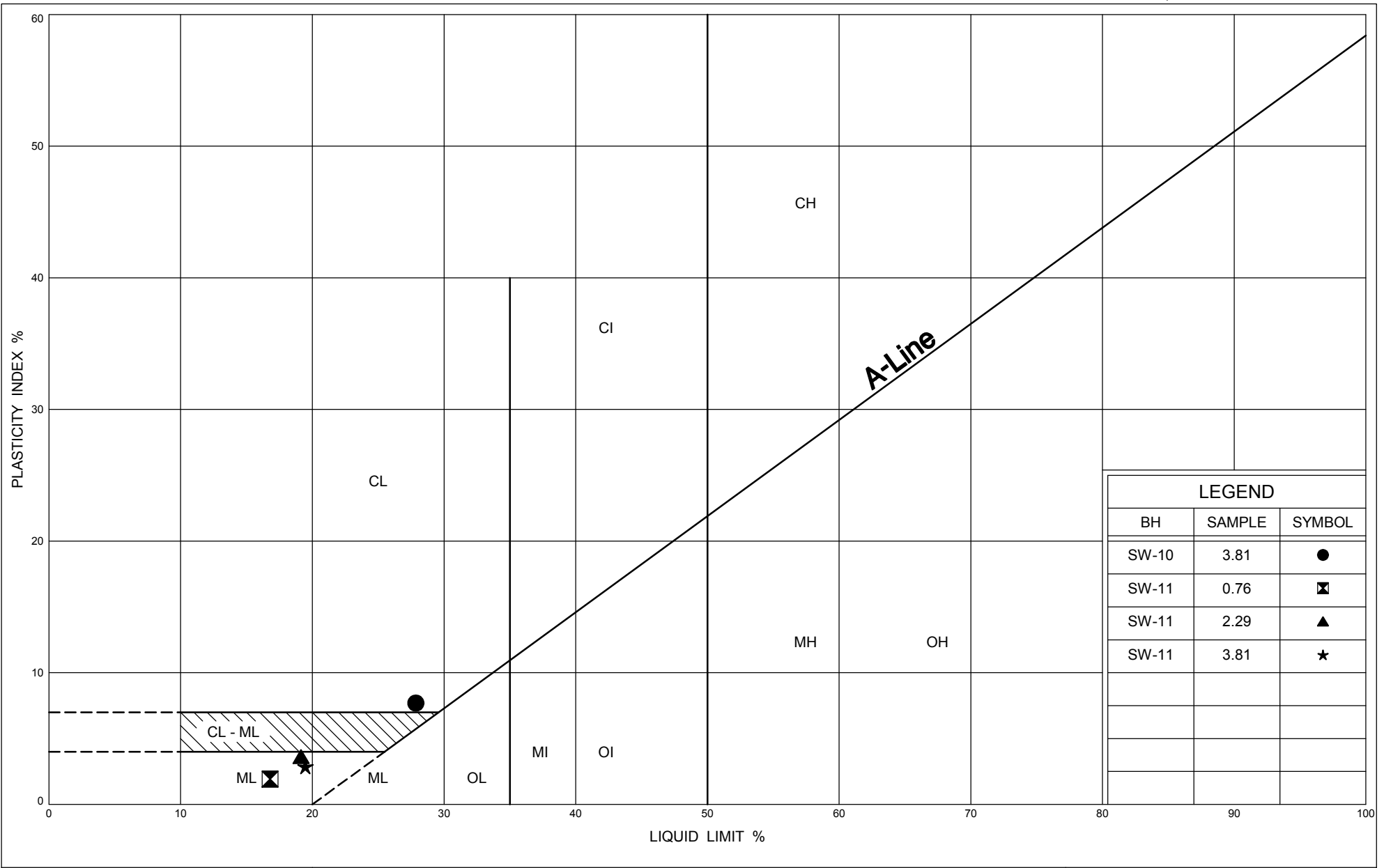
FIG No D1

GWP 167-91-00

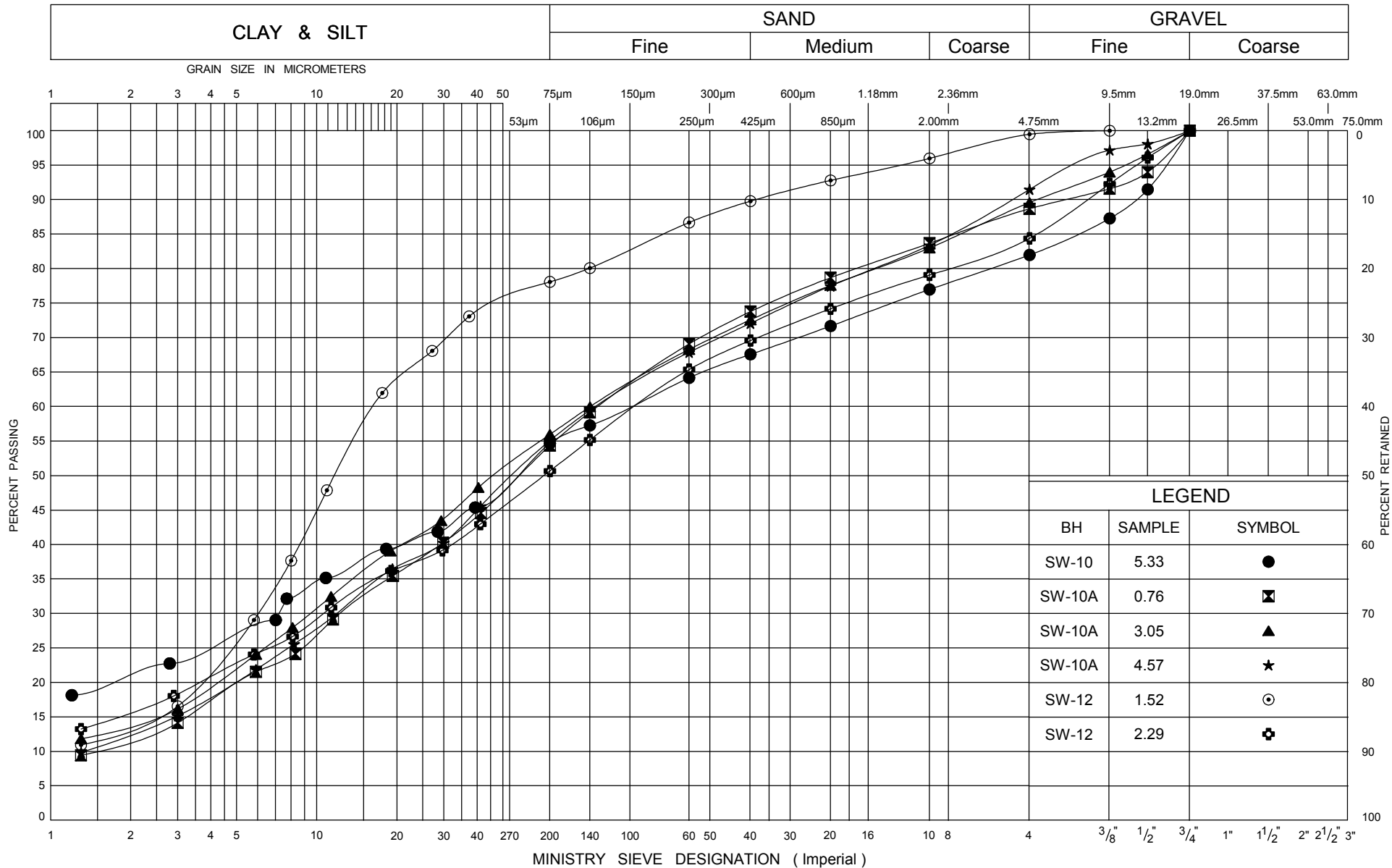
Hwy 26 - Sydenham Townline to Meaford



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ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO MOT.GDT 31/10/09



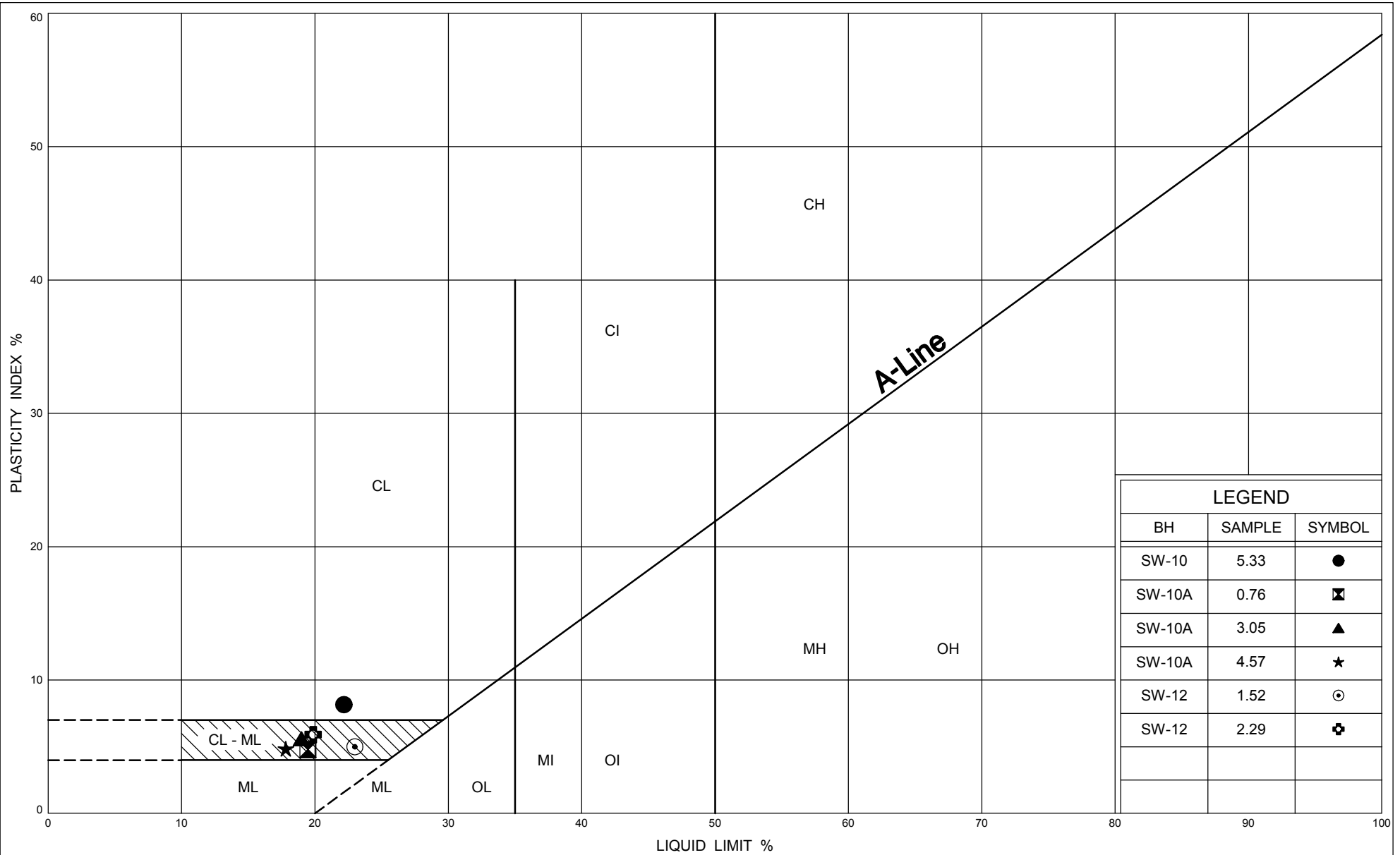
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GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No D3

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford



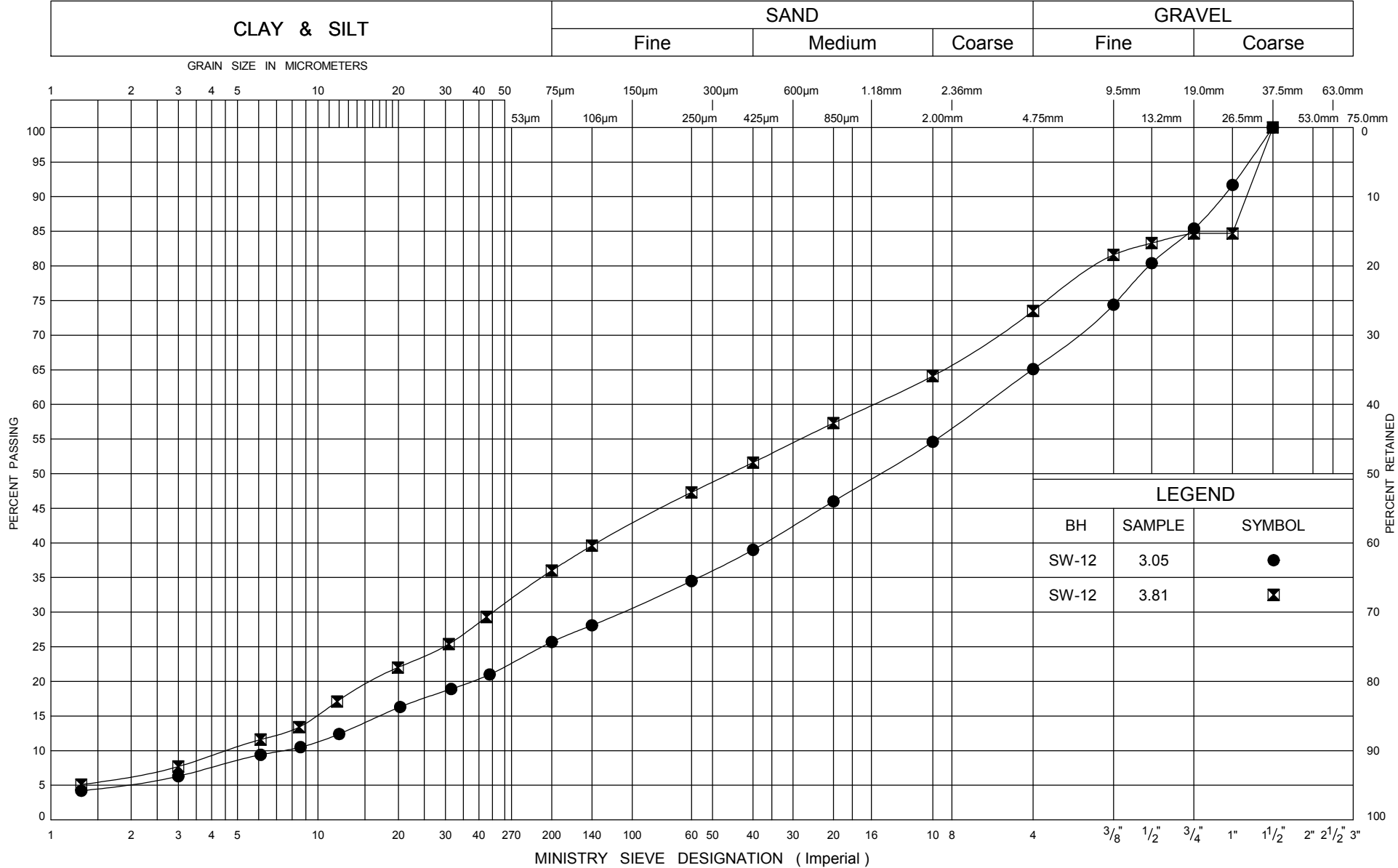
PLASTICITY CHART CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No D4

GWP 167-91-00

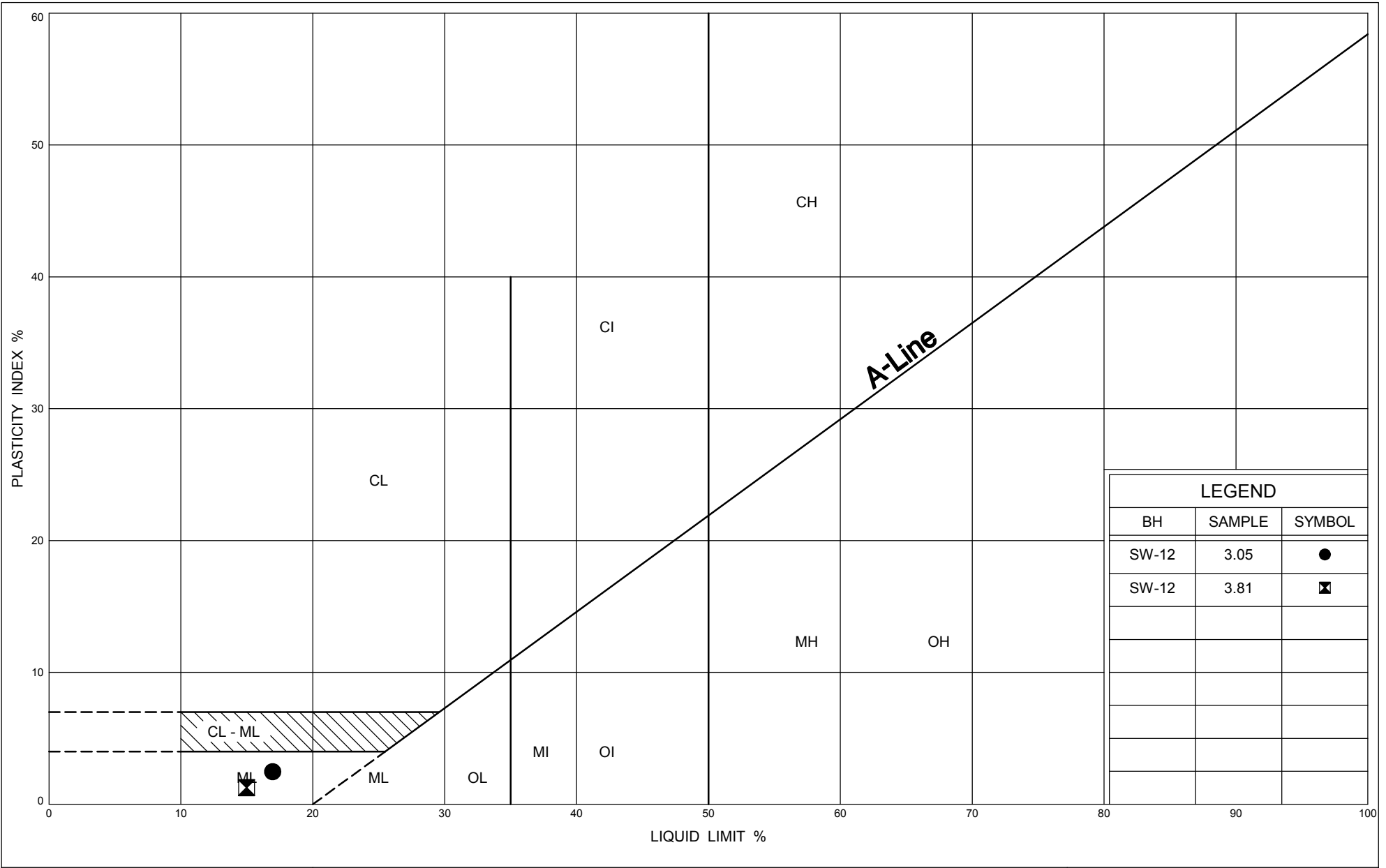
Hwy 26 - Sydenham Townline to Meaford

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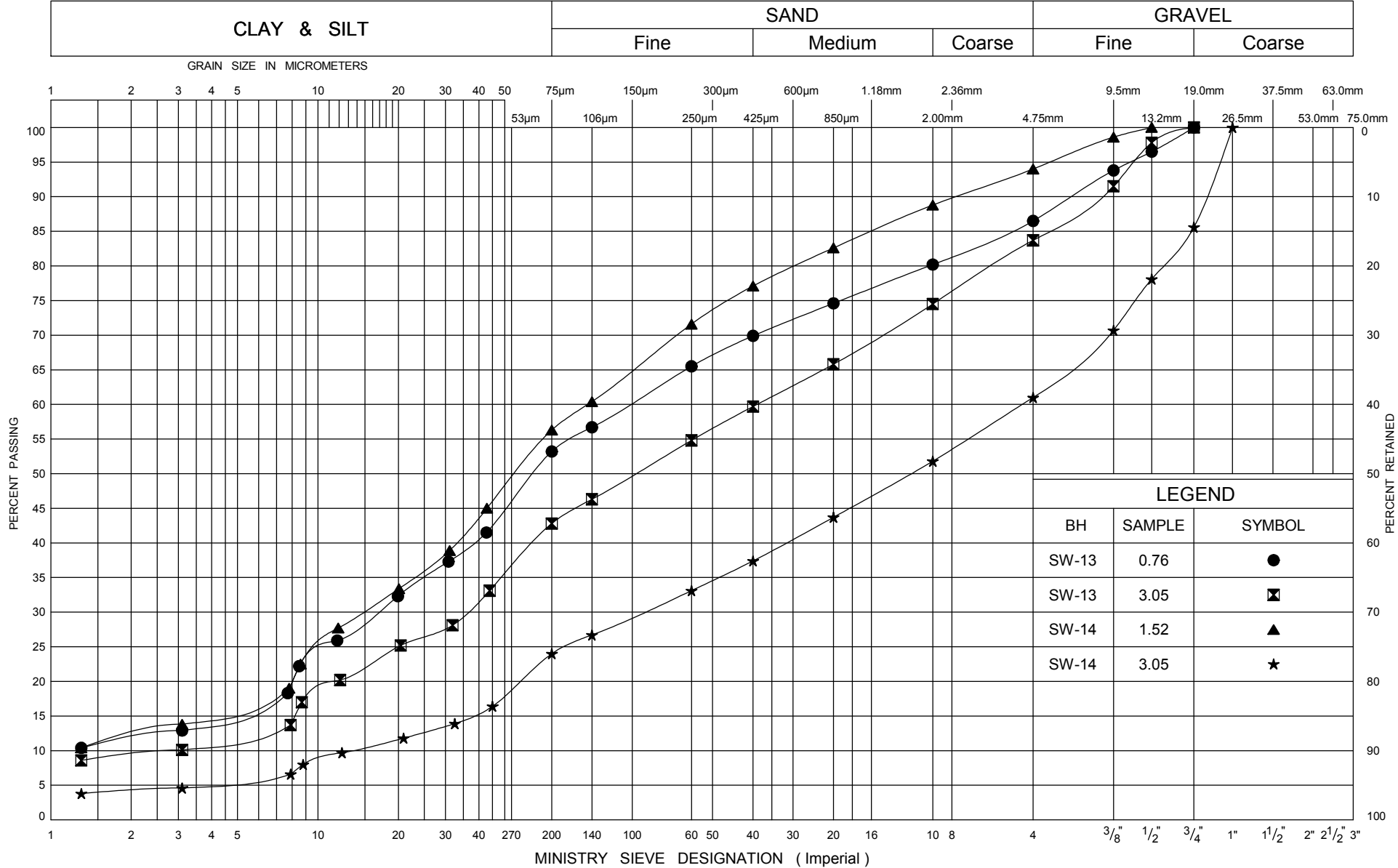


GRAIN SIZE DISTRIBUTION
SAND AND SILT TILL, SM-ML

FIG No D5
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



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GRAIN SIZE DISTRIBUTION

FILL

FIG No E1

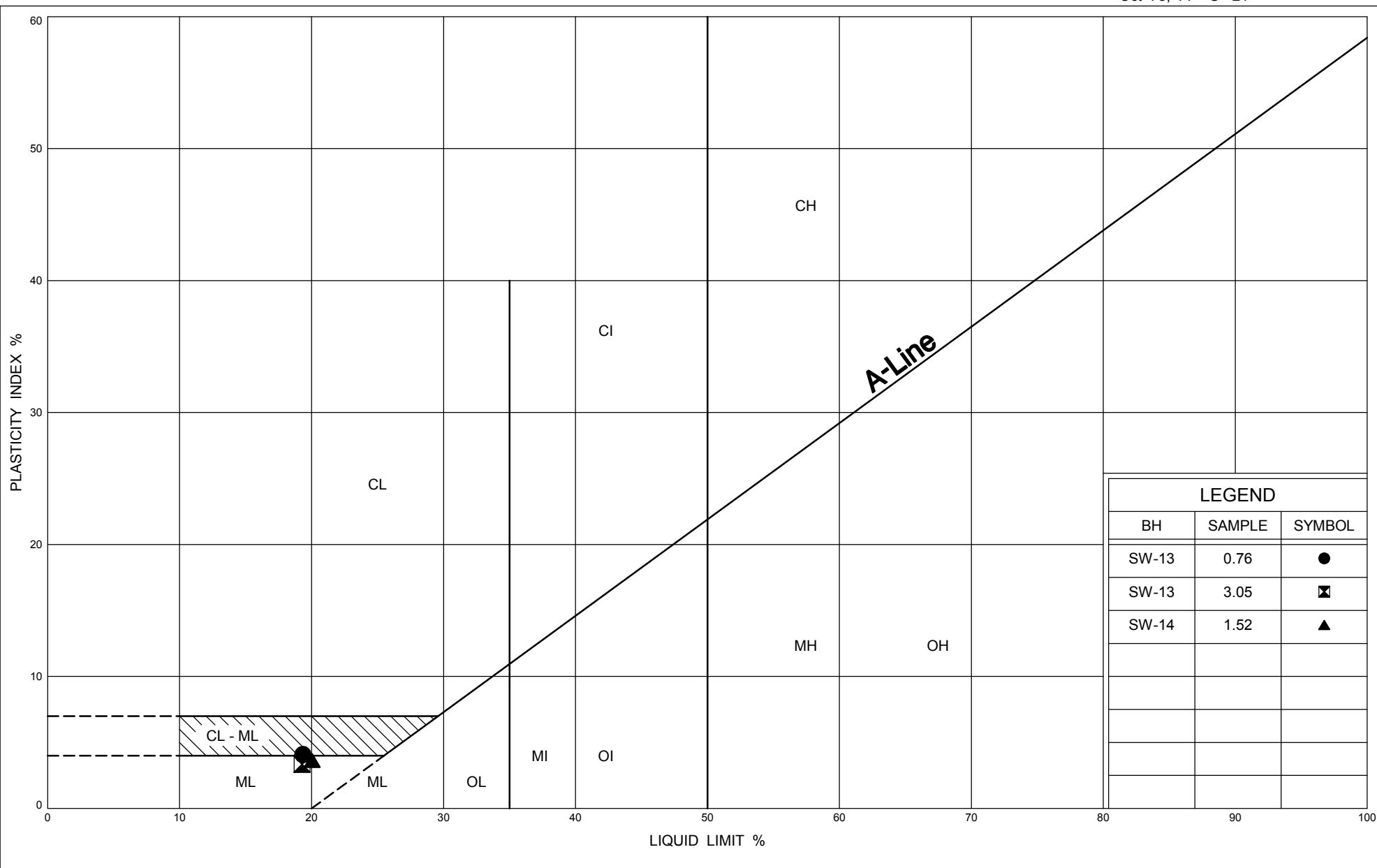
GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

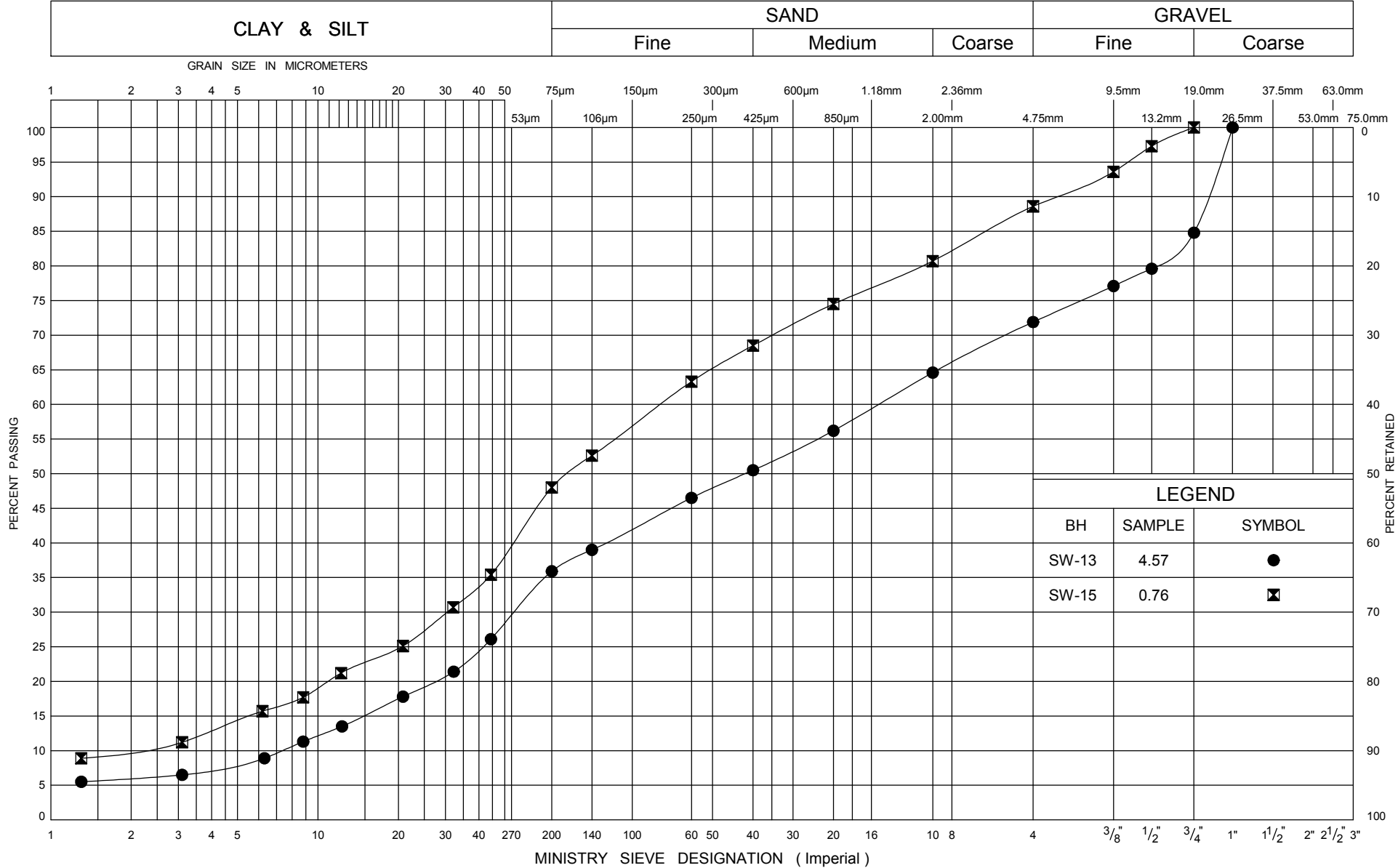


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LEGEND		
BH	SAMPLE	SYMBOL
SW-13	4.57	●
SW-15	0.76	⊠

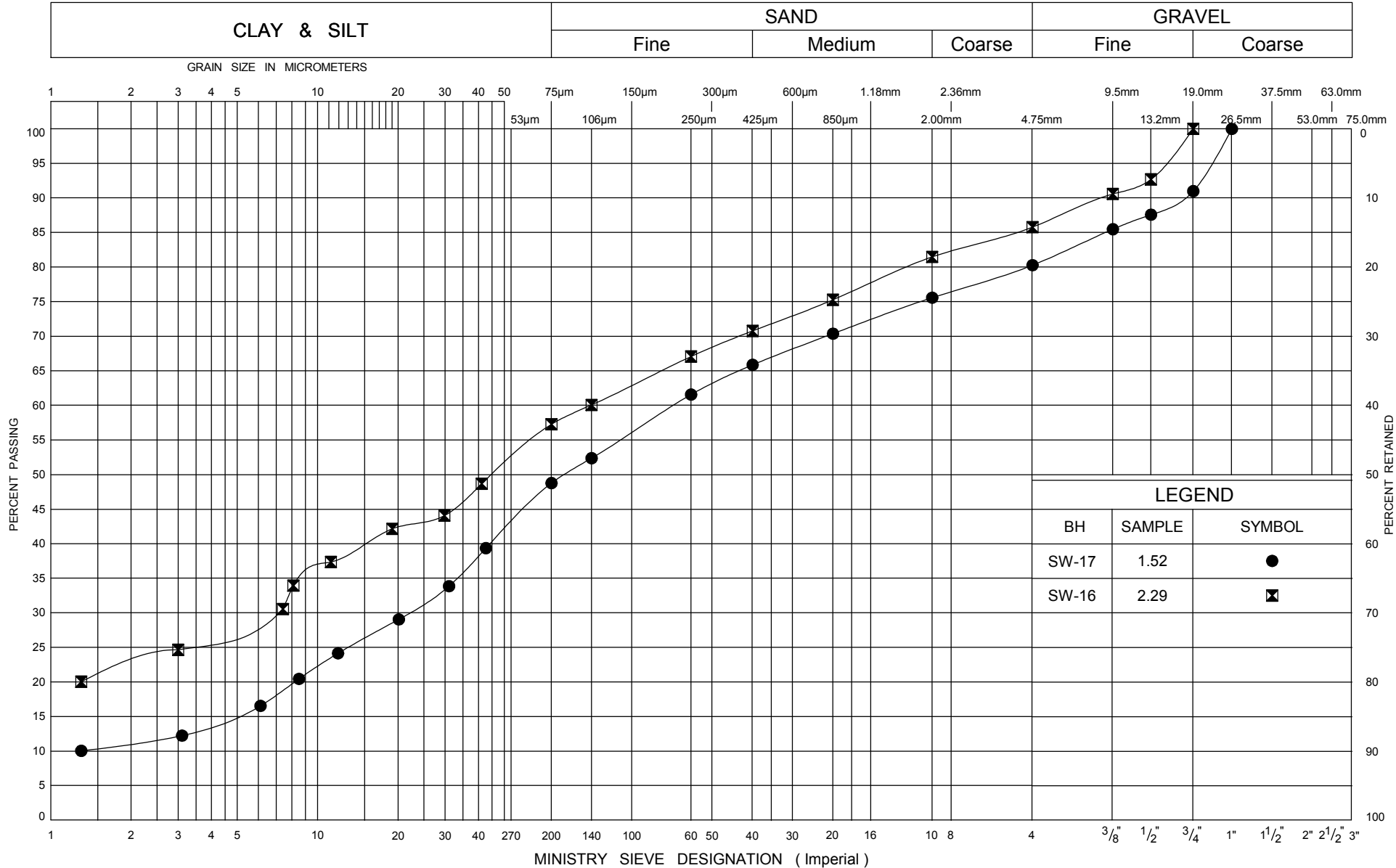
ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 27/10/09



GRAIN SIZE DISTRIBUTION
SAND & SILT TILL, SM-ML

FIG No E3
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford

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GRAIN SIZE DISTRIBUTION FILL

FIG No F1

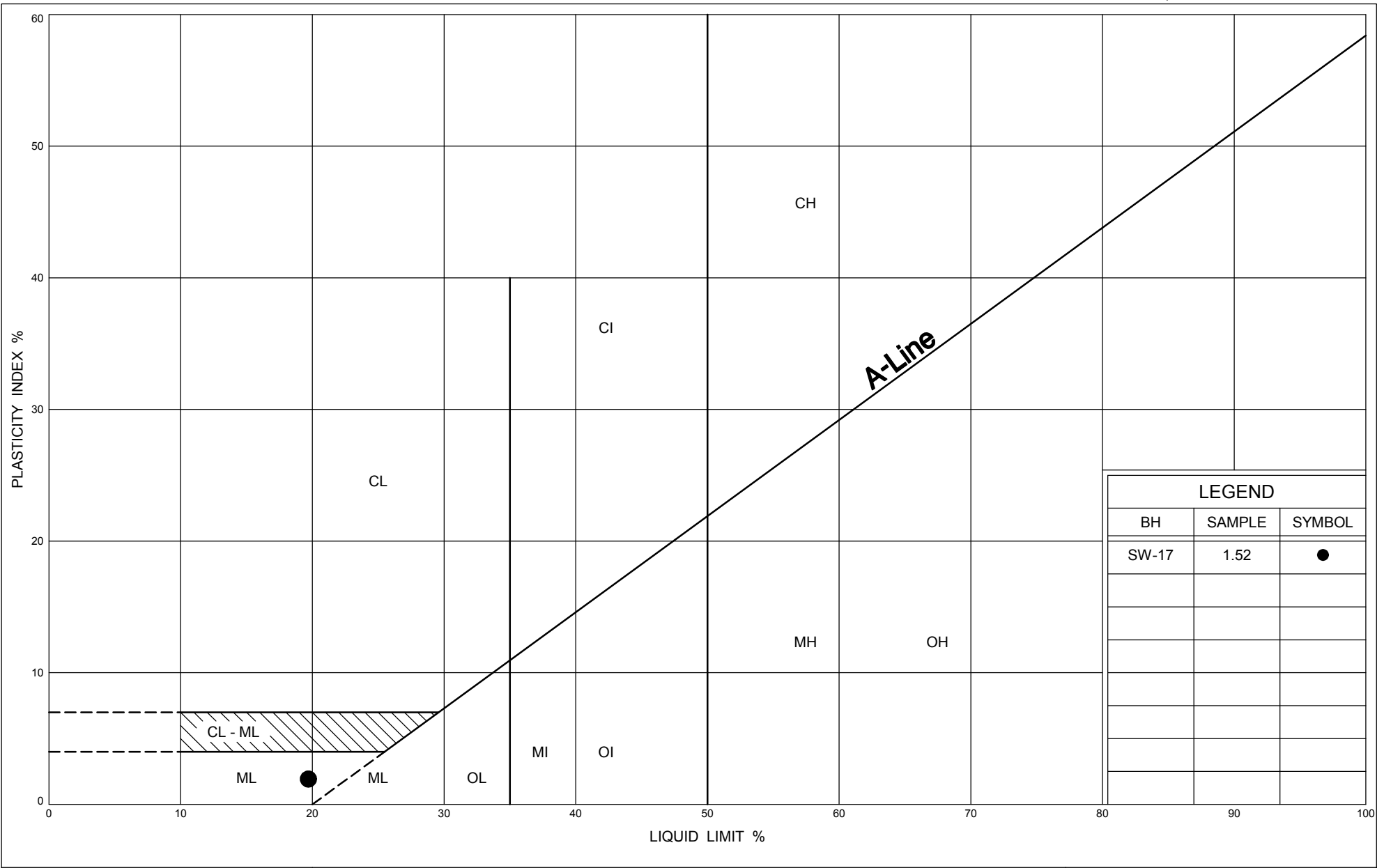
GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

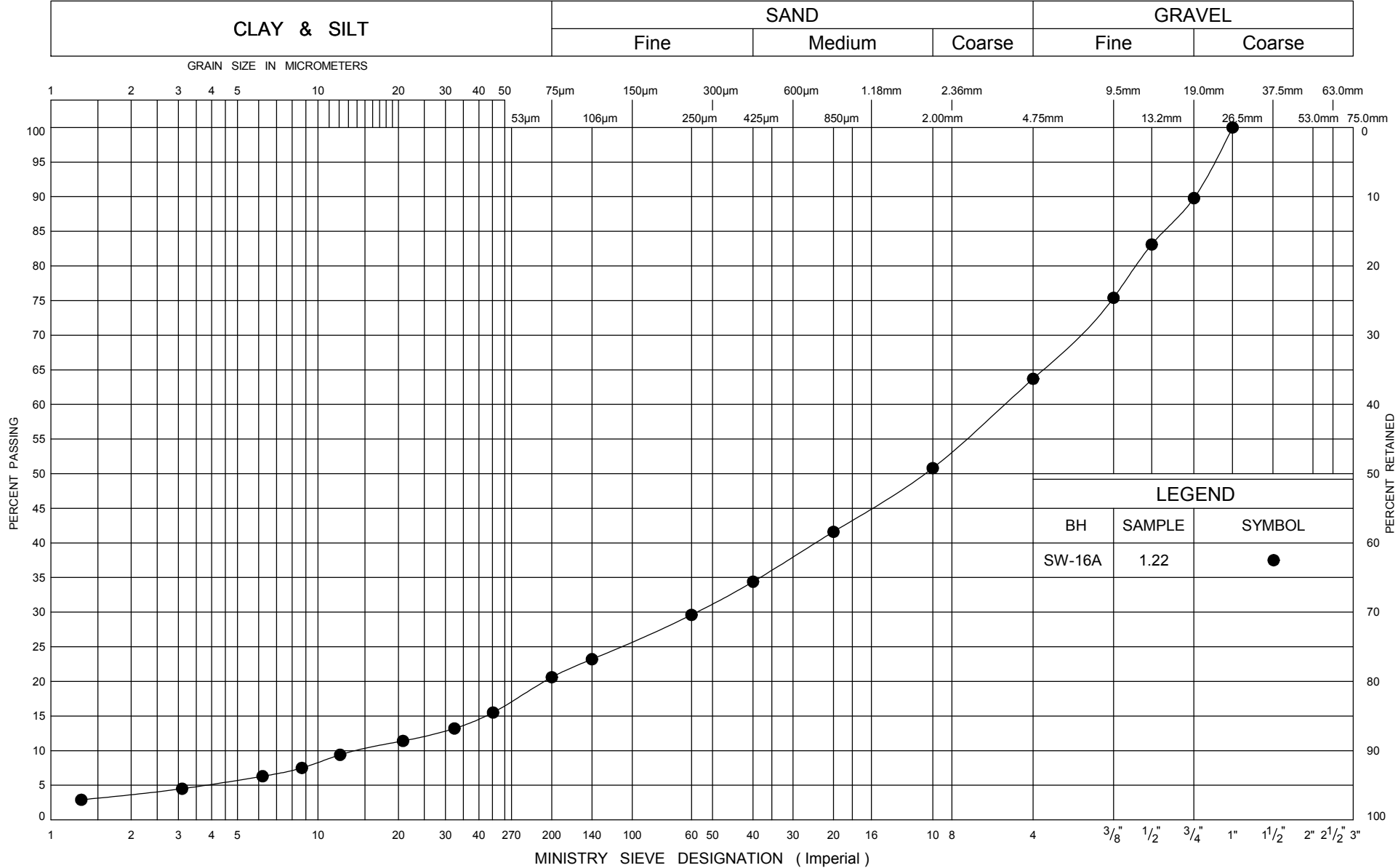


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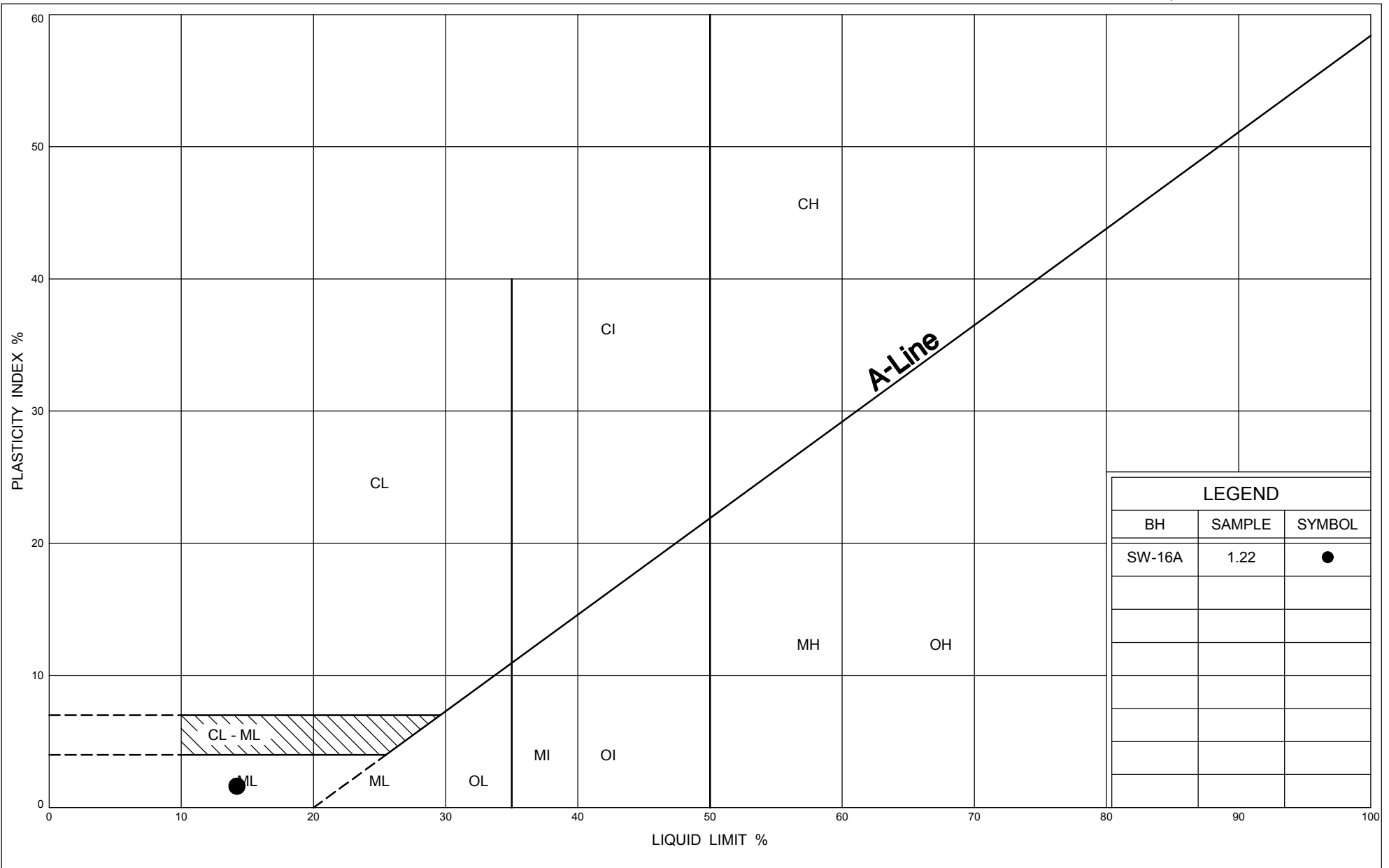
UNIFIED SOIL CLASSIFICATION SYSTEM



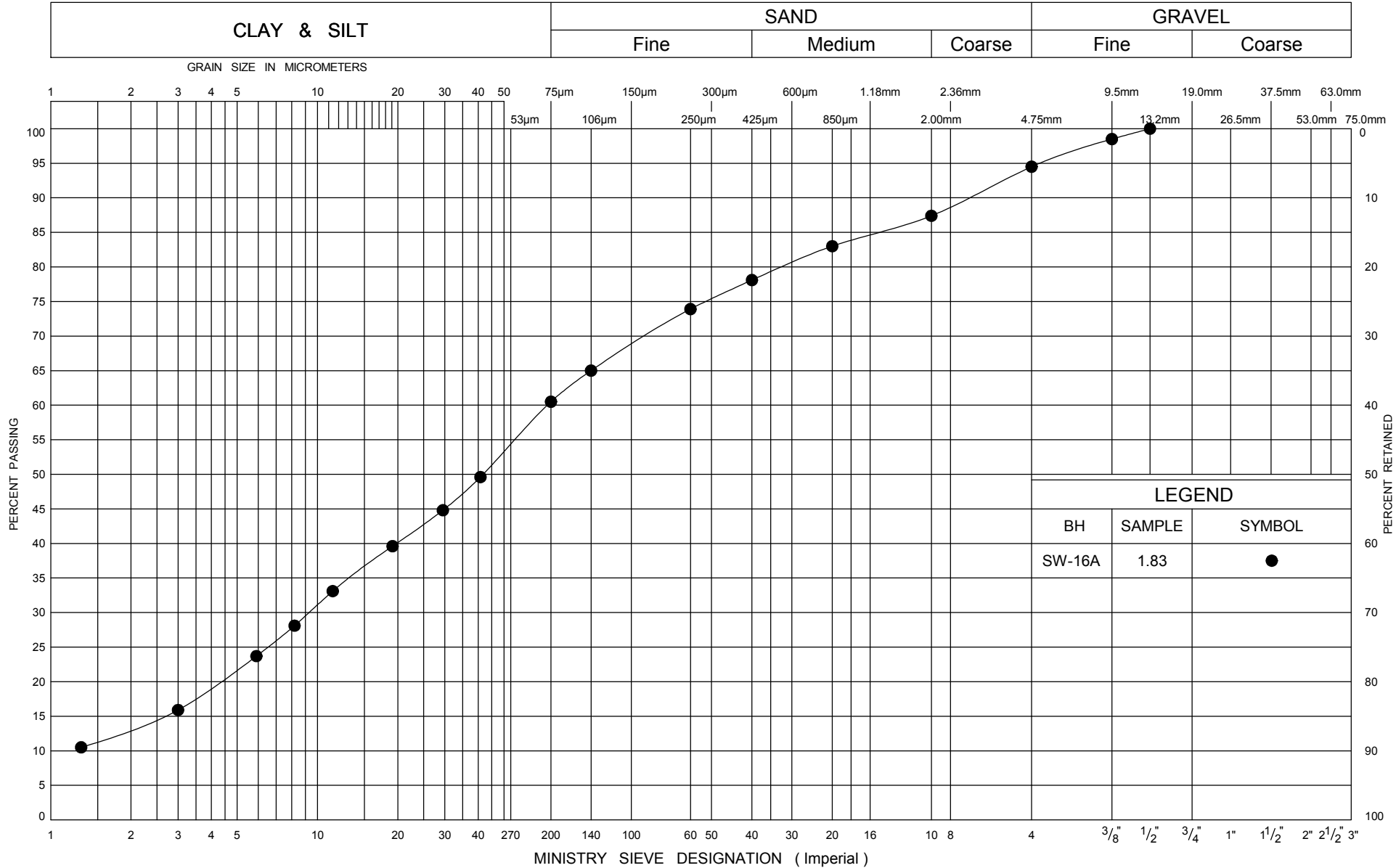
GRAIN SIZE DISTRIBUTION
SAND & GRAVEL, SM-GM

FIG No F3
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford

ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 4/1/09



UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION
CLAYEY SILT TILL, CL-ML

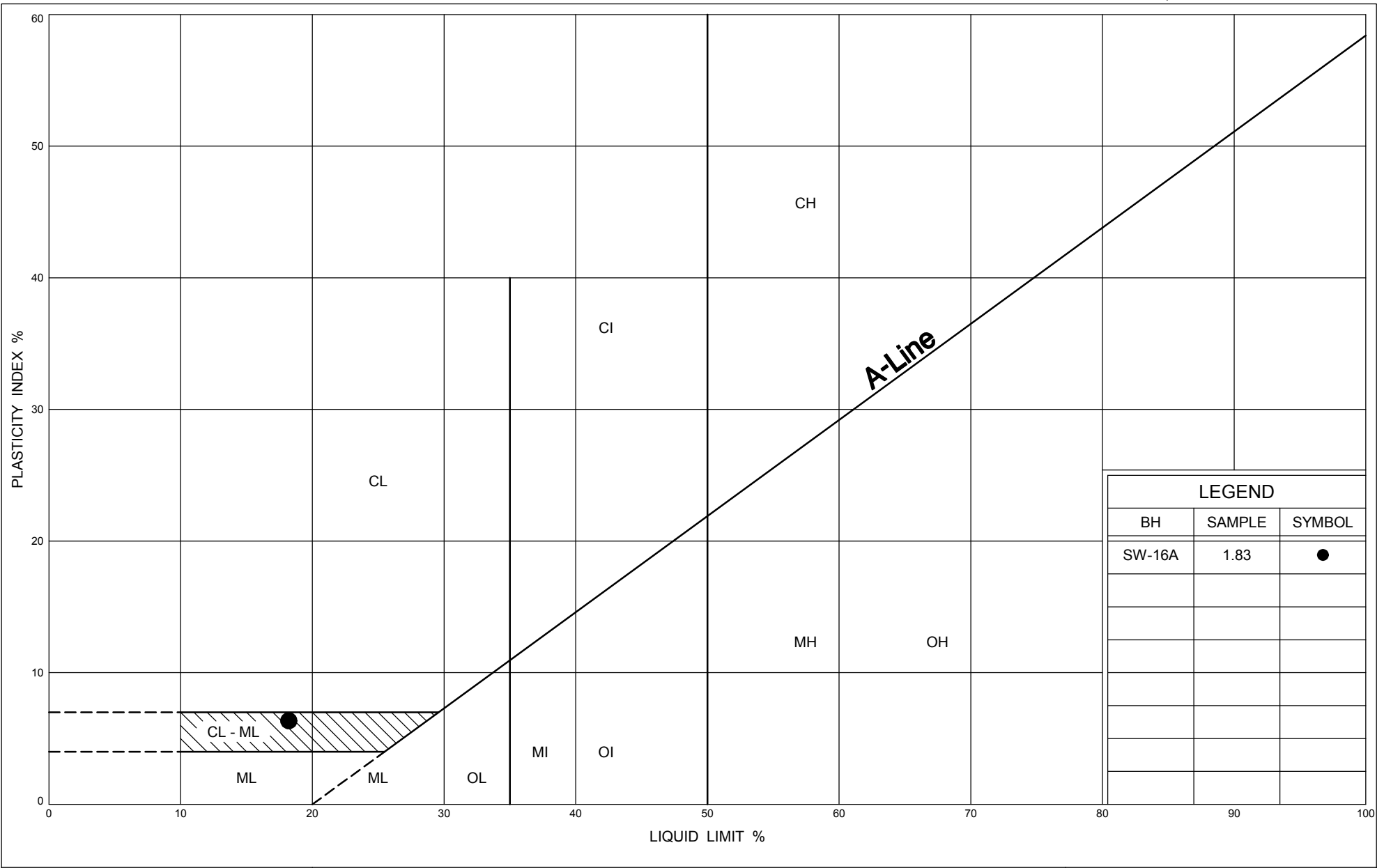
FIG No F5

GWP 167-91-00

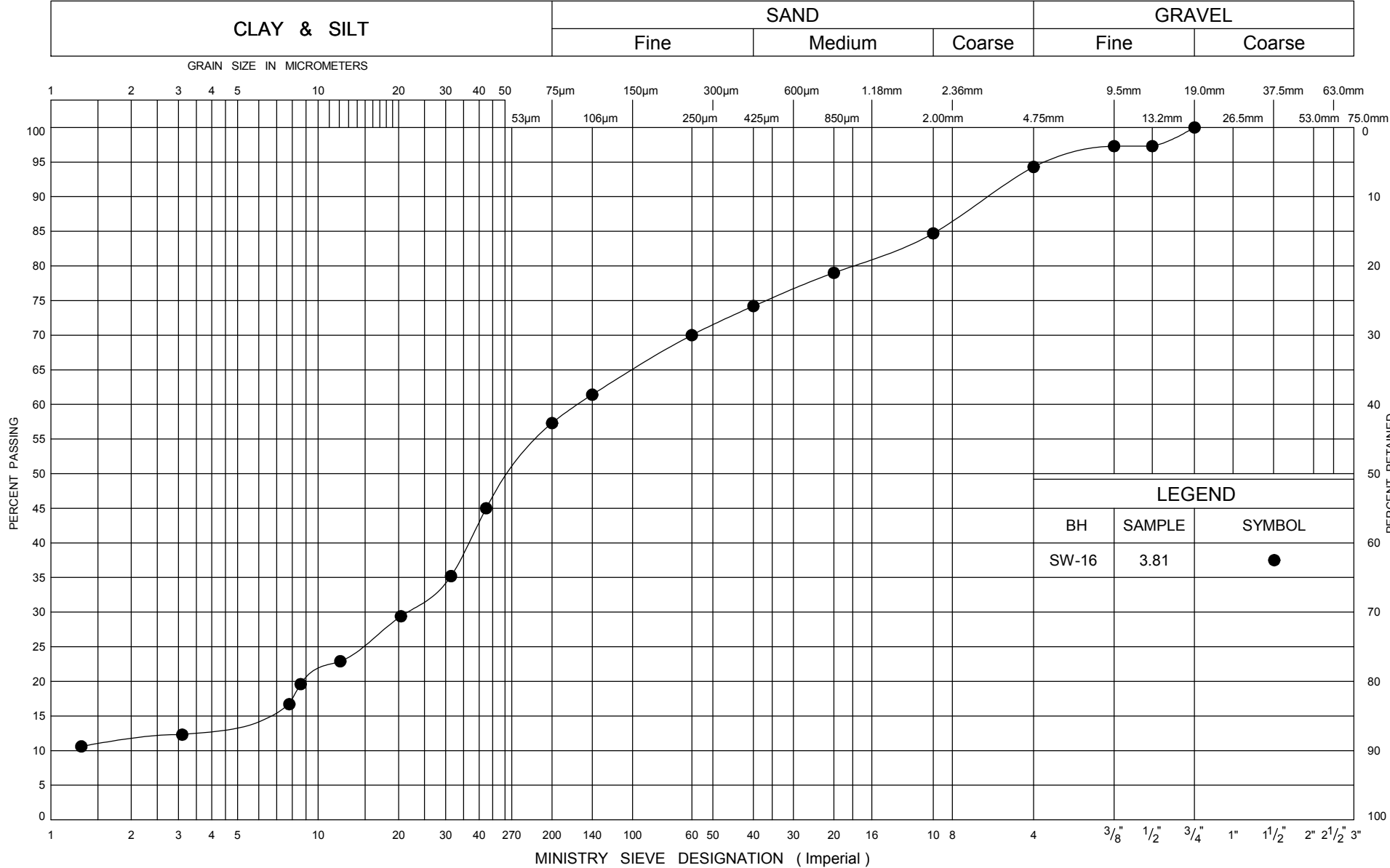
Hwy 26 - Sydenham Townline to Meaford



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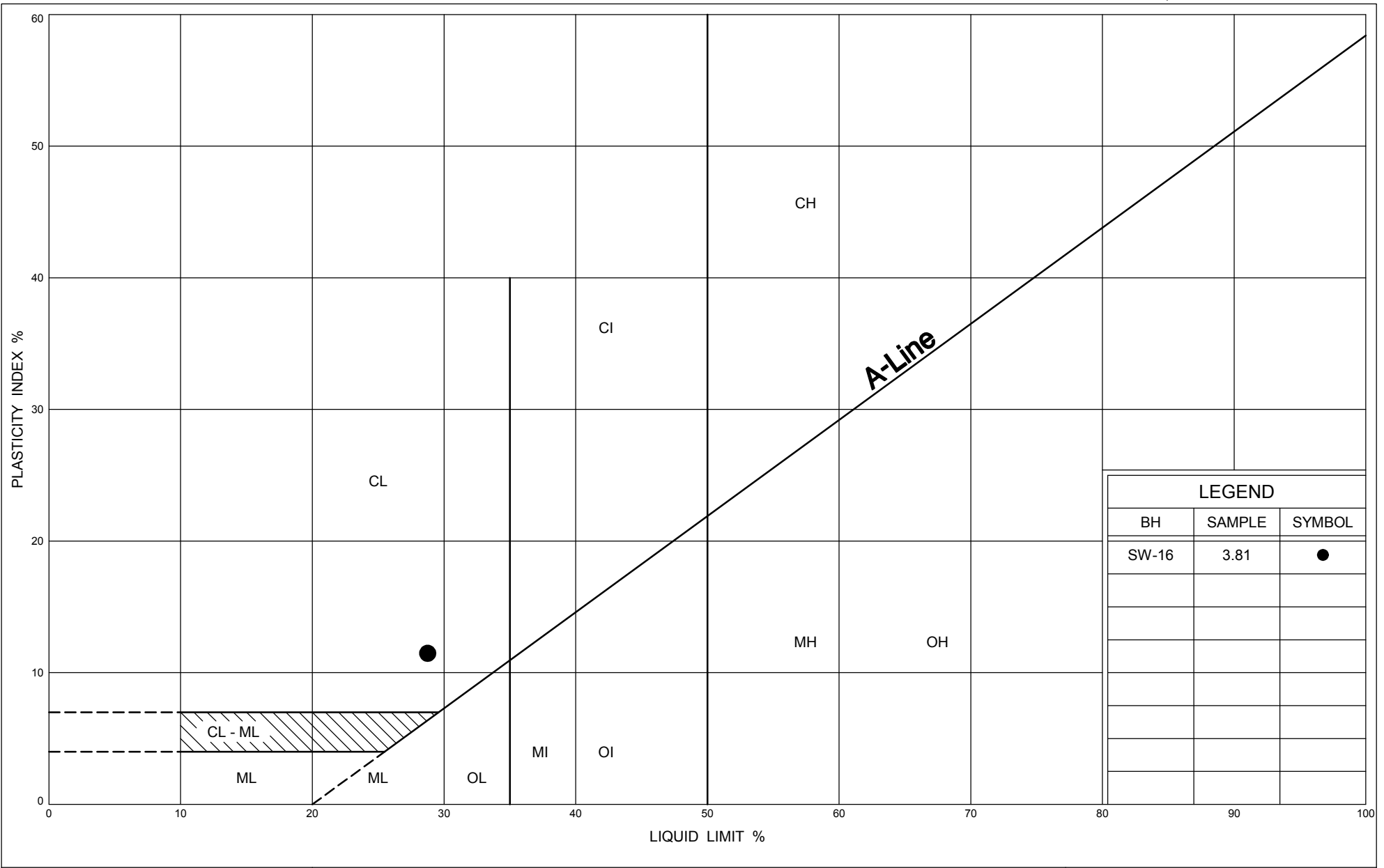
UNIFIED SOIL CLASSIFICATION SYSTEM



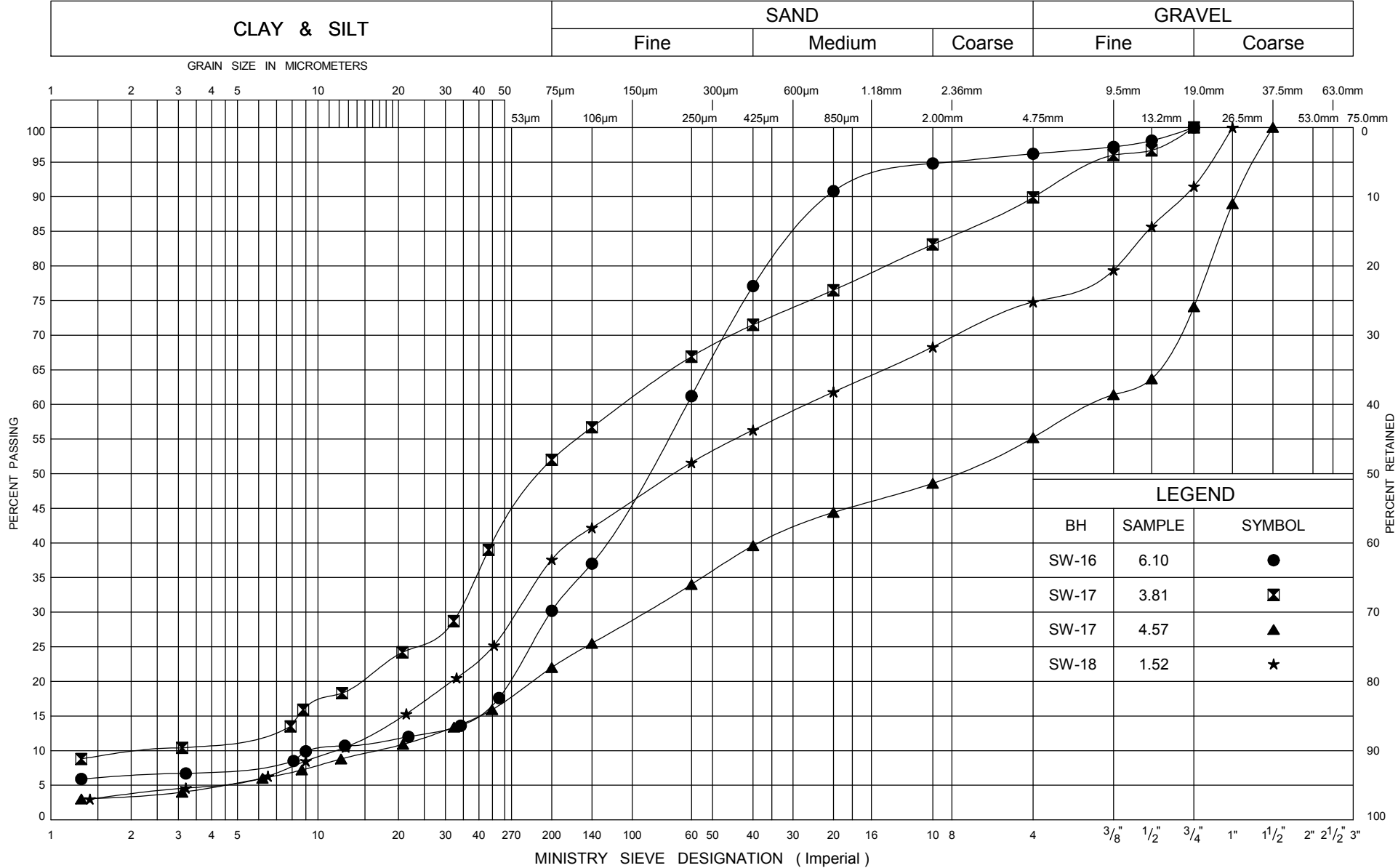
GRAIN SIZE DISTRIBUTION
SILTY CLAY POCKET, CL

FIG No F7
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford





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LEGEND		
BH	SAMPLE	SYMBOL
SW-16	6.10	●
SW-17	3.81	■
SW-17	4.57	▲
SW-18	1.52	★

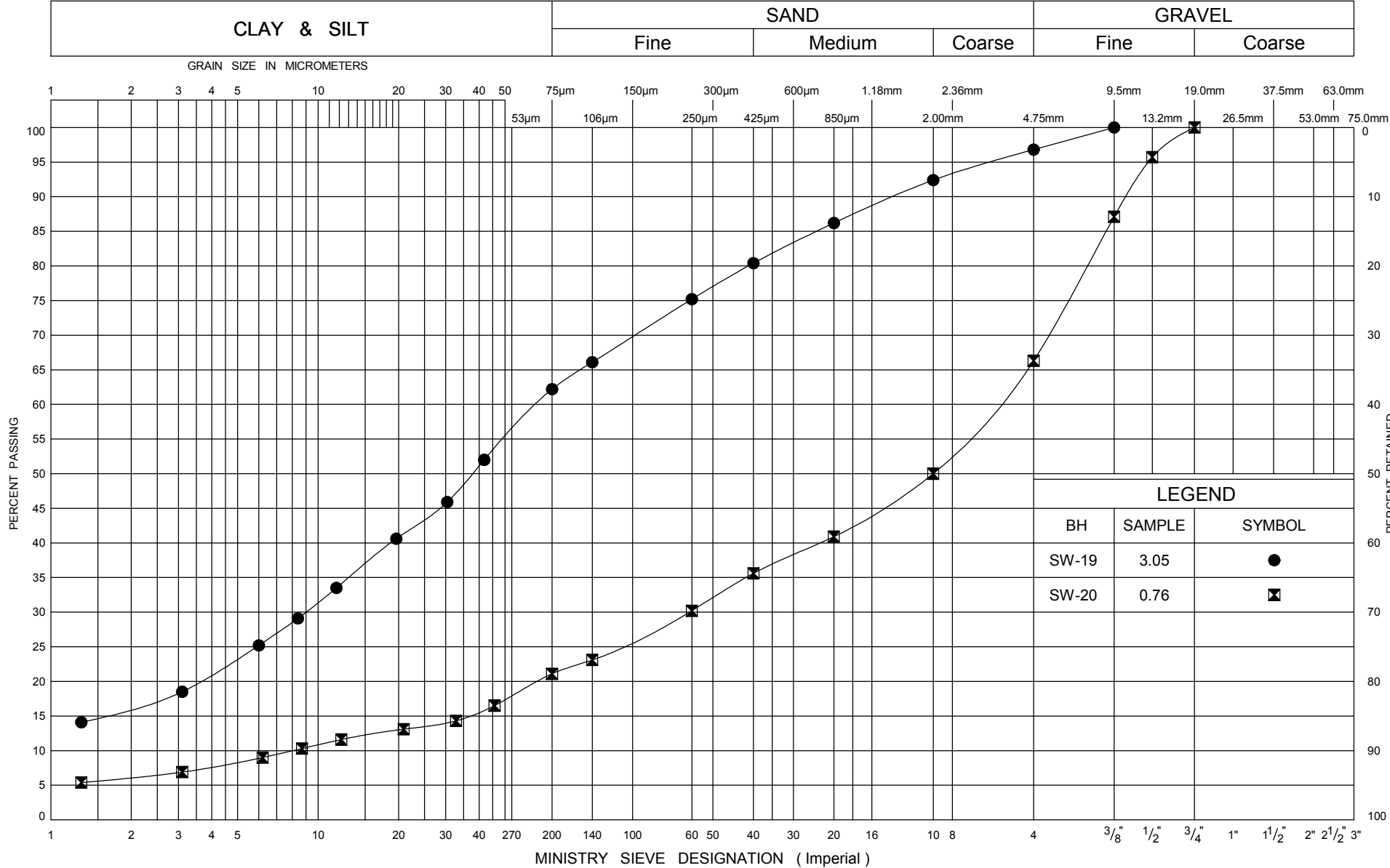
ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 31/10/09



GRAIN SIZE DISTRIBUTION
SAND & SILT TILL, SM-ML

FIG No F9
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford

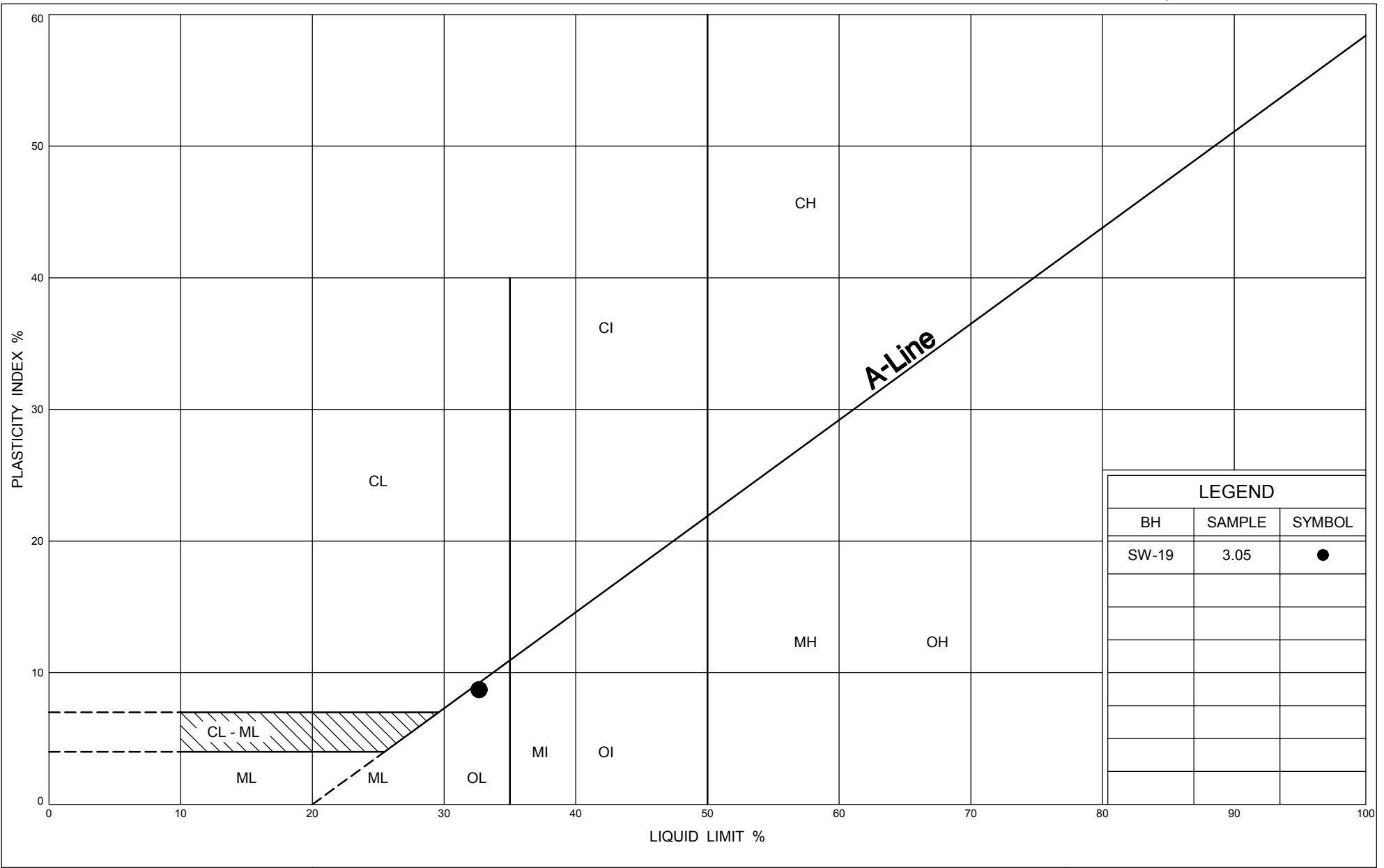
UNIFIED SOIL CLASSIFICATION SYSTEM



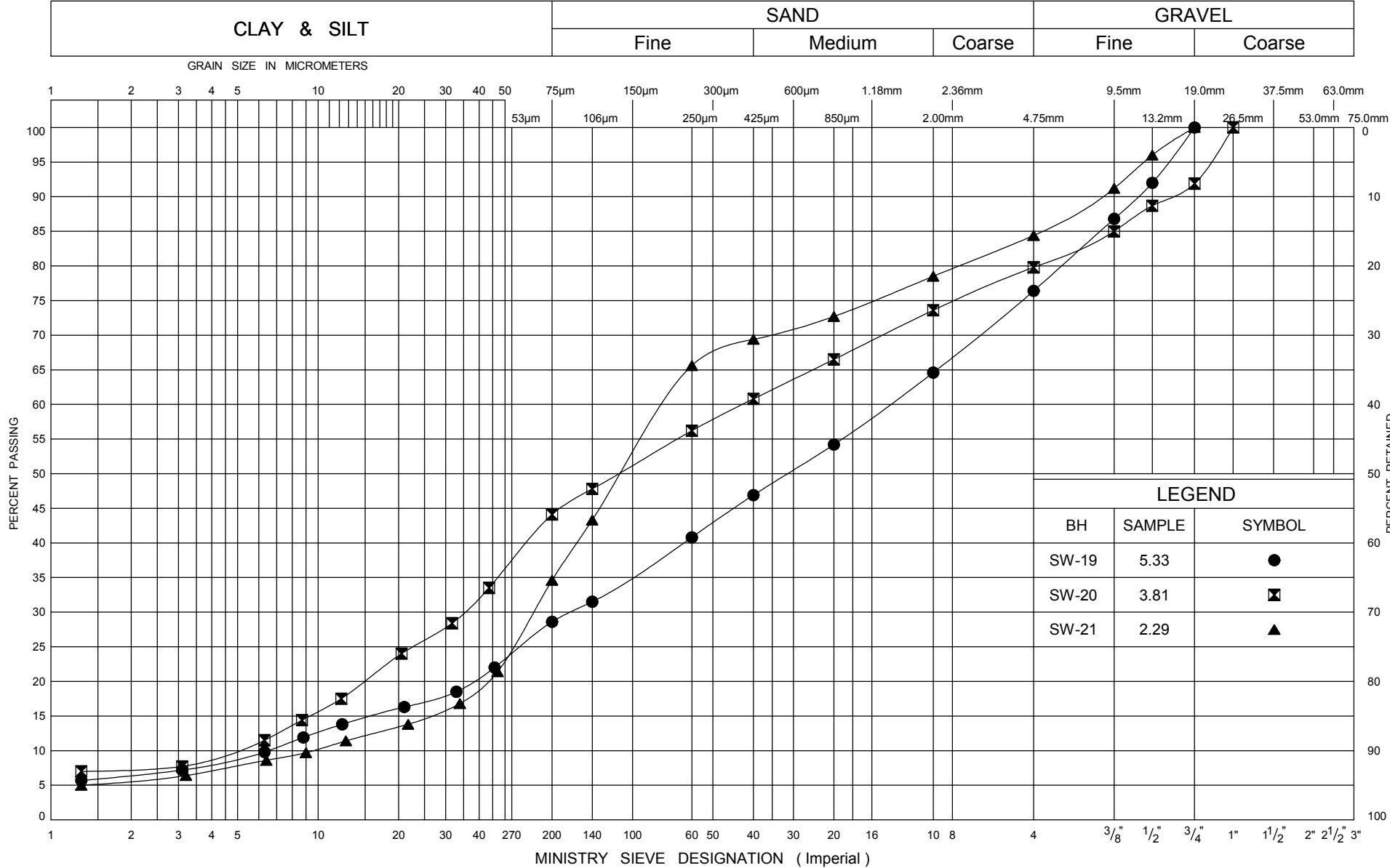
GRAIN SIZE DISTRIBUTION
FILL

FIG No G1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford





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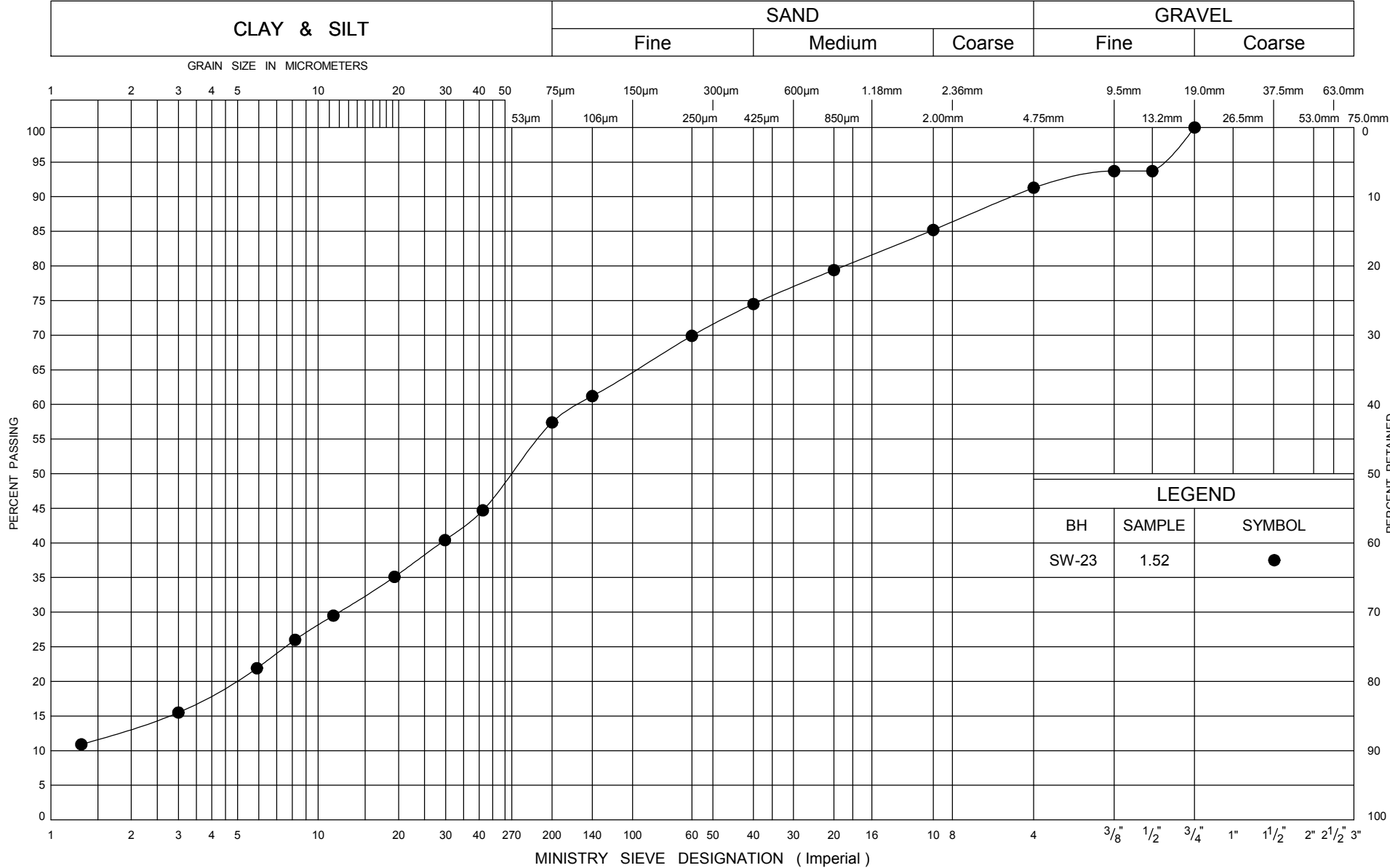
ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 27/10/09



GRAIN SIZE DISTRIBUTION
SAND & SILT TILL, SM-ML

FIG No G3
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford

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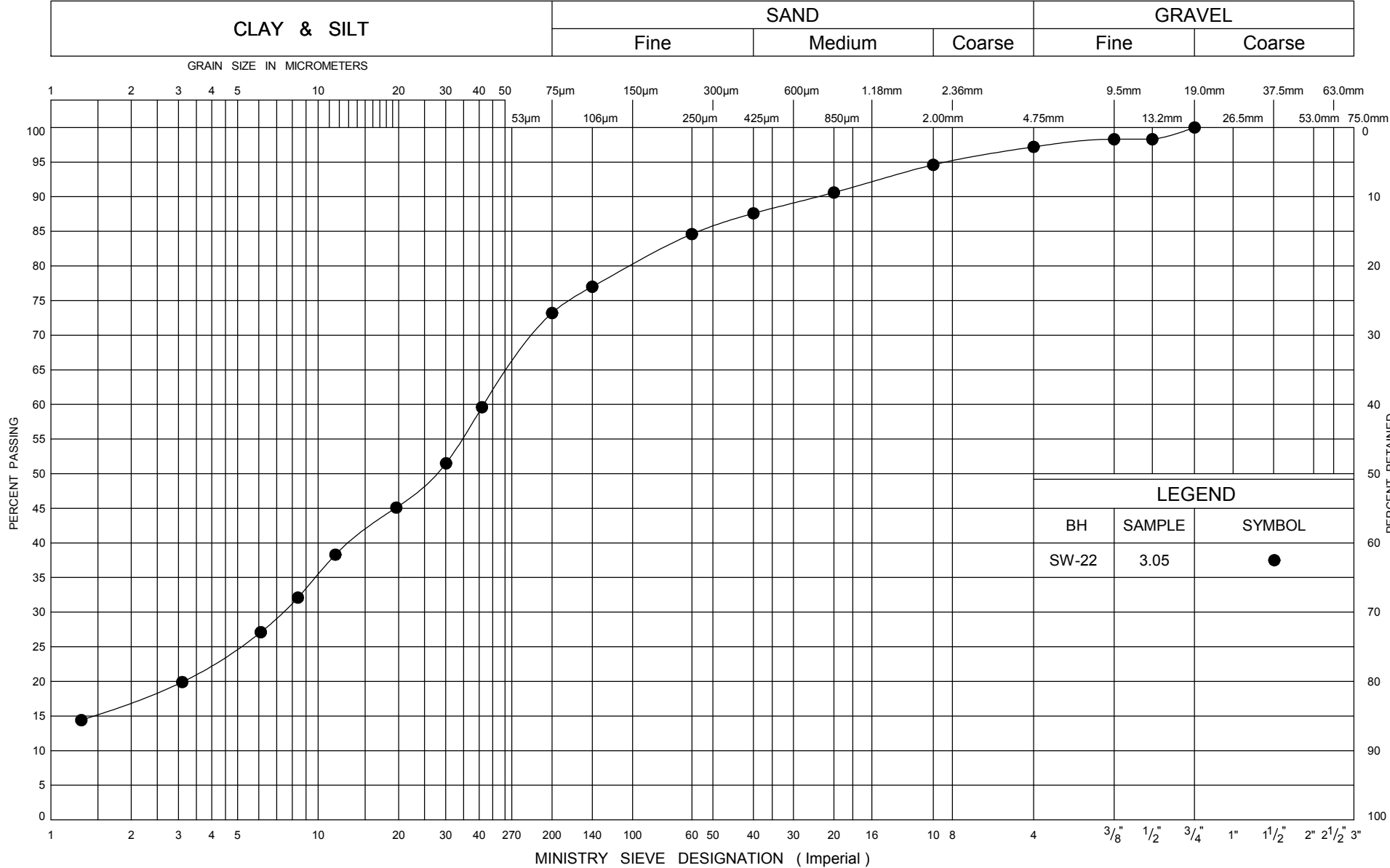
ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 27/10/09



GRAIN SIZE DISTRIBUTION
FILL

FIG No H1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford

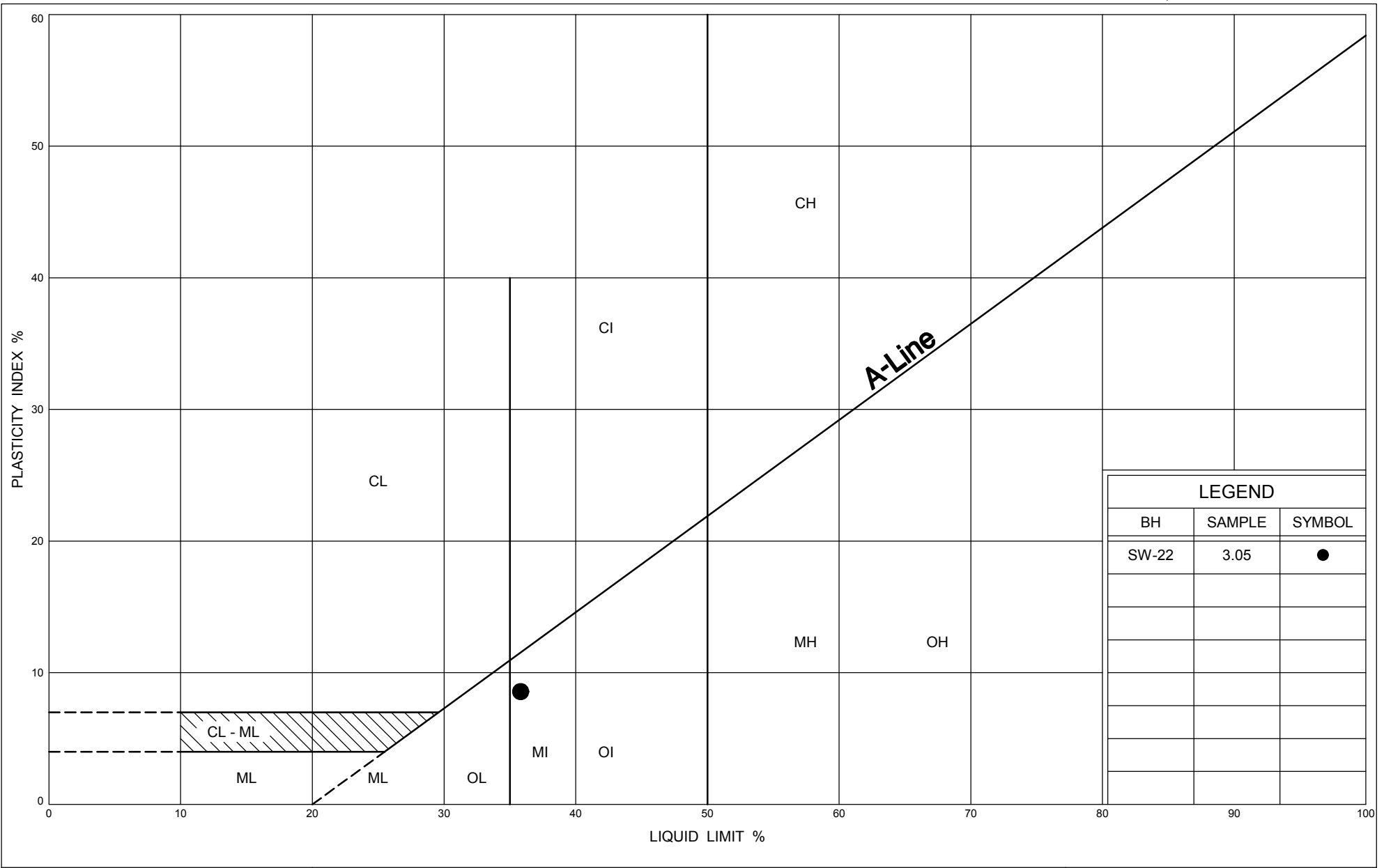
UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION
PEAT/TOPSOIL

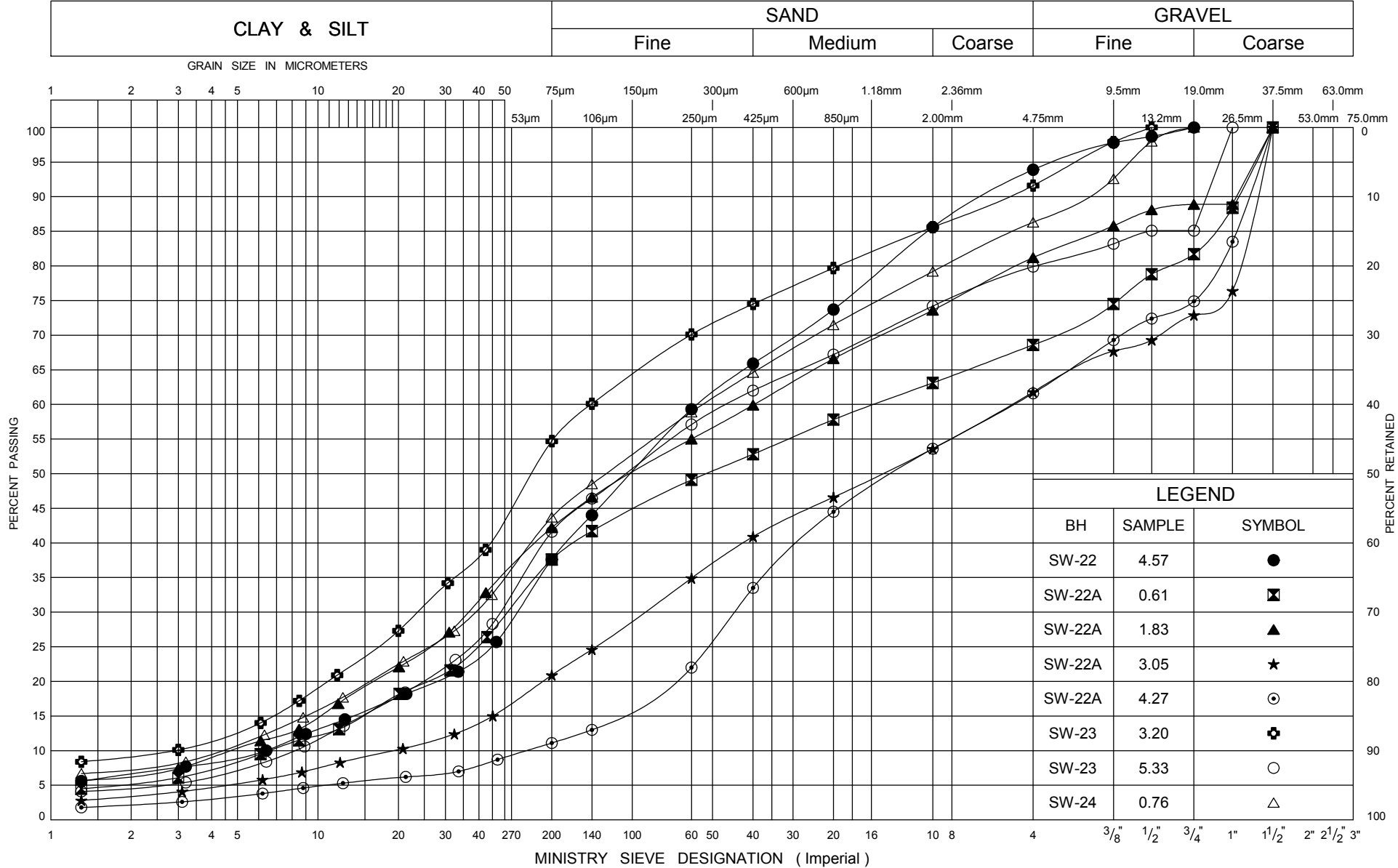
FIG No H2
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford





LEGEND		
BH	SAMPLE	SYMBOL
SW-22	3.05	●

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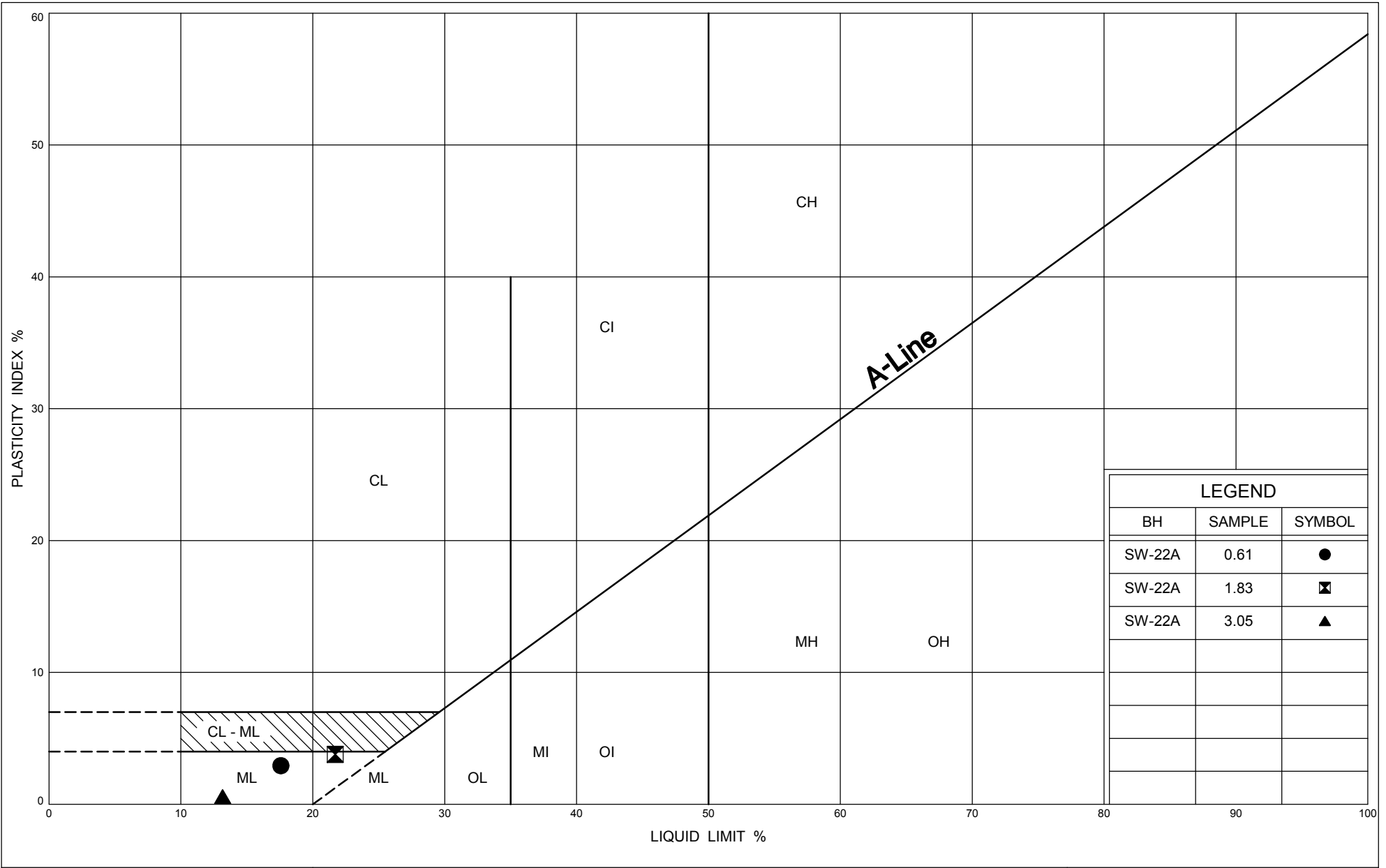


ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 4/1/09

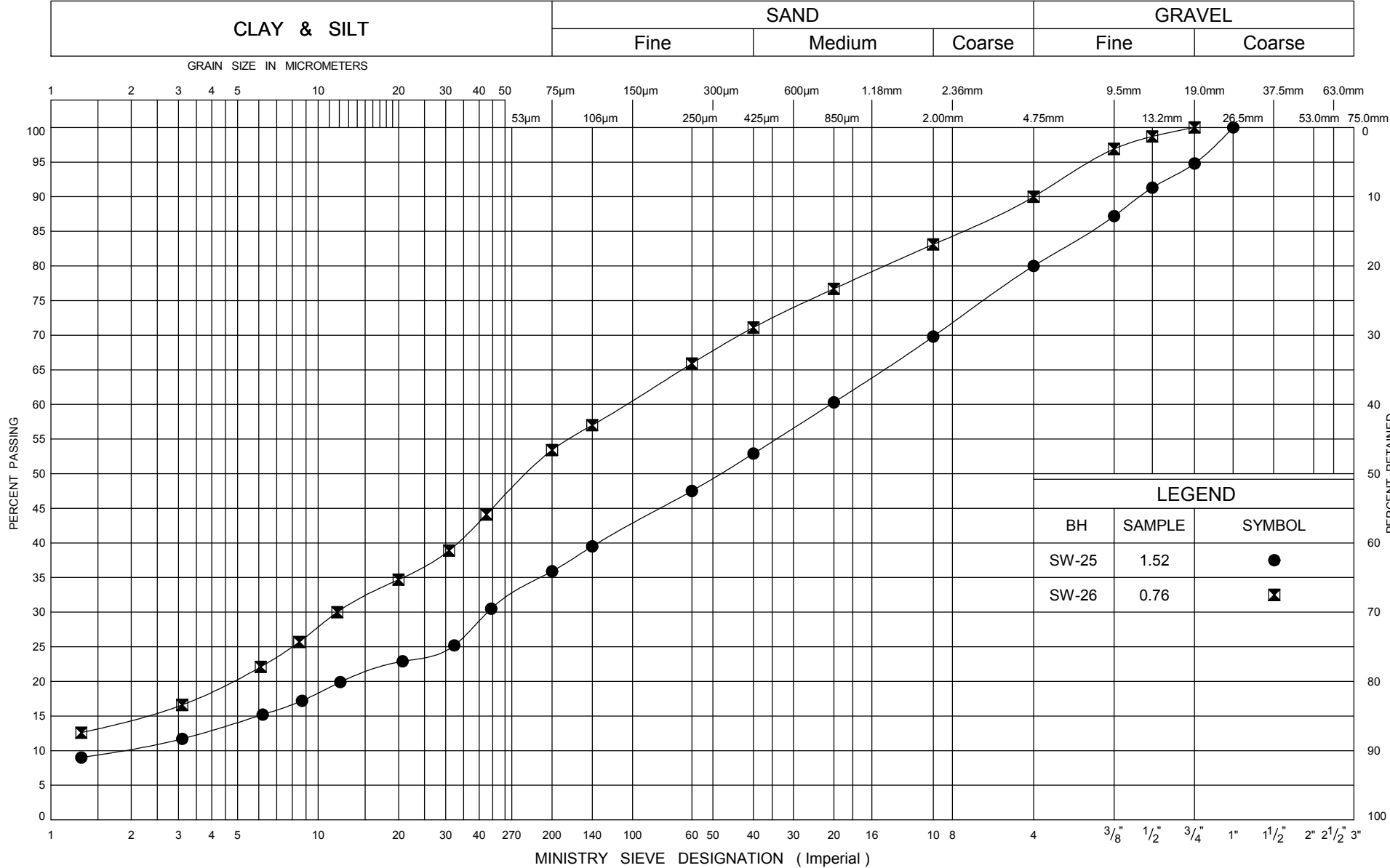


GRAIN SIZE DISTRIBUTION
SAND AND SILT TILL, SM-ML

FIG No H4
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



UNIFIED SOIL CLASSIFICATION SYSTEM



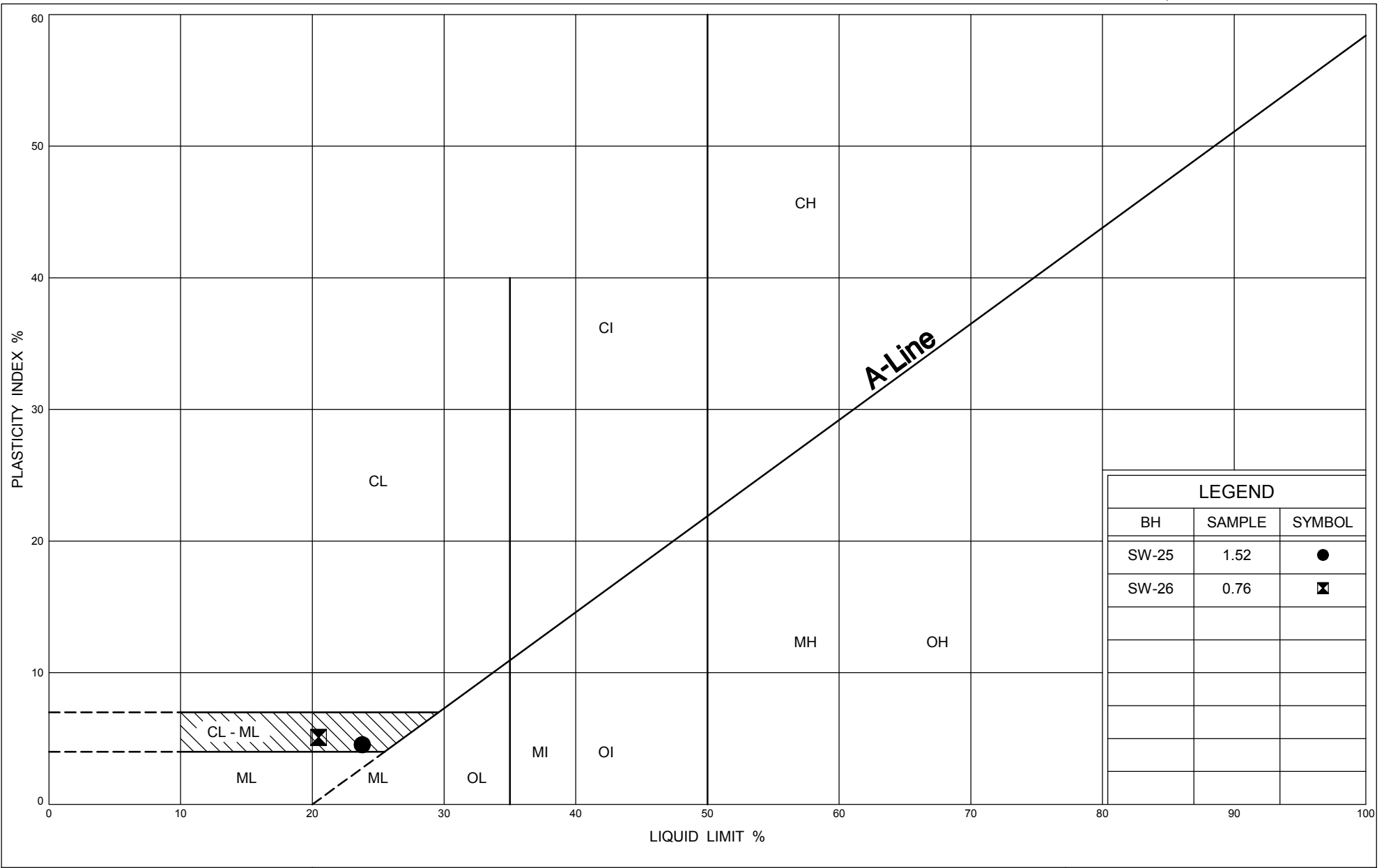
GRAIN SIZE DISTRIBUTION
FILL

FIG No J1

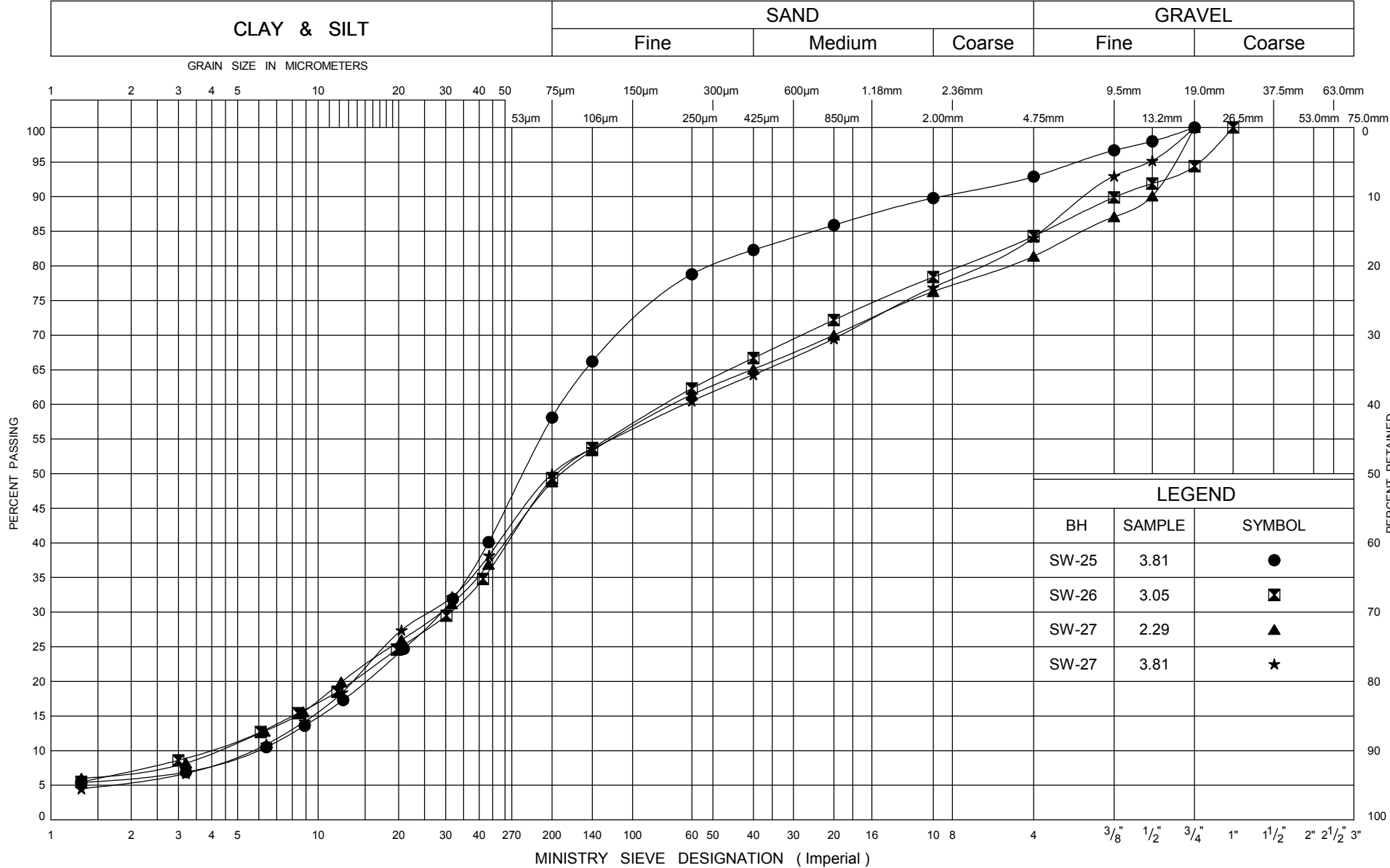
GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford





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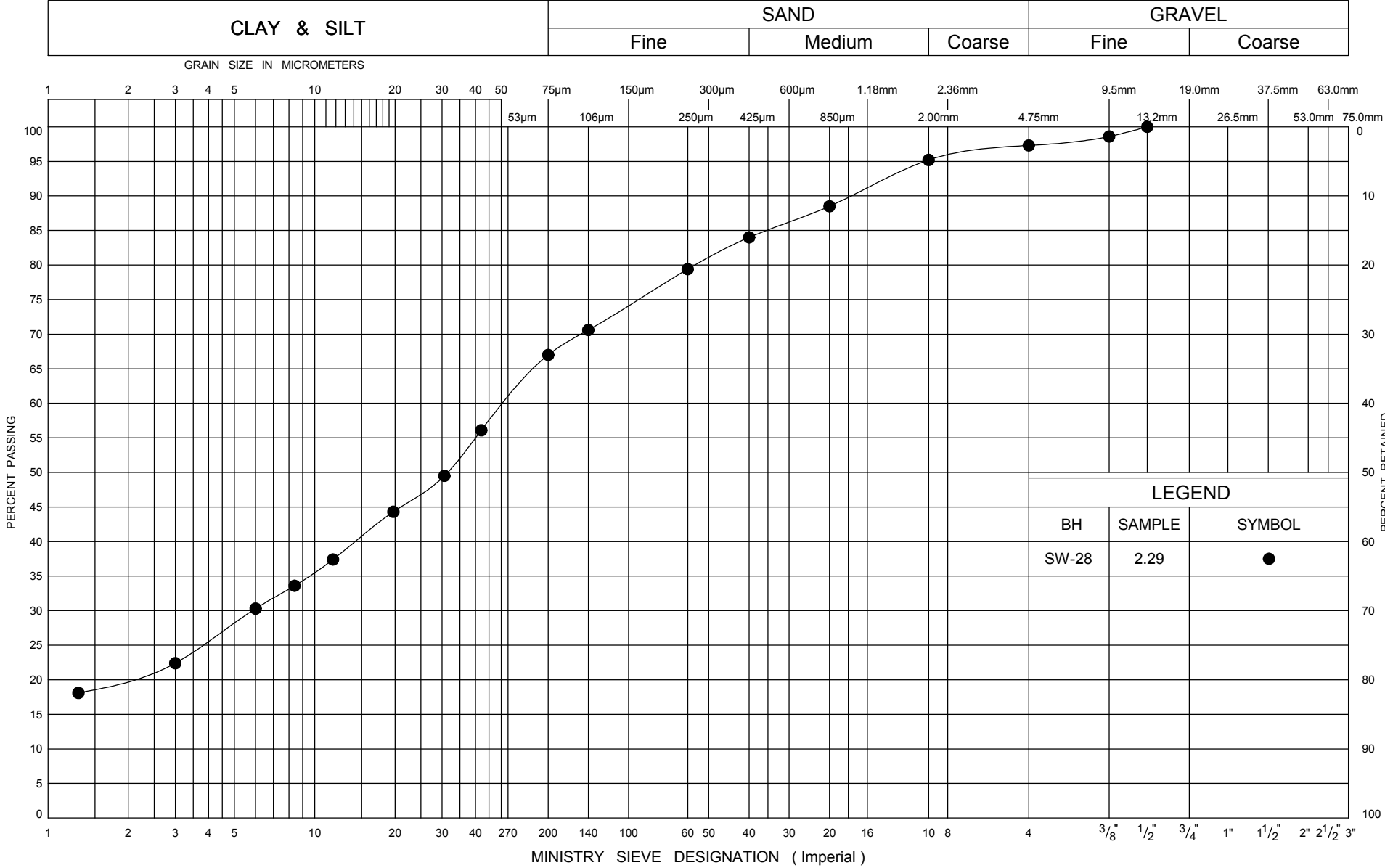
GRAIN SIZE DISTRIBUTION
SAND & SILT TILL, SM-ML

FIG No J3

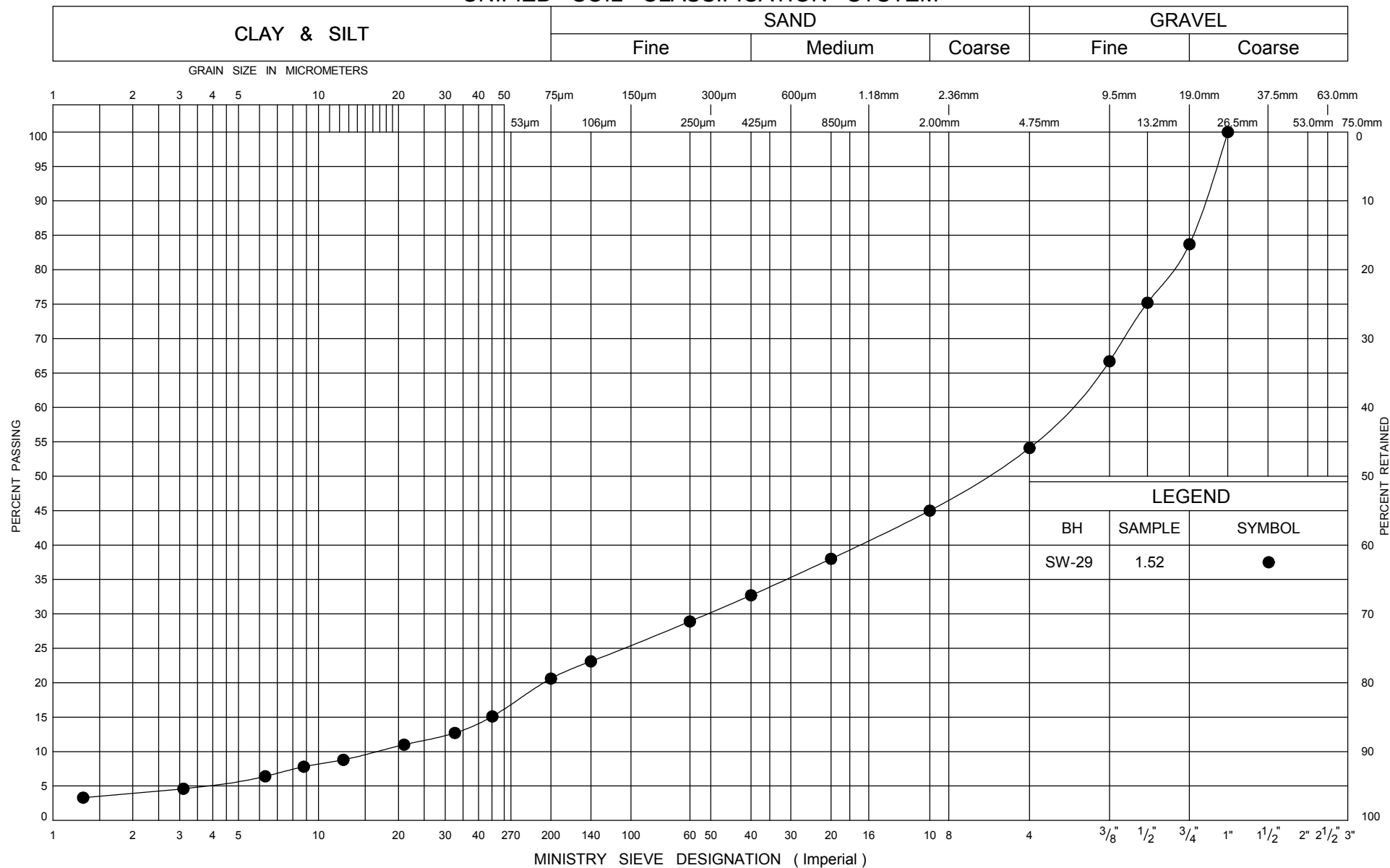
GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

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GRAIN SIZE DISTRIBUTION

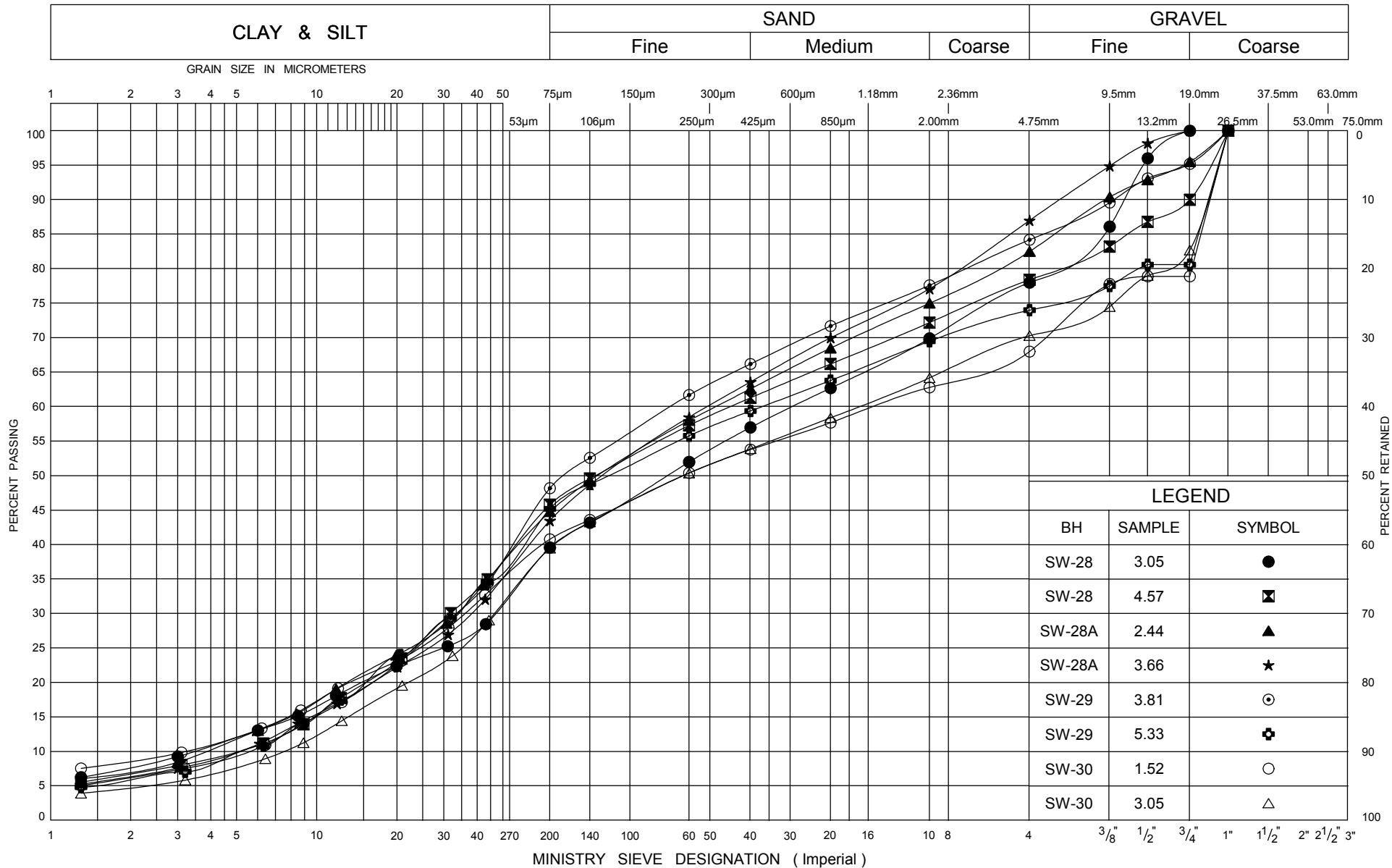
FILL

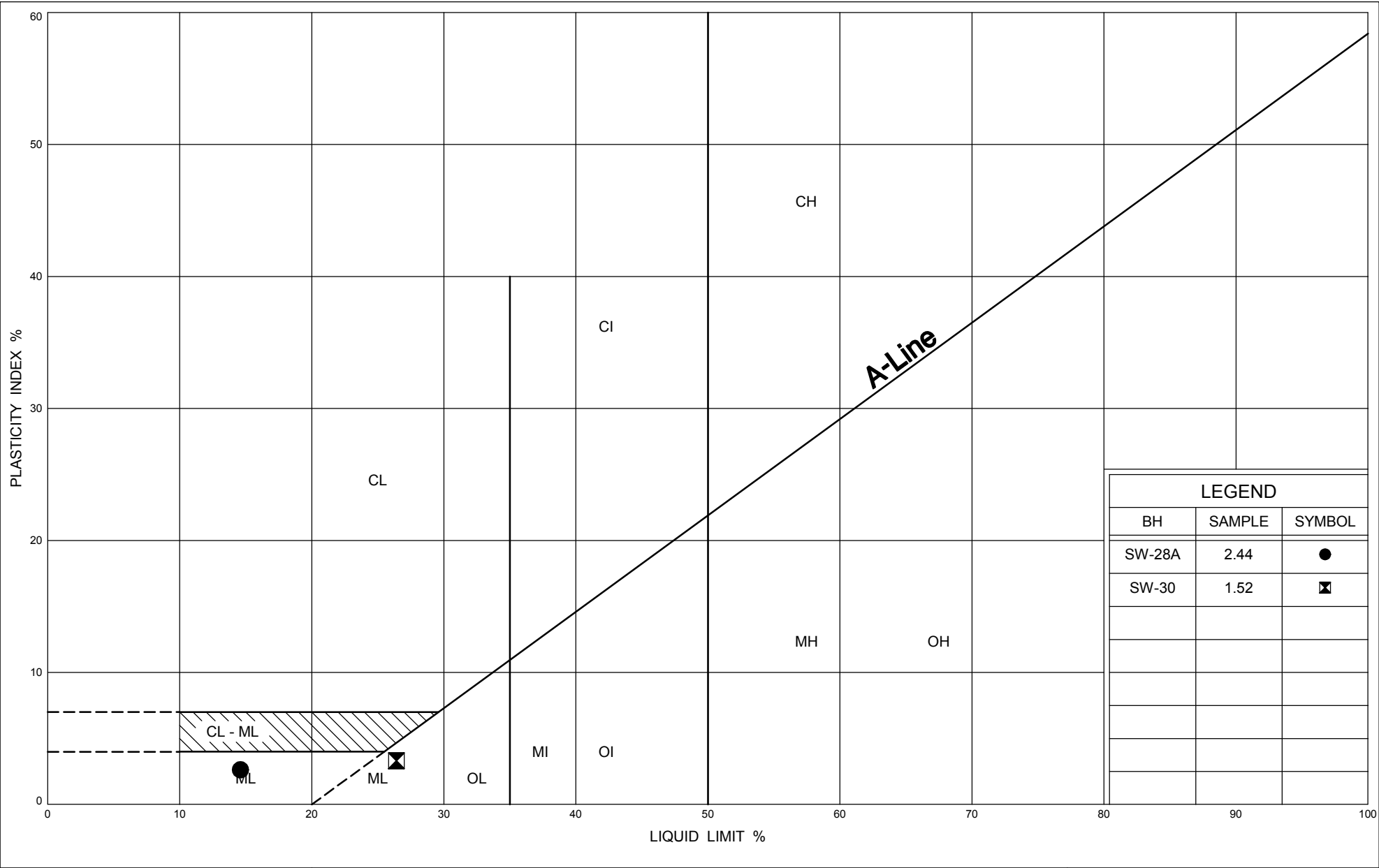
FIG No K2

GWP 167-91-00

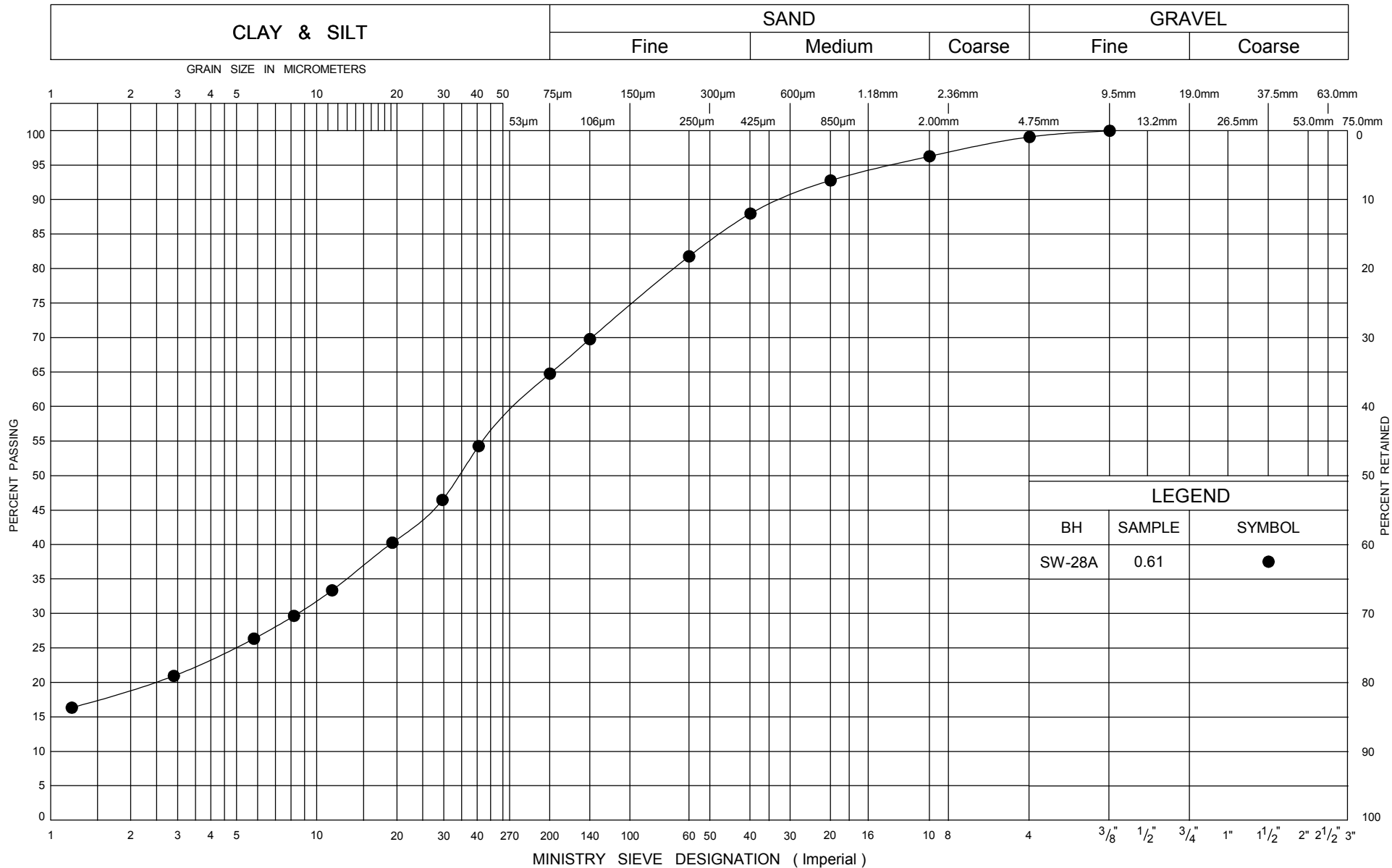
Hwy 26 - Sydenham Townline to Meaford

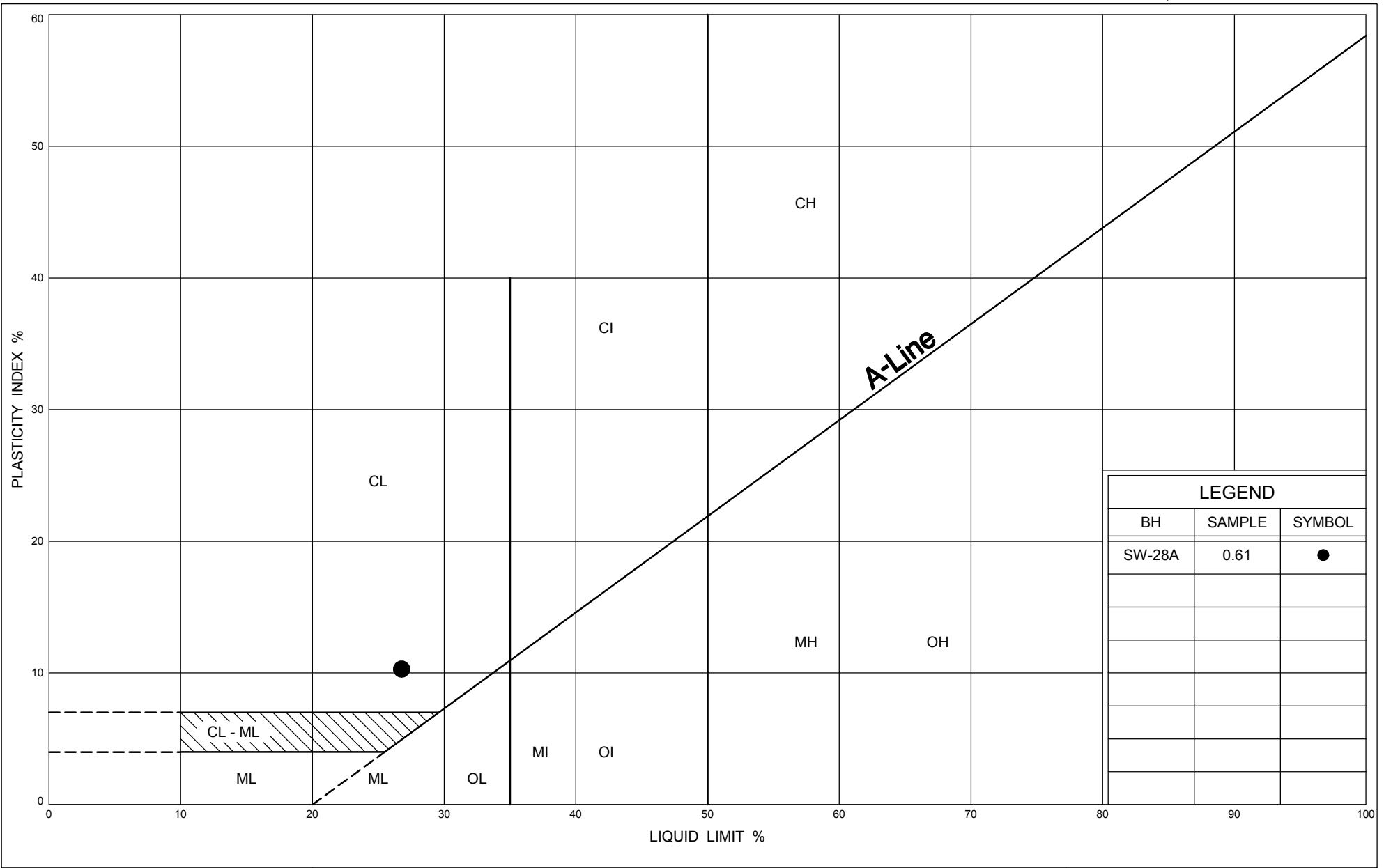
UNIFIED SOIL CLASSIFICATION SYSTEM



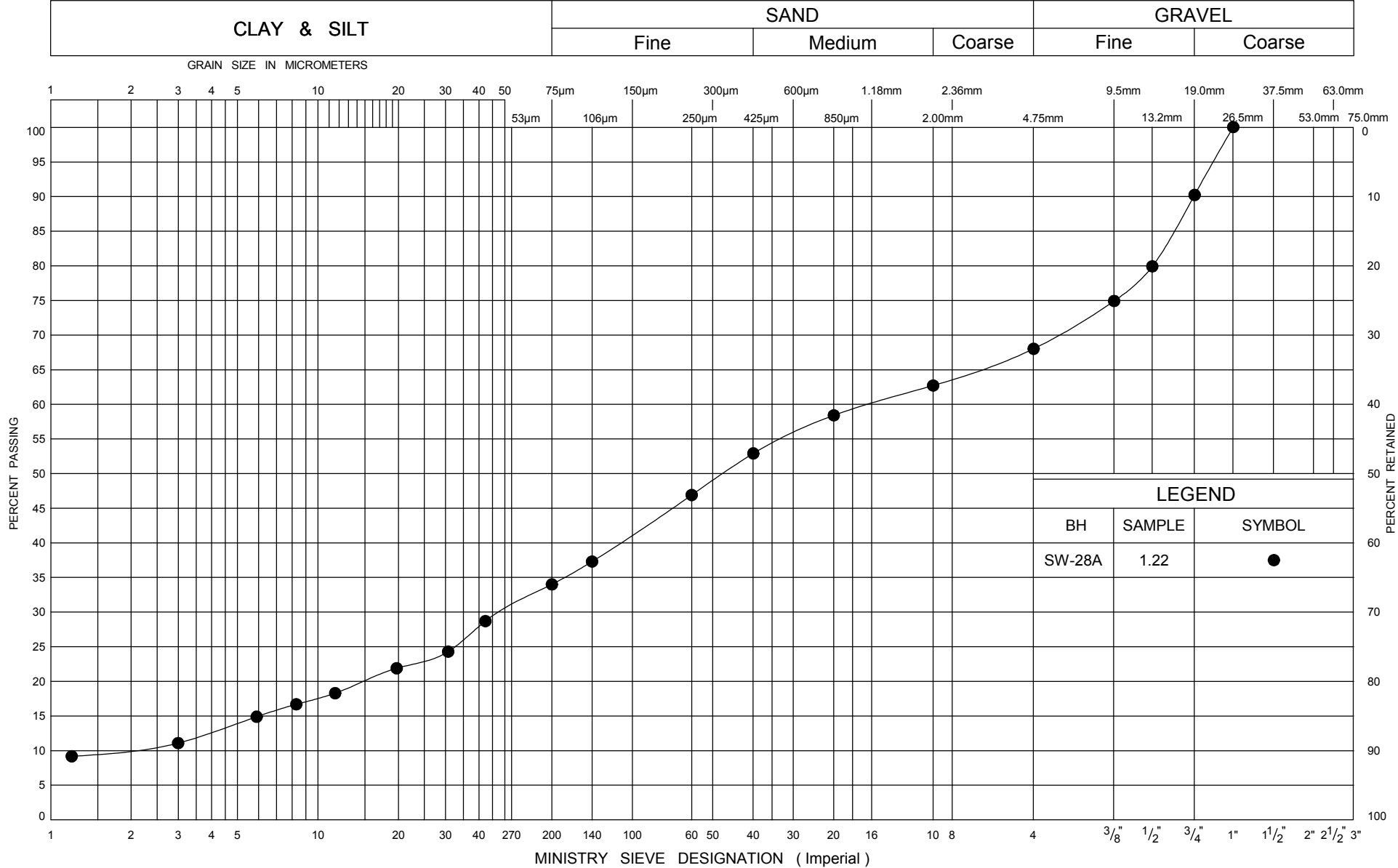


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UNIFIED SOIL CLASSIFICATION SYSTEM

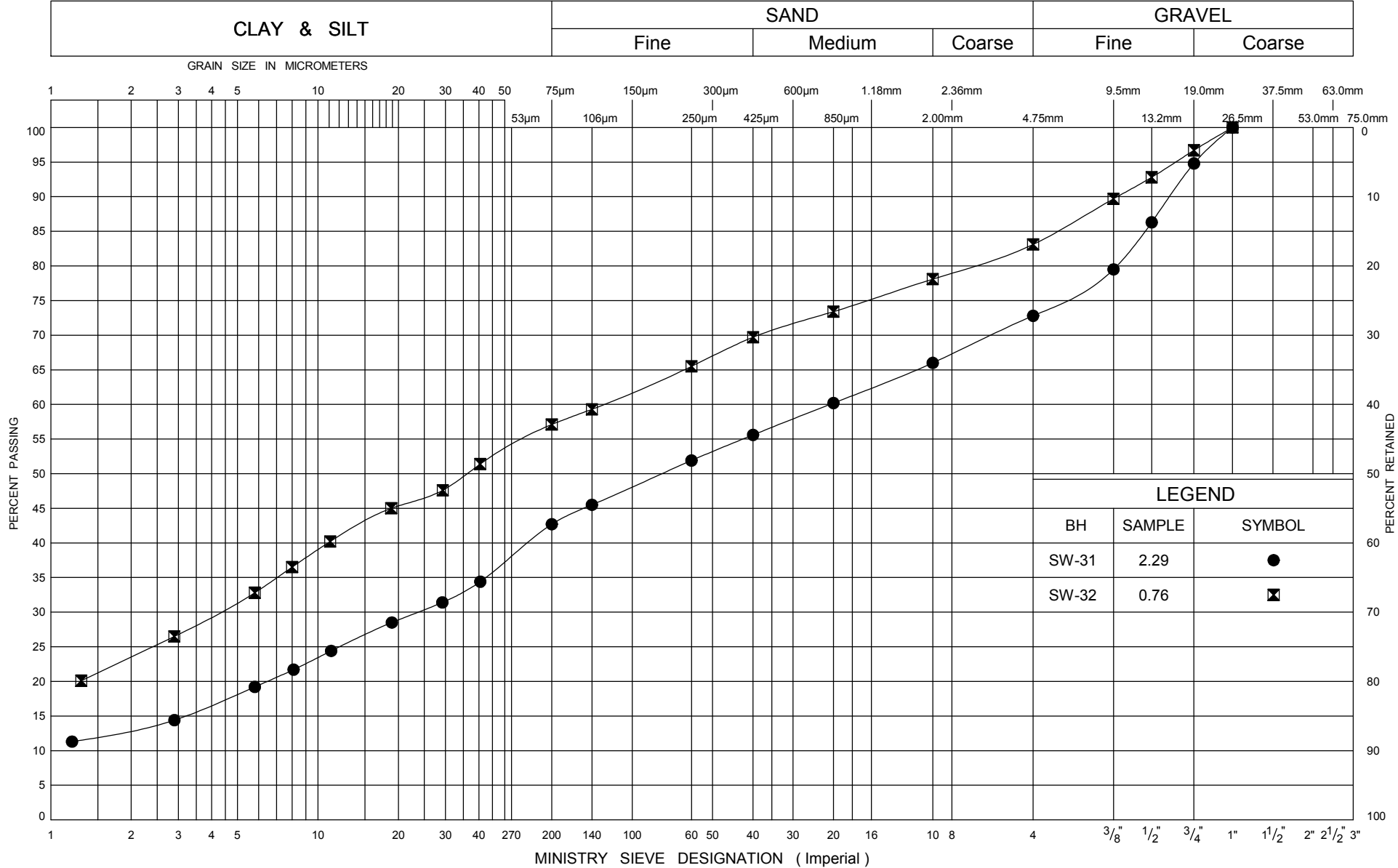


GRAIN SIZE DISTRIBUTION
SAND AND GRAVEL LAYER

FIG No K7
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



UNIFIED SOIL CLASSIFICATION SYSTEM



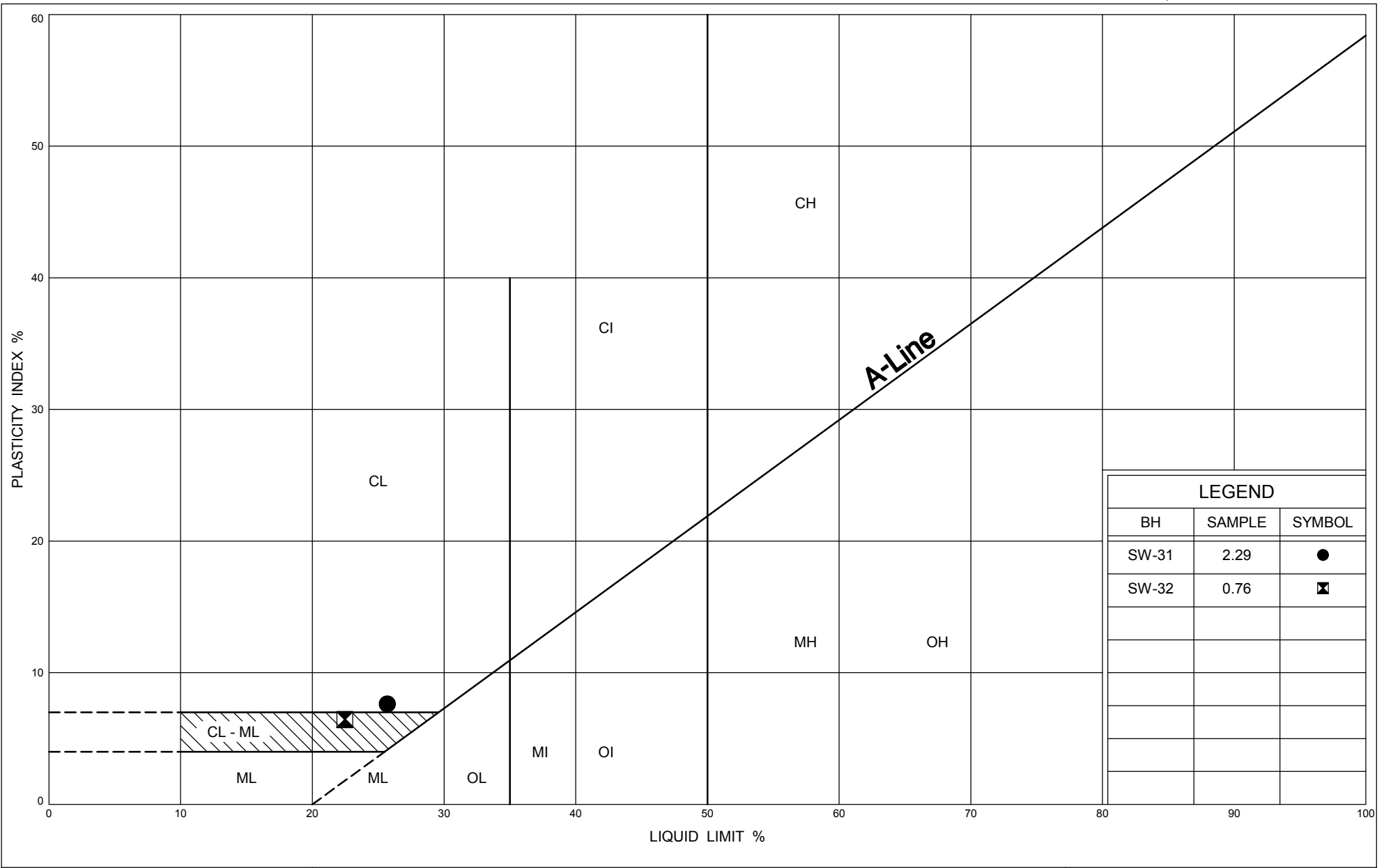
LEGEND		
BH	SAMPLE	SYMBOL
SW-31	2.29	●
SW-32	0.76	⊠

ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 27/10/09



GRAIN SIZE DISTRIBUTION
FILL

FIG No L1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



PLASTICITY CHART
FILL

FIG No L2

GWP 167-91-00

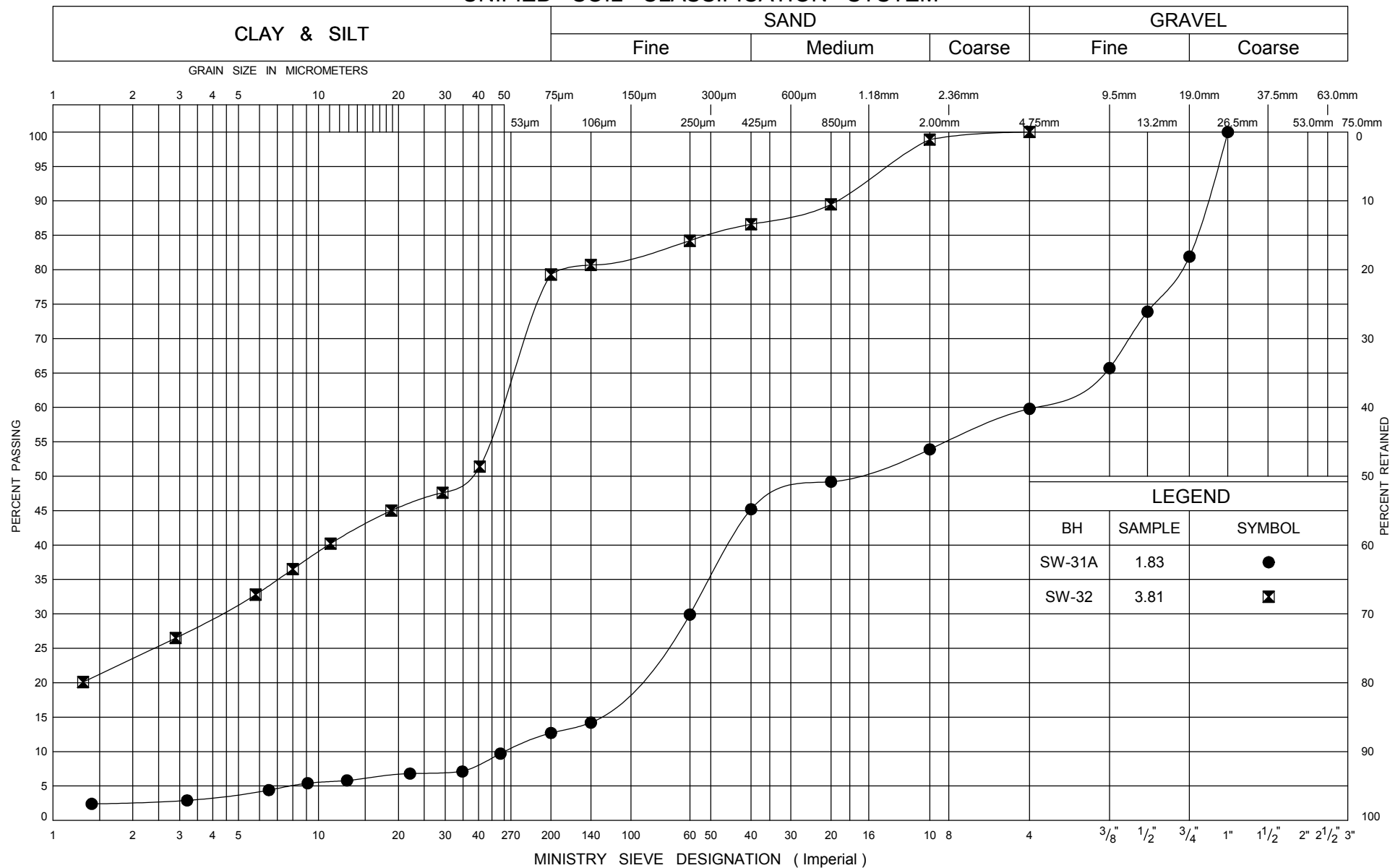
Hwy 26 - Sydenham Townline to Meaford



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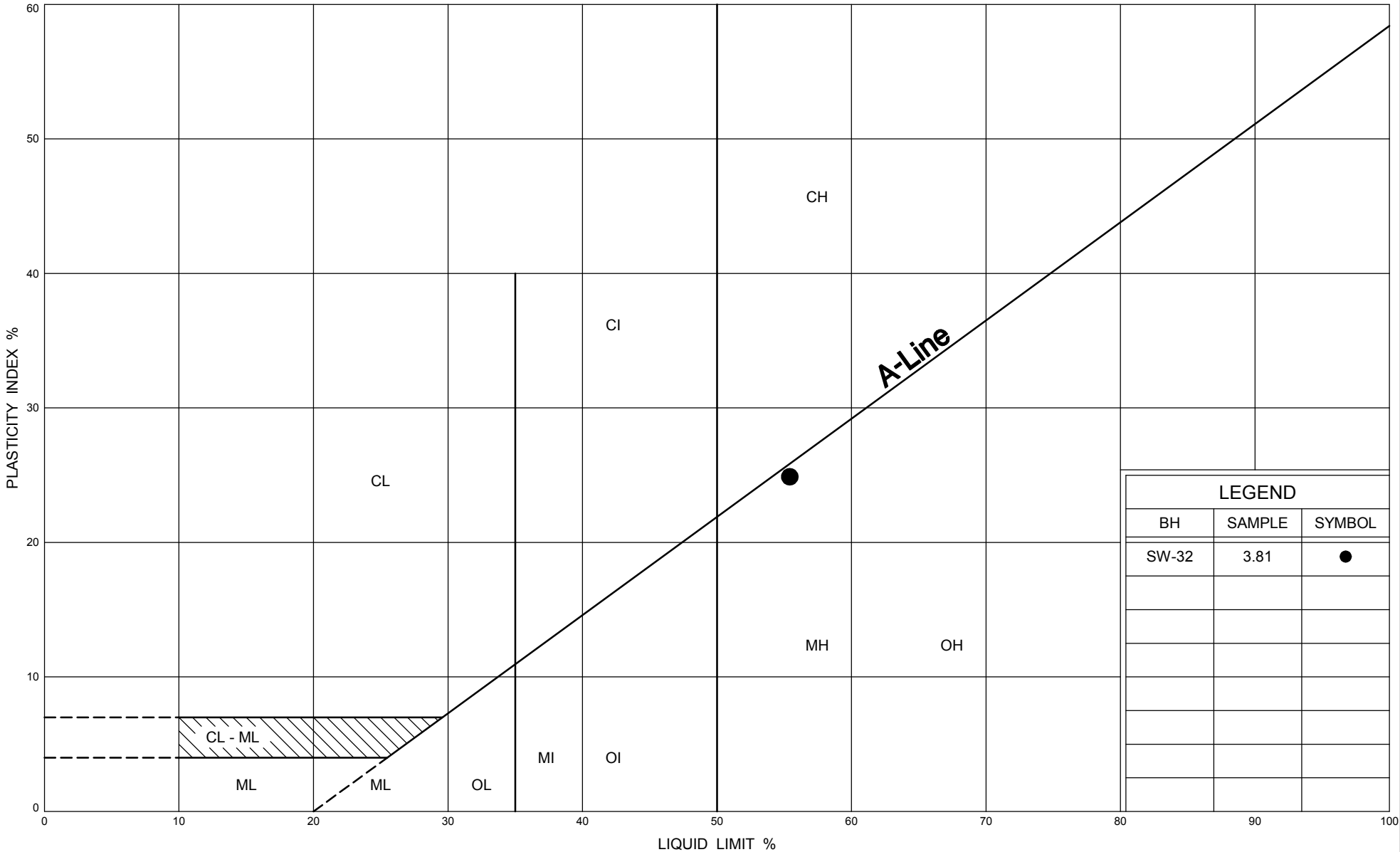
GRAIN SIZE DISTRIBUTION

PEAT

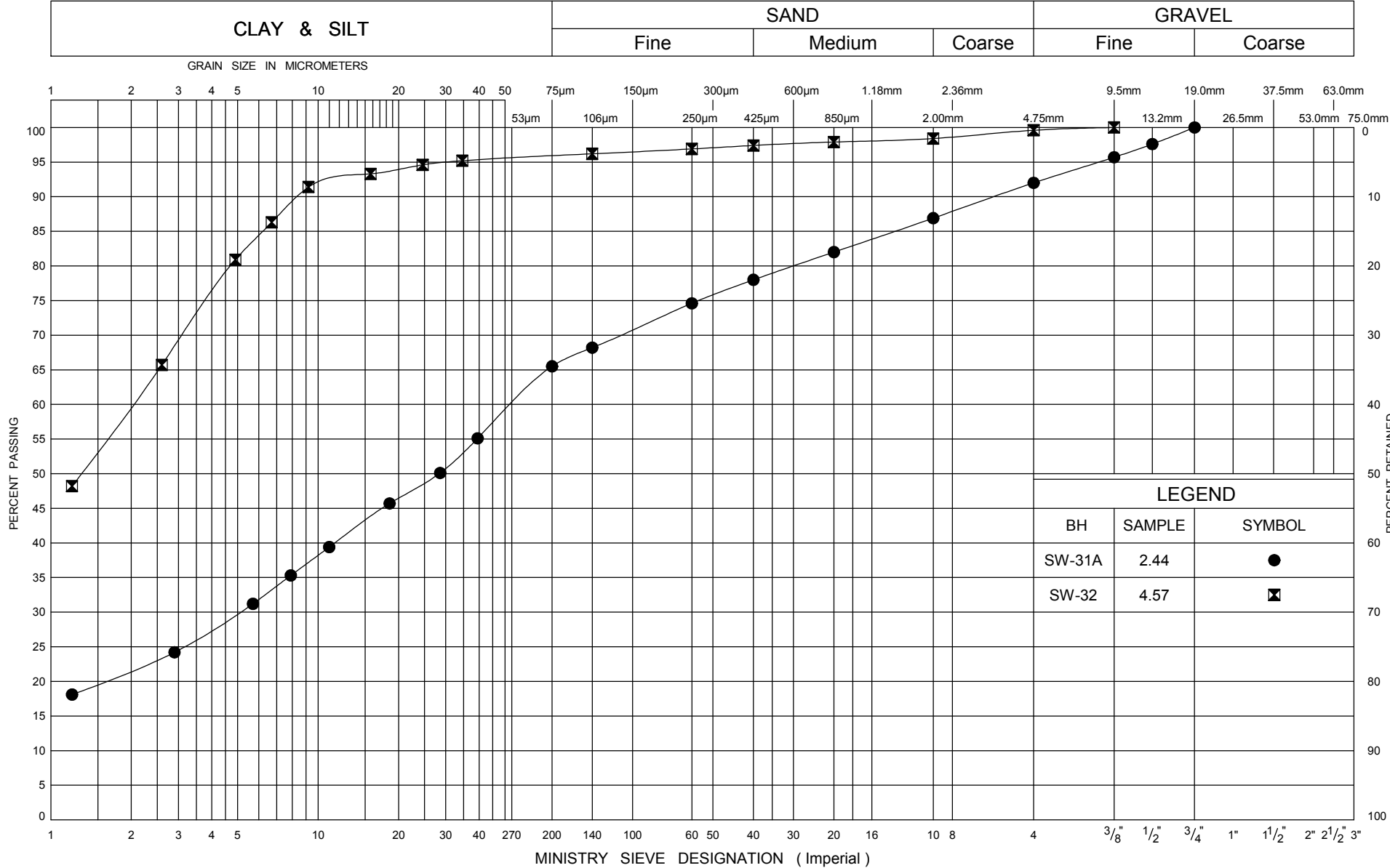
FIG No L3

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford



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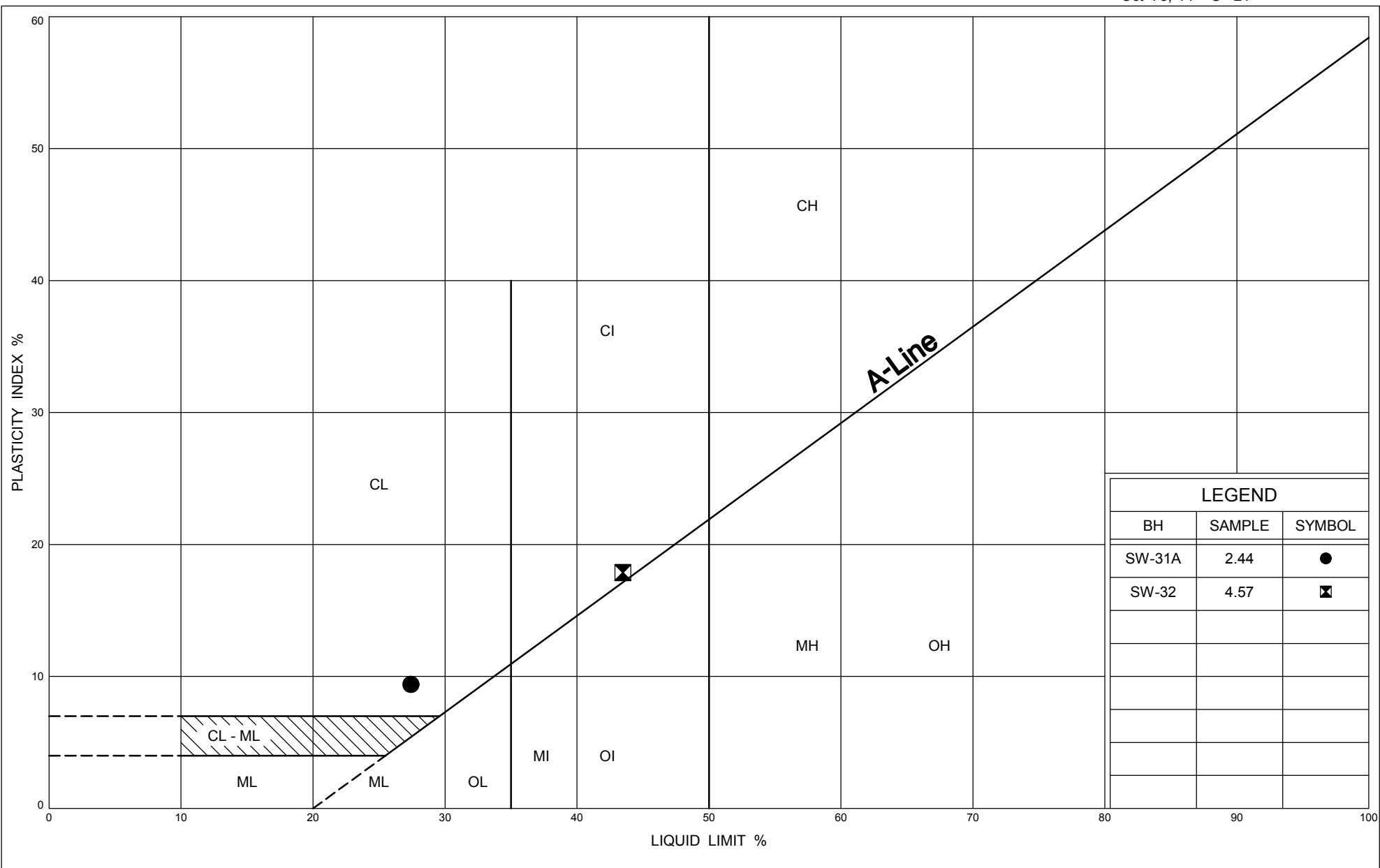


LEGEND		
BH	SAMPLE	SYMBOL
SW-31A	2.44	●
SW-32	4.57	⊠

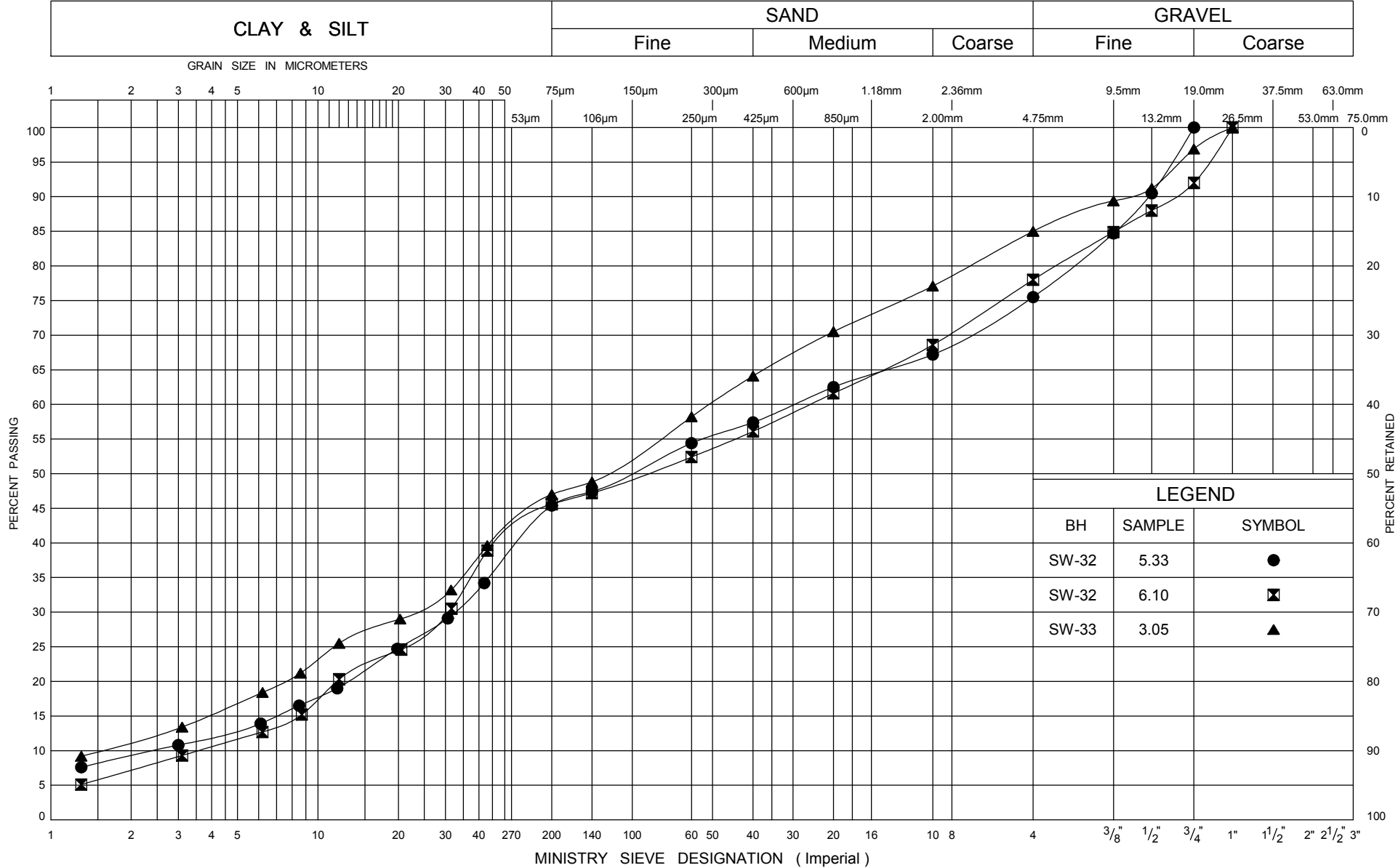
GRAIN SIZE DISTRIBUTION
SILTY CLAY, CL TO CI

FIG No L5
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford





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GRAIN SIZE DISTRIBUTION
SAND & SILT TILL, SM-ML

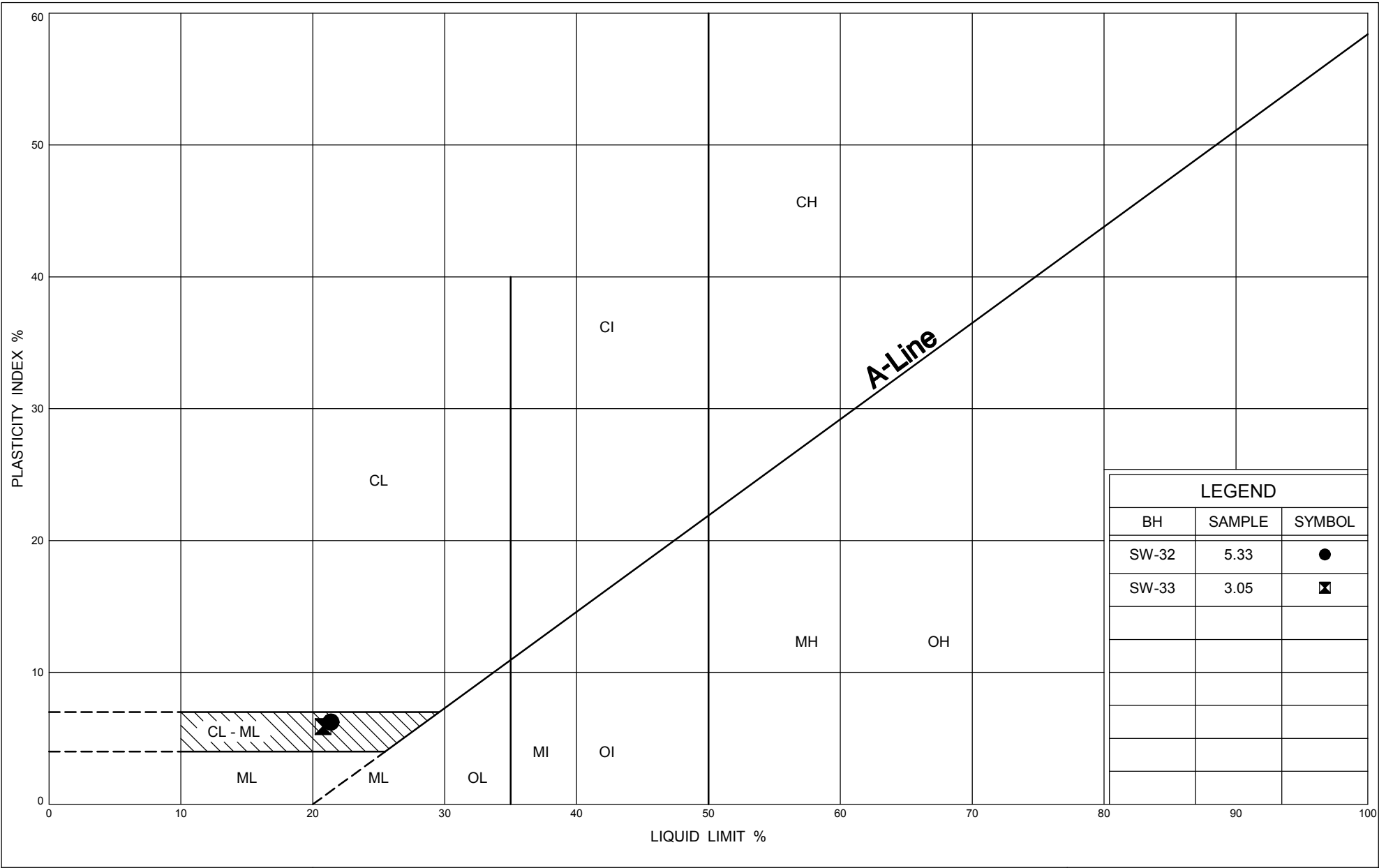
FIG No L7

GWP 167-91-00

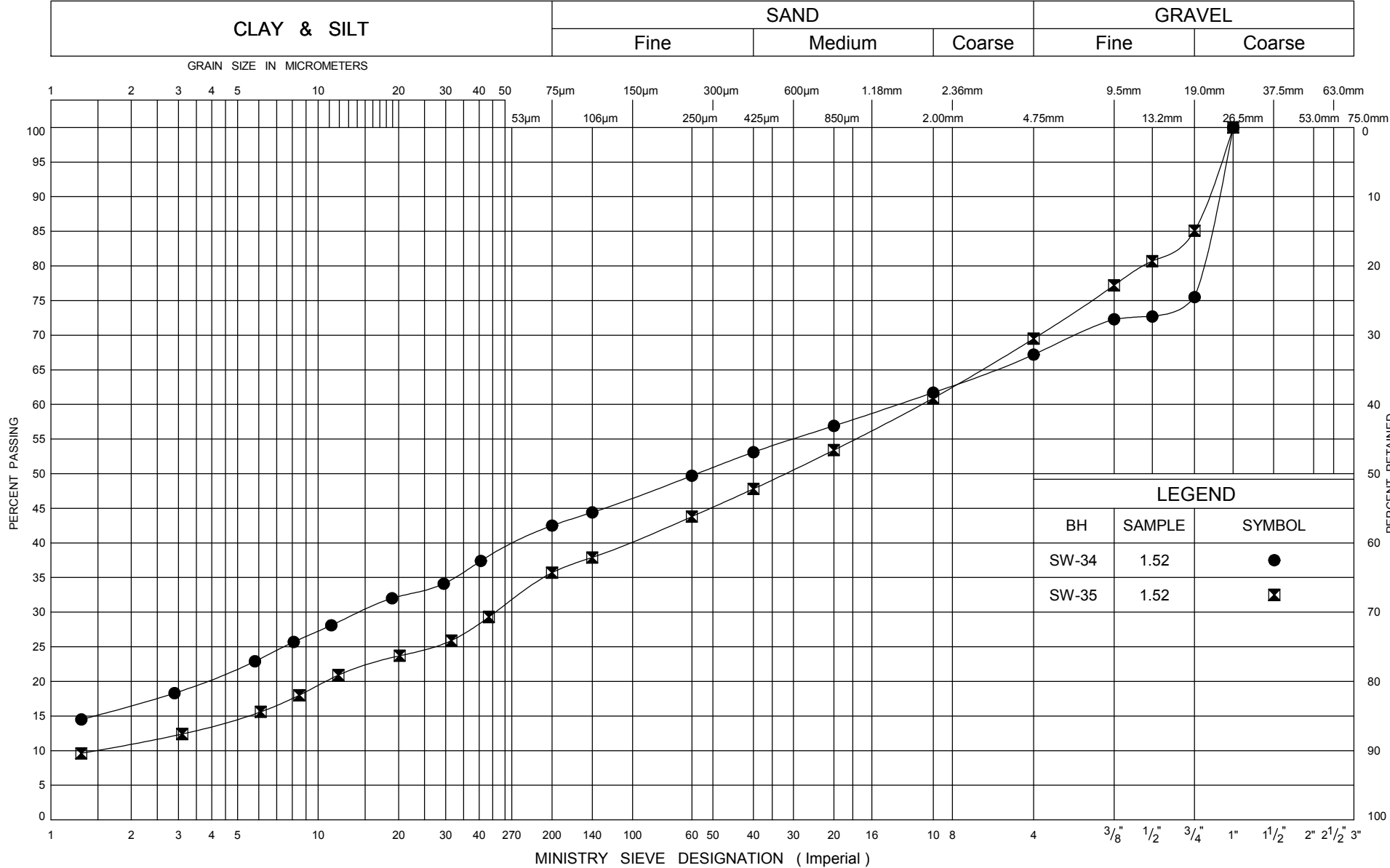
Hwy 26 - Sydenham Townline to Meaford



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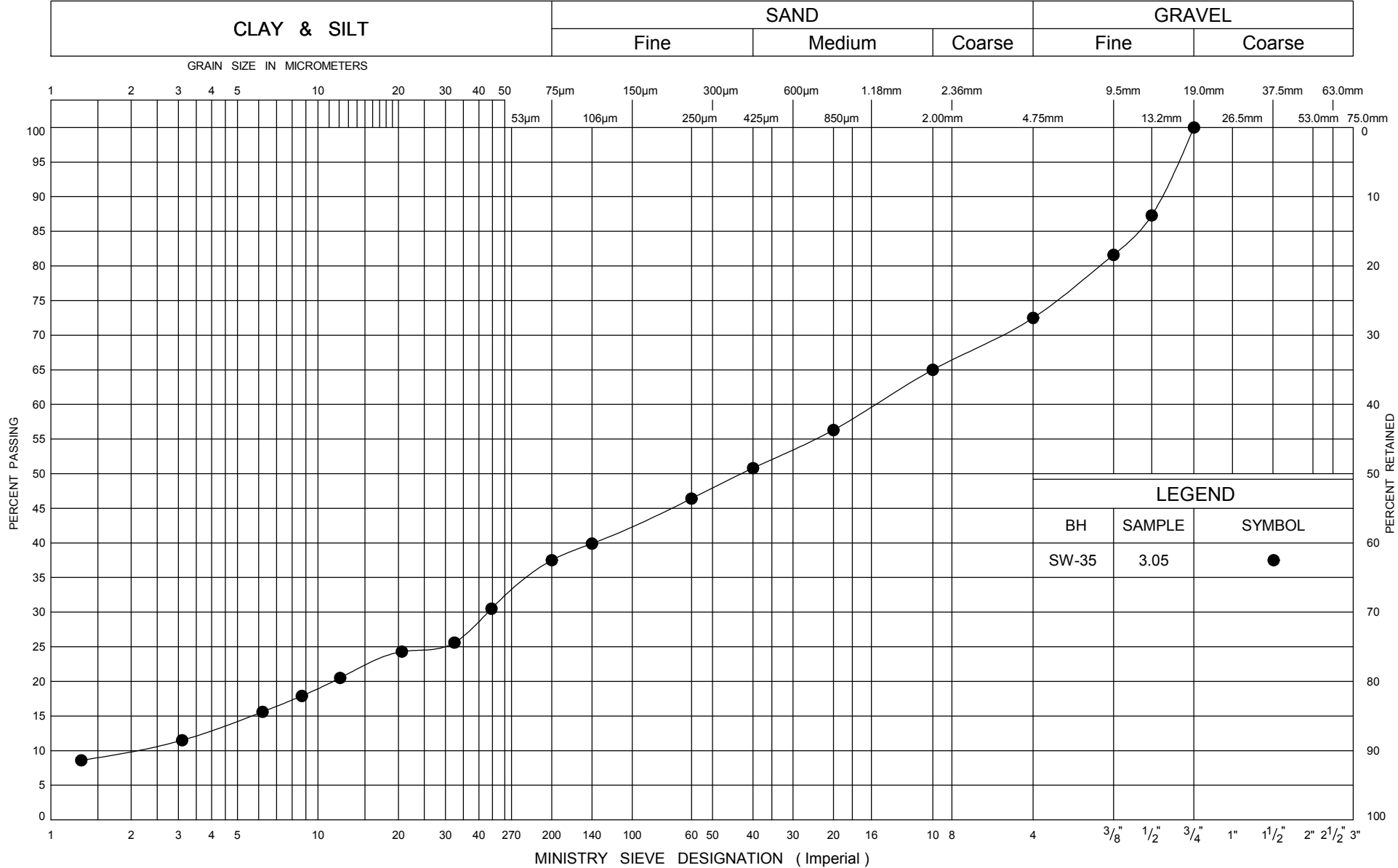


GRAIN SIZE DISTRIBUTION
FILL

FIG No M1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford

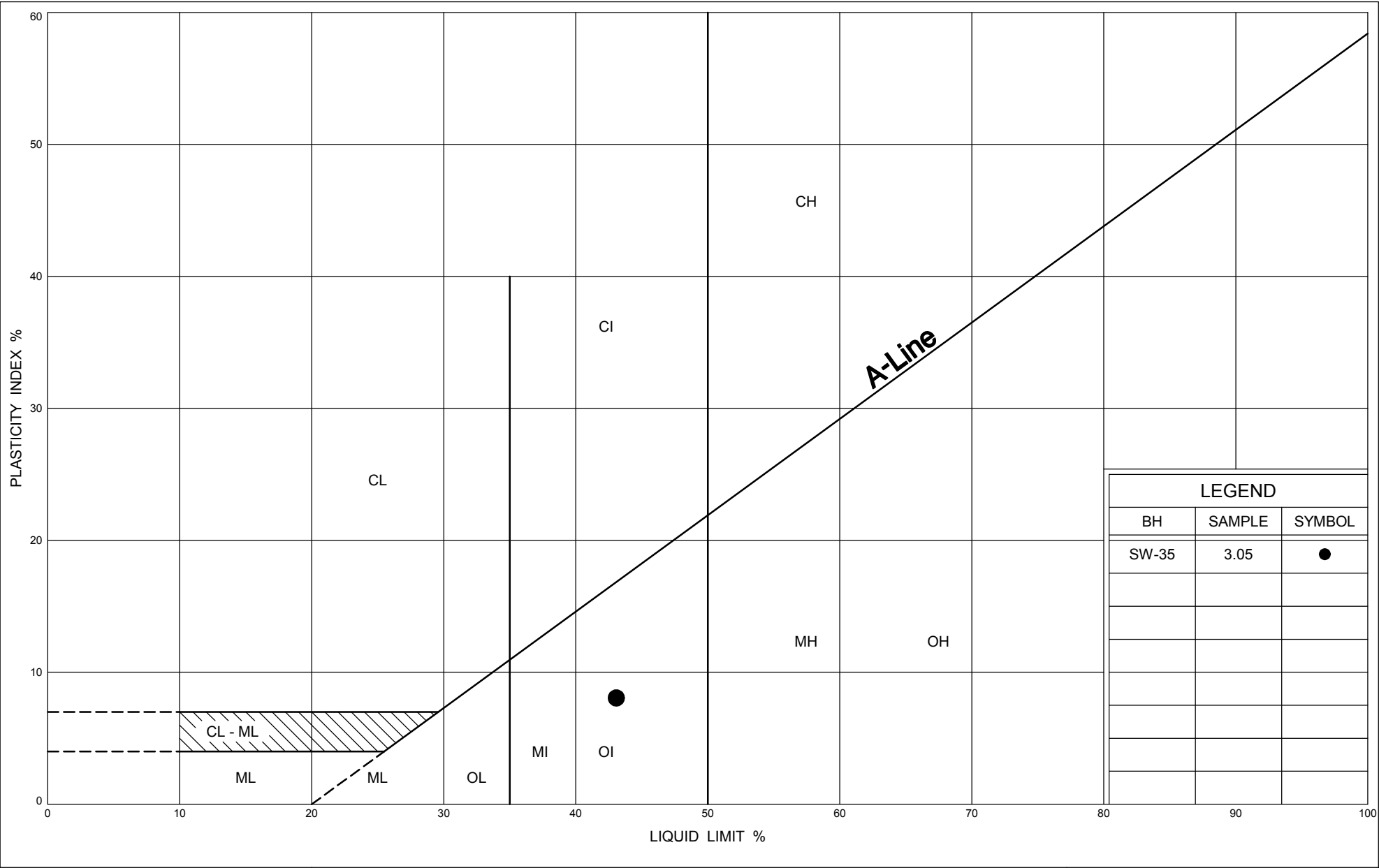


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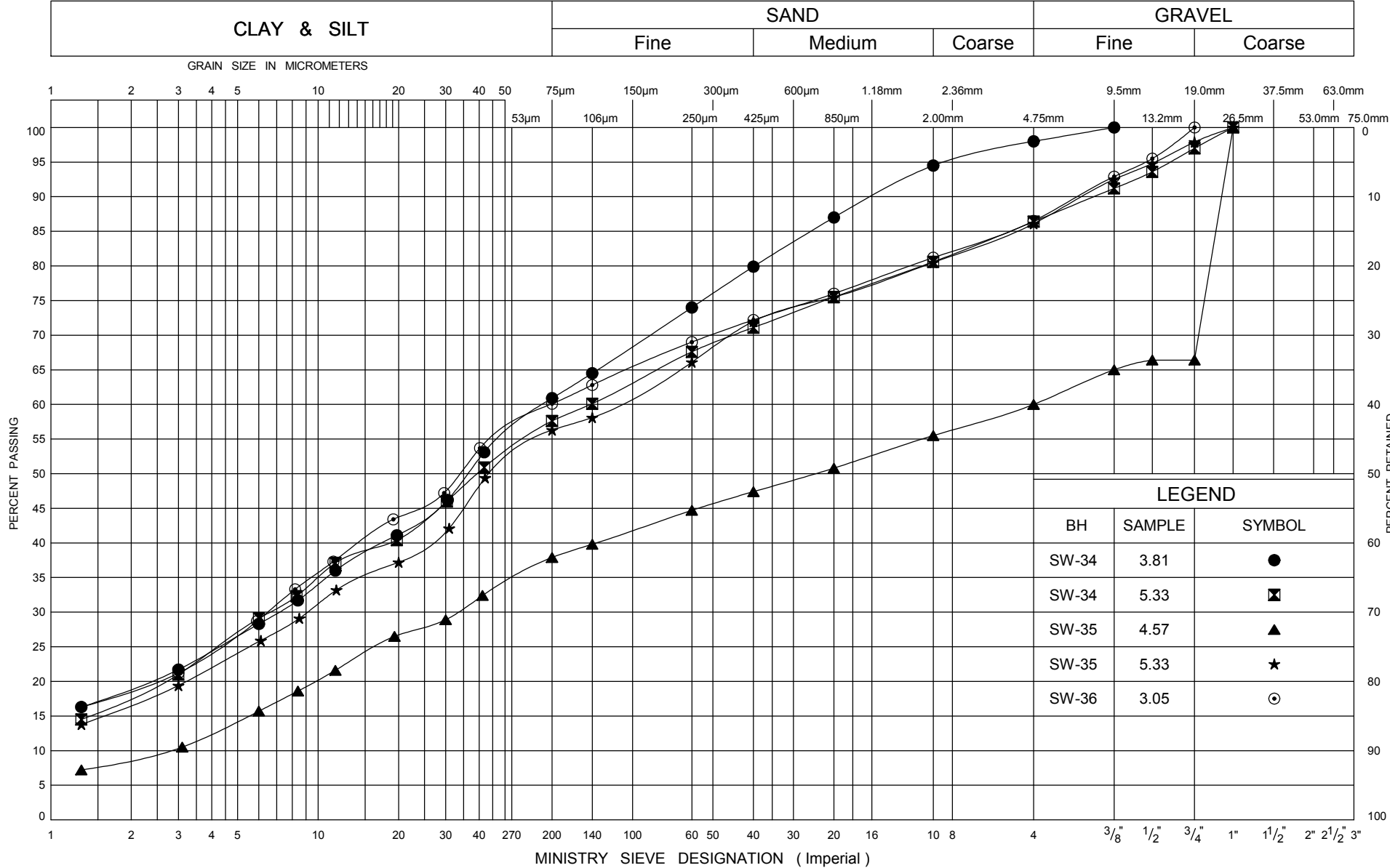
GRAIN SIZE DISTRIBUTION
PEAT

FIG No M2
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



LEGEND		
BH	SAMPLE	SYMBOL
SW-35	3.05	●

UNIFIED SOIL CLASSIFICATION SYSTEM



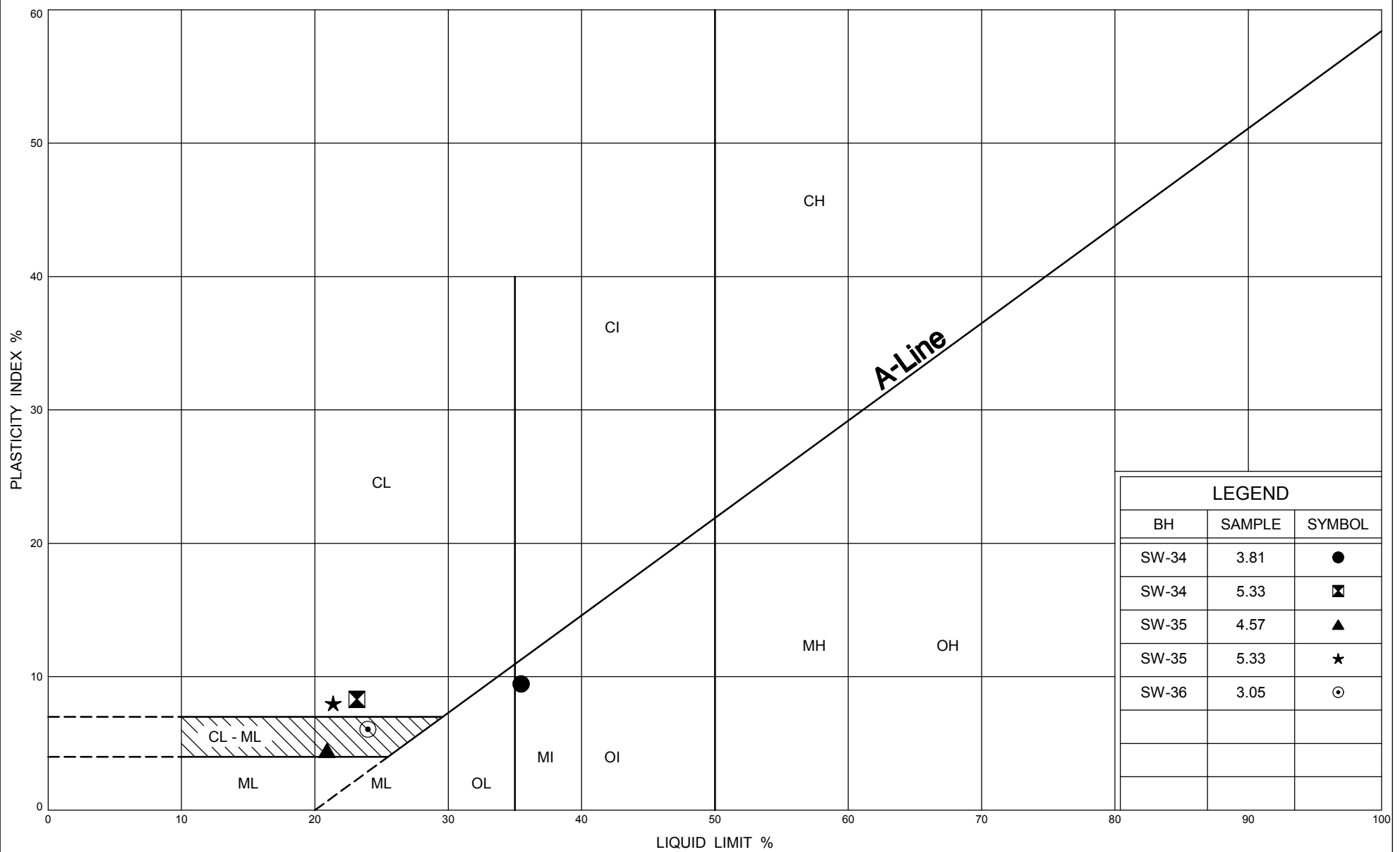
LEGEND		
BH	SAMPLE	SYMBOL
SW-34	3.81	●
SW-34	5.33	⊠
SW-35	4.57	▲
SW-35	5.33	★
SW-36	3.05	⊙

ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 1/1/09



GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILTY CLAY, CL-ML TO CL

FIG No M4
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



PLASTICITY CHART

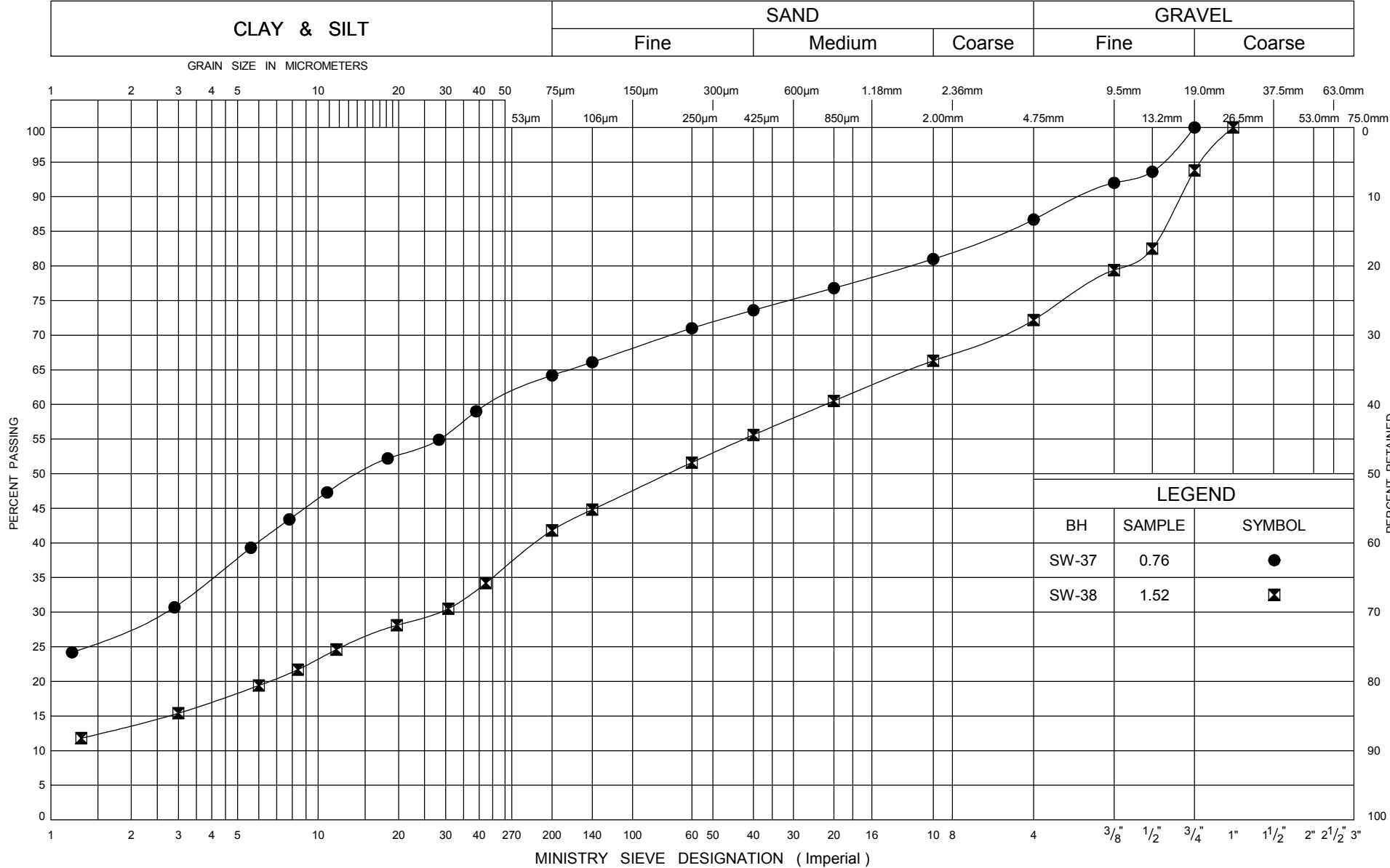
CLAYEY SILT TO SILTY CLAY, CL-ML TO CL

FIG No M5

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

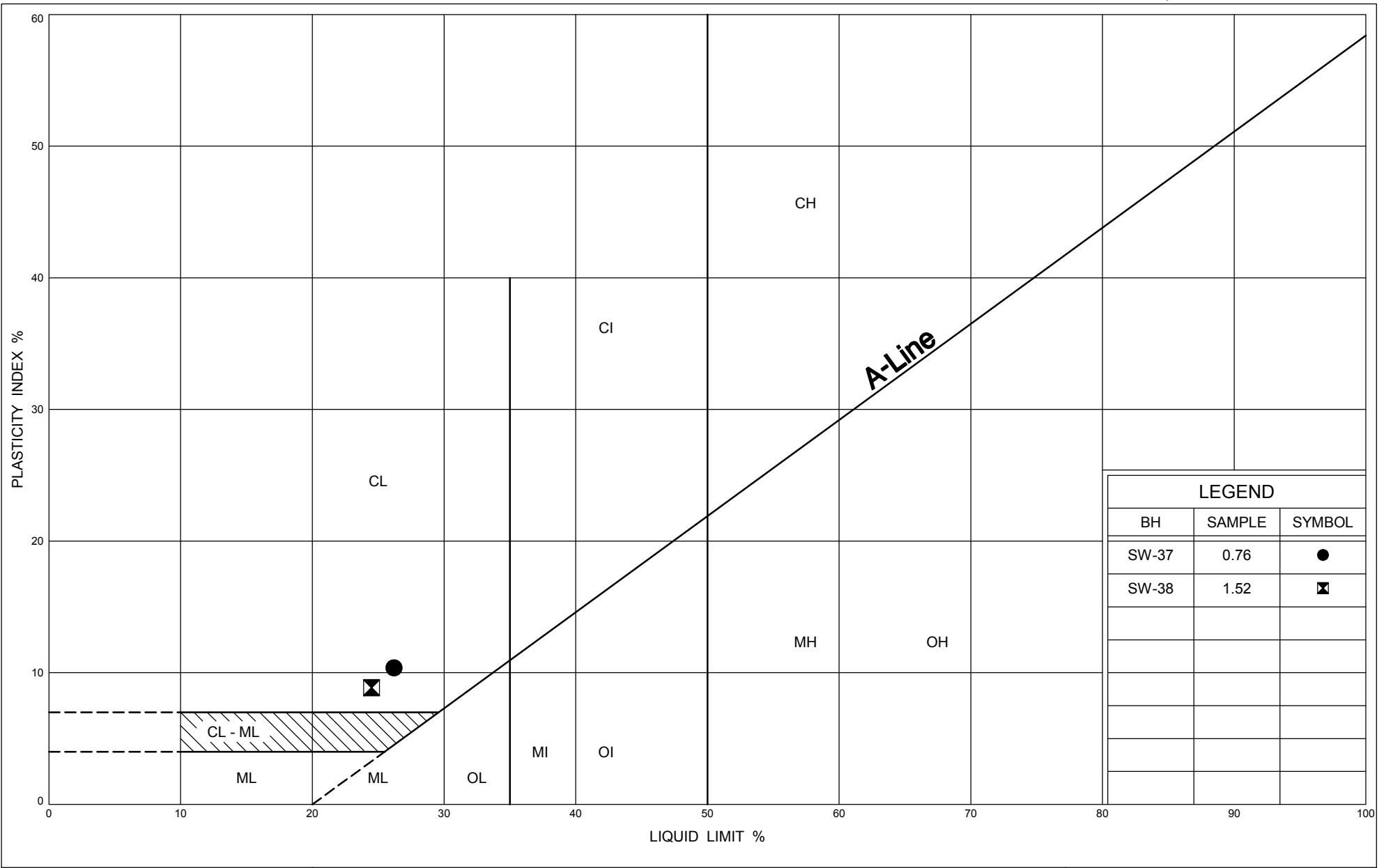
UNIFIED SOIL CLASSIFICATION SYSTEM



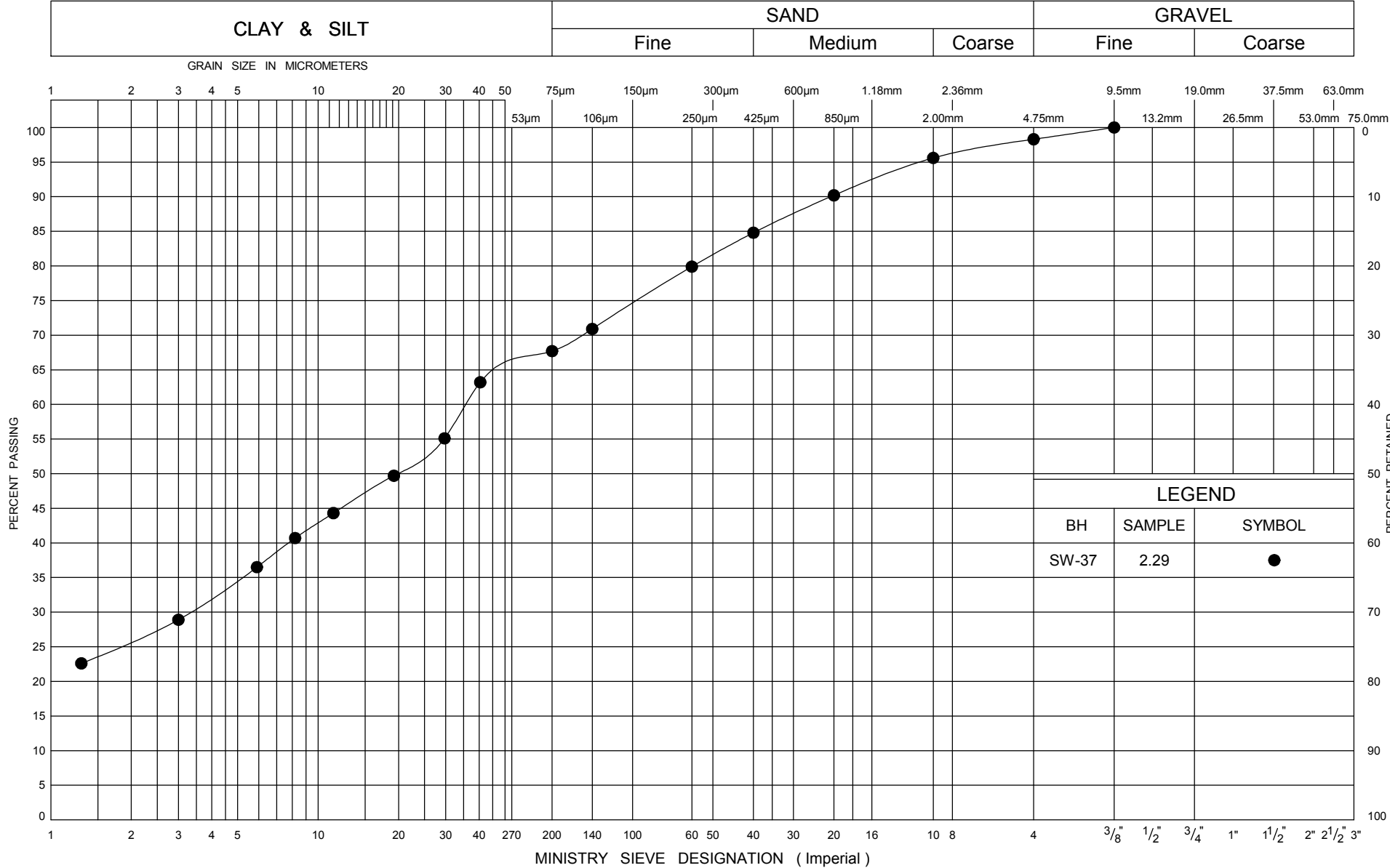
GRAIN SIZE DISTRIBUTION
FILL

FIG No N1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford





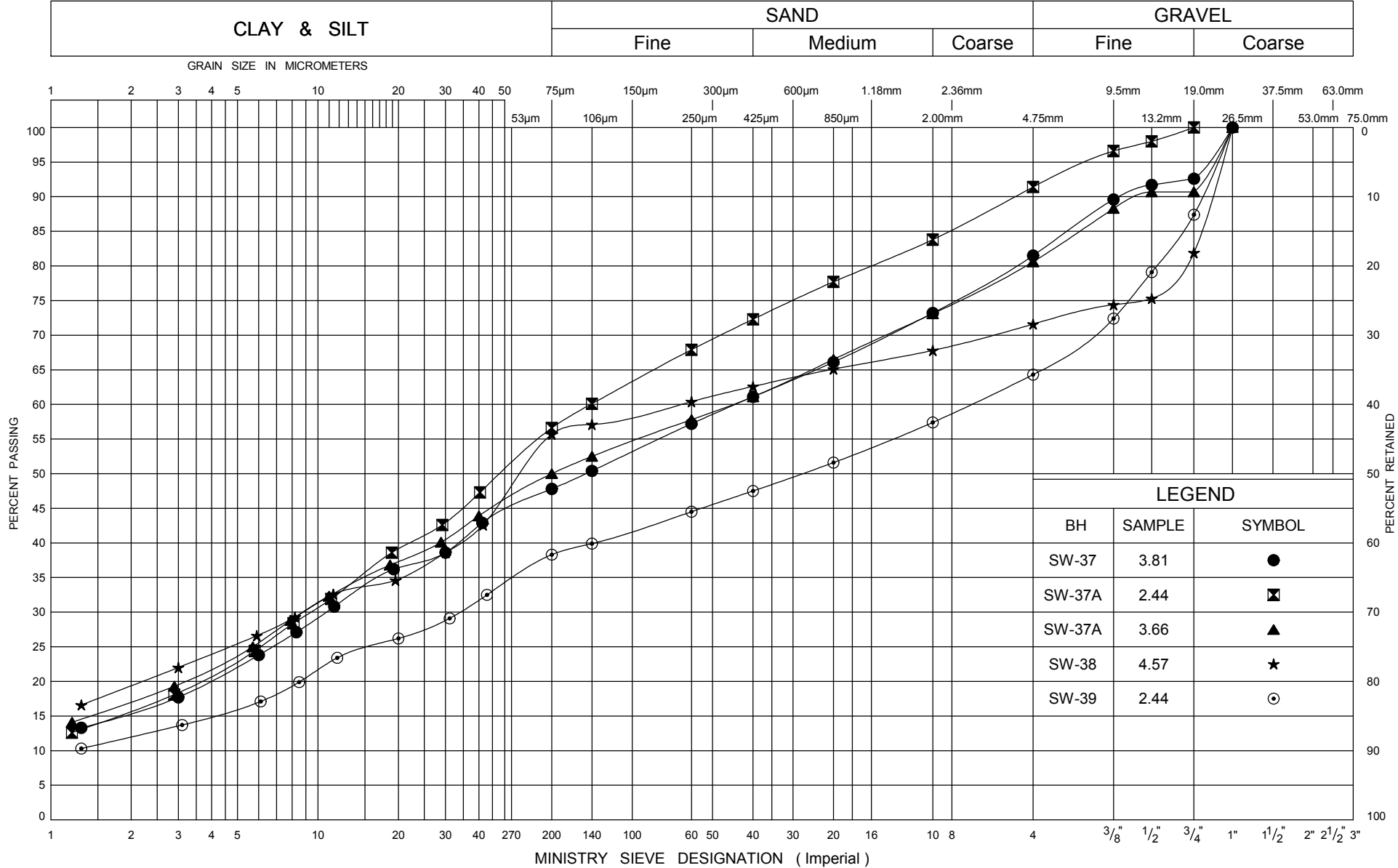
UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION
PEAT/TOPSOIL

FIG No N3
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford

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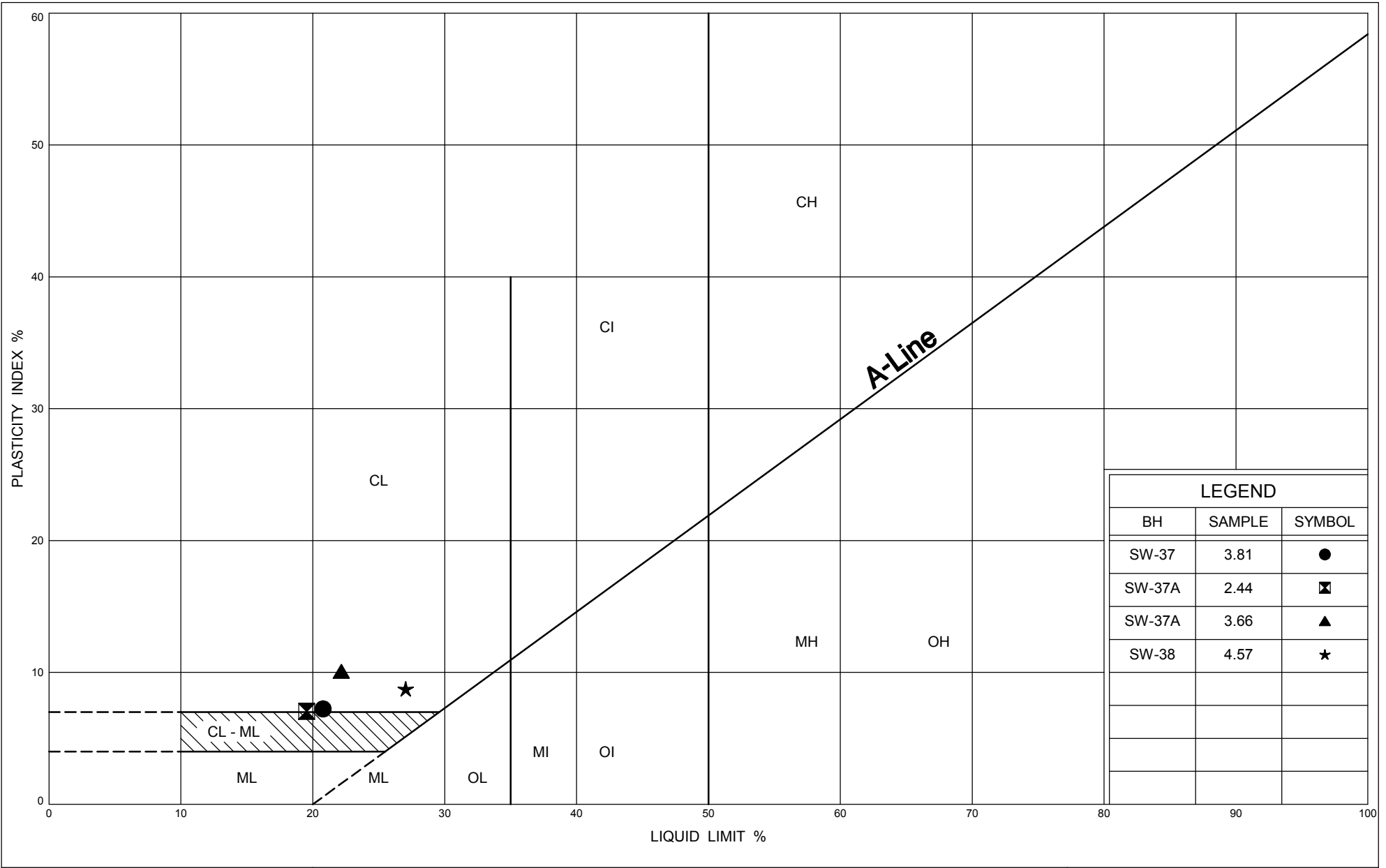


ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 27/10/09



GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No N4
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



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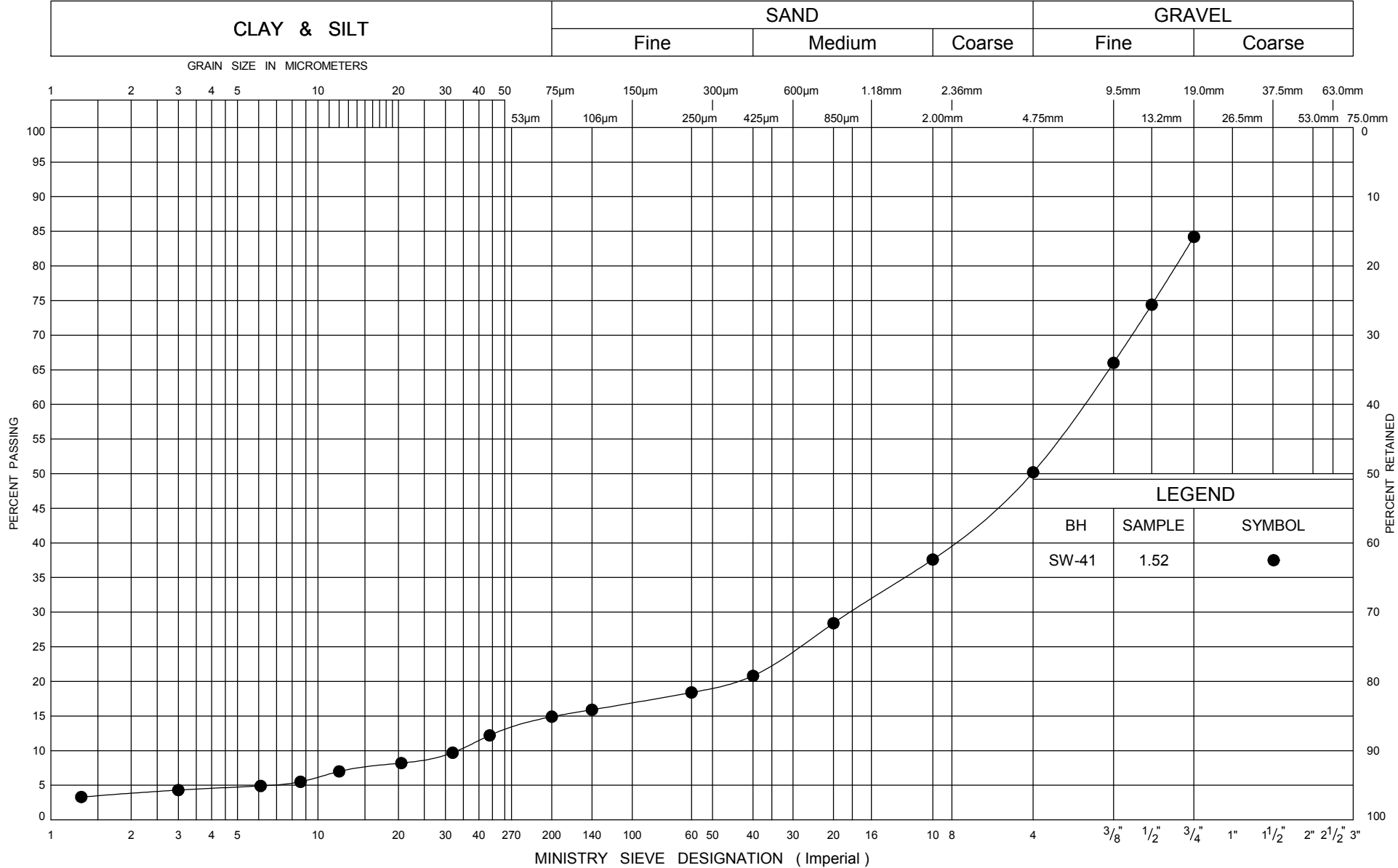
PLASTICITY CHART CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No N5

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

UNIFIED SOIL CLASSIFICATION SYSTEM



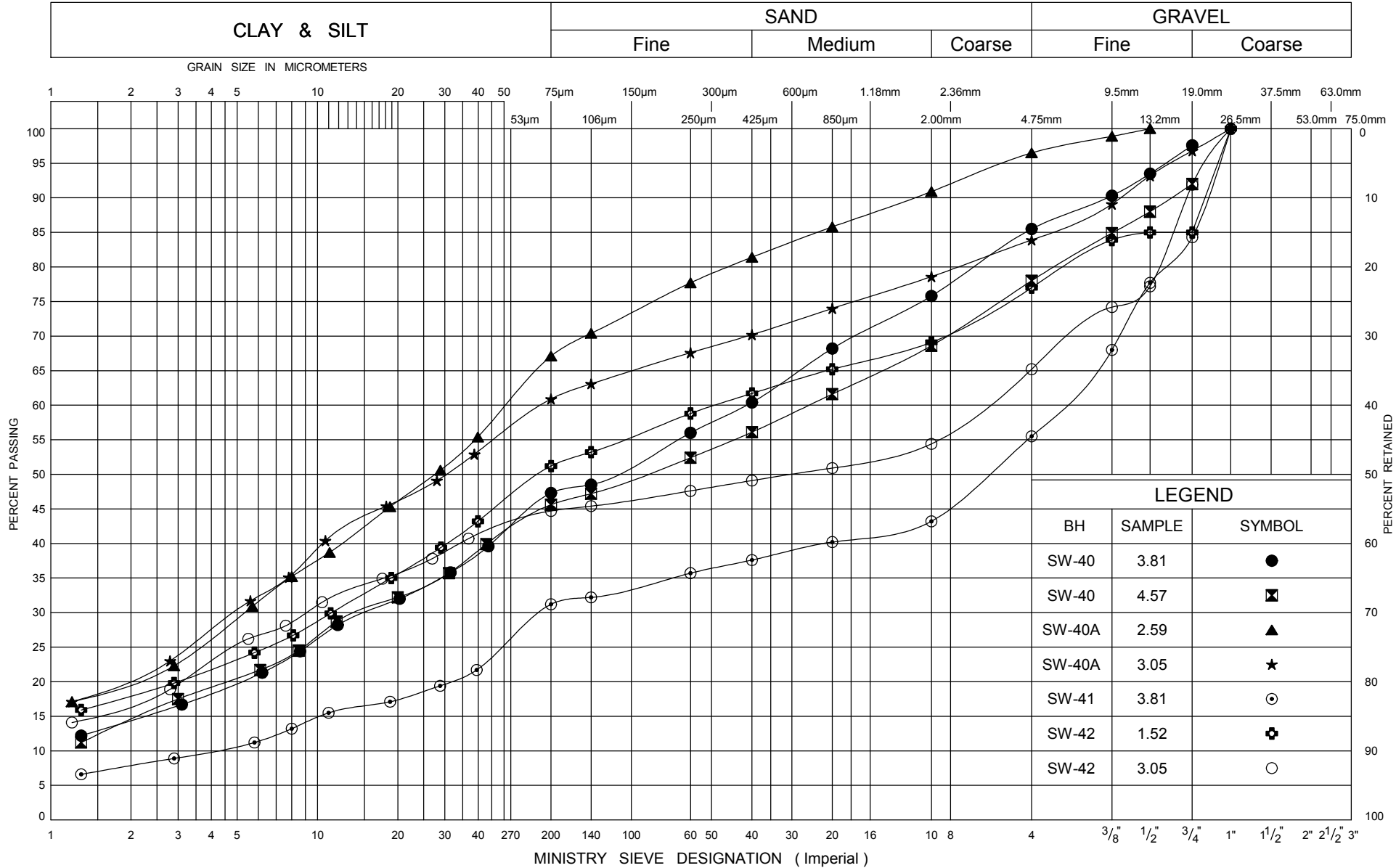
ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 27/10/09



GRAIN SIZE DISTRIBUTION
FILL

FIG No P1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford

UNIFIED SOIL CLASSIFICATION SYSTEM

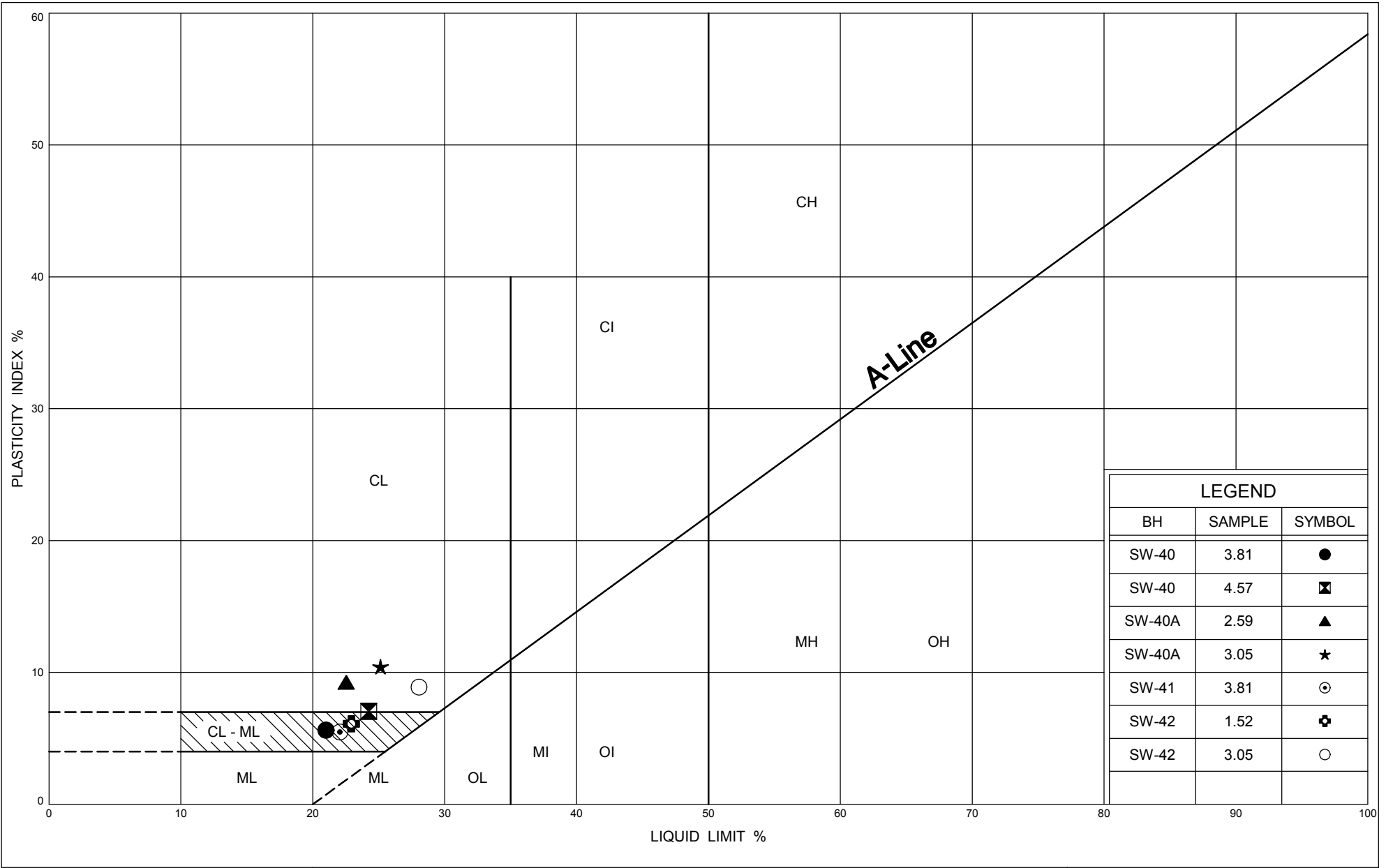


ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 27/10/09



GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No P2
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



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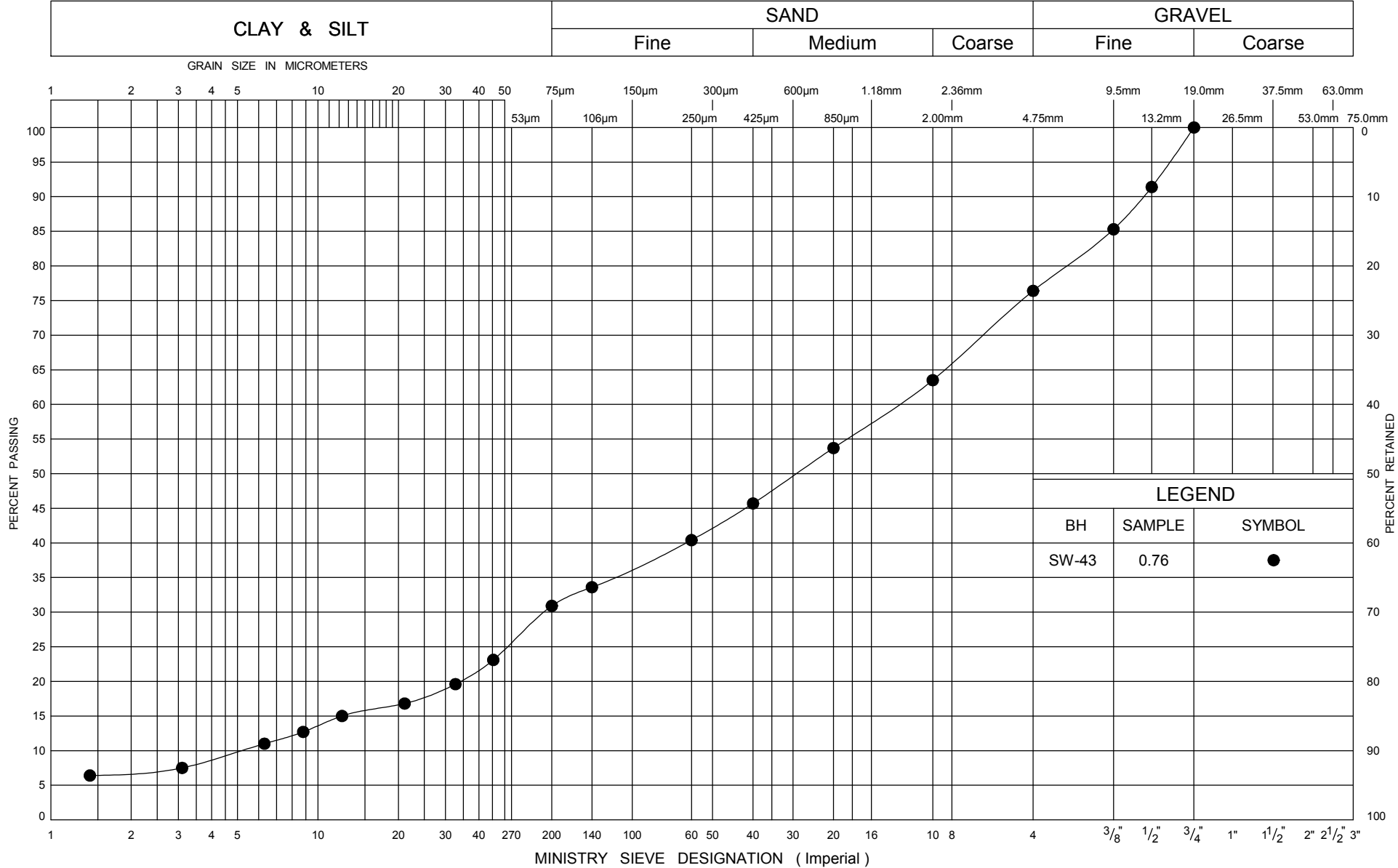
PLASTICITY CHART CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No P3

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

UNIFIED SOIL CLASSIFICATION SYSTEM

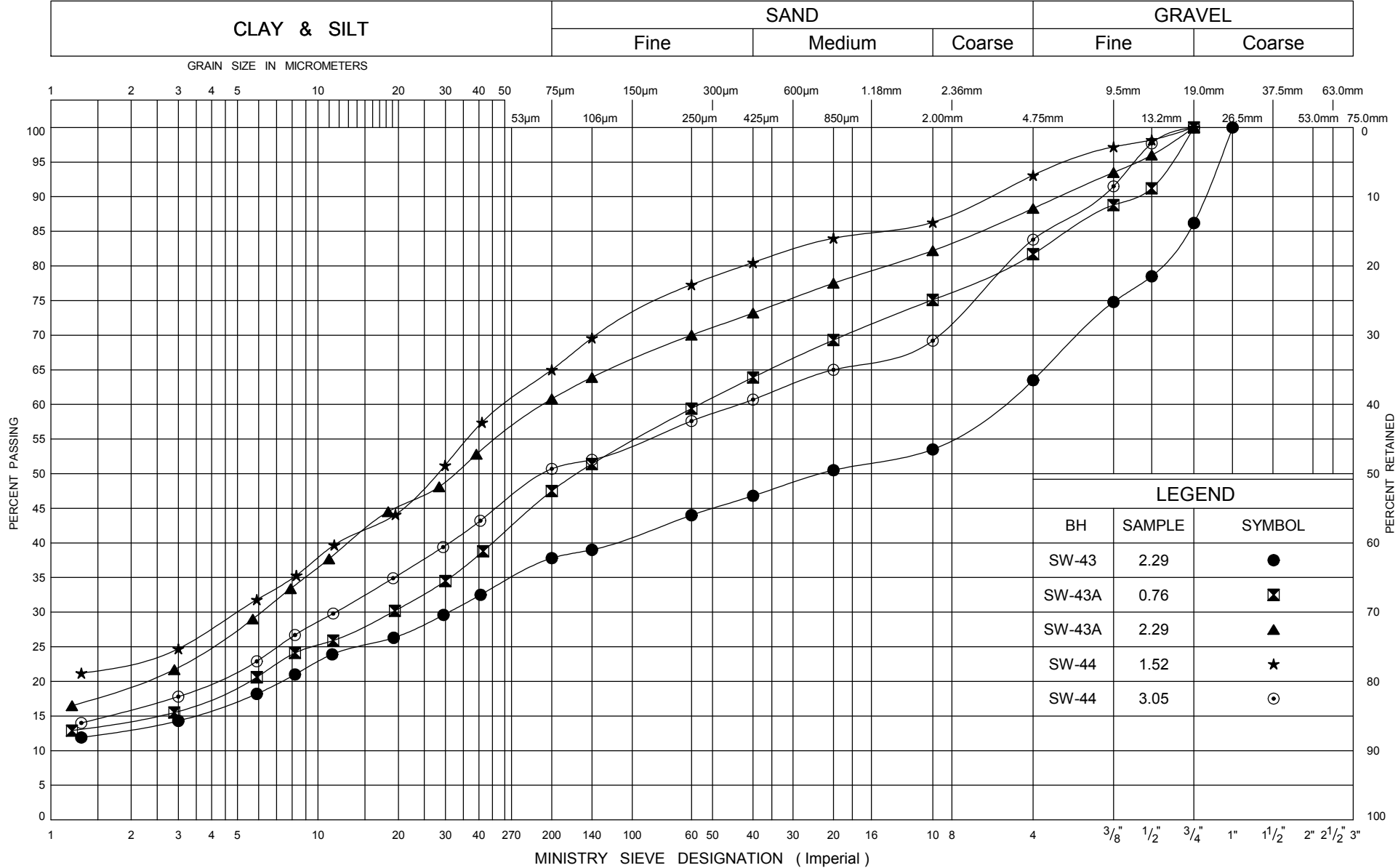


GRAIN SIZE DISTRIBUTION
FILL

FIG No Q1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



UNIFIED SOIL CLASSIFICATION SYSTEM

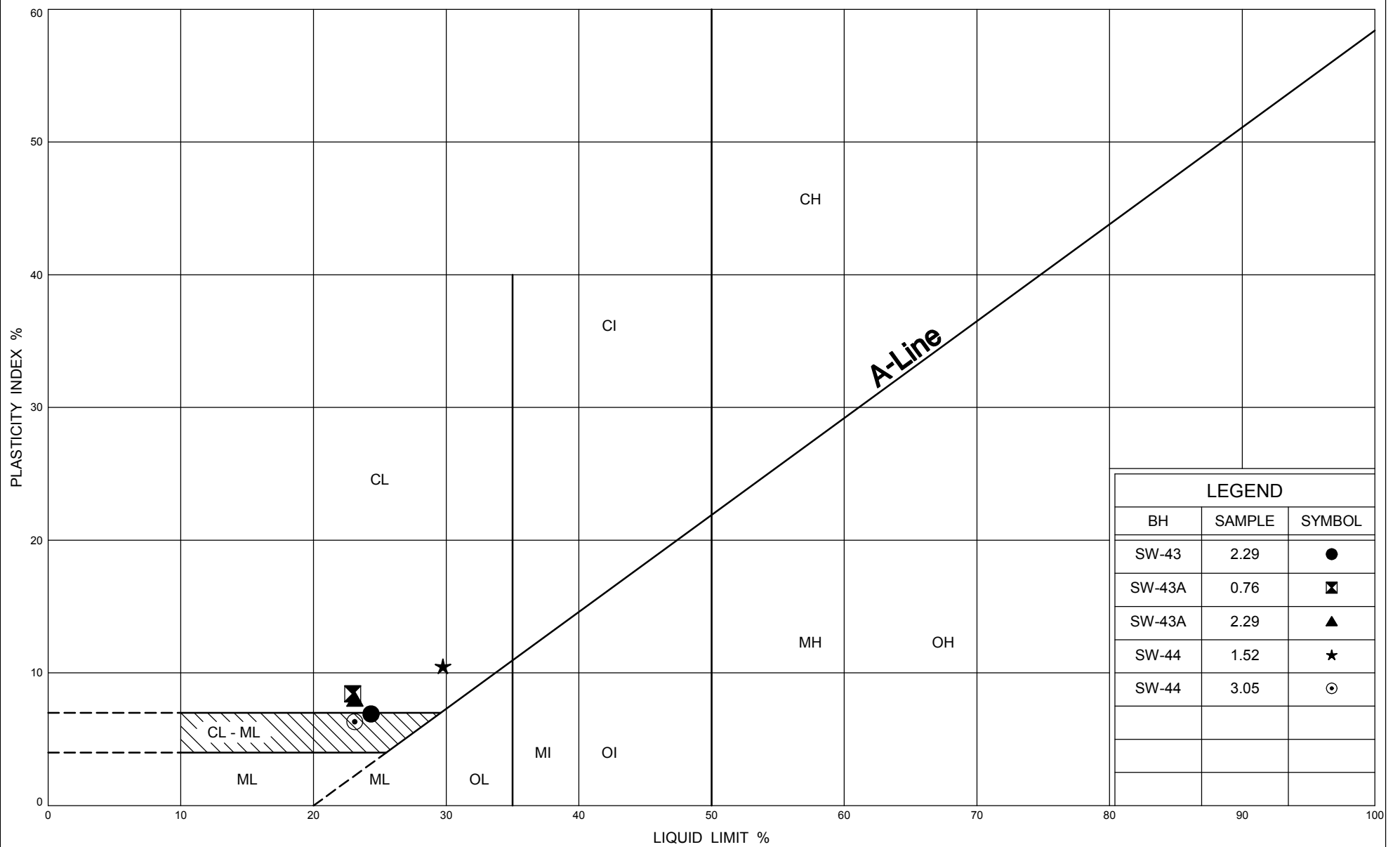


ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 4/1/09



GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No Q2
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



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Transportation

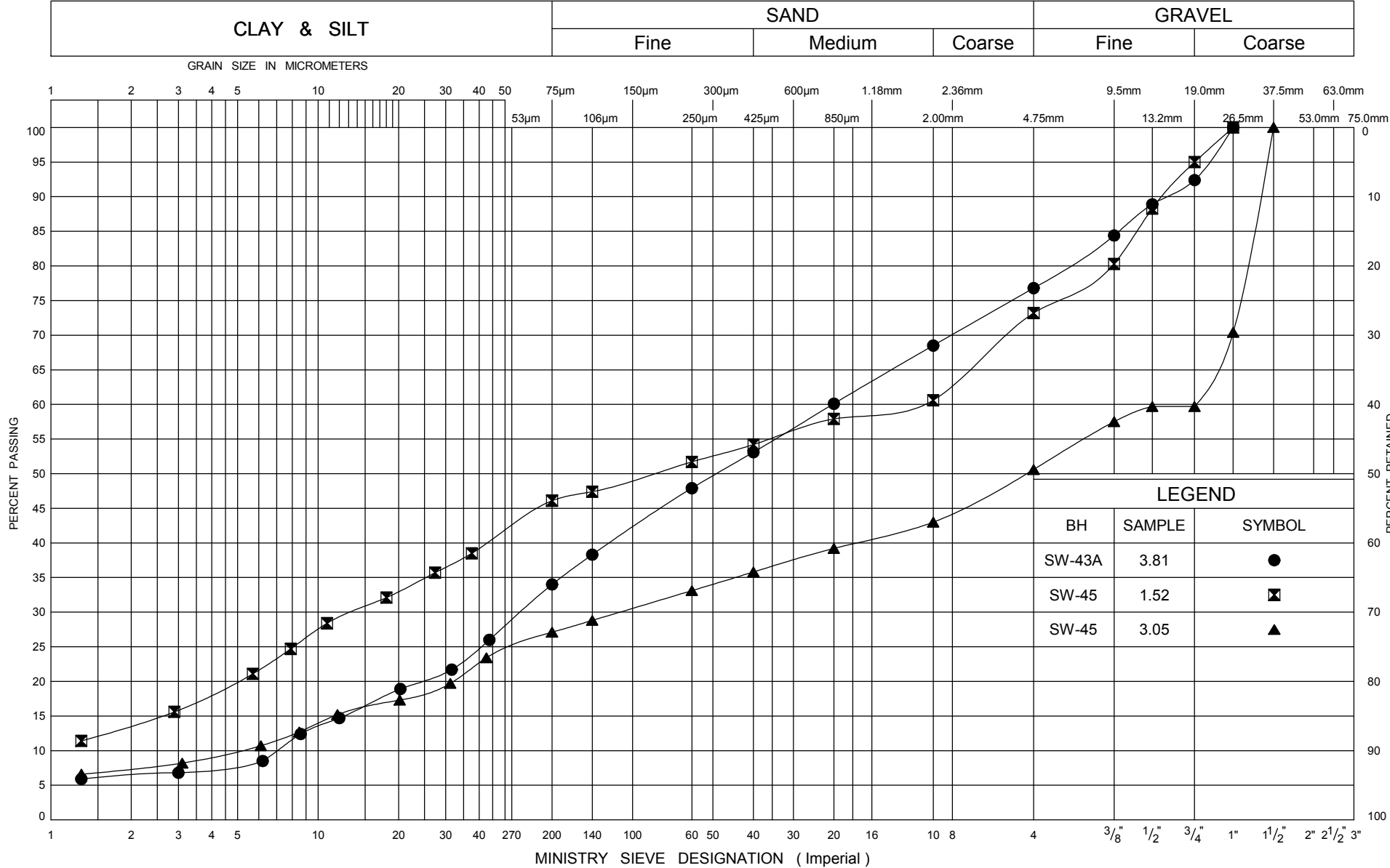
PLASTICITY CHART CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No Q3

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

UNIFIED SOIL CLASSIFICATION SYSTEM

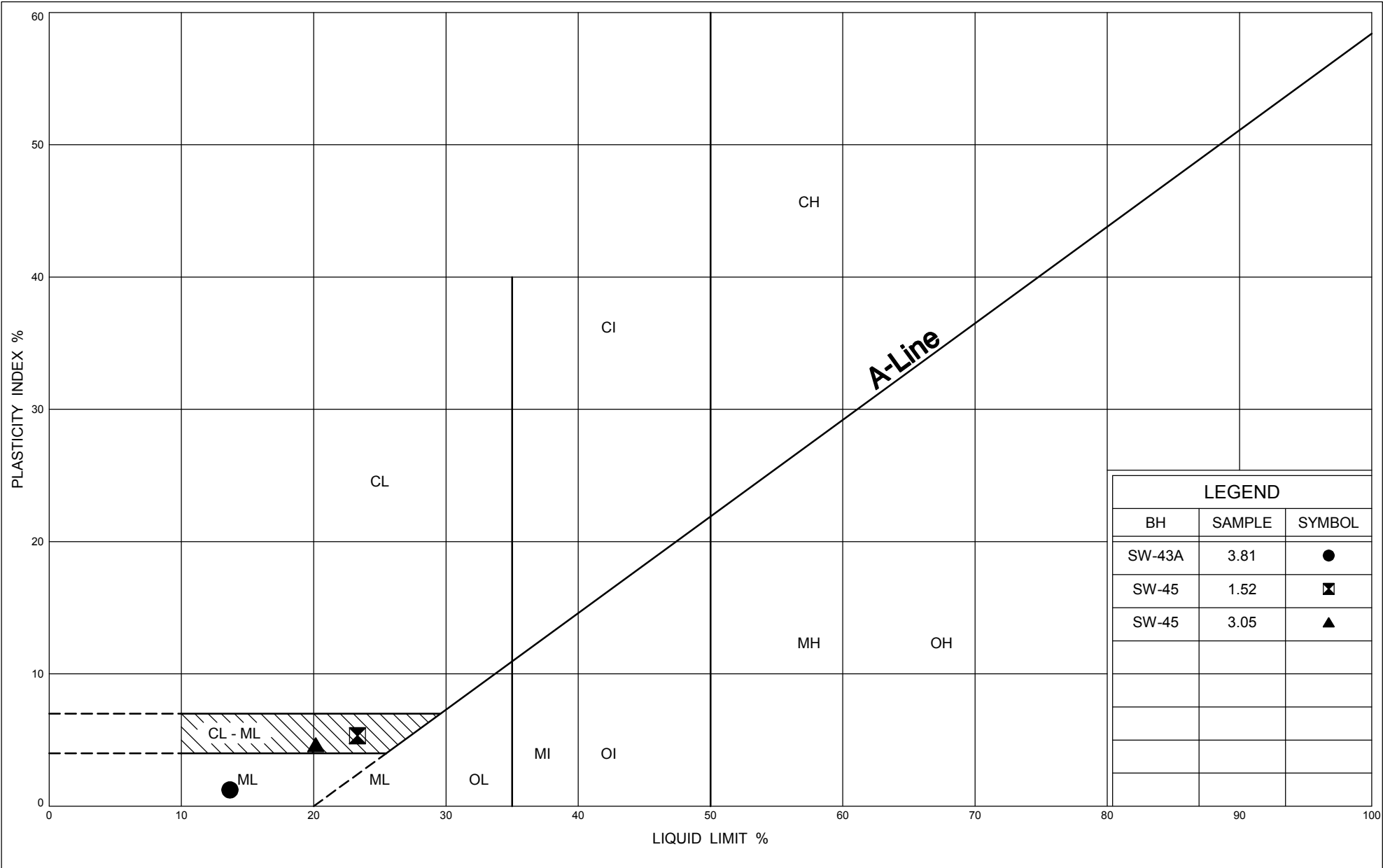


GRAIN SIZE DISTRIBUTION
SILTY SAND TO SAND & GRAVEL LAYERS

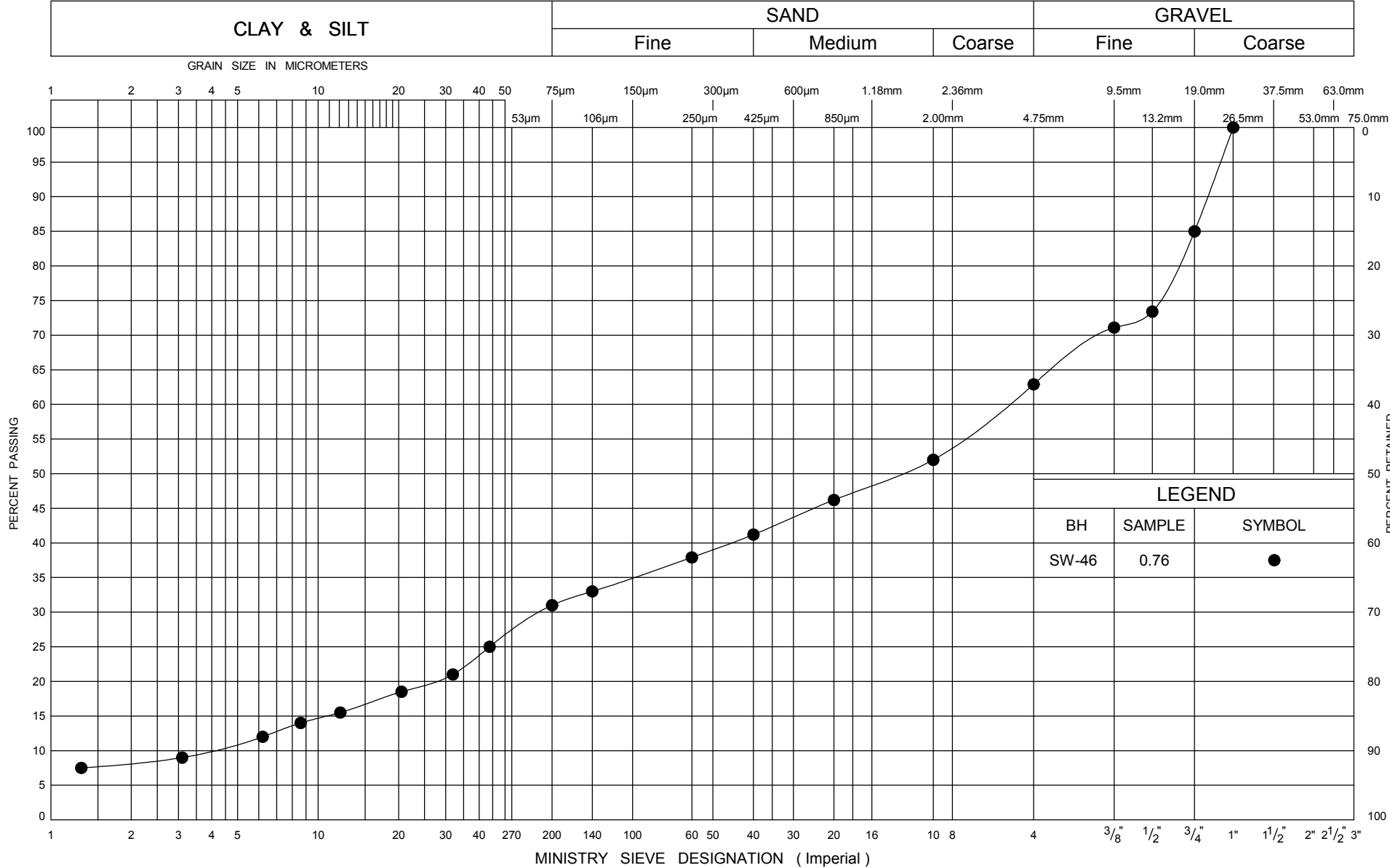
FIG No Q4
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford

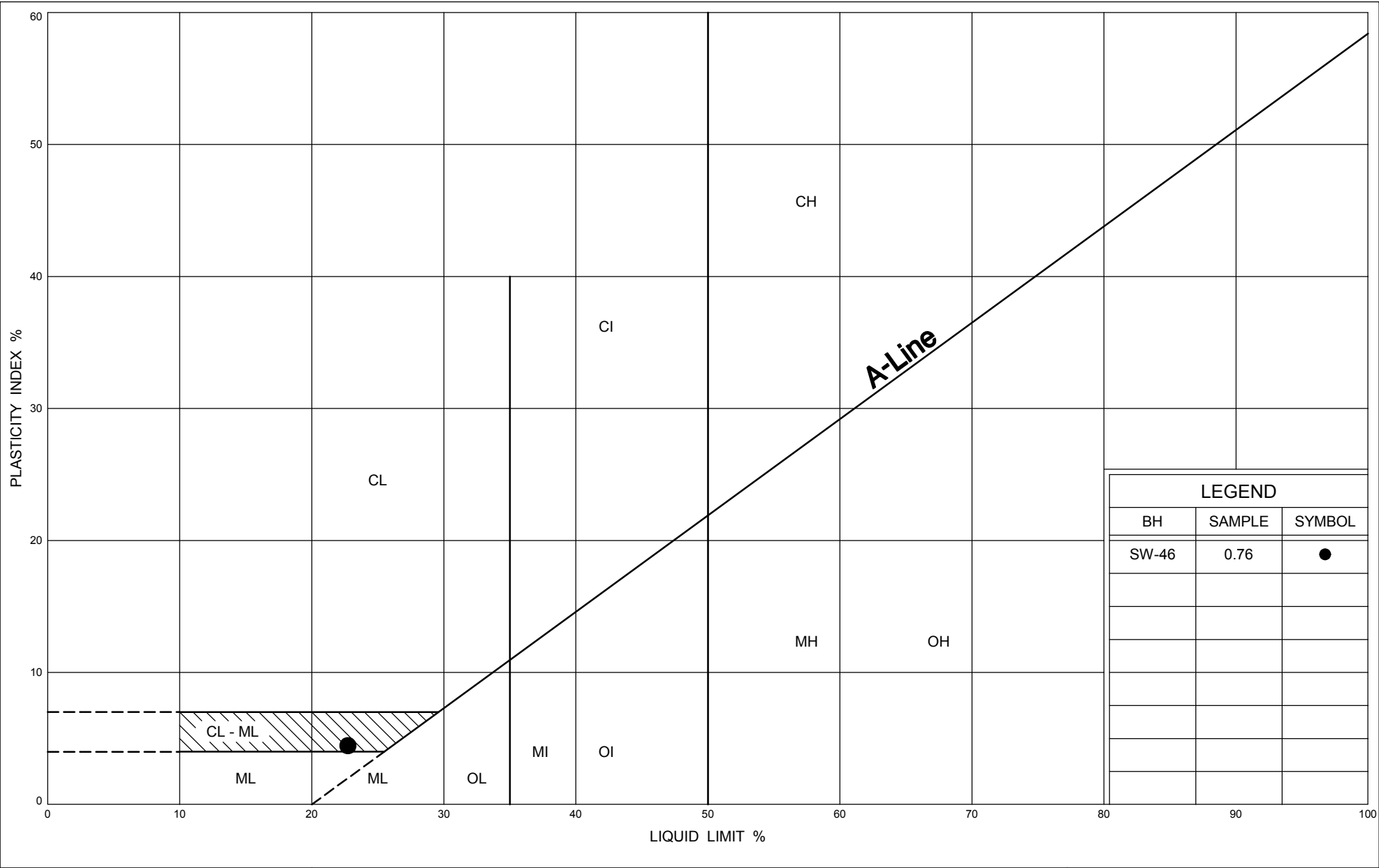


ONTARIO MOT PLASTICITY CHART LARGE CURVE 07-6-IEG1B.GPJ ONTARIO MOT.GDT 1/1/09



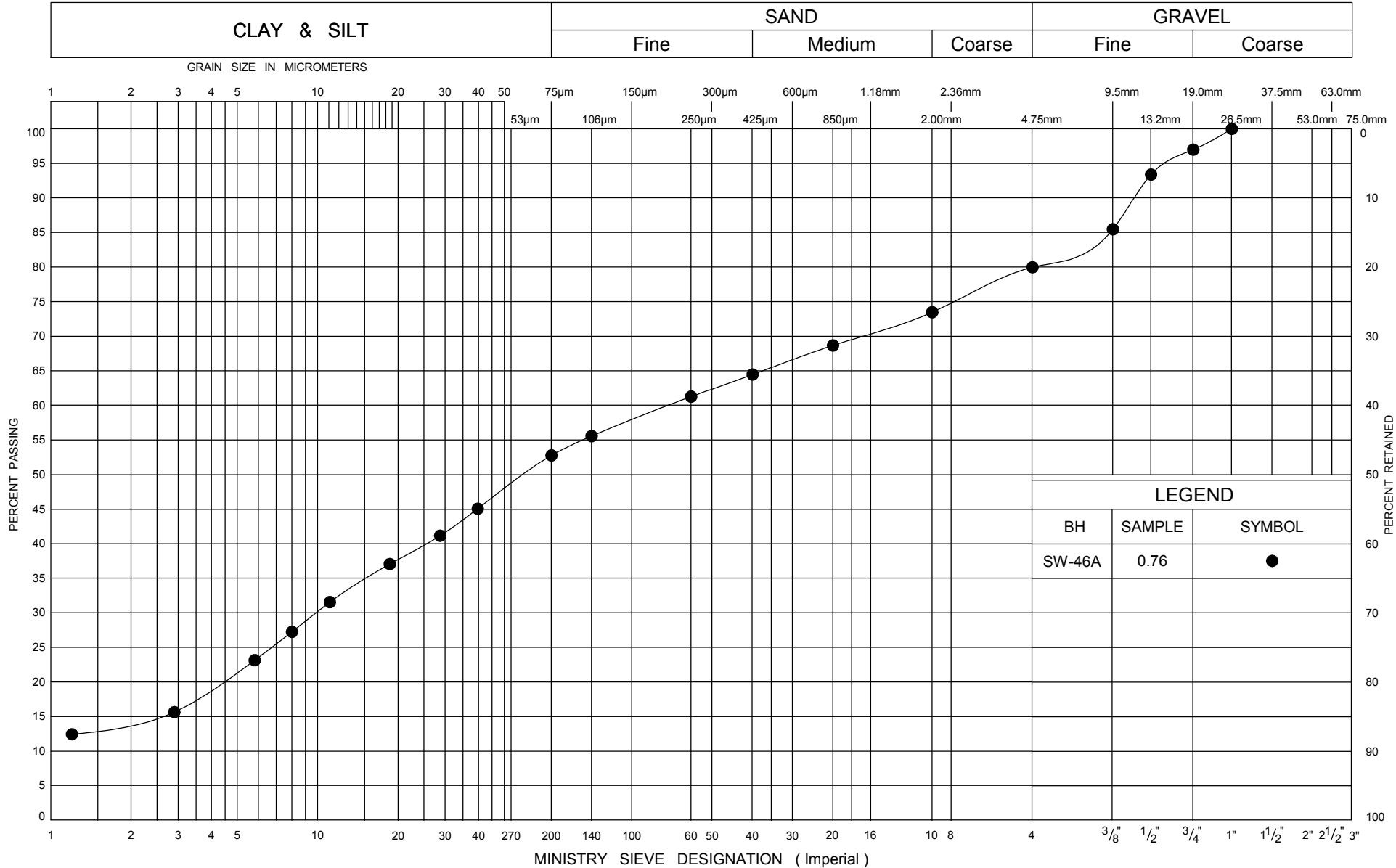
UNIFIED SOIL CLASSIFICATION SYSTEM





LEGEND		
BH	SAMPLE	SYMBOL
SW-46	0.76	●

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND		
BH	SAMPLE	SYMBOL
SW-46A	0.76	●

ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO MOT.GDT 27/10/09



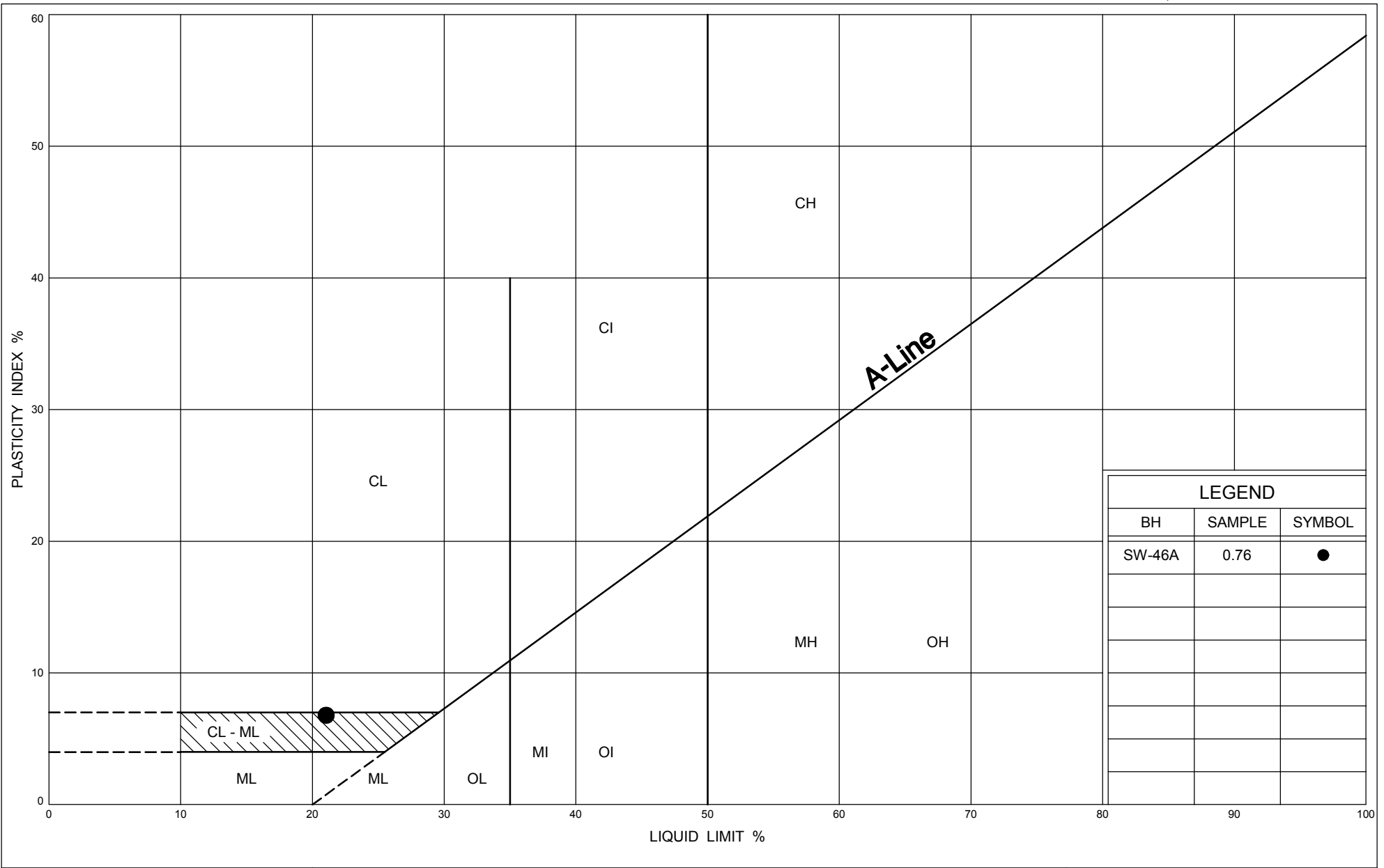
Ministry of
Transportation

GRAIN SIZE DISTRIBUTION
CLAYEY SILT TILL, CL-ML

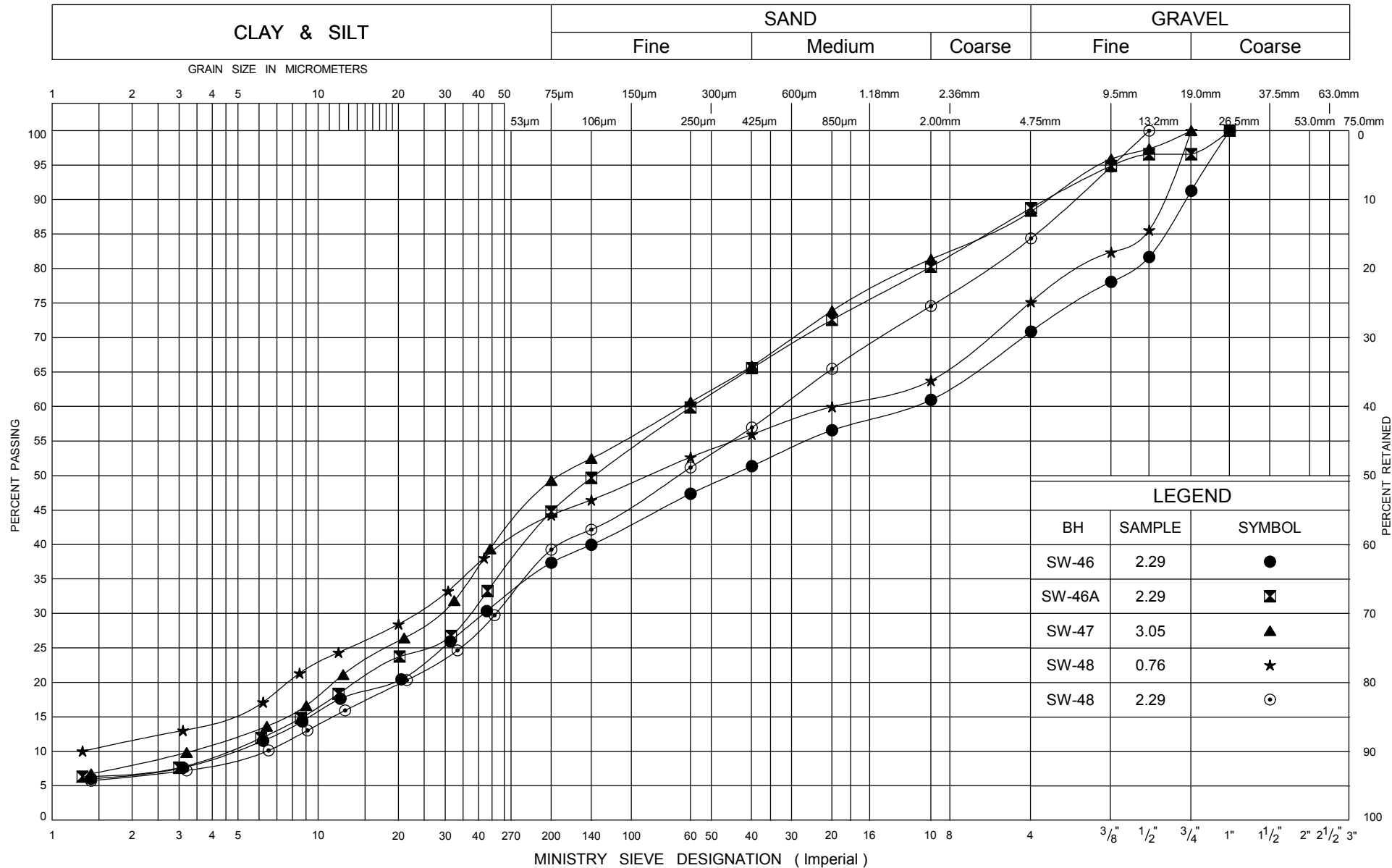
FIG No R3

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford



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GRAIN SIZE DISTRIBUTION

SAND & SILT TILL, SM-ML

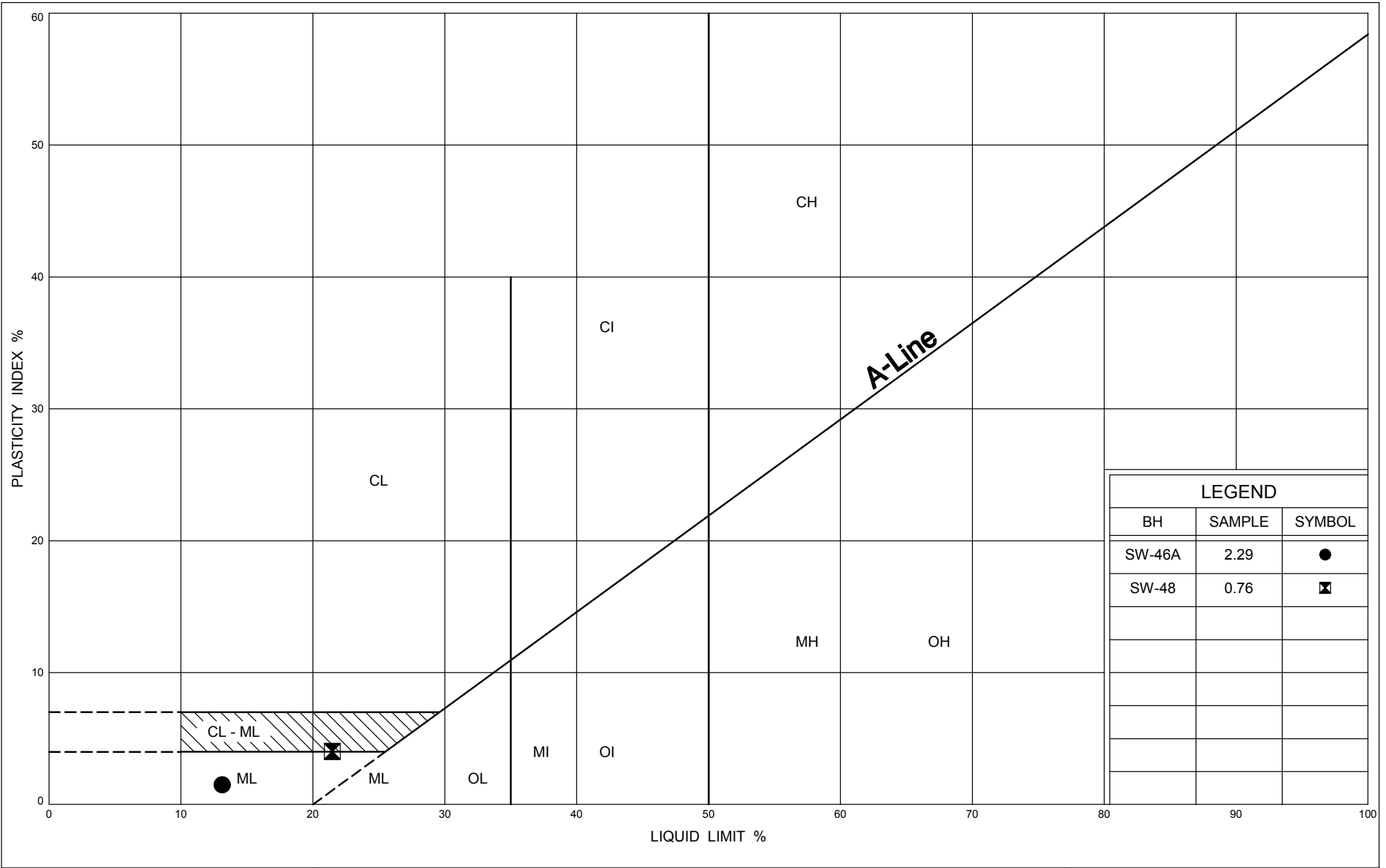
FIG No R5

GWP 167-91-00

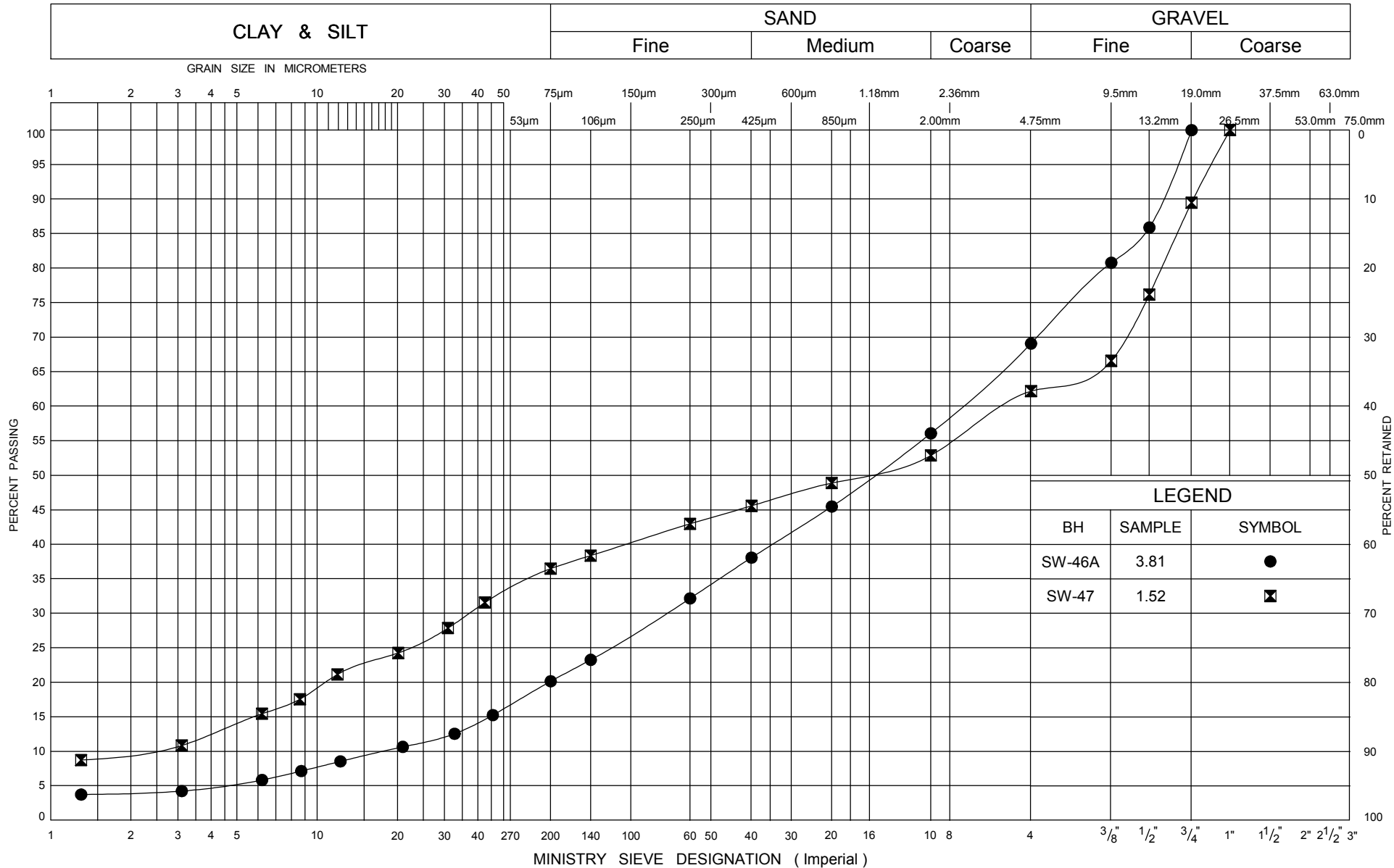
Hwy 26 - Sydenham Townline to Meaford

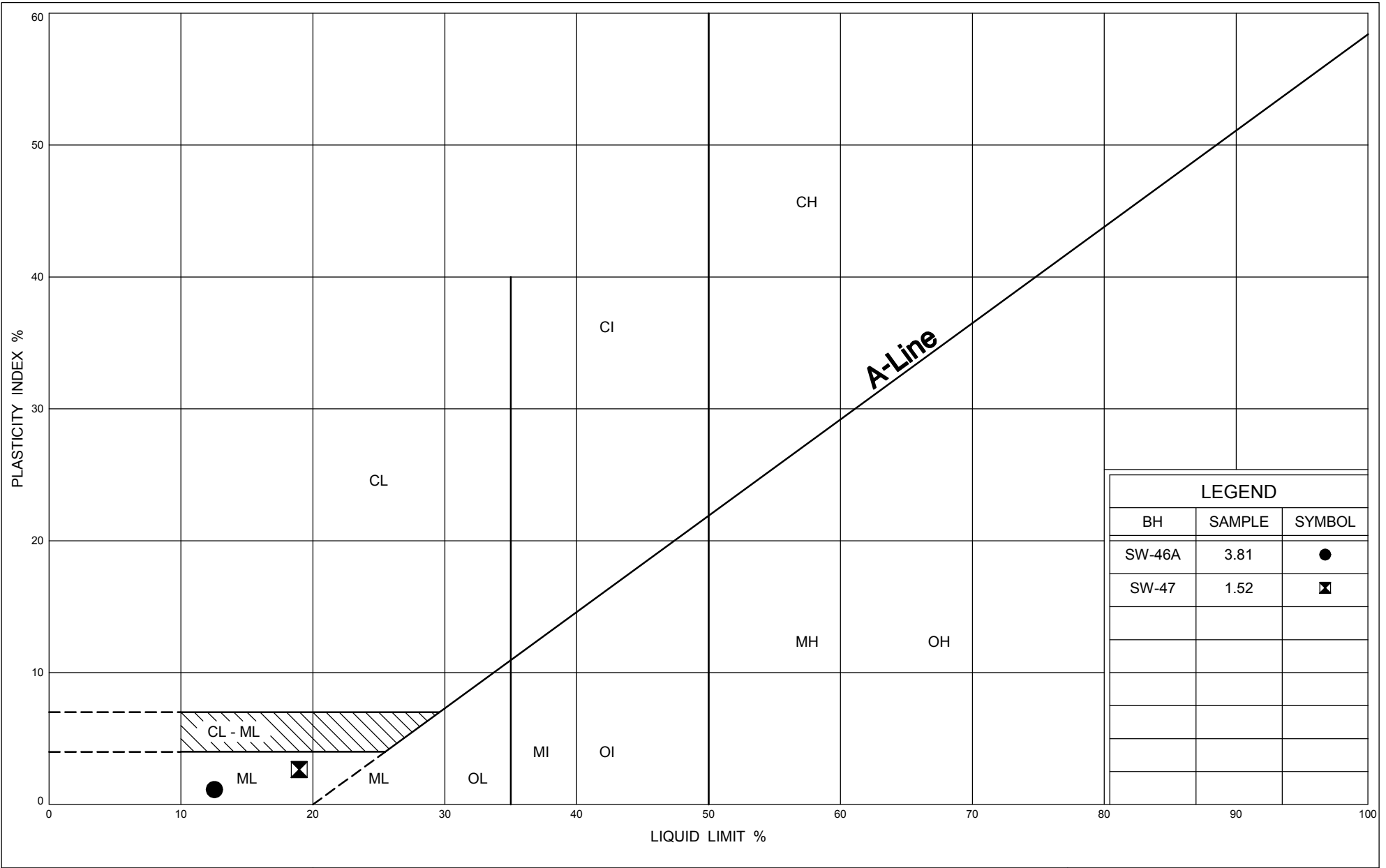


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Transportation

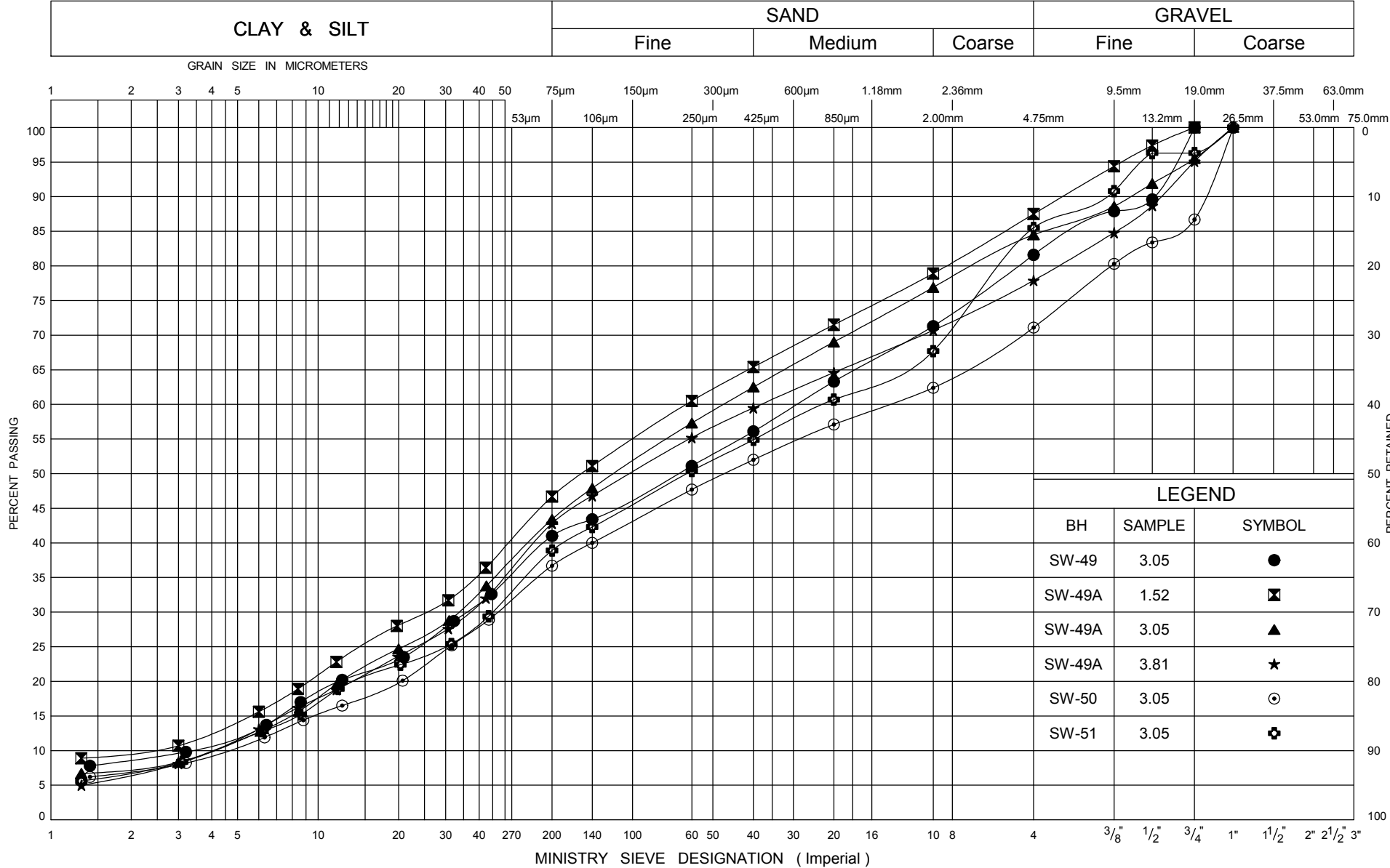


UNIFIED SOIL CLASSIFICATION SYSTEM





UNIFIED SOIL CLASSIFICATION SYSTEM



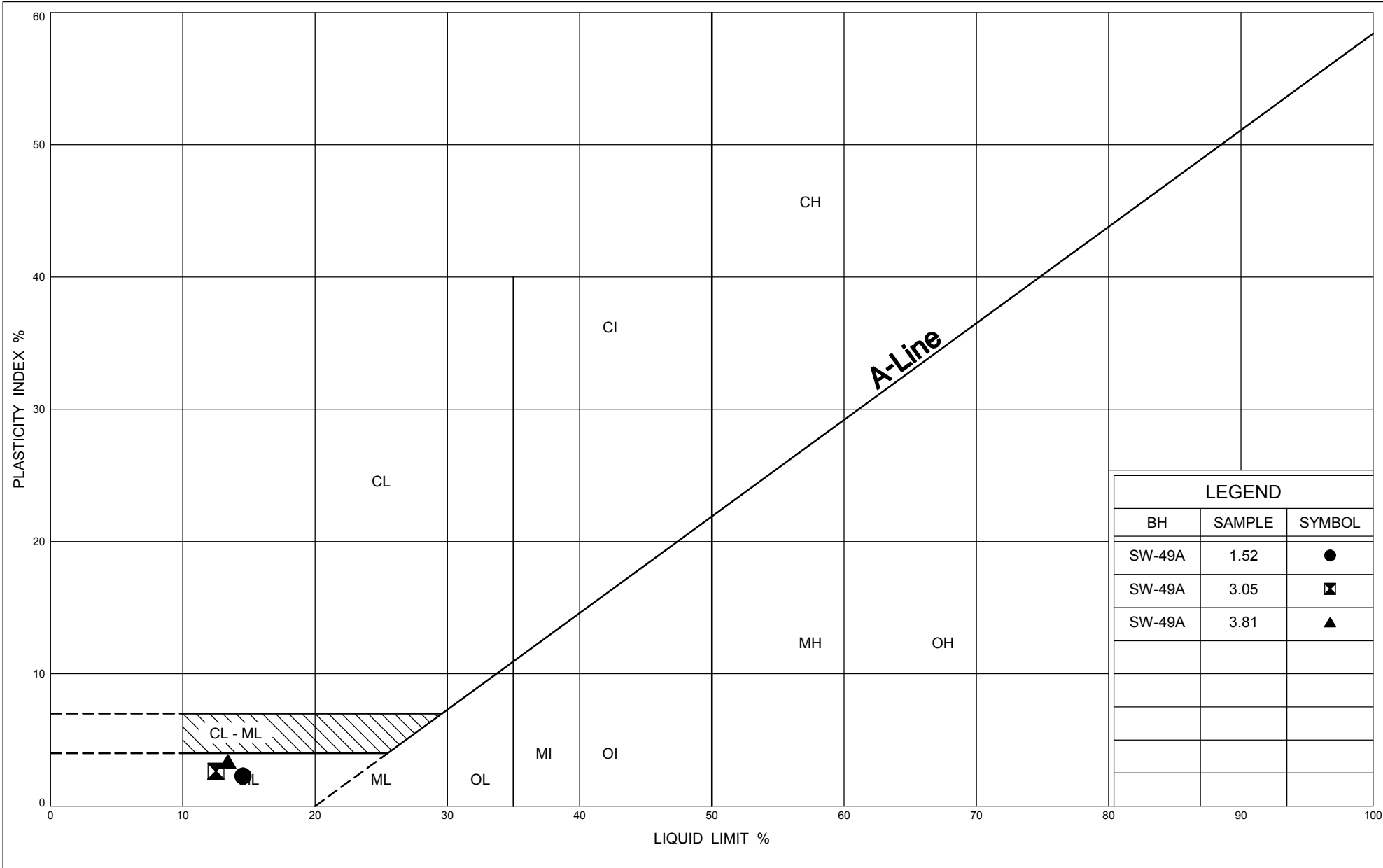
GRAIN SIZE DISTRIBUTION
SAND & SILT TILL, SM-ML

FIG No S1

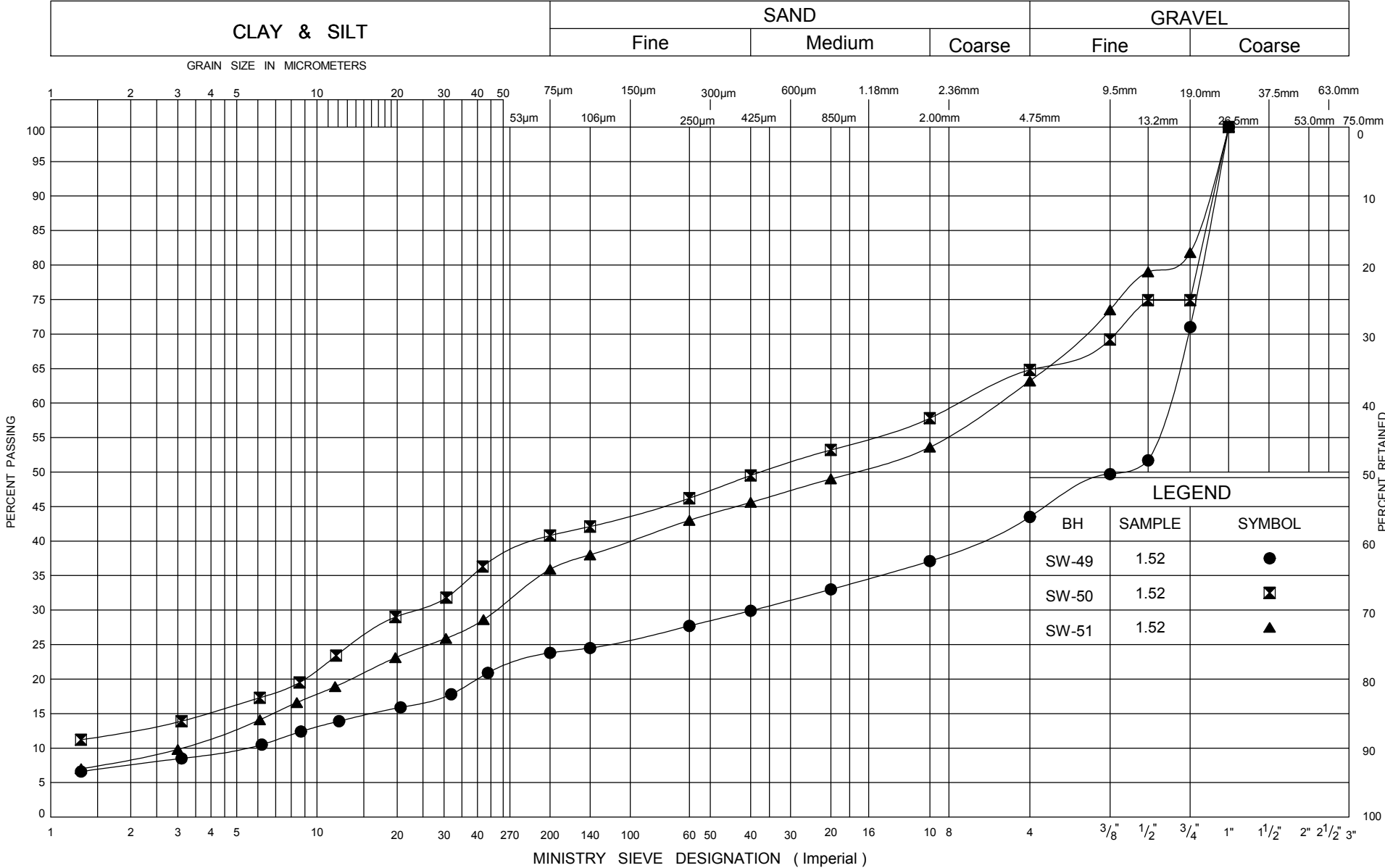
GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

ONTARIO MOT PLASTICITY CHART LARGE CULVE 07-6-IEG1B.GPJ ONTARIO MOT.GDT 27/10/09



UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION
GRAVELLY LAYER

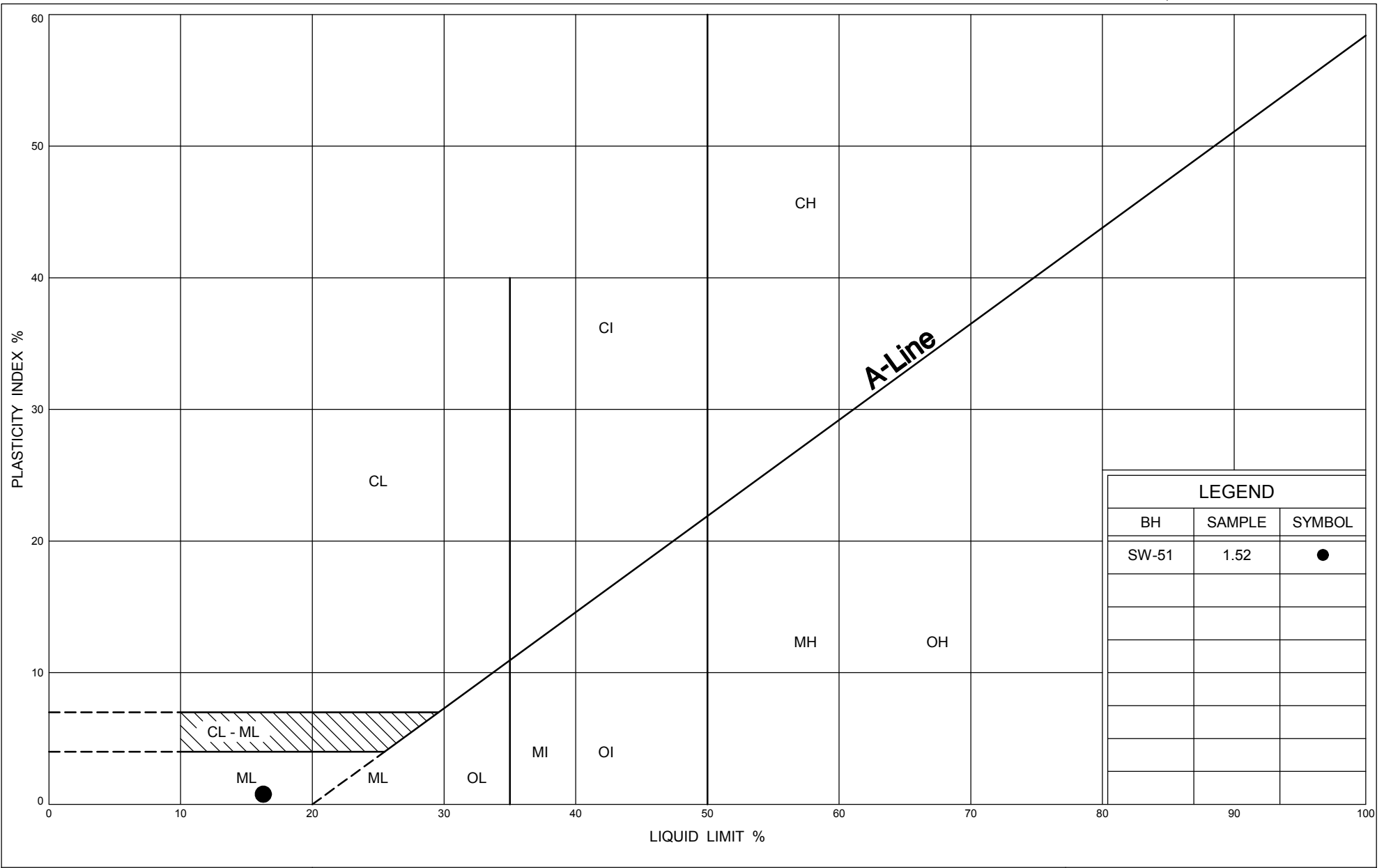
FIG No S3

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford



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PLASTICITY CHART
GRAVEL LAYER

FIG No S4

GWP 167-91-00

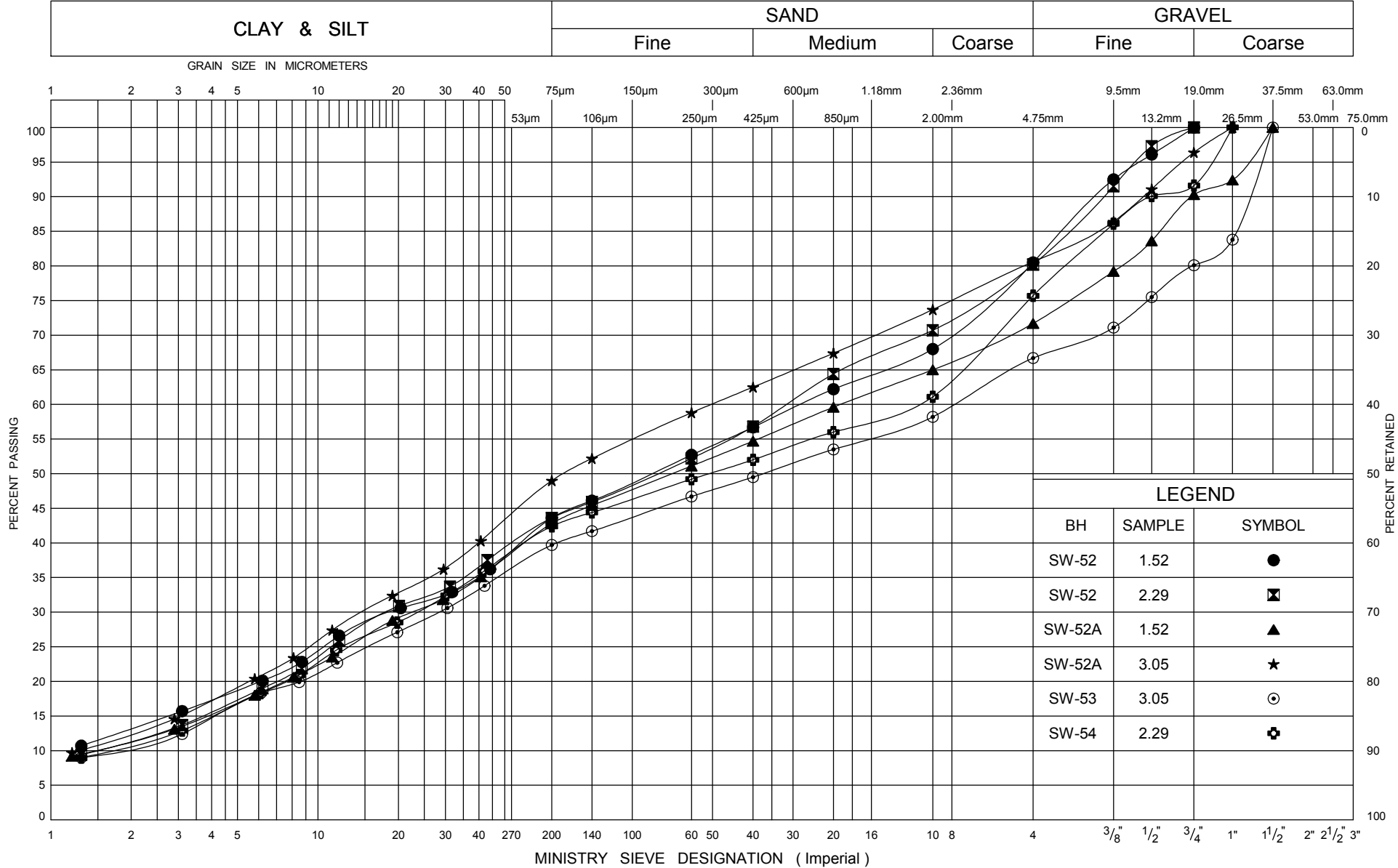
Hwy 26 - Sydenham Townline to Meaford



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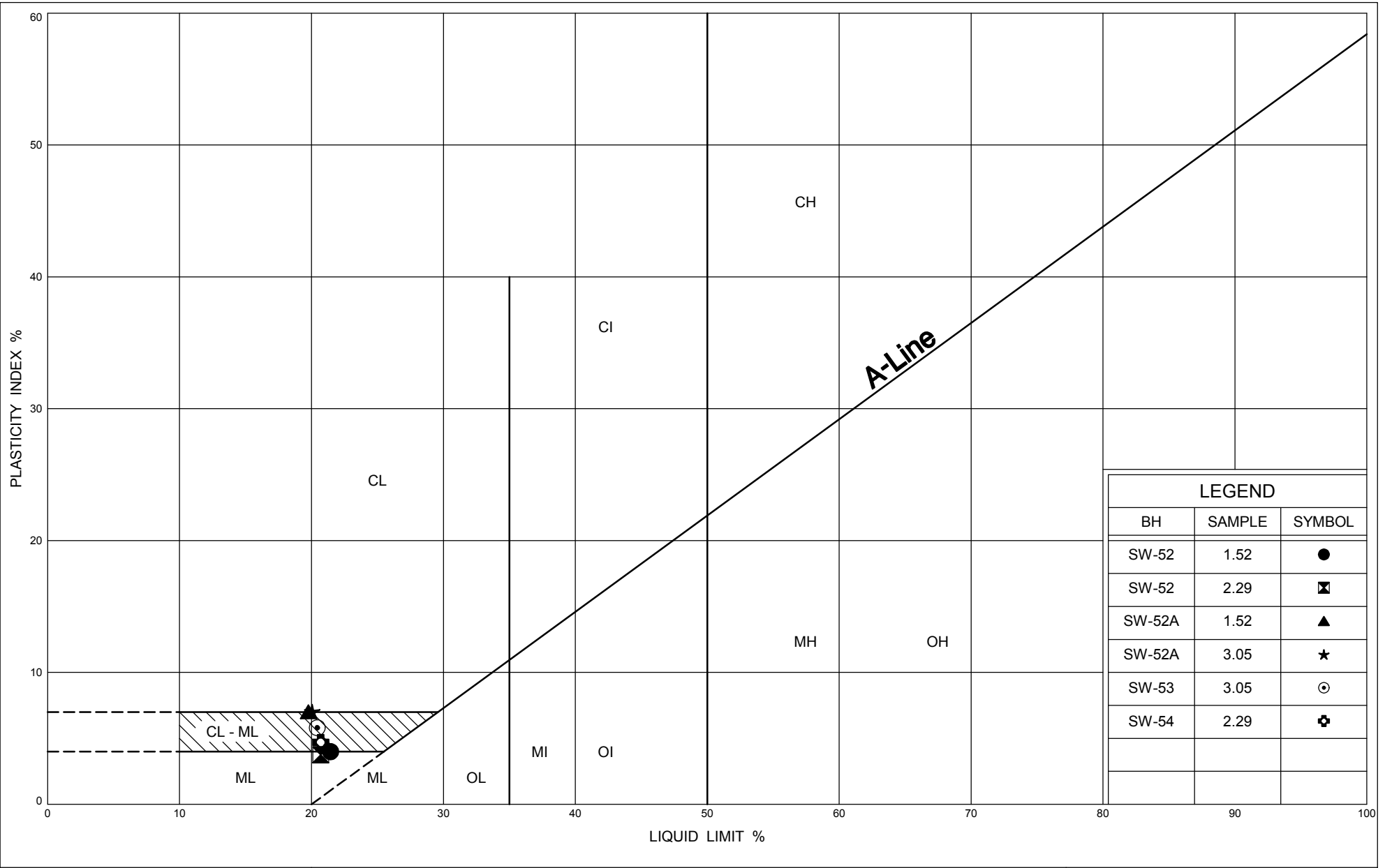
Ontario

UNIFIED SOIL CLASSIFICATION SYSTEM

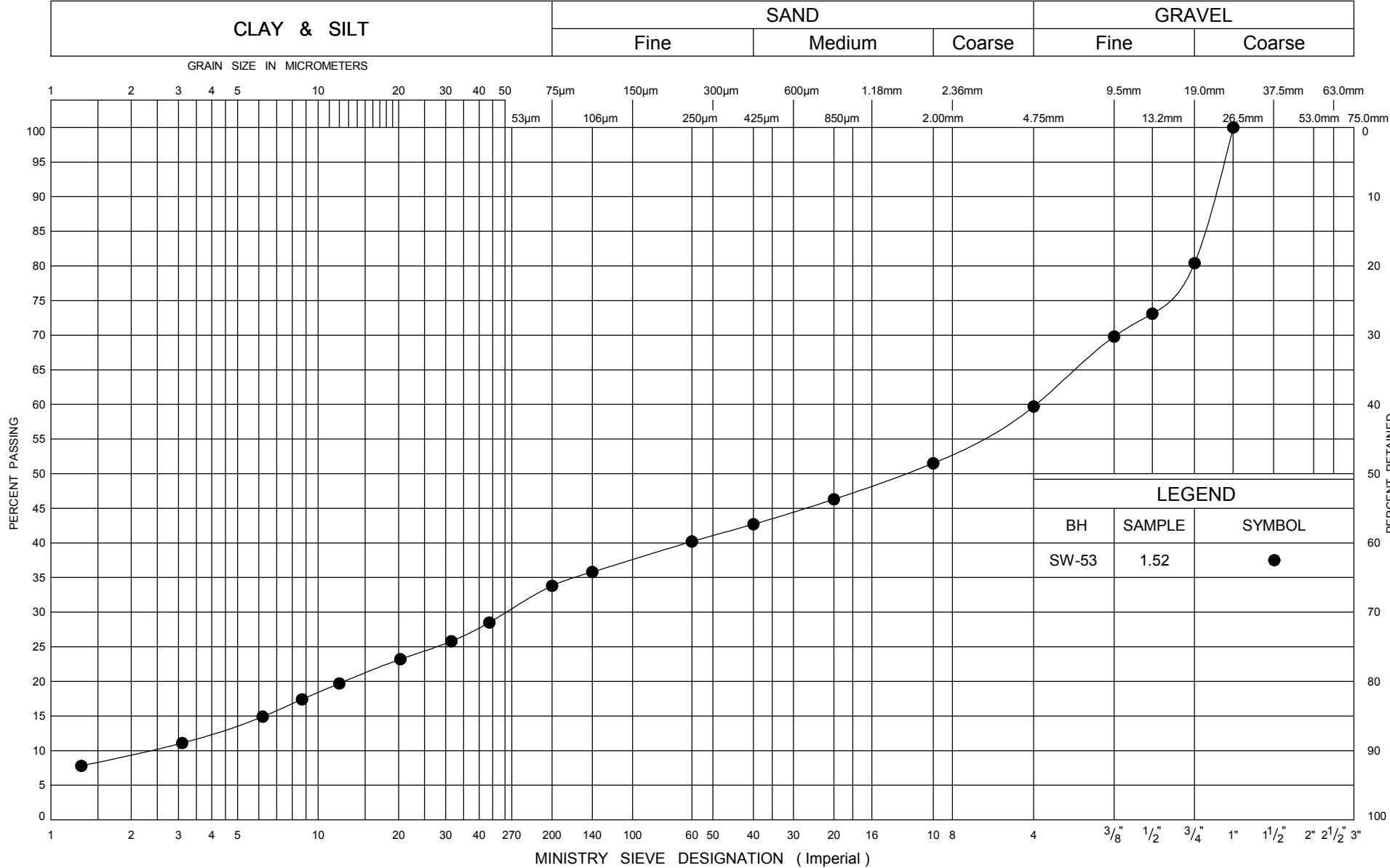


GRAIN SIZE DISTRIBUTION
SAND & SILT TILL, SM-ML

FIG No T1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



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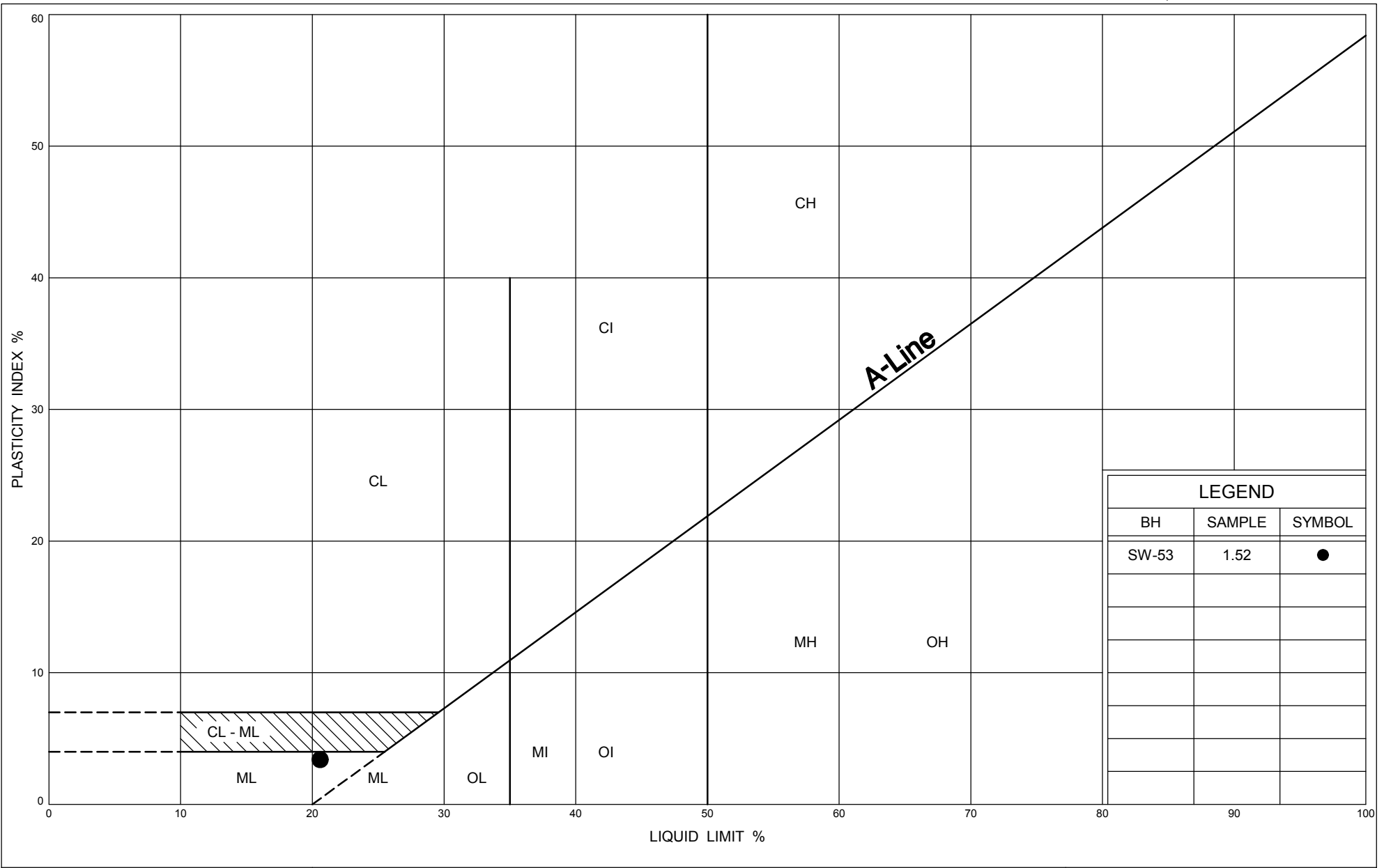


ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 27/10/09

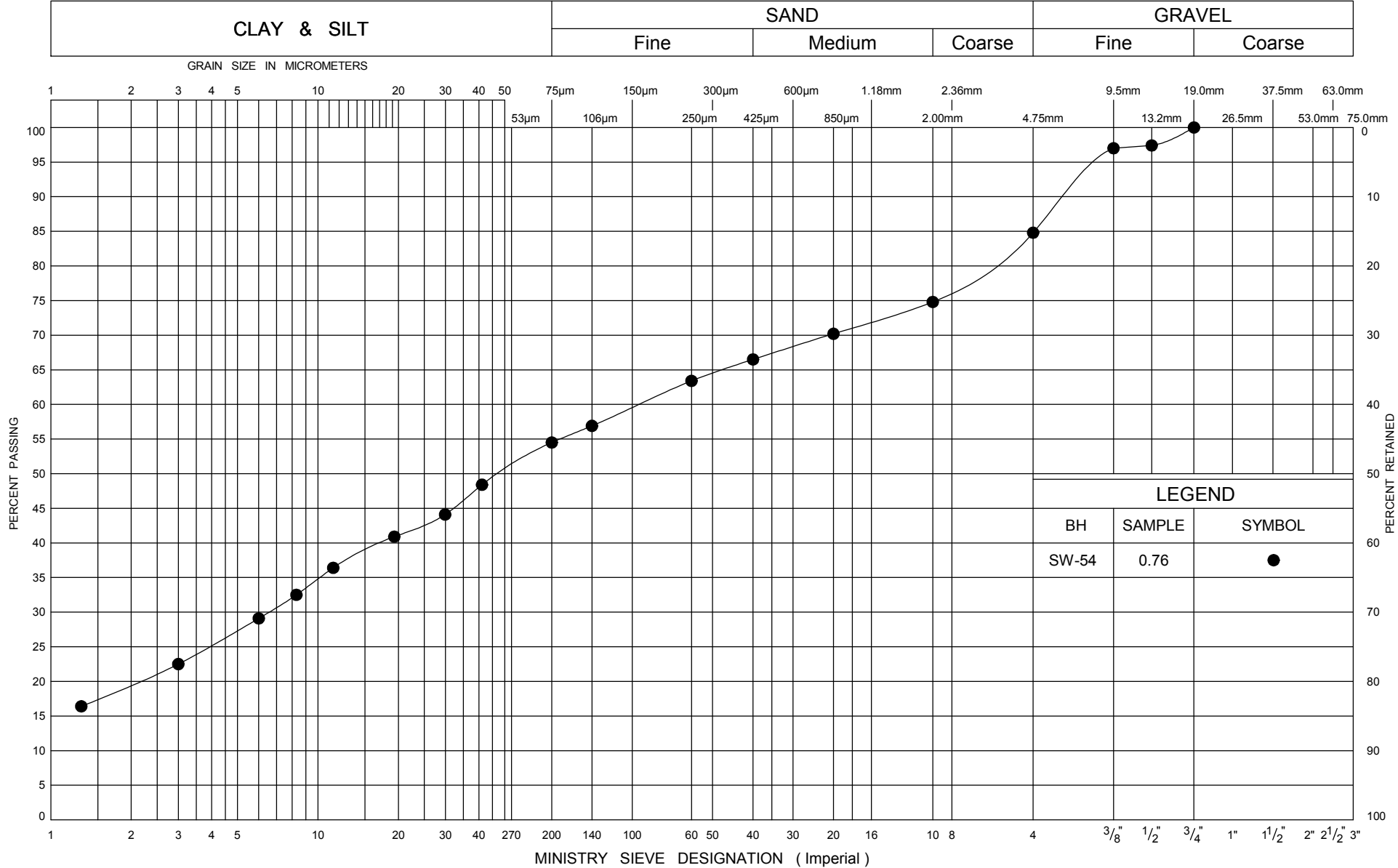


GRAIN SIZE DISTRIBUTION
SILTY SAND GRAVEL LAYER

FIG No T3
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



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GRAIN SIZE DISTRIBUTION
SILTY CLAY POCKET

FIG No T5

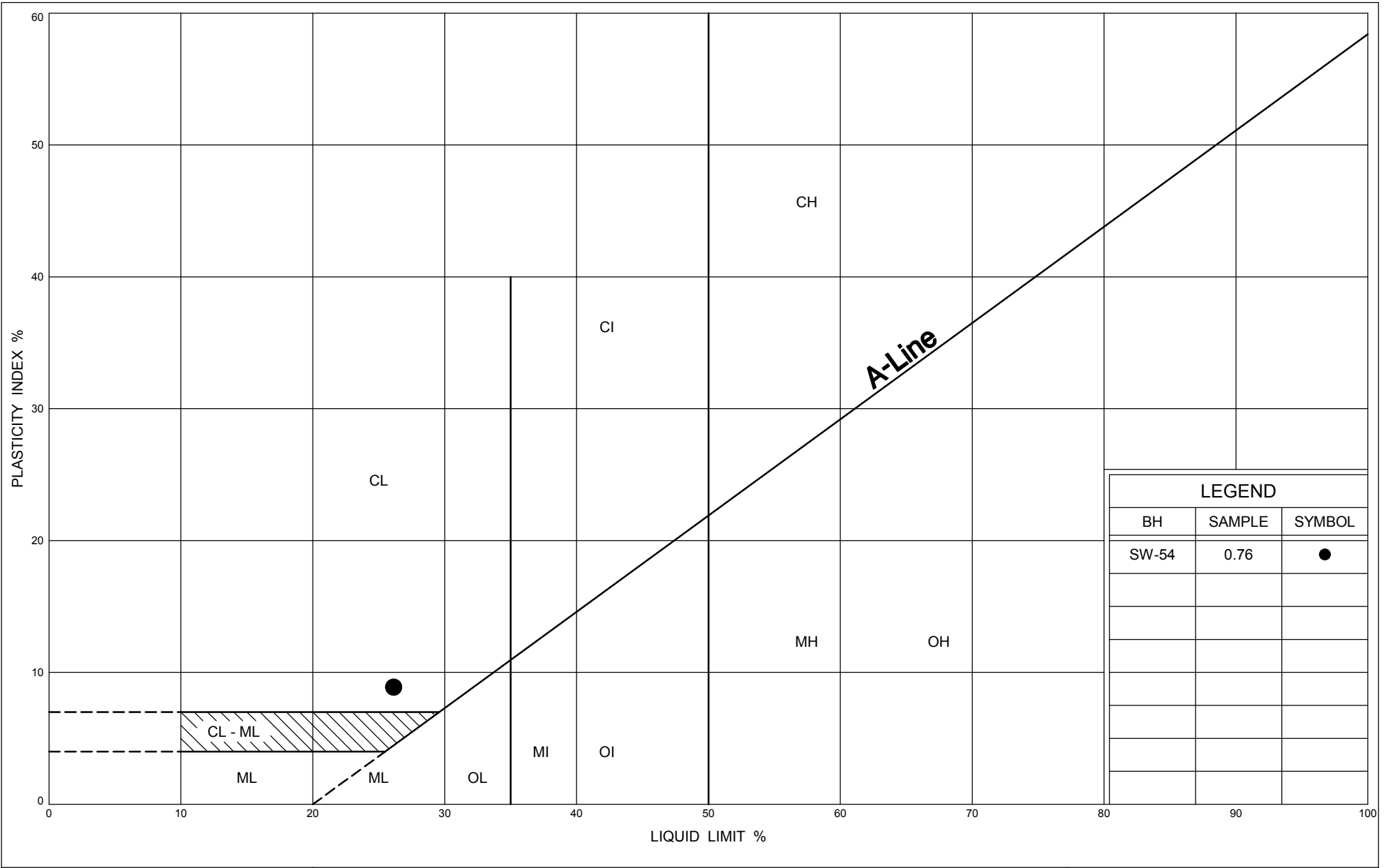
GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

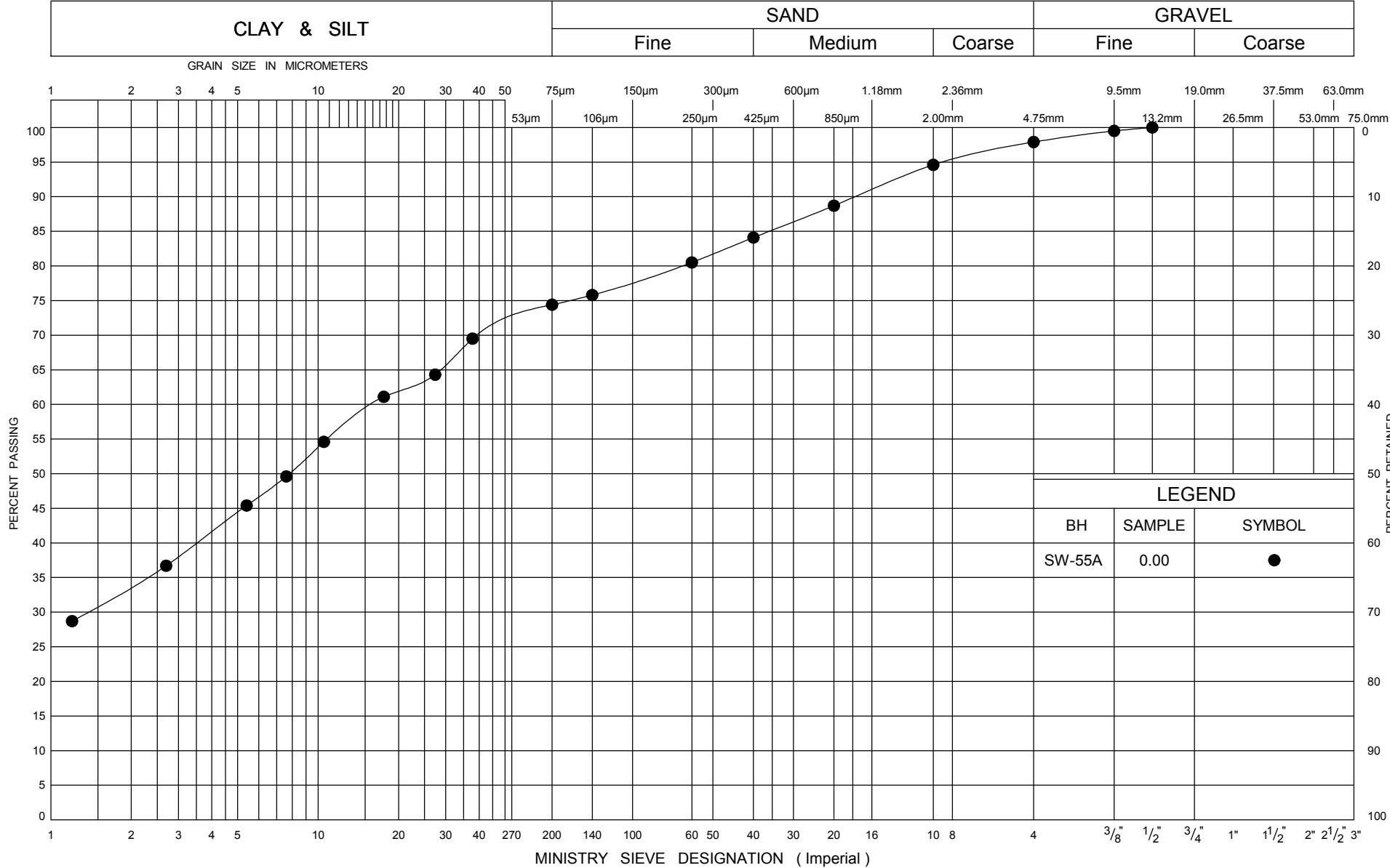


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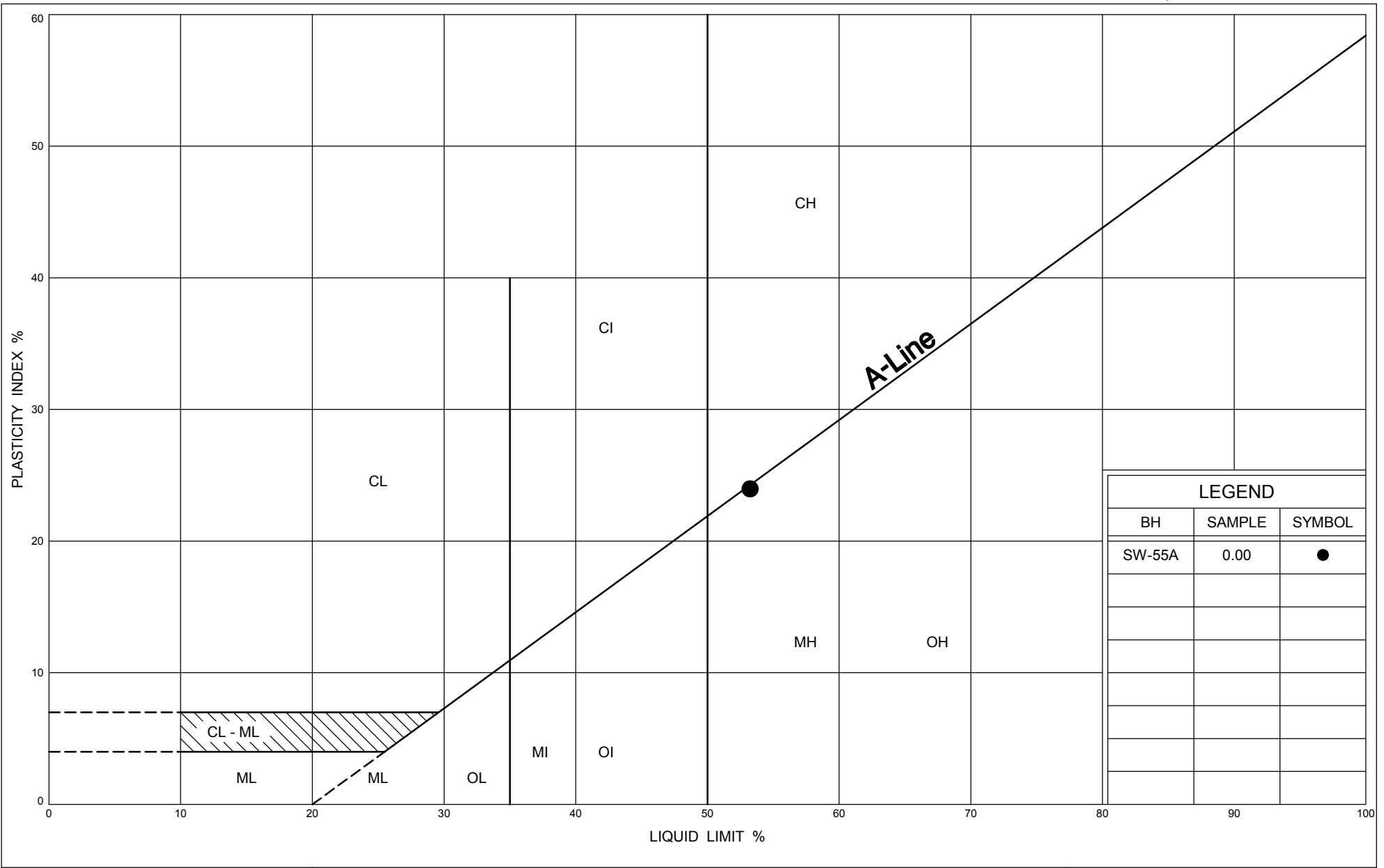


ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 30/10/09

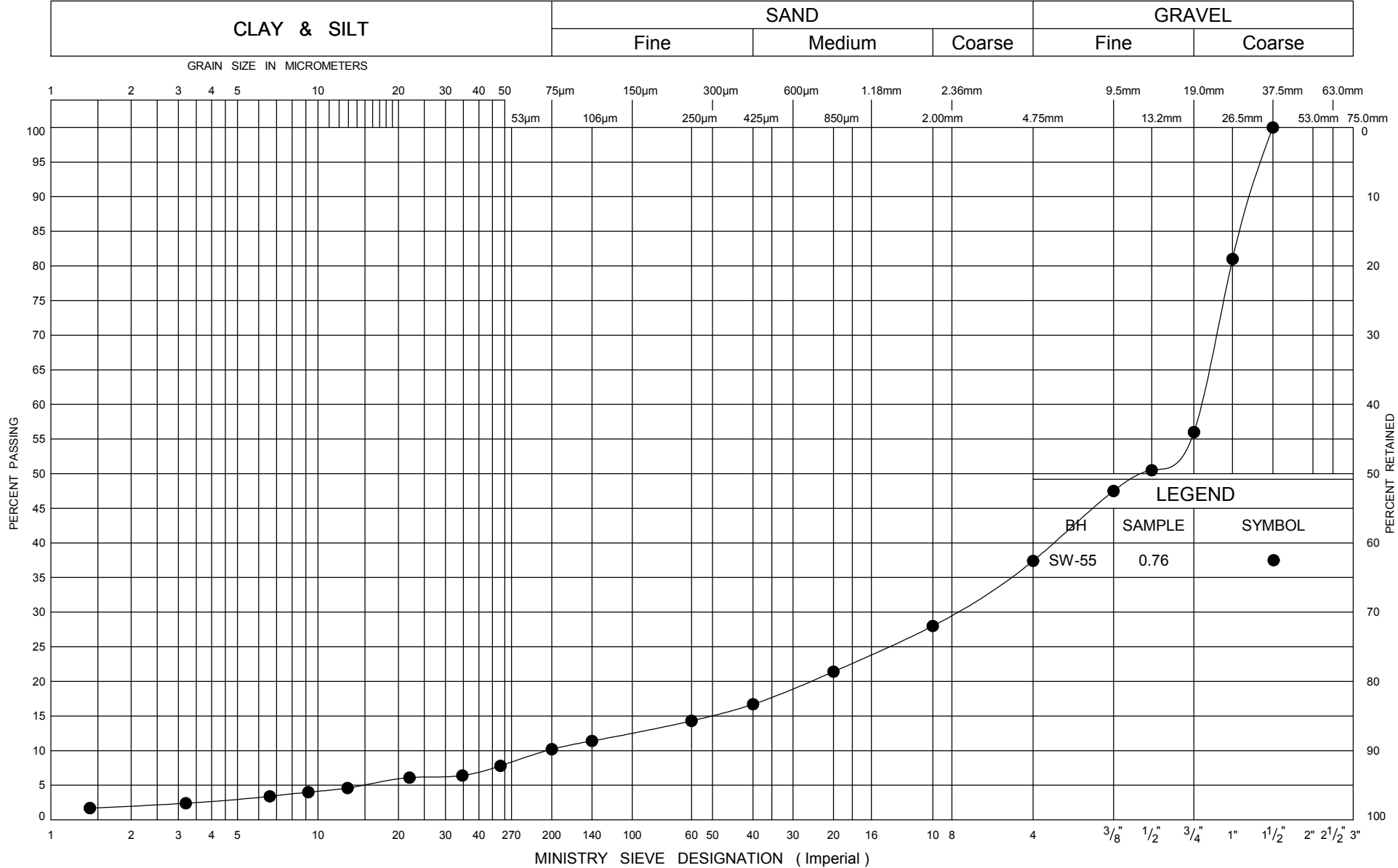


GRAIN SIZE DISTRIBUTION
TOPSOIL FILL

FIG No U1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



UNIFIED SOIL CLASSIFICATION SYSTEM



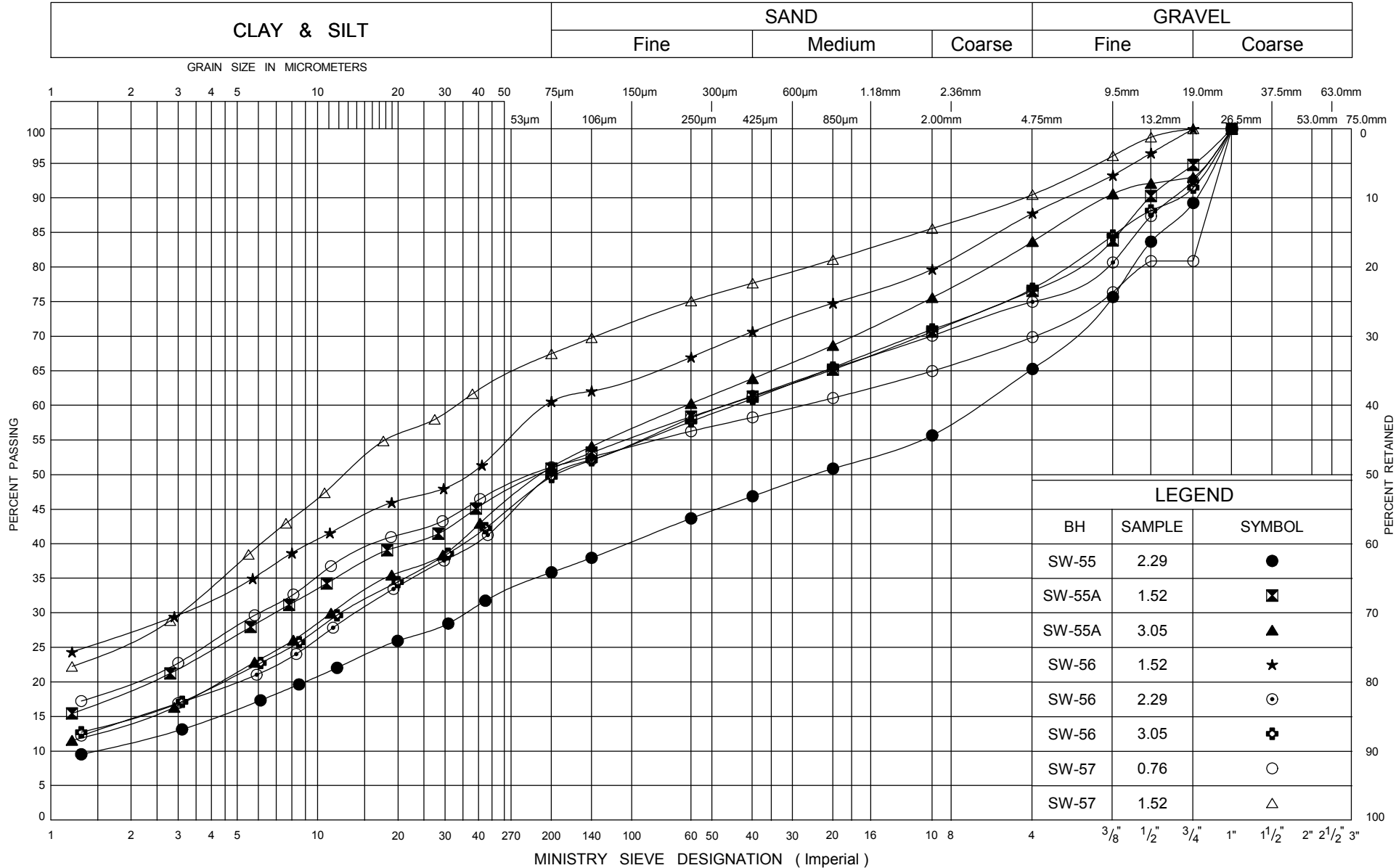
ONTARIO MOT GRAN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO MOT.GDT 30/10/09



GRAIN SIZE DISTRIBUTION
GRANULAR FILL

FIG No U3
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford

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GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No U4

GWP 167-91-00

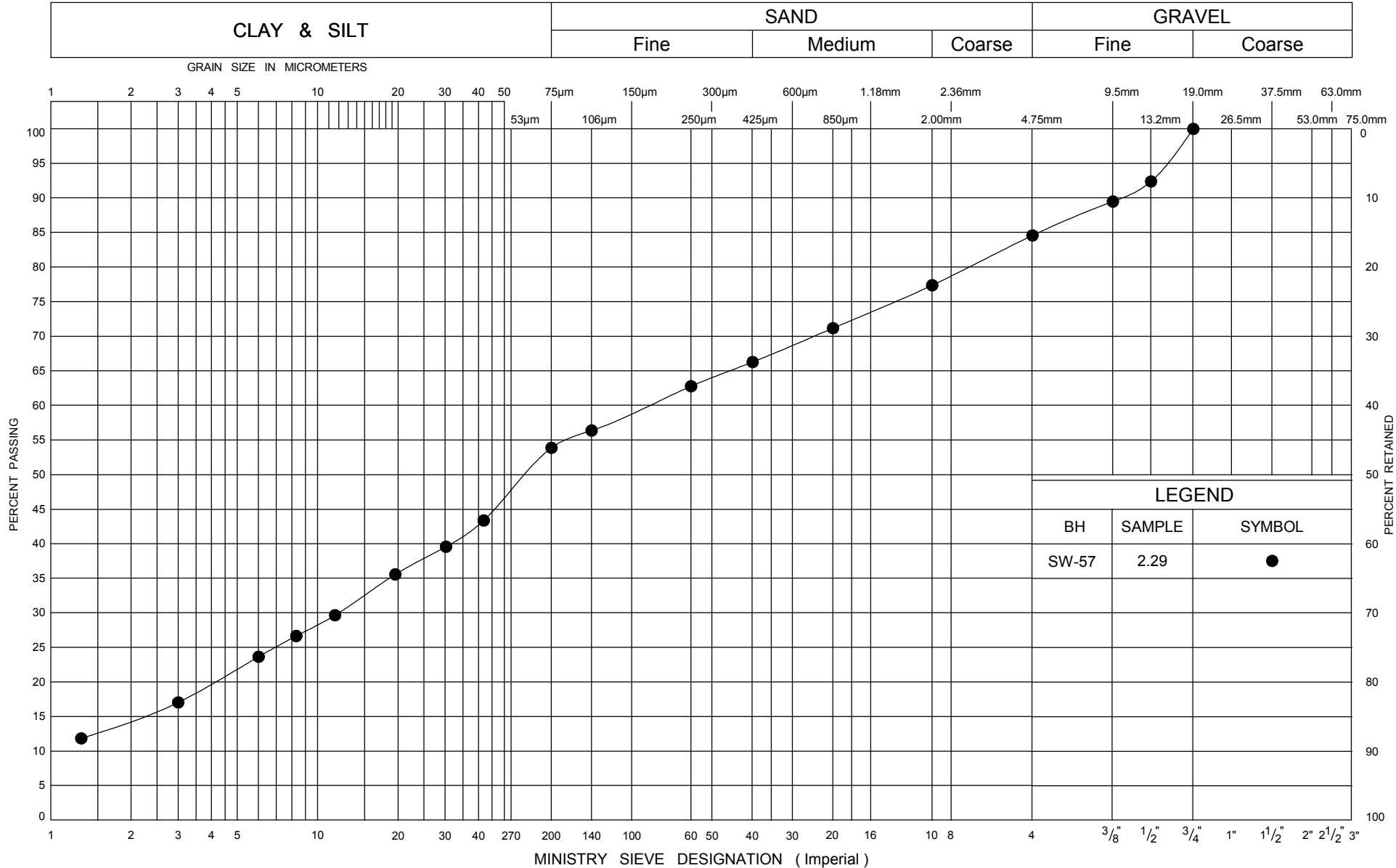
Hwy 26 - Sydenham Townline to Meaford



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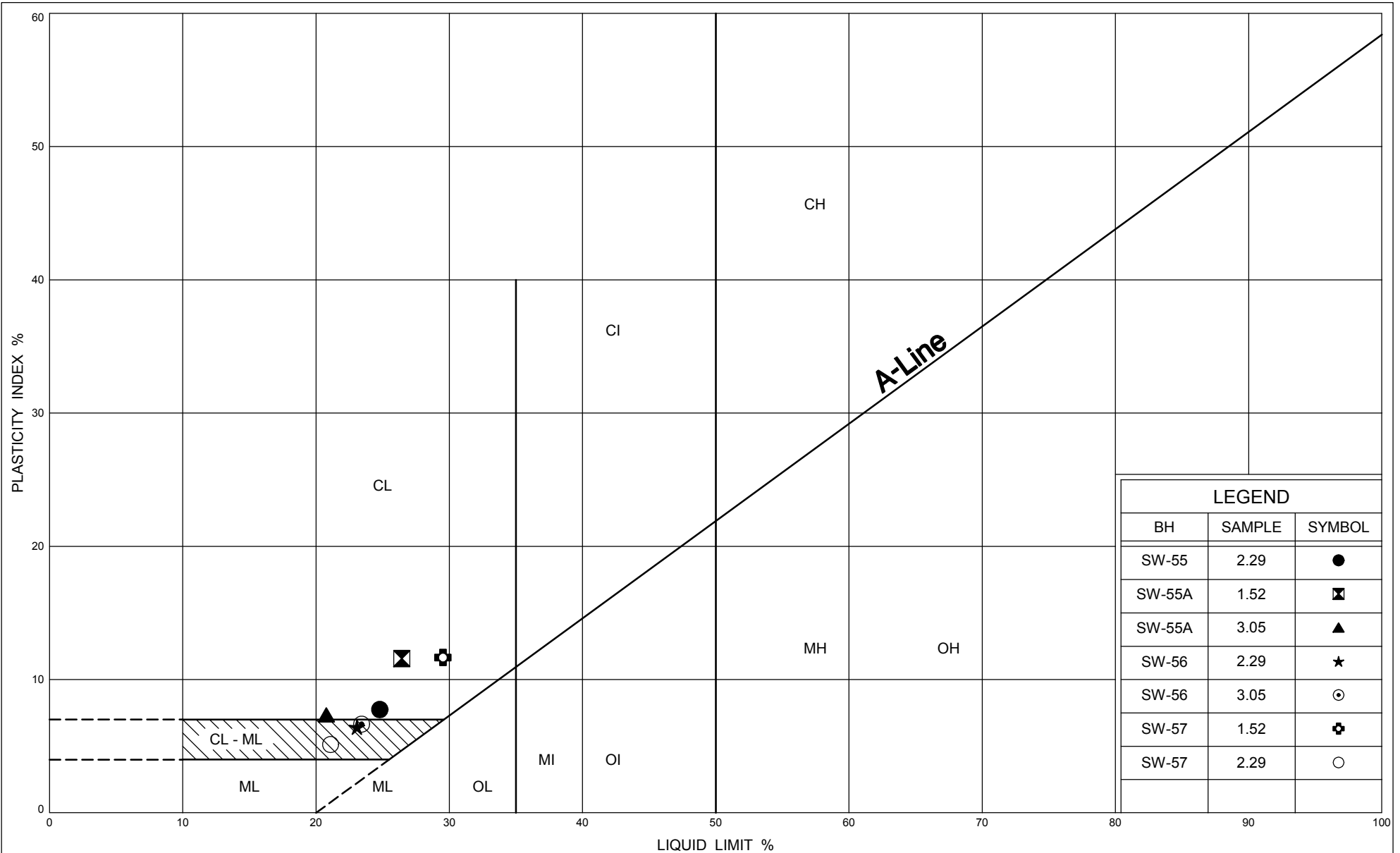
UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No U5
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford





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PLASTICITY CHART

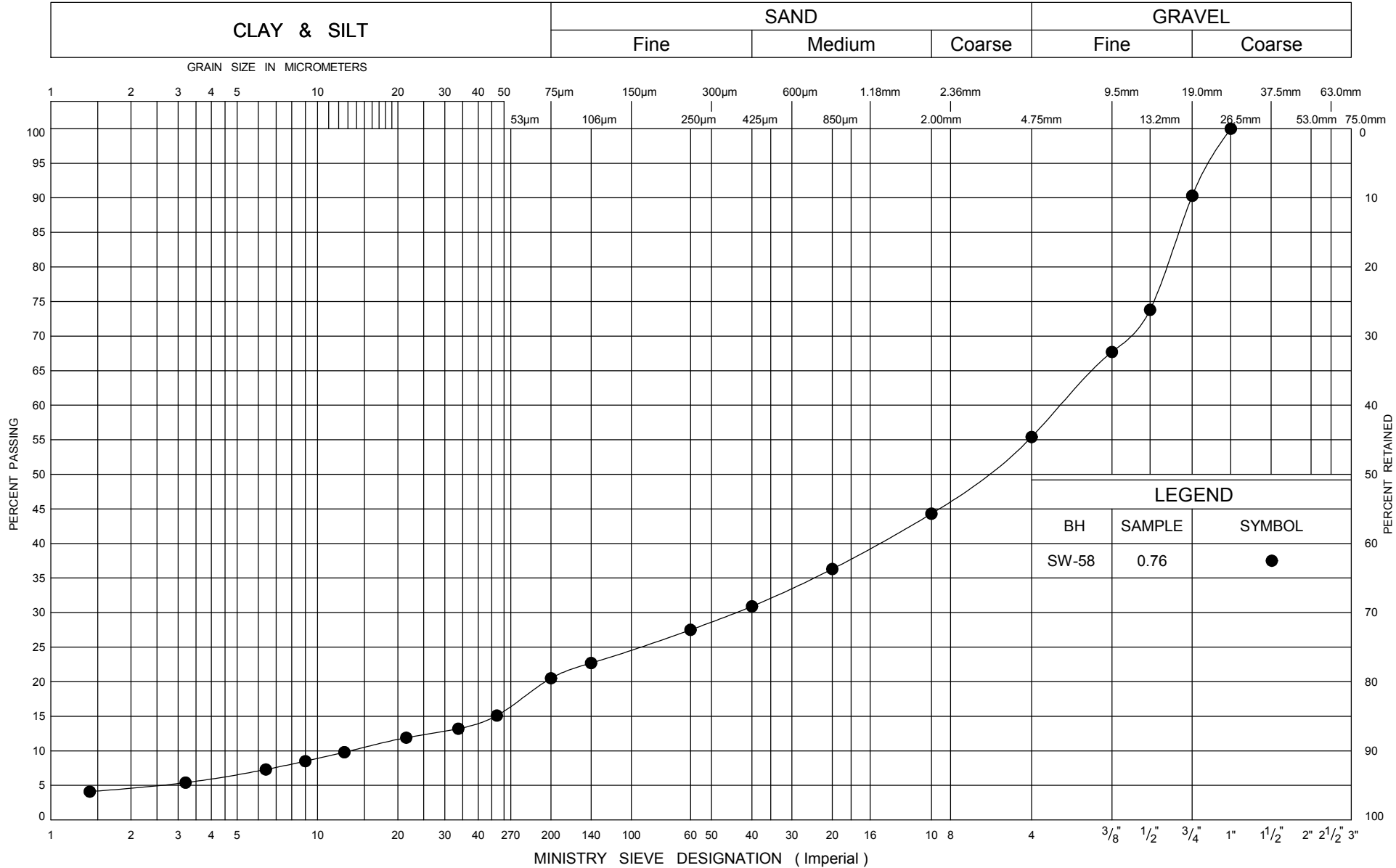
CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No U6

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

UNIFIED SOIL CLASSIFICATION SYSTEM

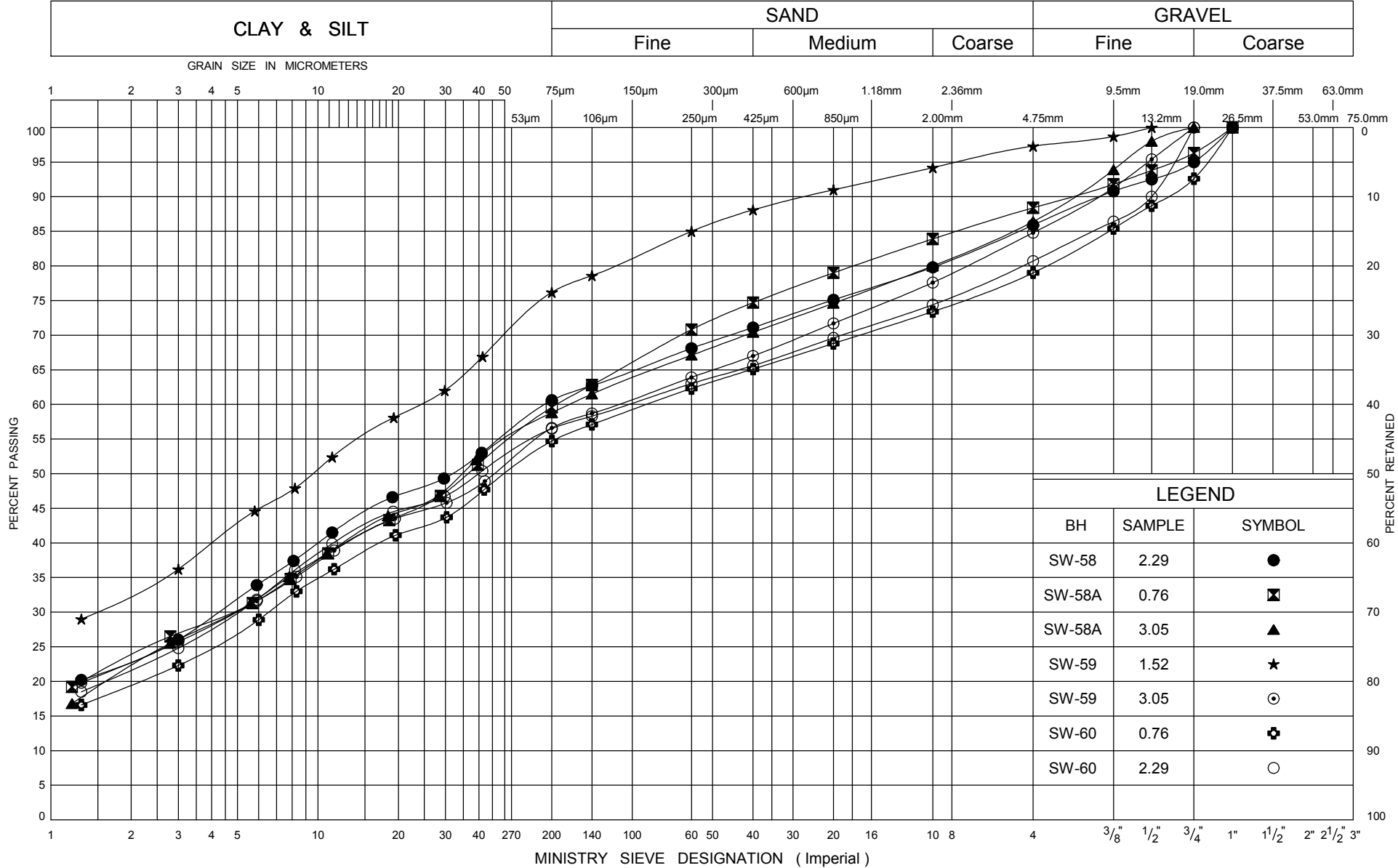


GRAIN SIZE DISTRIBUTION
FILL

FIG No V1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



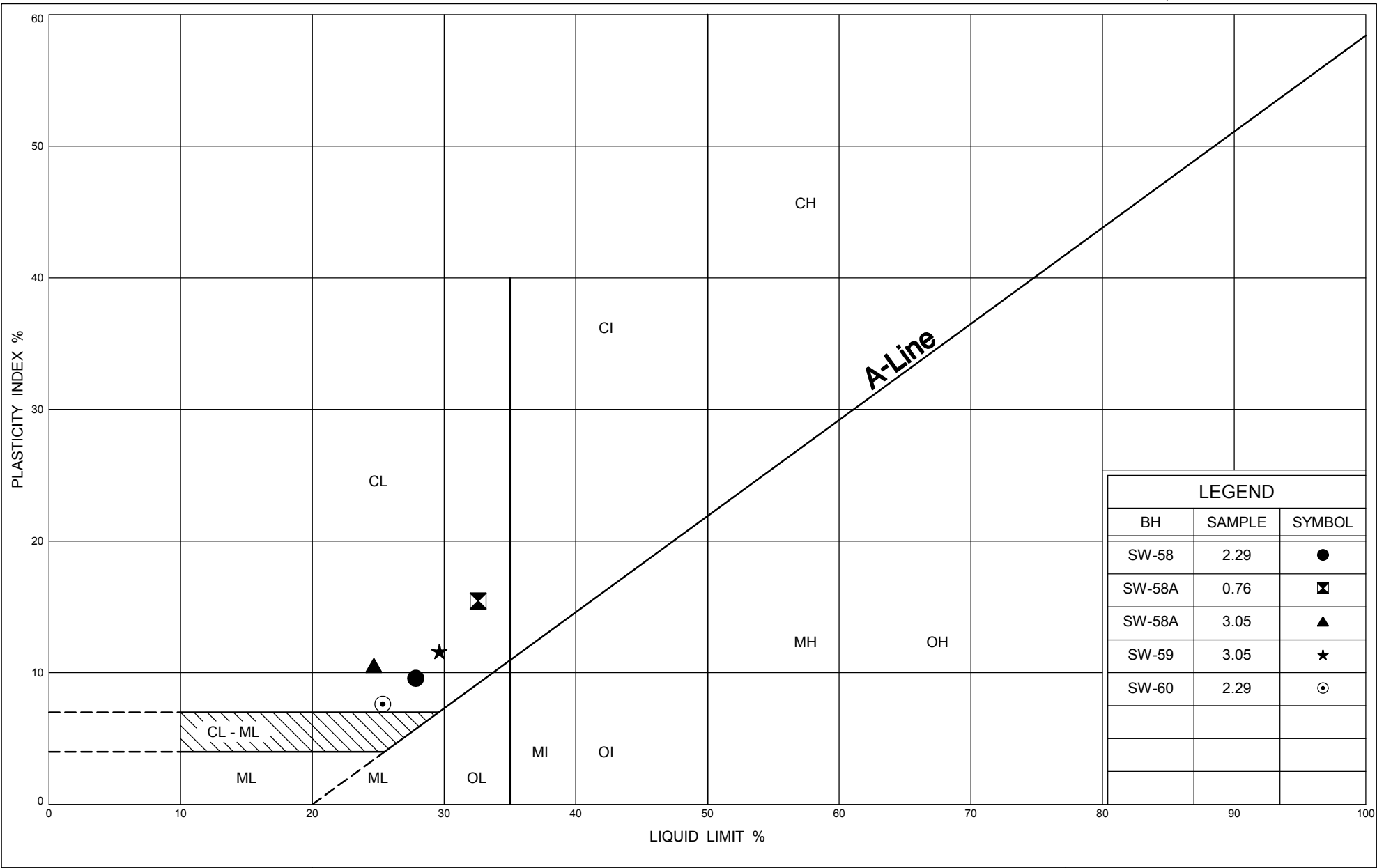
UNIFIED SOIL CLASSIFICATION SYSTEM



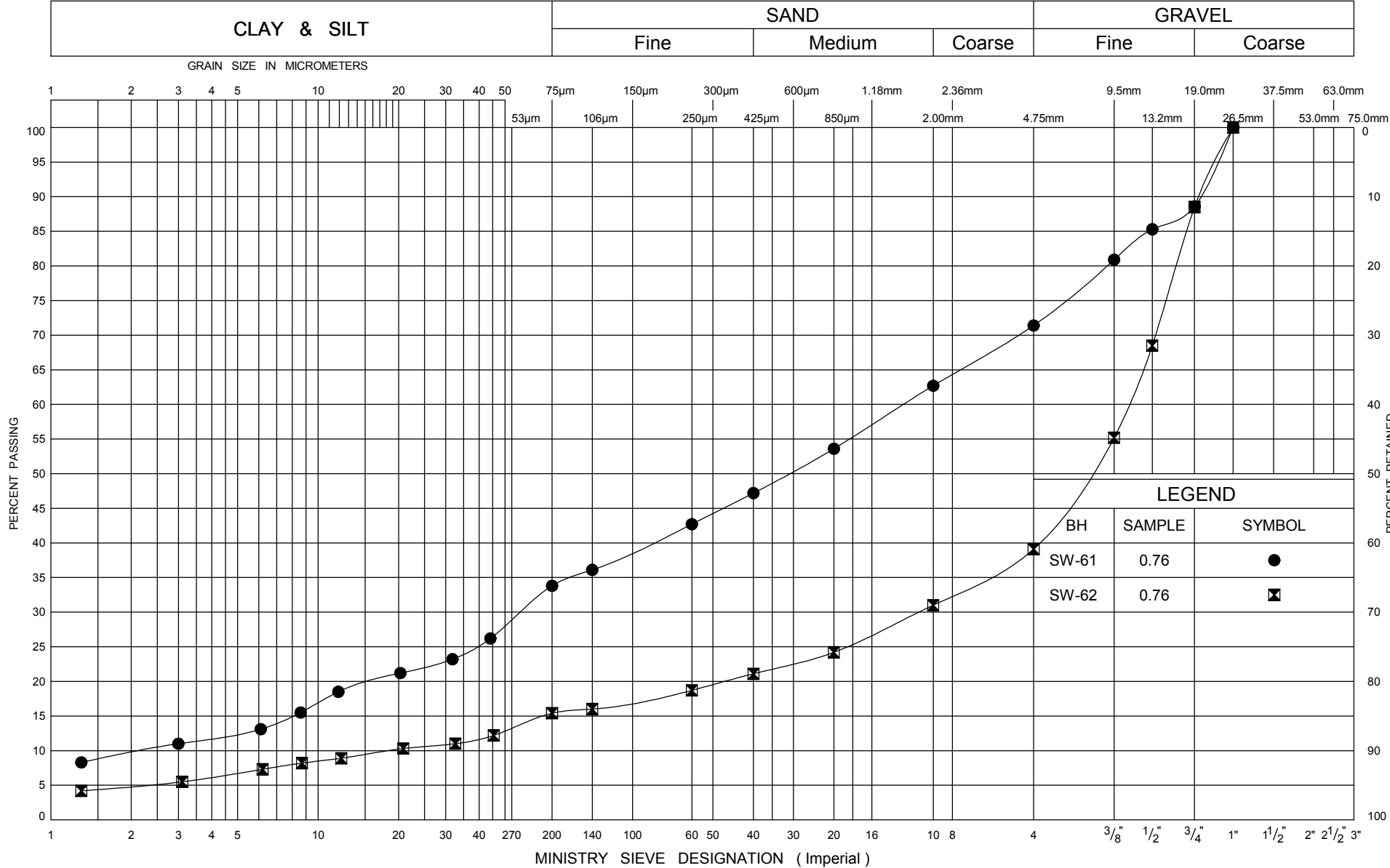
GRAIN SIZE DISTRIBUTION
SILTY CLAY TILL, CL

FIG No V2
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford





UNIFIED SOIL CLASSIFICATION SYSTEM

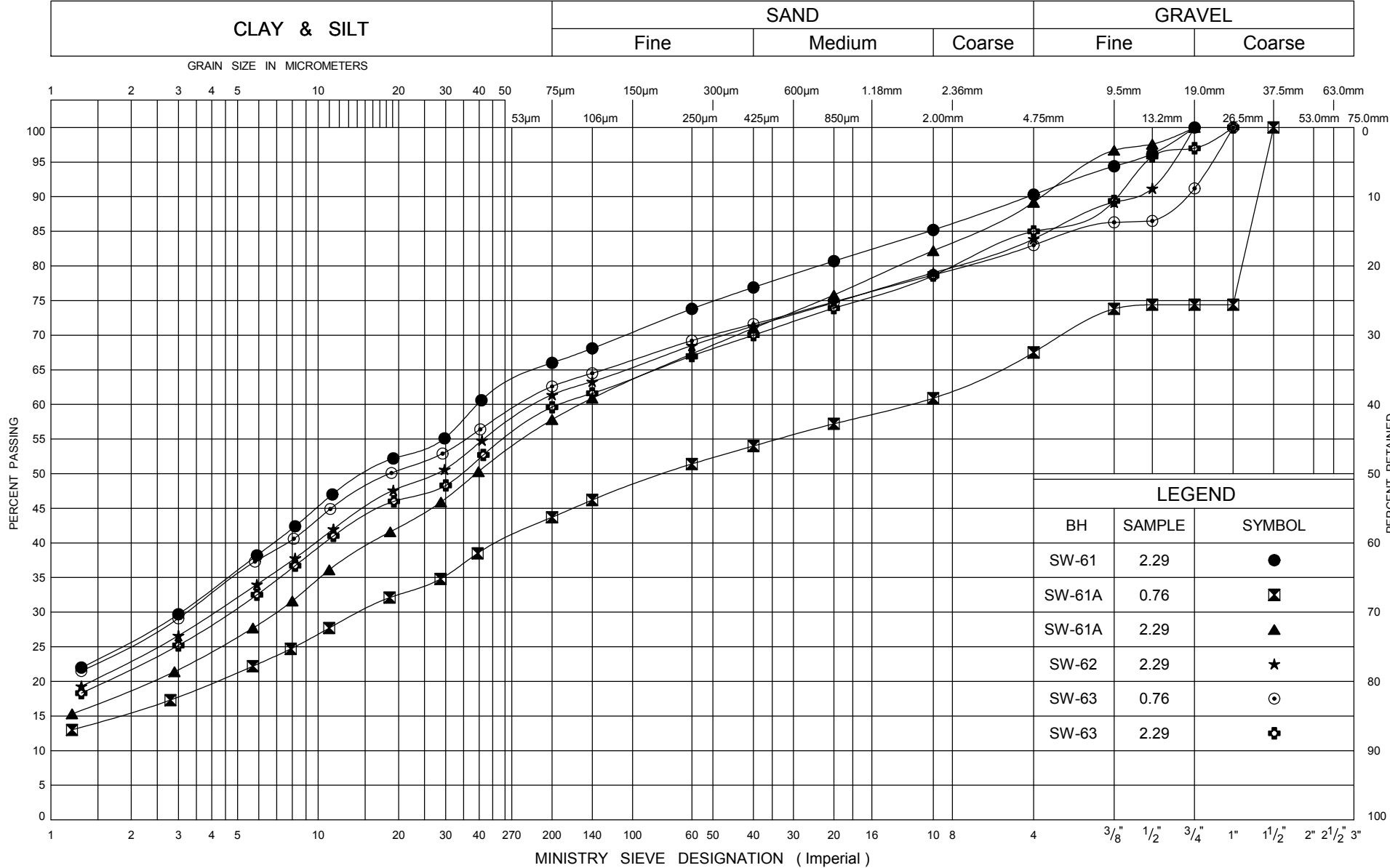


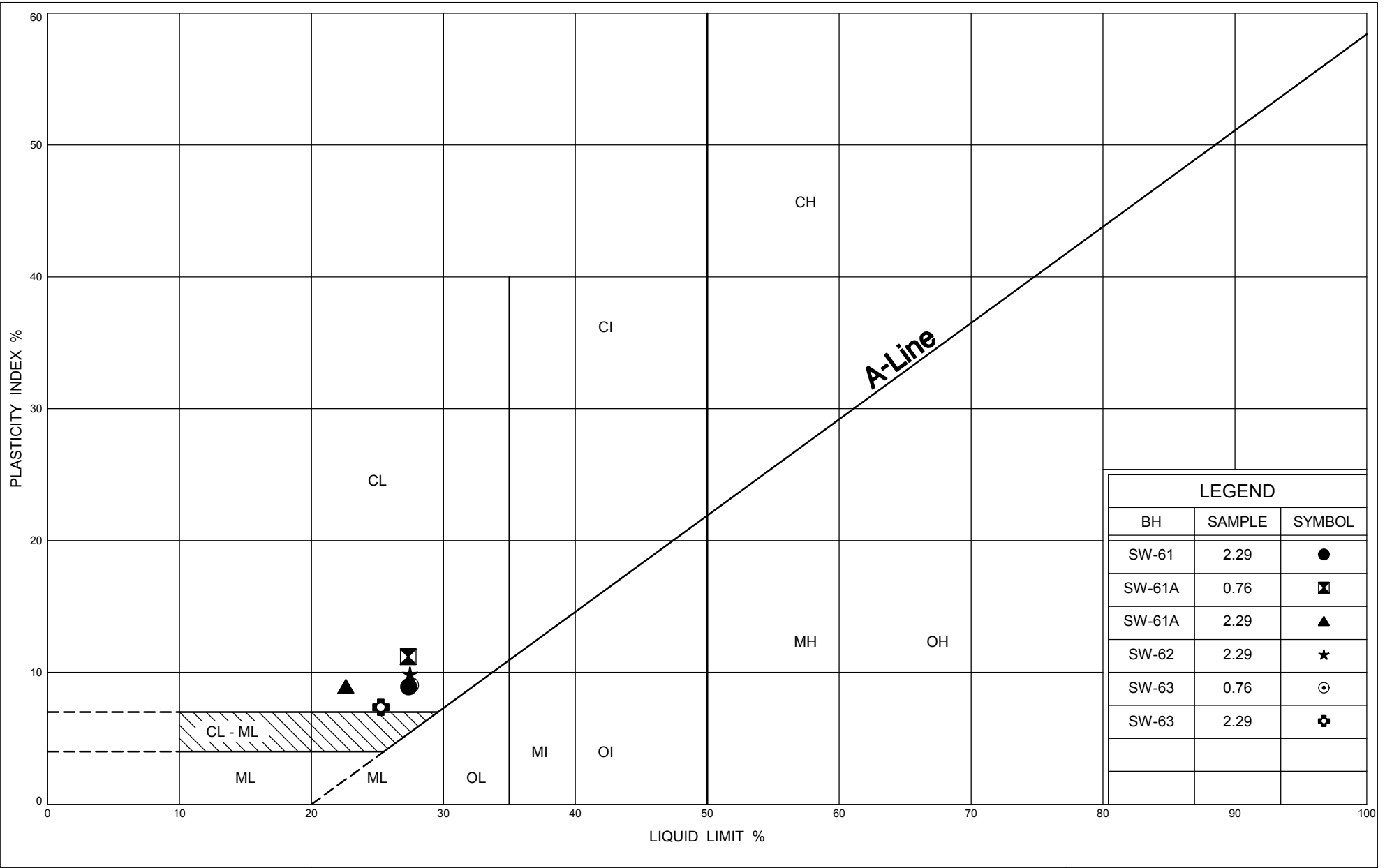
GRAIN SIZE DISTRIBUTION
FILL

FIG No W1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



UNIFIED SOIL CLASSIFICATION SYSTEM





LEGEND		
BH	SAMPLE	SYMBOL
SW-61	2.29	●
SW-61A	0.76	⊠
SW-61A	2.29	▲
SW-62	2.29	★
SW-63	0.76	⊙
SW-63	2.29	⊕



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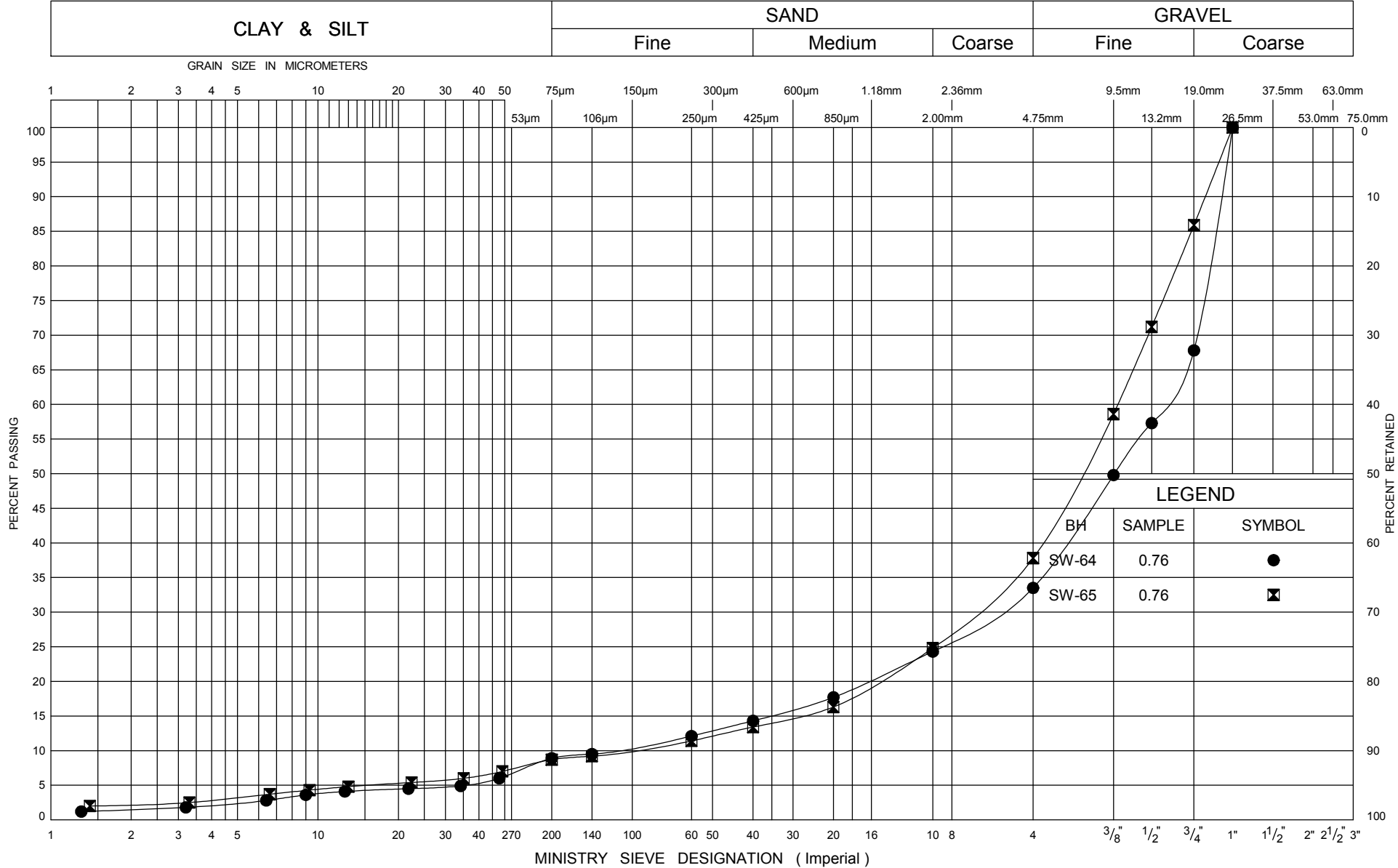
PLASTICITY CHART SILTY CLAY TILL, CL

FIG No W3

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

UNIFIED SOIL CLASSIFICATION SYSTEM

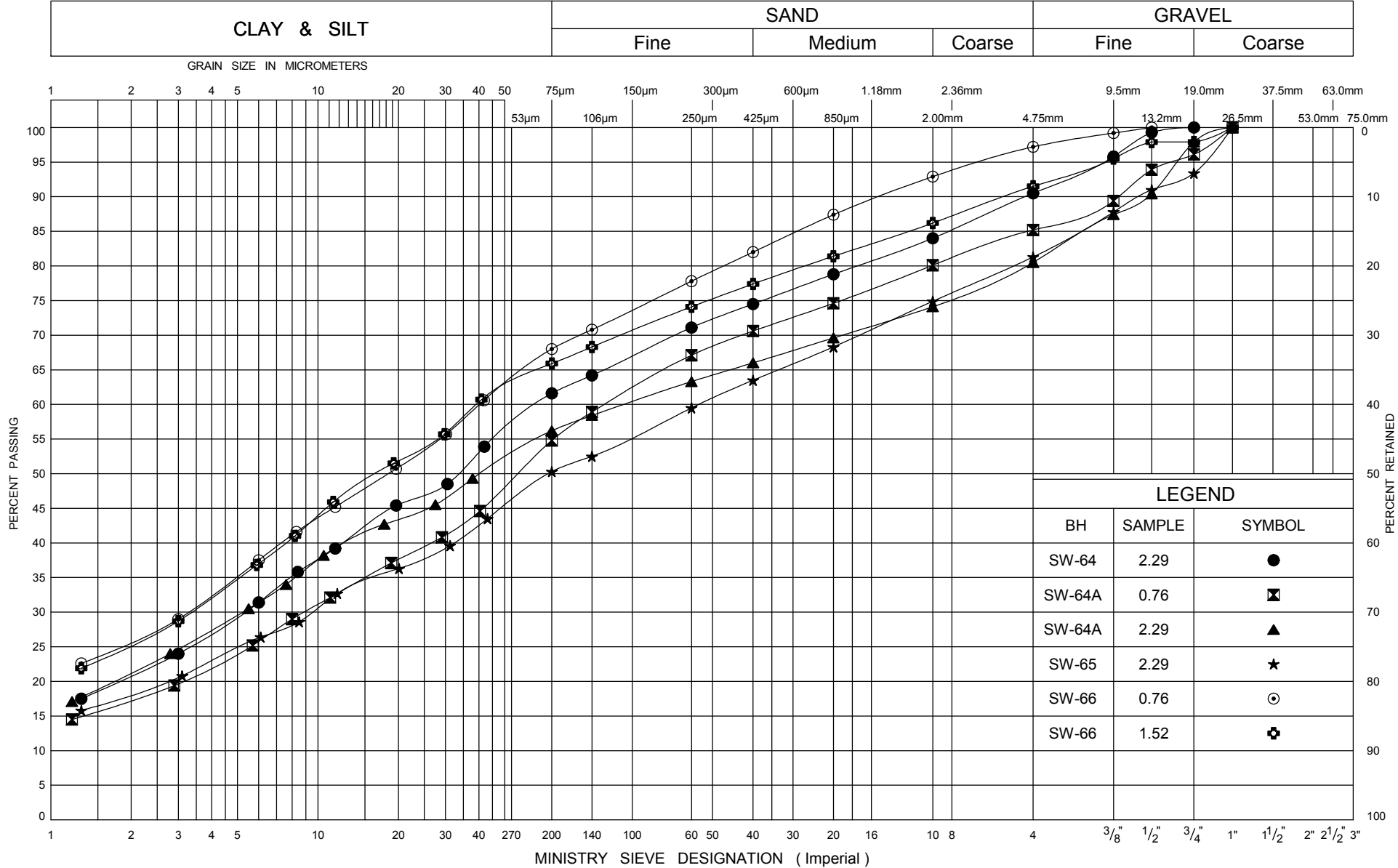


GRAIN SIZE DISTRIBUTION
FILL

FIG No X1
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



UNIFIED SOIL CLASSIFICATION SYSTEM

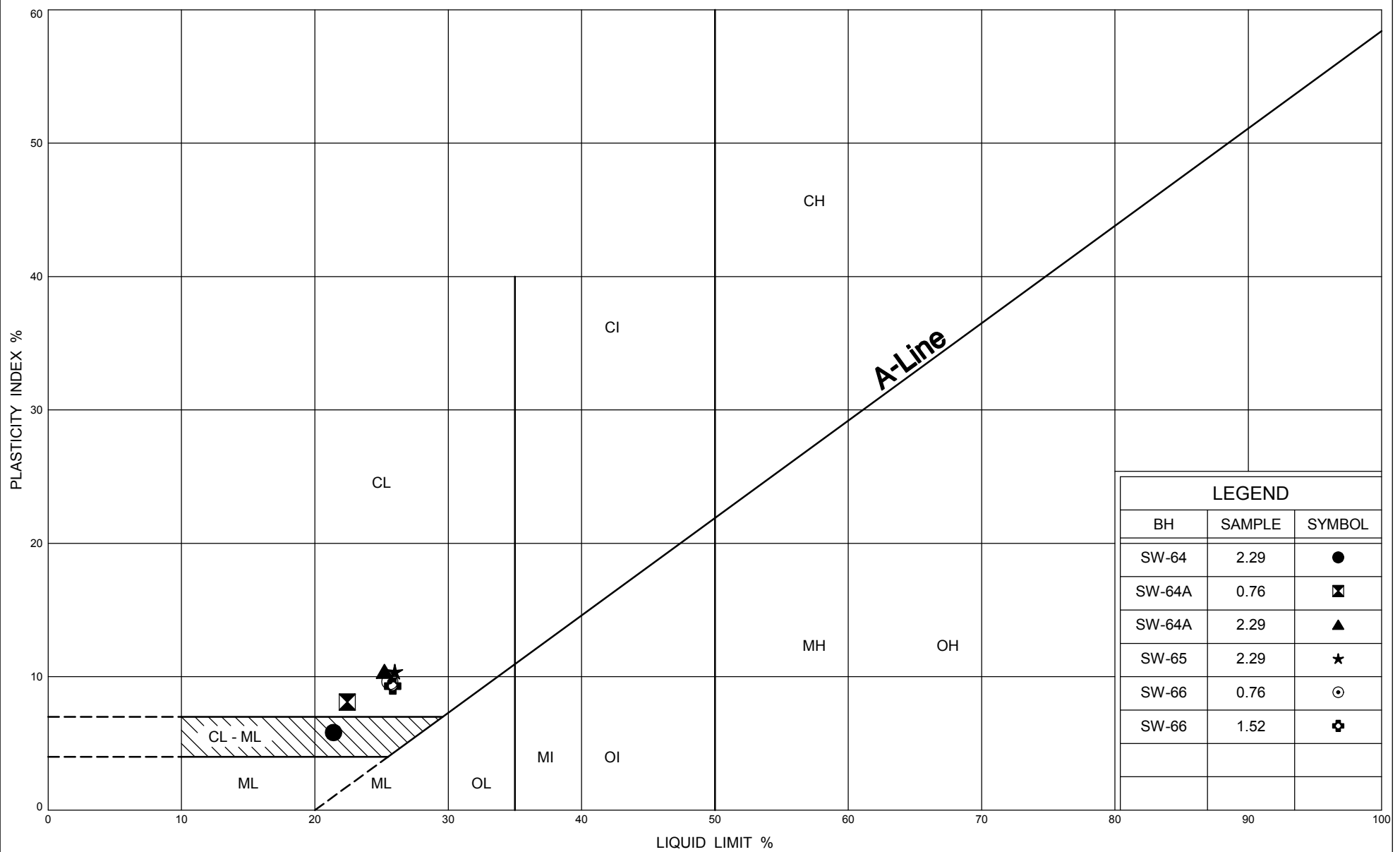


ONTARIO MOT GRAIN SIZE LARGE CULVERTS 07-6-IEG1B.GPJ ONTARIO.MOT.GDT 4/1/09



GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No X2
GWP 167-91-00
Hwy 26 - Sydenham Townline to Meaford



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PLASTICITY CHART CLAYEY SILT TO SILTY CLAY TILL, CL-ML TO CL

FIG No X3

GWP 167-91-00

Hwy 26 - Sydenham Townline to Meaford

Ministry of Transportation/Stantec Consulting Ltd.
G.W.P. 167-91-00 - Rehabilitation of Highway 26
From Former St. Vincent/Sydenham Townline to Meaford
Agreement # 3006-E-0002

07-6-IEG1-SWAMP
Final Report
Appendix C
May 17, 2010

Appendix C

Limitations of Report

APPENDIX C

LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the testhole locations. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Soils Engineer be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the testholes.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of testholes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusion as to how the subsurface conditions may affect their work.

The benchmark and elevations mentioned in this report were obtained strictly for use in the geotechnical design of the project and by this office only, and should not be used by any other parties for any other purposes.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Infrastructure Engineering Group Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This report does not reflect the environmental issues or concerns unless otherwise stated in the report.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, IEG recommends that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

Ministry of Transportation/Stantec Consulting Ltd.
G.W.P. 167-91-00 - Rehabilitation of Highway 26
From Former St. Vincent/Sydenham Townline to Meaford
Agreement # 3006-E-0002

07-6-IEG1-SWAMP
Final Report
Appendix D
May 17, 2010

Appendix D

Site Photographs



SWAMP SECTION – General View, West End Looking East



SWAMP SECTION – General View, East End Looking West



SWAMP SECTION – North Embankment Looking West from East End



SWAMP SECTION – South Embankment Looking West from East End



SWAMP SECTION – South Embankment Looking West from Middle



SWAMP SECTION – North Embankment Looking West from Middle



SWAMP SECTION – South Embankment High Fill Area Looking West



SWAMP SECTION – North Embankment High Fill Area Looking West



SWAMP SECTION – South Embankment High Fill Area, West End



SWAMP SECTION – North Embankment High Fill Area, West End



Cut Area – South Embankment at West end of Swamp Section



Cut Area – North Embankment at West end of Swamp Section