

Terraprobe

Consulting Geotechnical & Environmental Engineering

Construction Materials Inspection & Testing

**Final
FOUNDATION INVESTIGATION REPORT
QUEEN ELIZABETH WAY - BRIDGE LIFT SYSTEM
BURLINGTON, ONTARIO**

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1.0 INTRODUCTION

Terraprobe Inc. (Terraprobe) has been retained by IBI Group (IBI), to provide foundation engineering services in support of two pole mounted Variable Message Signs (VMS) that are to be installed on the Queen Elizabeth Way, in the vicinity of the Burlington Lift Bridge, Burlington, Ontario.

The scope of work for the foundation engineering services is outlined in Terraprobe's proposal titled *"Proposal for Geotechnical Engineering Services Pole Mounted Variable Message Signs Queen Elizabeth Way, Burlington, Ontario"* dated December 22, 2020. This report provides factual data on the subsurface conditions at the site.

2.0 SITE DESCRIPTION

The site is located at the Queen Elizabeth Way, Burlington, Ontario. It consists of two main locations where the poles will be deployed: a) at approximately 200 m south of the North Shore Boulevard East - Queen Elizabeth Way interchange, at the Queen Elizabeth Way, and b) at approximately 2.0 km south of the Burlington Canal, at the Queen Elizabeth Way. For reporting purposes throughout the body of this report, Queen Elizabeth Way is assumed to be orientated in a north and south direction at this section. The approximate borehole locations are shown in Drawing 1 (Borehole Location Plan).

3.0 INVESTIGATION PROCEDURES

The field work for this project was carried out on February 8, 2023, and February 10, 2023. Two boreholes numbered Borehole No.1 (BH1) and Borehole No.2 (BH2) were drilled and sampled to a depth of 15.8 m and 9.8 m below ground surface, respectively at the approximate locations shown on Appendix A. The boreholes were marked in the field by Terraprobe's staff in relation to existing features. The boreholes were also surveyed for coordinates and geodetic elevation with a Trimble R10 Receiver connected to the Global Navigation Satellite System. This data is summarized in the following table.

Borehole No.	UTM NAD 83 Coordinates (Zone 17)		Ground Surface Elevation (m)	Borehole Depth (m)
	Northing (m)	Easting (m)		
BH 1	4 796 332.9	596 822.4	79.0	15.8
BH 2	4 792 713.7	598 410.4	77.7	9.8

The boreholes were drilled with a truck mounted drill rig supplied and operated by a specialist drilling contractor. Terraprobe's staff observed and recorded the drilling, sampling and in situ testing operations and logged the boreholes.

Samples of the overburden soils were generally obtained at intervals of 0.75 m and 1.5 m depth using a 50 mm outer diameter (O.D.) split-spoon sampler in conjunction with the Standard Penetration Testing (SPT) procedures as specified in ASTM Method D 1586¹. Ground water conditions in the open boreholes were observed during the drilling operations.

The recovered soil samples were subjected to Visual Identification (VI) and select soil samples were also subjected to a laboratory testing programme consisting of natural moisture content, grain size distribution

¹ASTM D1586 – Standard Test Method for Standard Penetration Tests and Split Barrel Sampling of Soils.

analyses and Atterberg limits determinations in accordance with MTO and/or ASTM Standards as appropriate. Soil samples were submitted to Eurofins for chemical testing. The Laboratory testing Results can be found in Appendix B.

4.0 SUBSURFACE CONDITIONS

Reference is made to the Log of Borehole Sheets in Appendix A. Details of the encountered soil stratigraphy are presented in this appendix. An overall description of the stratigraphy is given in the following paragraphs.

The stratigraphic boundaries shown on the Log of Borehole Sheets and on the interpreted stratigraphic section are inferred from non-continuous soil sampling and therefore represent transitions between soil types rather than exact planes of geological change. The subsurface conditions will vary between and beyond the borehole locations.

4.1 Subsoil Conditions

In summary, borehole No.1 (BH1) encountered fill layers consisting of gravelly sand, overlaying native soils with variable composition consisting of silty clay, sand, clayey silt (with organic inclusion), and silty sand to sandy silt. Borehole No.2 (BH2) encountered a gravelly sand fill layer, overlaying sand to sand and gravel deposits. A more detailed description of the subsurface conditions is provided in the following sections.

4.1.1 Fill – Gravelly sand

Gravelly sand fill material was encountered from ground surface at Borehole Nos. 1 and 2. The thicknesses of the gravelly sand are summarized in the following table.

Borehole No.	Fill Thickness (m)
BH 1	2.5
BH 2	2.3

A Standard Penetration tests carried out in the gravelly sand fill, measured SPT N-values ranging from 4 blows to 40 blows for 0.3 m of penetration, indicating a loose to dense relative density. The natural water content of seven samples within this layer ranged between 4% and 9% by weight.

Grain size distribution test was carried out on one sample of the gravelly sand fill material and the grain size distribution curves are illustrated in Appendix B. The results show a grain size distribution consisting of 36% gravel, 50% sand, 11% silt, and 3% clay size particles.

4.1.2 Silty clay

Silty clay material was encountered at Borehole 1 below the top gravelly sand fill, and at deeper elevations. The locations, thicknesses, depths and base elevations of the silty clay are summarized in the following table.

Borehole No. 1	Thickness (m)	Depth (m)	Base Elevation (m)
Silty clay (upper layer)	1.9	2.5 to 4.4	74.6
Silty clay (lower layer)	1.5	8.7 to 10.2	68.8

Standard Penetration tests carried out in the silty clay material measured SPT N-values ranging from 3 blows to 23 blows for 0.3 m of penetration, indicating a soft to very stiff consistency. The moisture content of samples of the silty clay layers ranged between 12% to 38%.

Grain size distribution test was carried out on both samples of the silty clay material and the grain size distribution curves are illustrated in Appendix B. The results for the upper layer show a grain size distribution consisting of 7% gravel, 22% sand, 31% silt, and 40% clay size particles, while the lower layer show a grain size distribution consisting of 0% gravel, 4% sand, 19% silt, and 76% clay size particles.

The samples of the silty clay were also subjected to Atterberg Limits tests. These results indicate that the upper silty clay is a low plasticity (CL-ML) cohesive soil, while the lower silty clay is a medium to high plasticity (CI to CH) cohesive soil. The results from the Atterberg limits tests are summarized below:

Test	Borehole No. 1 Silty clay (upper layer)	Borehole No. 1 Silty clay (lower layer)
Liquid Limit	14%	22%
Plastic Limit	30%	48%
Plastic Index	16%	26%
Natural Moisture Content	12%	38%

4.1.3 Sand

Sand material was encountered at BH1 below the silty clay layer, at a base layer depth of 5.8 m below grade. A Standard Penetration test carried out in the gravelly sand layer, measured SPT N-value of 18 blows for 0.3 m of penetration, indicating a compact relative density. The natural water content of this layer was 13% by weight.

4.1.4 Clayey silt

Clayey silt was encountered at Borehole 1. The locations, thicknesses, depths and base elevations of the clayey silt layers are summarized in the following table:

Borehole No. 1	Thickness (m)	Depth (m)	Base Elevation (m)
Clayey silt layer	1.4	5.8 to 7.2	71.8
Clayey silt layer (Some organic)	5.6*	10.2 to 15.8*	63.1*

* Borehole termination depth

Standard Penetration tests carried out in the clayey silt layer measured SPT N-values ranging from 3 blows to 5 blows for 0.3 m of penetration, indicating a soft consistency. The moisture content of samples of the clayey silt layer ranged from 28% to 90% (indicating organic inclusions).

Grain size distribution test was carried out on one sample of the clayey silt layer material and the grain size distribution curves are illustrated in Appendix B. The results show a grain size distribution consisting of 8% gravel, 21% sand, 49% silt, and 22% clay size particles.

4.1.5 Silty sand to Sandy silt

Silty sand to sandy silt layer material was encountered at Borehole No. 1. The locations, thicknesses, depths and base elevations of the silty sand to sandy silt layer are summarized in the following table.

Borehole No.	Thickness (m)	Depth (m)	Base Elevation (m)
BH1	1.4	7.2 to 8.7	70.3

A Standard Penetration tests carried out in silty sand to sandy silt layer material, measured SPT N-value of 4 blows for 0.3 m of penetration, indicating a loose relative density. The natural water content of this layer was 29%.

4.1.6 Sand to Sand and Gravel

Below the fill deposits, BH2 encountered sand to sand and gravel native soils. The locations, thicknesses, depths, and base elevations of the sand to sand and gravel deposits are summarized in the following table.

Borehole No.	Thickness (m)	Depth (m)	Base Elevation (m)	Soil Description
BH2	3.5	2.3 to 5.8	71.9	Sand
	4.0*	5.8 to 9.8*	67.9*	Sand and gravel

* Borehole termination depth

The N-values of Standard Penetration tests carried out in the sand to sand and gravel deposits range from 6 blows to 68 blows for 0.3 m of penetration, suggesting a loose to very dense relative density. The moisture content of samples of the sand to sand and gravel deposits ranged from 7% to 23%.

A sample of the sand deposit was subjected to a grain size distribution test and the grain size distribution curve is illustrated in Appendix B. The test results show a grain size distribution consisting of <1% gravel, 92% sand, 5% silt and, 3% clay size particles.

Similarly, a sample of the sand and gravel deposit subjected to a grain size distribution test and the grain size distribution curve is illustrated in Appendix B. The test results show a grain size distribution consisting of 54% gravel, 40% sand, 5% silt and, 1% clay size particles.

4.2 Ground Water Levels

The ground water conditions were observed in the boreholes during drilling. The measured ground water levels in the boreholes are summarized in the following table:

Borehole No.	Date	Water Levels	
		Depth (m)	Elevation (m)
BH 1	February 8, 2023	4.3	74.7
BH 2	February 10, 2023	1.6	76.1

Based on the ground water observations during drilling and the measured water contents of the soil samples, the ground water table elevation is estimated to be ranged at elevation 74.7± m to 76.1± m. The ground water level is expected to fluctuate seasonally and is expected to rise during wet periods of the year. It should be noted that the Lake Ontario water level in early February 2023 is reported to have been at elevation 74.7 m.

5.0 MISCELLANEOUS

The investigation was carried out using drilling equipment supplied and operated by Groundwork Drilling Inc., Etobicoke, Ontario. The field operations were organized and monitored under the full-time supervision of Terraprobe technical staff. The laboratory testing was carried out at Terraprobe's Brampton laboratory.

This report was prepared by Mr. Ala Abu Obeid, M.Sc., P.Eng., PMP (Englobe Corp.), and reviewed by Mr. Michael Tanos, P.Eng. (Terraprobe inc.).

Englobe Corp. and Terraprobe, an Englobe Company (previously known as Terraprobe Inc.) ("Terraprobe") are affiliated companies. Terraprobe has commissioned Englobe Corp. to complete this report.

Terraprobe Inc.



Ala Abu Obeid, M.Sc., P.Eng., PMP
Technical Director- Geotechnical (Englobe Corp.)

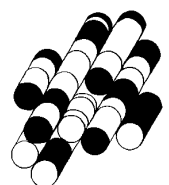


Michael Tanos, P.Eng.
Designated MTO Contact



DRAWING

TERRAPROBE INC.





REFERENCE
Image © 2023 Google Earth

LEGEND
📍 Approximate Borehole Location

100 0 250m
SCALE 1:125



Terraprobe

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Title:

BOREHOLE LOCATION PLAN

File No.

T1220577.001

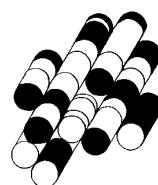
FIGURE :

1

APPENDIX A

Record of Borehole Sheets

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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{u} .

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

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

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 (RQD), 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

SS	SPLIT SPOON	TP	THINWALL PISTON
WS	WASH SAMPLE	OS	OSTERBERG SAMPLE
ST	SLOTTED TUBE SAMPLE	RC	ROCK CORE
BS	BLOCK SAMPLE	PH	TW ADVANCED HYDRAULICALLY
CS	CHUNK SAMPLE	PM	TW ADVANCED MANUALLY
TW	THINWALL OPEN	FS	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_r	1	SENSITIVITY = c_u / τ_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 ² /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 = $(w - w_p)/I_p$	i	1	HYDRAULIC GRADIENT
γ_{sat}	kN/m ³	UNIT WEIGHT OF SATURATED SOIL	I_C	1	CONSISTENCY INDEX = $(w_L - w)/I_p$	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						

LIMITATIONS AND RISK

Procedures

The soil conditions were confirmed at the borehole locations only and conditions may vary between and beyond the boreholes. The boundaries between the various strata as shown on the logs are based on non-continuous sampling. These boundaries represent an inferred transition between the various strata, rather than a precise plane of stratigraphic change.

This investigation has been carried out using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by Terraprobe and other engineering practitioners, working under similar conditions and subject to the time, financial and physical constraints applicable to this project. The discussions and recommendations that have been presented are based on the factual data obtained.

It must be recognized that there are special risks whenever engineering or related disciplines are applied to identify subsurface conditions. Even a comprehensive sampling and testing programme implemented in accordance with the most stringent level of care may fail to detect certain conditions. Terraprobe has assumed for the purposes of providing design parameters and advice, that the conditions that exist between sampling points are similar to those found at the sample locations. The conditions that Terraprobe has interpreted to exist between sampling points can differ from those that actually exist.

It may not be possible to drill a sufficient number of boreholes or sample and report them in a way that would provide all the subsurface information that could affect construction costs, techniques, equipment and scheduling. Contractors bidding on or undertaking work on the project should be directed to draw their own conclusions as to how the subsurface conditions may affect them, based on their own investigations and their own interpretations of the factual investigation results, cognizant of the risks implicit in the subsurface investigation activities.

Changes In Site And Scope

It must be recognized that the passage of time, natural occurrences, and direct or indirect human intervention at or near the site have the potential to alter subsurface conditions. Groundwater levels are particularly susceptible to seasonal fluctuations.

The design advice is based on the factual data obtained from this investigation made at the site by Terraprobe and are intended for use by the owner and its retained designers in the design phase of the project. If there are changes to the project scope and development features, or there is any additional information relevant to the interpretations made of the subsurface information, the geotechnical design parameters and comments relating to constructibility issues and quality control may not be relevant or complete for the revised project. Terraprobe should be retained to review the implications of such changes with respect to the contents of this report.

This report was prepared for the express use of Alectra Utilities, its retained design consultants and NBM Engineering Inc. It is not for use by others. This report is copyright of Terraprobe Inc. and no part of this report may be reproduced by any means, in any form, without the prior written permission of Terraprobe Inc. The Ministry of Transportation, Alectra Utilities, its retained design consultants and NBM Engineering Inc, are authorized users.

METRIC

[illegible]

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

METRIC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	SPT N' VALUE			20 40 60 80 100	w _p	w	w _L			WATER CONTENT (%)
								SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE						
63.2	(continued) CLAYEY SILT, trace gravel, trace rootlets, some organics, trace peat and seashell fragments, firm, grey, wet		13	SS	4							90 ○		






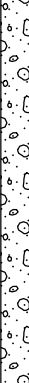
Unstabilized water level measured at 4.3 m below ground surface; borehole was open upon completion of drilling.

RECORD OF BOREHOLE No 2

1 of 1

METRIC

G.W.P. _____ LOCATION _____ Coords: E:598410.44 N:4792713.68 (UTM 17T) ORIGINATED BY SM
 DIST IBI GROUP HWY QEW BOREHOLE TYPE SOLID STEM / HOLLOW STEM AUGERS COMPILED BY AM
 DATUM GEODETIC DATE 2023-2-10 CHECKED BY RM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	SPT 'N' VALUE			SHEAR STRENGTH (kPa)								WATER CONTENT (%)				
77.7	GROUND SURFACE						20	40	60	80	100					GR SA SI CL				
76.9 0.8	FILL, gravelly sand, trace silt, trace cobbles, loose to dense, grey, moist		1	SS	10								○			36 50 11 3				
	Trace broken cobbles		2	SS	30								○							
			3	SS	5								○							
75.4 2.3	SAND, some organics, trace gravel, compact, brown, moist		4	SS	14								○							
74.7 3.0	Trace silt, trace seashell fragments, loose, brown to grey, moist to wet			5	SS		7								○					
73.1 4.6	Without seashell fragments			6	SS		6								○					
71.9 5.8	SAND AND GRAVEL, trace silt, compact to very dense, grey, wet			7	SS		28								○					
				8	SS	28								○						
																54 40 5 1				
			9	SS	68									○		34 58 6 2				
67.9																				

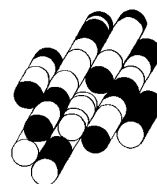
END OF BOREHOLE

Unstabilized water level measured at 1.6 m below ground surface; borehole caved to 1.8 m below ground surface upon completion of drilling.

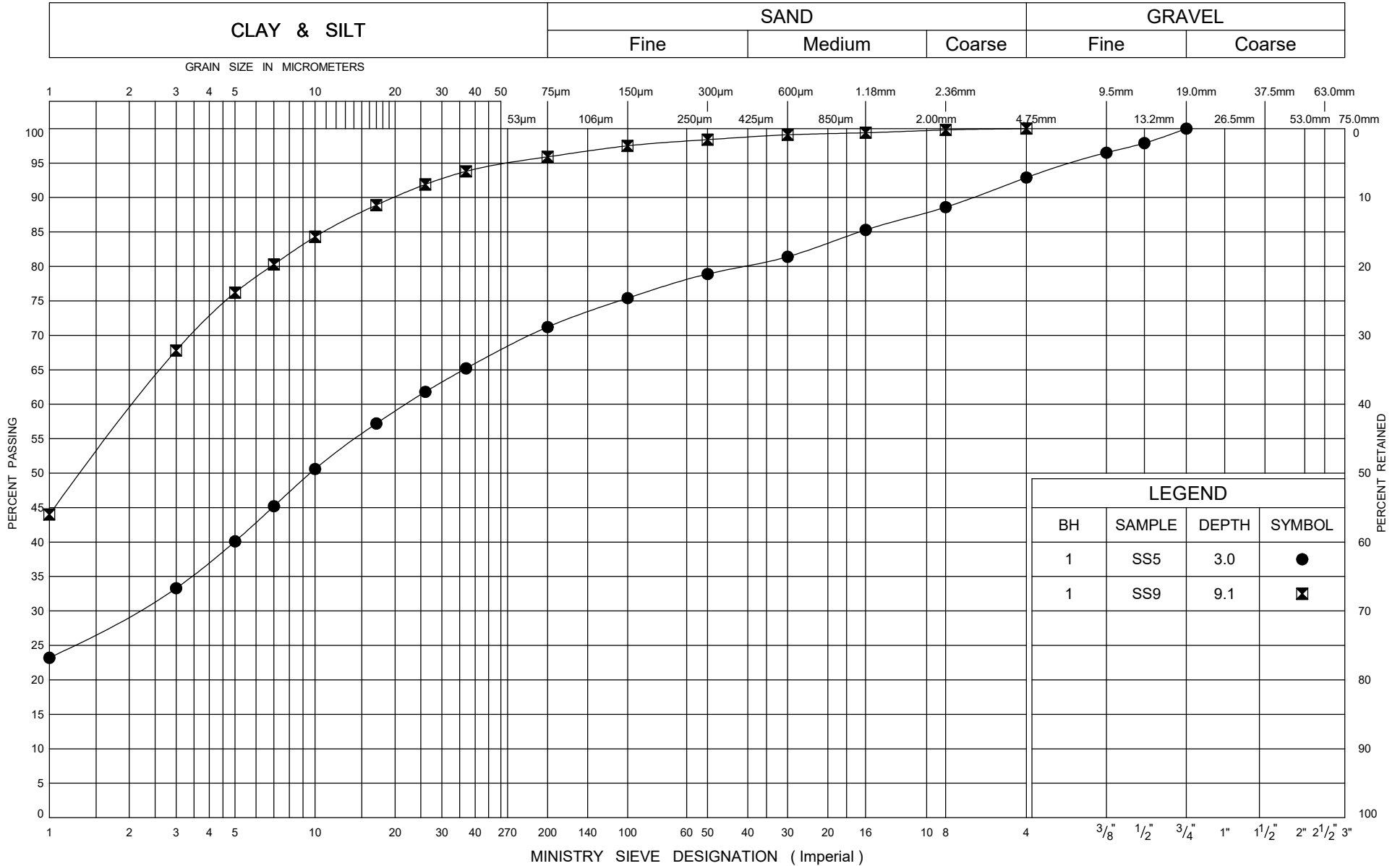
APPENDIX B

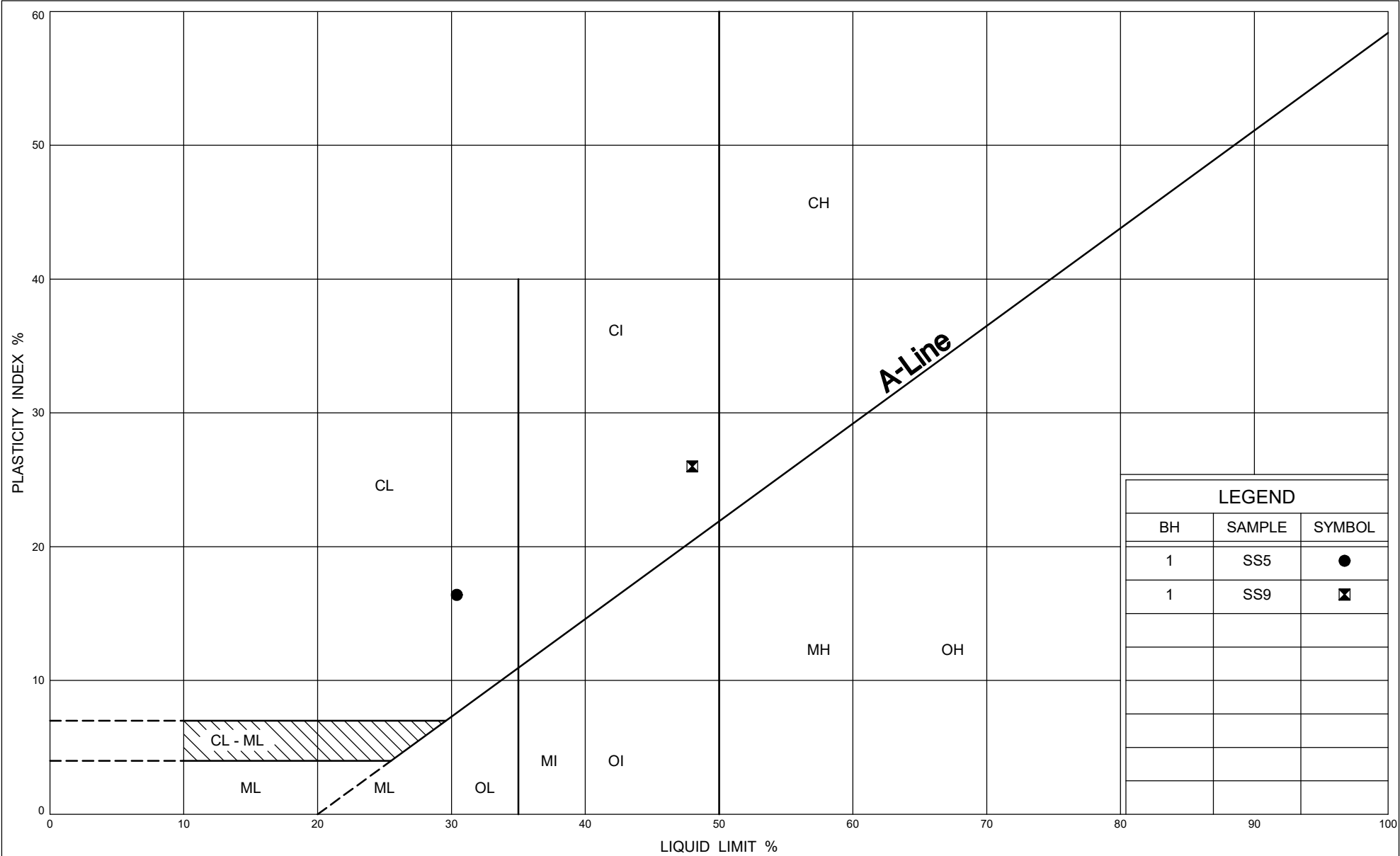
Laboratory Test Results

TERRAPROBE INC.



UNIFIED SOIL CLASSIFICATION SYSTEM





file: t1220577.001 bh.logs.gpj



Ministry of
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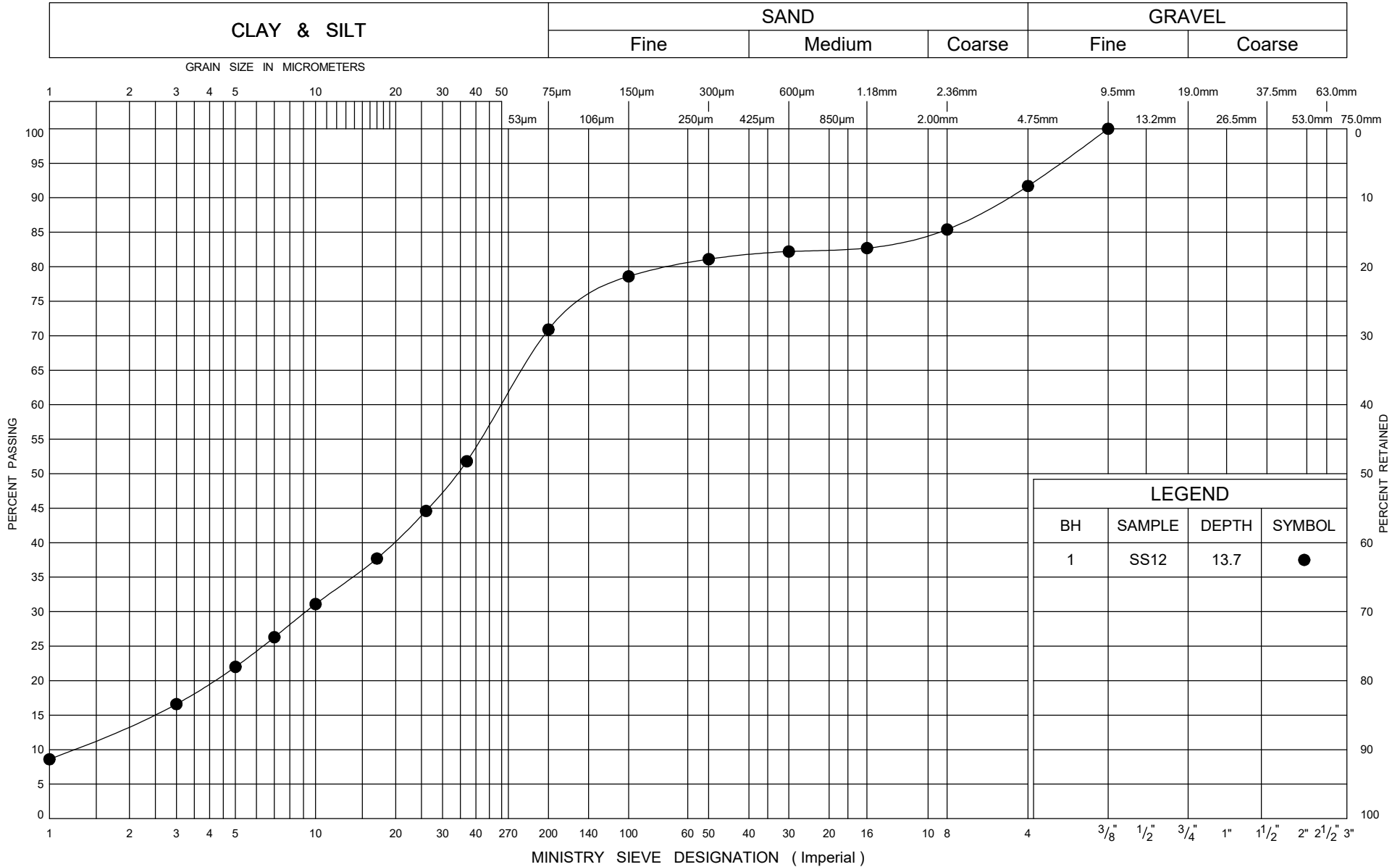
PLASTICITY CHART
SILTY CLAY

FIG No B2

G W P

QEW at Burlington Lift Bridge

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation

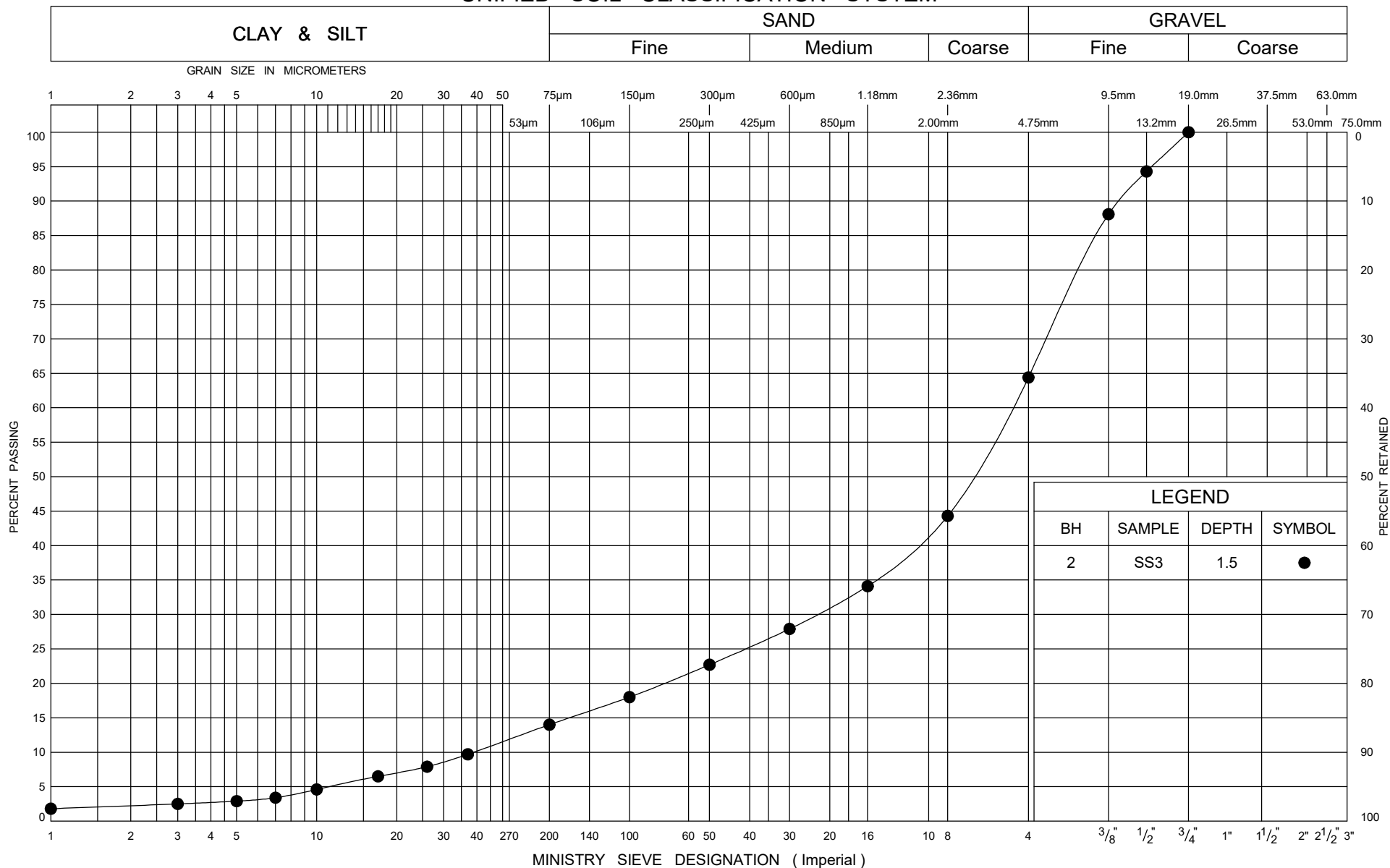
GRAIN SIZE DISTRIBUTION CLAYEY SILT

FIG No B3

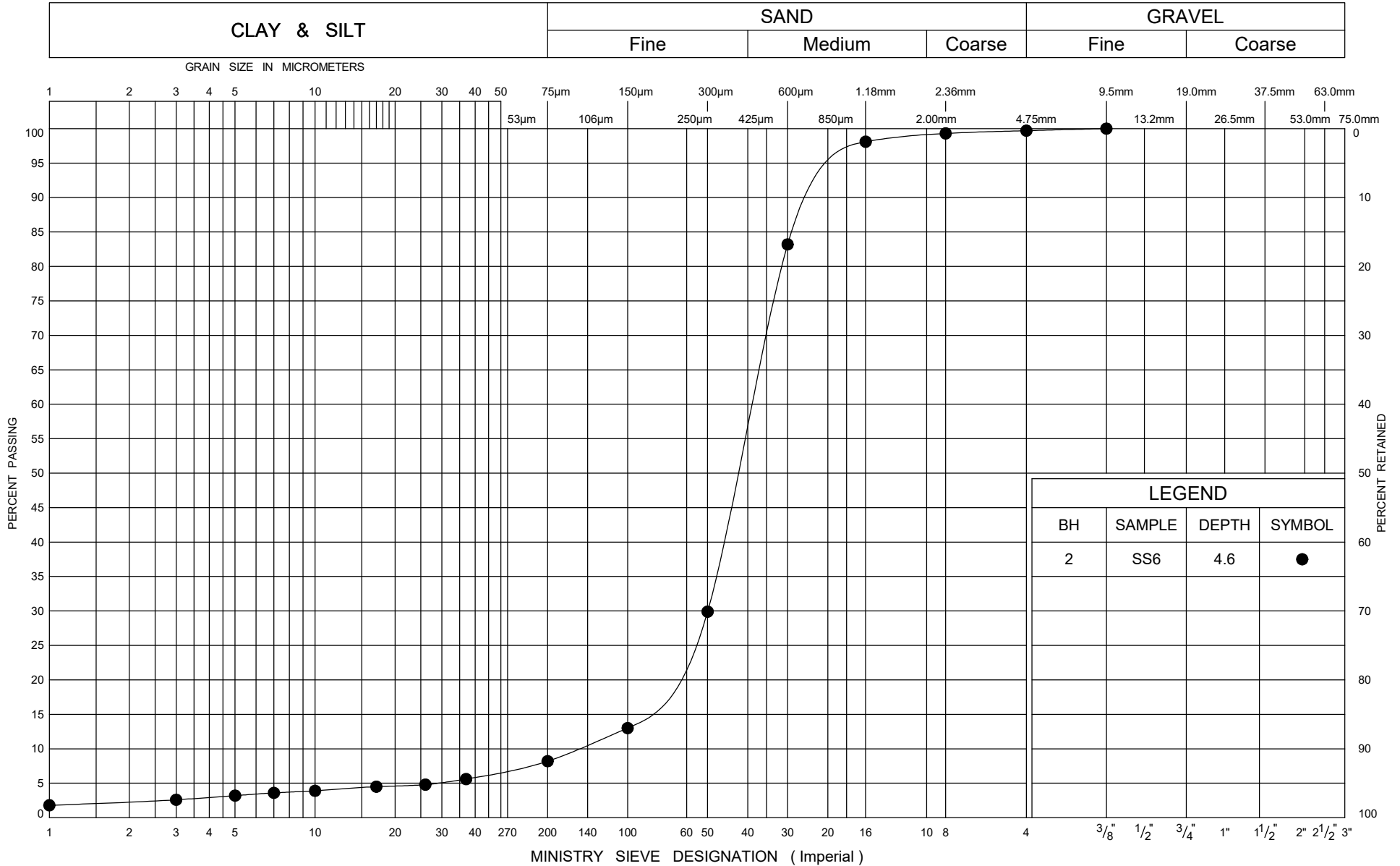
G W P

QEW at Burlington Lift Bridge

UNIFIED SOIL CLASSIFICATION SYSTEM



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Ministry of
Transportation

GRAIN SIZE DISTRIBUTION SAND

FIG No B5

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