

GEOCRES No:

30M15-68

ENGINEERING MATERIALS OFFICE  
PAVEMENT & FOUNDATION DESIGN SECTION

WP 470-711-606 DIST 6

HWY GO-ALRT STR SITE N/A

Lynde Creek Structure

DISTRIBUTION

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FOUNDATION INVESTIGATION REPORT  
for  
Lynde Creek Structure, GO ALRT  
Project No. 470-711-606  
District 6, Toronto

INTRODUCTION

This report summarizes the factual information obtained from a foundation investigation carried out on 83 05 31 and 83 06 01 at the above mentioned structure site. The fieldwork consisted of 2 sampled boreholes, each accompanied by dynamic cone penetration tests, and 2 additional cone penetration tests. One borehole was advanced by means of hollow stem augers and the other using solid stem augers. One additional boring was carried out to obtain in situ strength measurements using a field vane. The sampled boreholes were advanced to depths of 12.4 and 13.0 m. Bedrock was cored in both sampled boreholes by obtaining up to 3.1 m of BXL rock core.

SITE DESCRIPTION AND GEOLOGY

The site of the proposed crossing is located just south of Highway 401, 2.2 km east of the Brock St. interchange, in the Town of Whitby, Region of Durham.

Land use in the vicinity of Lynde Creek is predominantly agricultural with residential subdivisions encroaching from the northeast. The Toronto-Montreal CNR mainline crosses Lynde Creek 20 m to the south of the proposed structure, and is parallel to the proposed GO ALRT alignment at this location.

Topographically, the surrounding area is generally flat to undulating. Lynde Creek flows in a southerly direction and at the time of the field work, was approximately 15 m wide at the proposed structure site and 2 to 3 m deep.

Soft silty clay is exposed at the stream edge.

The site is located in the physiographic region known as the 'Iroquois Plain'. This plain was formed by the inundation of glacial Lake Iroquois which smoothed the ground surface by wave action or lacustrine deposits.

#### SUBSURFACE CONDITIONS

##### General

The predominant subsoil across the site is a soft to stiff silty clay with varying amounts of sand and gravel. This deposit extends to a maximum depth of 7.3 m. At approximately the middle portion of this deposit is a 0.9 to 1.7 m layer of sand containing some silt. A 0.7 m thick deposit of gravelly sand was encountered below the silty clay on the east side.

Underlying the silty clay deposit and the gravelly sand deposit is shale bedrock.

The boundaries between the various soil types, in situ and laboratory test results are shown on the attached Record of Borehole Sheets. The elevations and locations of the boreholes are shown on Drawing No. 470711606-A, along with a profile showing an estimated stratigraphical section based on borehole data.

The various soil types encountered are described in the following paragraphs.

##### Silty Clay some Sand trace Gravel

This deposit extends to the bedrock surface on the west side of the site and is underlain by gravelly sand to the east. Occasional sand and silt seams are present in the silty clay stratum. The overall deposit varies in depth from 6.7 to 7.3 m.

Field vane tests indicate undrained shear strengths of 19 to 55 kPa with sensitivities of 2 to 5. A quick triaxial test and an unconfined compression test gave results of 11 and 9 kPa with strains of 9 and 20 percent respectively.

A grain size distribution test completed on a sample from this stratum is plotted on Figure 1.

Two consolidation tests were conducted on samples taken from this deposit and gave the following results: Compression Index ( $C_c$ ) values of 0.134 and 0.191 and Initial Void ratio ( $e_o$ ) values of 0.715 and 0.652 and one Preconsolidation Pressure of 96 kPa, which indicate the soil to be moderately compressible.

Based on interpretation of 'N' values ranging from 2 to 11 blows per 0.3 m and field vane tests, the consistency of the stratum is assessed as being soft to stiff.

#### Sand some Silt trace of Gravel

This stratum of material is found sandwiched within the silty clay deposit. The deposit is relatively thin, varying in thickness from 0.9 to 1.7 m.

Grain size distribution tests conducted on samples taken from this layer are plotted on Figure 2 and indicate that the deposit consists of sand some silt with a trace of gravel.

The denseness of this stratum is estimated as very loose based on 'N' values of 2 blows per 0.3 m.

#### Gravelly Sand some Silt trace Clay

This 0.7 m thick deposit is sandwiched between the silty clay and the bedrock on the east side of the site.

The results of a grain size distribution test performed on a sample taken from this layer are plotted on Figure 1.

An 'N' value of 19 blows per 0.3 m indicates this layer is compact.

#### Shale Bedrock

Bedrock is a grey shale of the Whitby Formation, which was found to be relatively level with an approximate elevation of 70.8. The bedrock was cored for a maximum depth of 3.1 m. The shale is highly weathered in the upper 1.0 to 1.5 m zone, becoming less weathered with depth, and sound at elevation 67.0.

#### Groundwater Conditions

The groundwater elevations measured in open boreholes 1 and 2 indicate a groundwater elevation of 77.1. This was approximately 0.5 m higher than the water level in the creek during the time of investigation.

## DISCUSSION & RECOMMENDATIONS

### General

In order to carry the new GO ALRT transit line over Lynde Creek, it is proposed to construct a single 15.0 m span closed abutment structure. The line is to be located between Highway 401 and the existing CNR tracks to the south.

The proposed profile grade of the GO ALRT alignment will be approximately at elevation 80.5 which will require fills in the order of 1.7 to 2.9 m.

The predominant overburden across this site is a 6.7 to 7.3 m deposit of soft to stiff silty clay, bisected by a thin layer of sand. Underlying the overburden is grey shale bedrock.

The following recommendations pertain to the design and construction of the structure foundations and related earthworks.

### Structure Foundations

The foundations for the proposed closed abutments can be founded on spread footings in the highly weathered shale. The bottom of the footings should be located at or below elevation 70.0 for a factored bearing capacity at the U.L.S. of 750 kPa. The bearing capacity at the S.L.S. Type II will be 500 kPa for maximum differential settlement of 25 mm.

If lower values of differential settlement are required, please contact this office for revised bearing capacity values.

Excavations for the structure footings will require dewatering measures. This can be accomplished by driving sheeting into the weathered bedrock surface.

An alternative to using spread footings would be to socket 760 mm diameter caissons into the sound shale bedrock at elevation 67.0. The factored bearing capacity at Ultimate Limit States for this caisson can be taken as 2,700 kN. A bearing capacity of 2,000 kN can be used for S.L.S. Type II for maximum differential settlement of 25 mm.

Earth pressures against the abutment wall should be computed as per Subsection 6.6.1.2.2 of the O.H.B.D.C. Manual.

The underside of all footing elements or caisson caps should be provided with a minimum of 1.3 m of earth cover for frost protection purposes.

#### Stability of Embankments

The existing 3.6 m fills for the CNR tracks are stable at 1.5:1 to 2:1 slopes.

No stability problems are anticipated for fills up to 2.9 m and constructed with 2:1 side slopes and 1.5:1 front slopes. Protection against erosion of the 1.5:1 front slopes should be provided. If fills heights greater than 2.9 m are required, please contact this office.

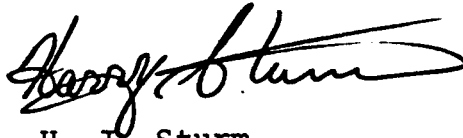
#### Settlement

The structure approach fills will settle a maximum of 100 mm as consolidation of the underlying silty clay takes place. Ninety percent of the total settlement will occur in approximately 6 months after loading.

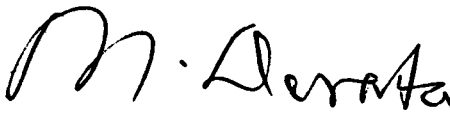
If scheduling permits, the fills should be placed 6 months before the final bed of the transit line is constructed, in order to minimize differential settlement between the structure and the embankments.

Miscellaneous

The fieldwork for this investigation was carried out under the supervision of Mr. R. Matthys, Student Specialist, and Mr. H. Sturm, Project Foundations Engineer, utilizing equipment owned and operated by Master Soil Investigation, Toronto. This report was written by Mr. H. Sturm and reviewed by Mr. M. Devata, Senior Foundations Engineer.



H. J. Sturm  
Project Foundations Engineer



M. Devata, P. Eng.  
Senior Foundations Engineer

HJS:gm



**APPENDIX**



Ministry of  
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Ontario

# RECORD OF BOREHOLE No 1

METRIC

W P 470-711-606 LOCATION Co-ords N 4 858 357.4; E 347 957.9 ORIGINATED BY RM  
DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger, BXL Rock Core, Cone Test COMPILED BY HS  
DATUM Geodetic DATE 83 05 31 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT Wp	NATURAL MOISTURE CONTENT W	LIQUID LIMIT Wl	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
78.8	Ground Surface												
0.0	Silty Clay Some Sand Trace Gravel Occasional Sand and Silt Seams		1	SS	11		78						
			2	SS	3		76						
			3	SS	9								
	Soft to Stiff		4	SS	4								
75.0			5	SS	2								
3.8	Sand some Silt with Seams of Silty Clay V. loose		6	SS	2		74						2 71 25 2
73.3													
5.5	Firm		7	SS	4		72						
71.5													
70.8	Gravelly Sand Compact		8	SS	19								29 47 19 5
8.0	Shale Bedrock Highly weathered		9	SS	93		70						
	moderately weathered		10	RC BXL	REC 73%		68						
	sound		11	RC BXL	REC 100%		66						
65.8													
13.0	End of Borehole												

+3, x5: Numbers refer to  
Sensitivity

20  
15 5 (%) STRAIN AT FAILURE  
10

# RECORD OF BOREHOLE No 2

METRIC

W P 470-711-606 LOCATION Co-ords N 4 858 350.6; E 347 960.1 ORIGINATED BY RM  
DIST 6 HWY GO ALRT BOREHOLE TYPE Solid Stem Auger, Cone and Vane Tests COMPILED BY HS  
DATUM Geodetic DATE 83 05 31 CHECKED BY CP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
78.8	Ground Surface													
0.0	Probable Silty Clay Some Sand Trace Gravel Occasional Sand and Silt Seams						78							
							76							
							74							
72.2	End of Auger Hole						72							
6.6														
70.2	End of Cone Test													
8.6	Probable weathered shale  NOTE: Description based on augering operations													

+3, x5: Numbers refer to  
Sensitivity

20  
15  
10  
5 (%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 3

METRIC

W P 470-711-606 LOCATION Co-ords N 4 858 340.4; E 347 934.3 ORIGINATED BY RM  
DIST 6 HWY GO ALRT BOREHOLE TYPE Solid Stem Auger, BXL Rock Core, Cone Test COMPILED BY HS  
DATUM Geodetic DATE 83 06 01 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	10 20 30 40 50					
77.6	Ground Surface													
0.0	Silty Clay Some Sand Trace Gravel Occasional Sand and Silt Seams		1	SS	2									
			2	SS	3									
			3	TW	PH									
73.9	Soft to Firm		4	SS	2									
3.7	Sand Some Silt		5	TW	PH									
73.0	Some Gravel V. loose		6	TW	PH									
4.6	Soft to Stiff		7	SS	10									
70.9	Shale Bedrock		8	SS	54									
6.7	Highly weathered		9	RC	REC									
	moderately weathered		10	BXL	95%									
	slightly weathered													
	sound													
65.2														
12.4	End of Borehole													
	*NOTE: Water level not established													

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

# RECORD OF BOREHOLE No 4

METRIC

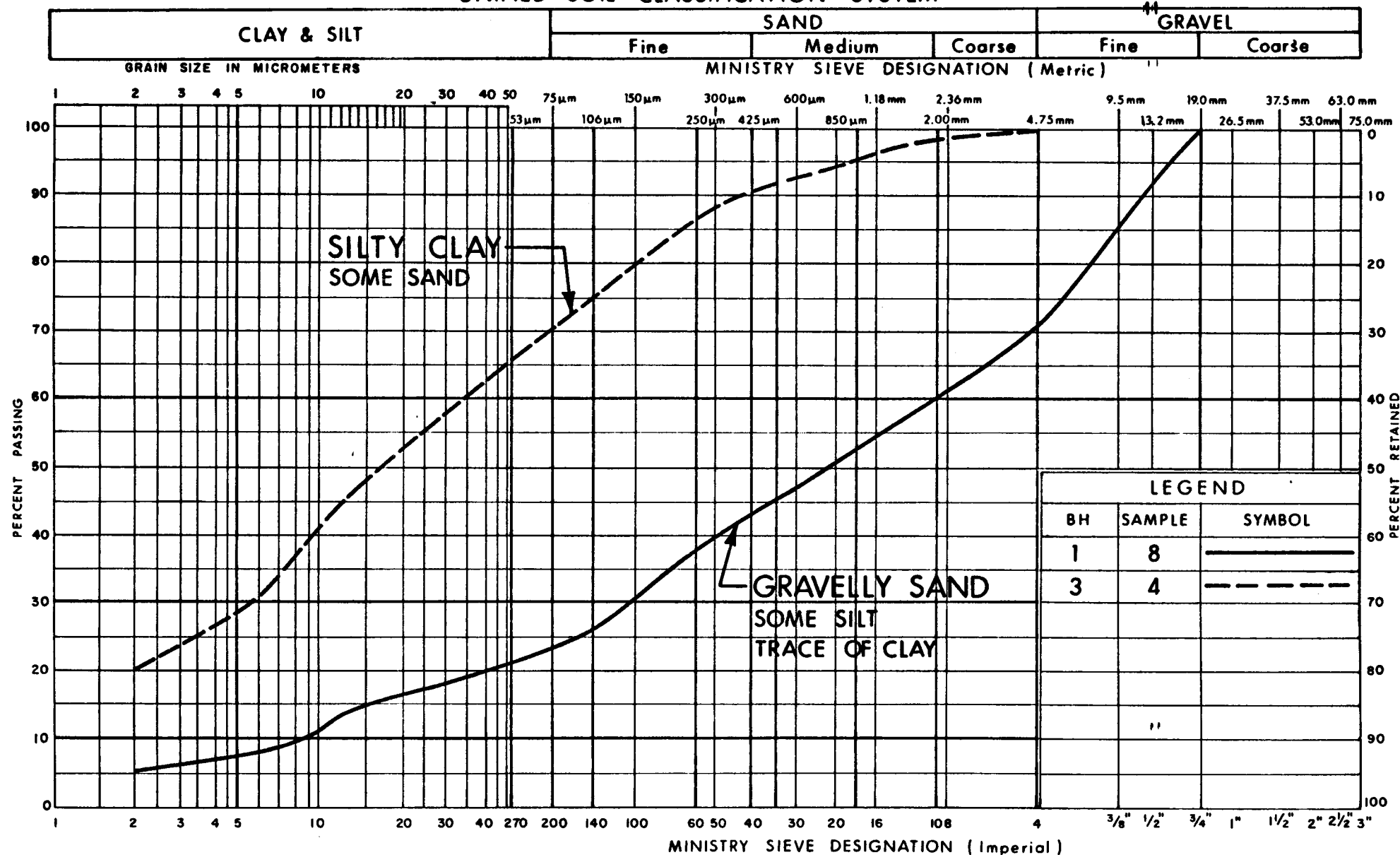
W P 470-711-606 LOCATION Co-ords N 4 858 350.6; E 347 933.2 ORIGINATED BY RM  
DIST 6 HWY GO ALRT BOREHOLE TYPE Cone Test COMPILED BY HS  
DATUM Geodetic DATE 83 06 01 CHECKED BY *CP*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W <sub>p</sub> NATURAL MOISTURE CONTENT W LIQUID LIMIT W <sub>L</sub> WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
77.3	Ground Surface										
0.0	Probable Silty Clay Some Sand Trace Gravel Occasional Sand and Silt Seams										
70.3	End of Cone Test										
7.0	Probable weathered shale										

+<sup>3</sup>, x<sup>5</sup>: Numbers refer to Sensitivity 20  
15 5 (%) STRAIN AT FAILURE  
10

UNITED REPORT ON SOIL EXPLORATION

## UNIFIED SOIL CLASSIFICATION SYSTEM



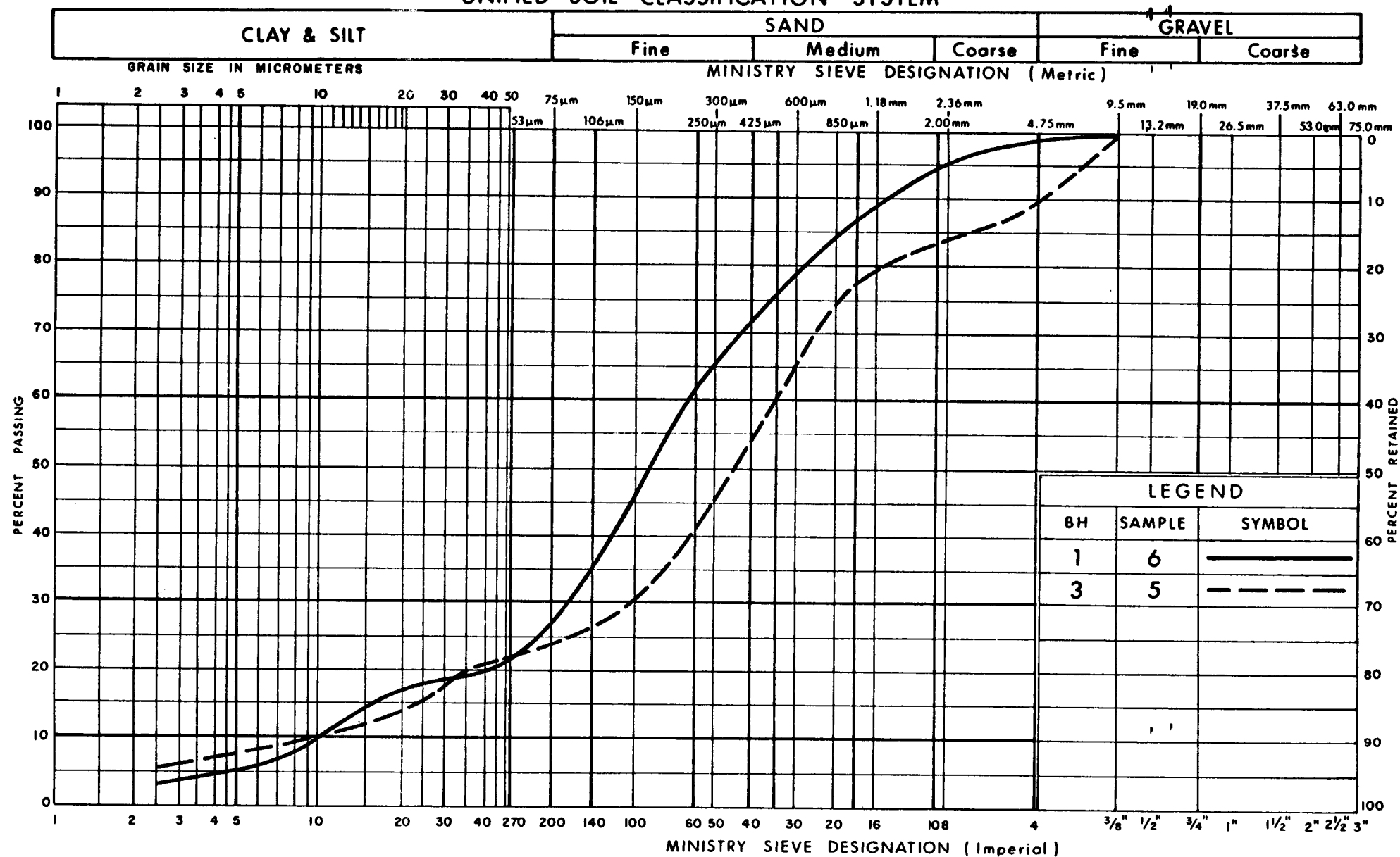
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## GRAIN SIZE DISTRIBUTION

FIG No 1

W P 470-711-606

## UNIFIED SOIL CLASSIFICATION SYSTEM



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# GRAIN SIZE DISTRIBUTION

## SAND, SOME SILT

FIG No 2

W P 470-711-606

## EXPLANATION OF TERMS USED IN REPORT

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

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

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

**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
$\sigma$	kPa	TOTAL NORMAL STRESS
$\sigma'$	kPa	EFFECTIVE NORMAL STRESS
$\tau$	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
$\epsilon$	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
$\mu$	1	COEFFICIENT OF FRICTION

### MECHANICAL PROPERTIES OF SOIL

$m_v$	kPa <sup>-1</sup>	COEFFICIENT OF VOLUME CHANGE
$C_c$	1	COMPRESSION INDEX
$C_s$	1	SWELLING INDEX
$C_\alpha$	1	RATE OF SECONDARY CONSOLIDATION
$c_v$	m <sup>2</sup> /s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
$T_v$	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
$\sigma'_{v0}$	kPa	EFFECTIVE OVERBURDEN PRESSURE
$\sigma'_p$	kPa	PRECONSOLIDATION PRESSURE
$\tau_f$	kPa	SHEAR STRENGTH
$c'$	kPa	EFFECTIVE COHESION INTERCEPT
$\phi'$	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
$c_u$	kPa	APPARENT COHESION INTERCEPT
$\phi_u$	-°	APPARENT ANGLE OF INTERNAL FRICTION
$\tau_R$	kPa	RESIDUAL SHEAR STRENGTH
$\tau_r$	kPa	REMOULDED SHEAR STRENGTH
$S_f$	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

### PHYSICAL PROPERTIES OF SOIL

$\rho_s$	kg/m <sup>3</sup>	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	$e_{min}$	1, %	VOID RATIO IN DENSEST STATE
$\gamma_s$	kN/m <sup>3</sup>	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	$I_D$	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
$\rho_w$	kg/m <sup>3</sup>	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
$\gamma_w$	kN/m <sup>3</sup>	UNIT WEIGHT OF WATER	$S_r$	%	DEGREE OF SATURATION	$D_n$	mm	n PERCENT - DIAMETER
$\rho$	kg/m <sup>3</sup>	DENSITY OF SOIL	$w_L$	%	LIQUID LIMIT	$C_u$	1	UNIFORMITY COEFFICIENT
$\gamma$	kN/m <sup>3</sup>	UNIT WEIGHT OF SOIL	$w_p$	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
$\rho_d$	kg/m <sup>3</sup>	DENSITY OF DRY SOIL	$w_s$	%	SHRINKAGE LIMIT	q	m <sup>3</sup> /s	RATE OF DISCHARGE
$\gamma_d$	kN/m <sup>3</sup>	UNIT WEIGHT OF DRY SOIL	$I_p$	%	PLASTICITY INDEX = $w_L - w_p$	v	m/s	DISCHARGE VELOCITY
$\rho_{sat}$	kg/m <sup>3</sup>	DENSITY OF SATURATED SOIL	$I_L$	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
$\gamma_{sat}$	kN/m <sup>3</sup>	UNIT WEIGHT OF SATURATED SOIL	$I_C$	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
$\rho'$	kg/m <sup>3</sup>	DENSITY OF SUBMERGED SOIL	$e_{max}$	1, %	VOID RATIO IN LOOSEST STATE	j	kN/m <sup>3</sup>	SEEPAGE FORCE
$\gamma'$	kN/m <sup>3</sup>	UNIT WEIGHT OF SUBMERGED SOIL						



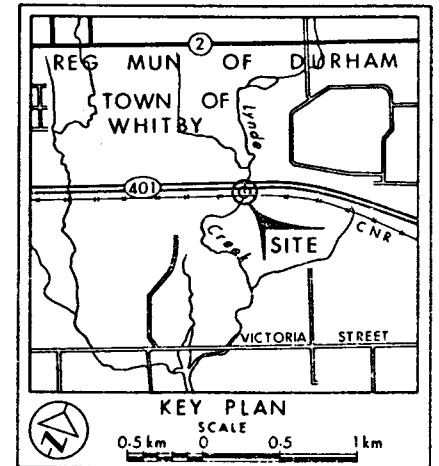
**METRIC**  
DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES UNLESS  
OTHERWISE SHOWN. STATIONS  
IN KILOMETRES + METRES.

CONT No  
WP No 470-711-606

LYNDE CREEK STRUCTURE  
(GO ALRT)  
BORE HOLE LOCATIONS & SOIL STRATA



SHEET



**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 83 05 31
- W.L. Not Established in BH 3

No	ELEVATION	CO-ORDINATES NORTH	EAST
1	78.8	4 858 357.4	3 479 57.9
2	78.8	4 858 350.6	3 479 60.1
3	77.6	4 858 340.4	3 479 34.3
4	77.3	4 858 350.6	3 479 33.2

**NOTE**

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

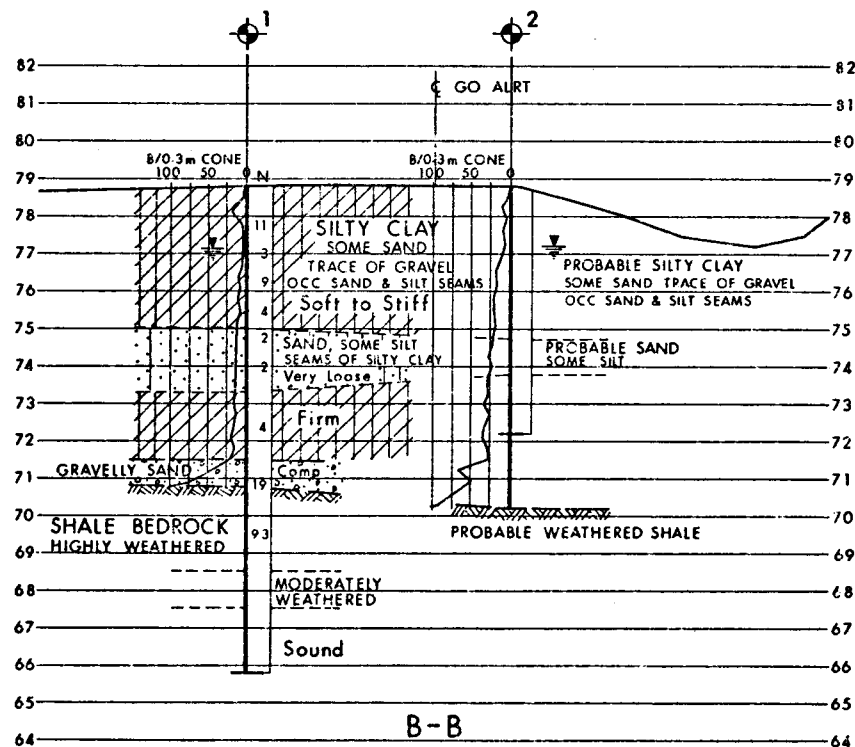
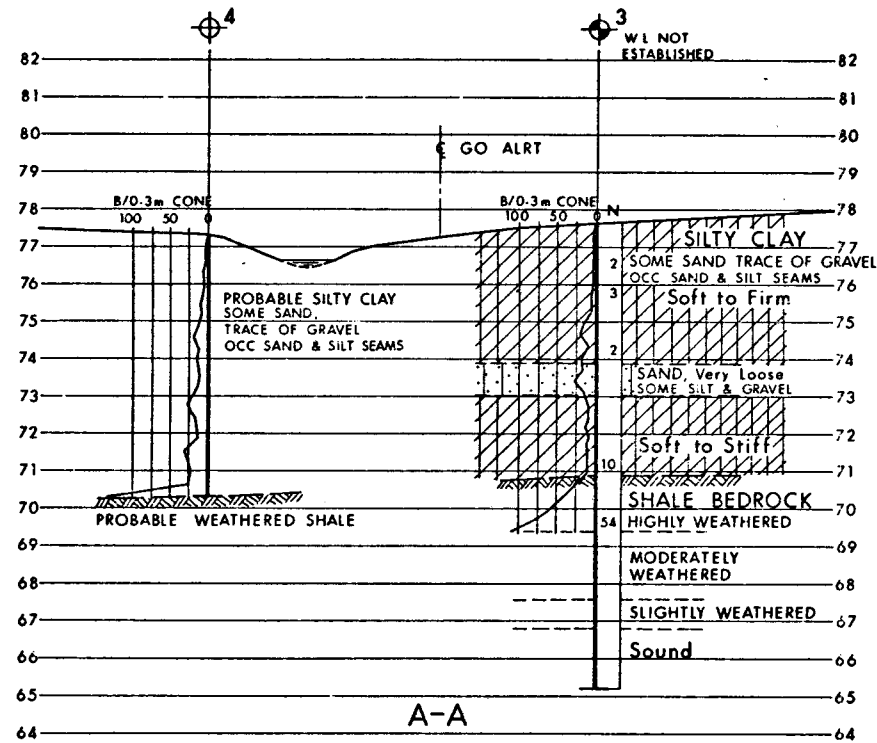
NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 102-2 of Form 100.

REV	DATE	BY	DESCRIPTION
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Geocres No 30M15-68

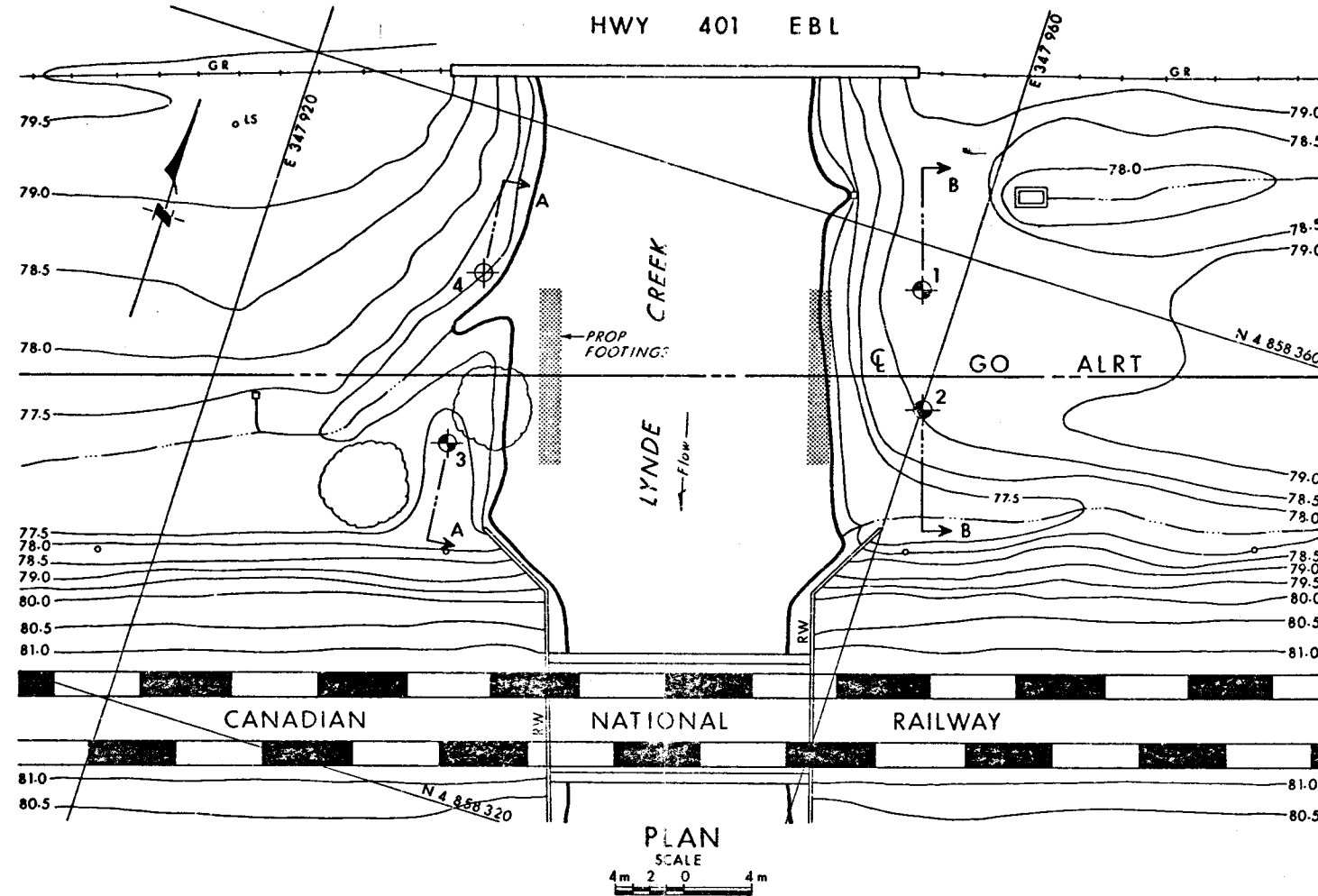
Drawn by	Checked by	Date	1983 07 05	Site	
Drawn by	Checked by	Approved		Site	

REF DWG No PD1 600, 1983 06



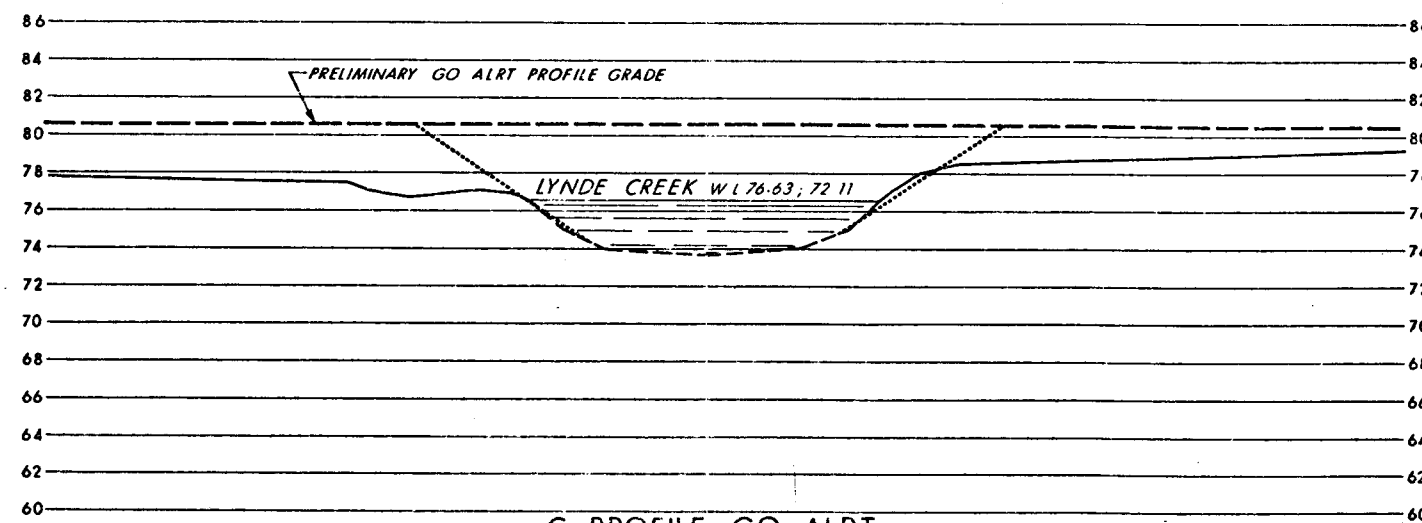
**B-B**  
**SECTIONS**

SCALE  
2m 1 0 2m



**PLAN**  
**SCALE**

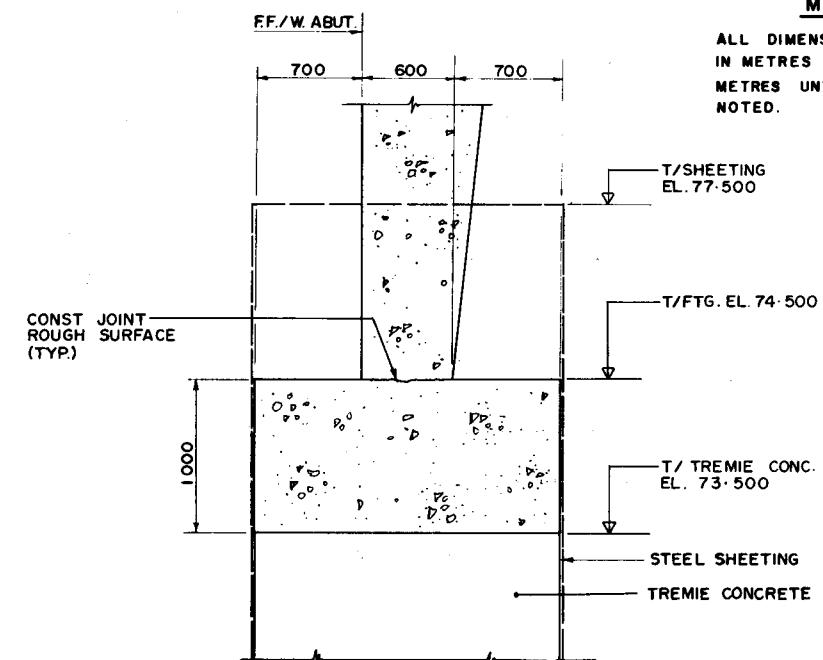
4m 2 0 4m



**PROFILE GO ALRT**

SCALE  
4m 2 0 4m

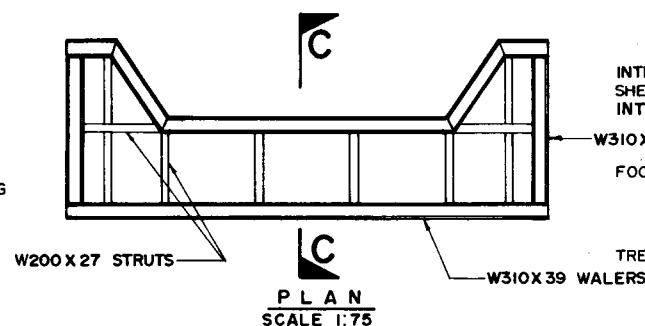
ALL DIMENSIONS SHOWN ARE  
IN METRES AND/OR MILLI-  
METRES UNLESS OTHERWISE  
NOTED.



Technical drawing of a mechanical assembly, likely a cross-section of a component. The drawing shows a central vertical structure with a U-shaped base. The top of the structure is labeled "F.F./E. ABUT." with a dimension line indicating a distance. The central vertical part is labeled "A30015". The base of the structure is labeled "A20014". The side walls of the base are labeled "A15010" and "A15001". The bottom of the base is labeled "A25018". The drawing includes various dimension lines and arrows indicating measurements and assembly points.

## NOTES


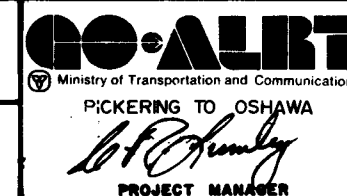
- STEEL SHALL BE IN ACCORDANCE WITH THE C.S.A. SPECIFICATION 640.21M GRADE 300 W
- ALL WELDING SHALL BE IN ACCORDANCE WITH C.S.A. STANDARD W59
- ALTERNATE SCHEMES FOR BRACING DETAILS WILL BE CONSIDERED SUBJECT TO APPROVAL OF THE ENGINEER.
- BRACE FRAME SHALL NOT BE REMOVED UNTIL FOOTINGS HAVE BEEN COMPLETED.



PROVIDE FULL BEARING (TYP.)

W310X39 WALERS  
W200X27 STRUTS  
AT 2000

<b>DRAWN BY:</b> J. G. COOKSEY 83-12-29	<b>DESIGNED BY:</b> G. O. LODIN 83-10-01
<b>CHK'D BY:</b> T. V. MOSUR 84-01-06	<b>APPROVED BY:</b> G. L. ALEONG 84-02-24
<b>SCALE: FULL SIZE ONLY</b>	
<b>AS NOTED</b>	


**totten sims hubicki associates**  
**CONSULTANTS**

GO-ALRT REF

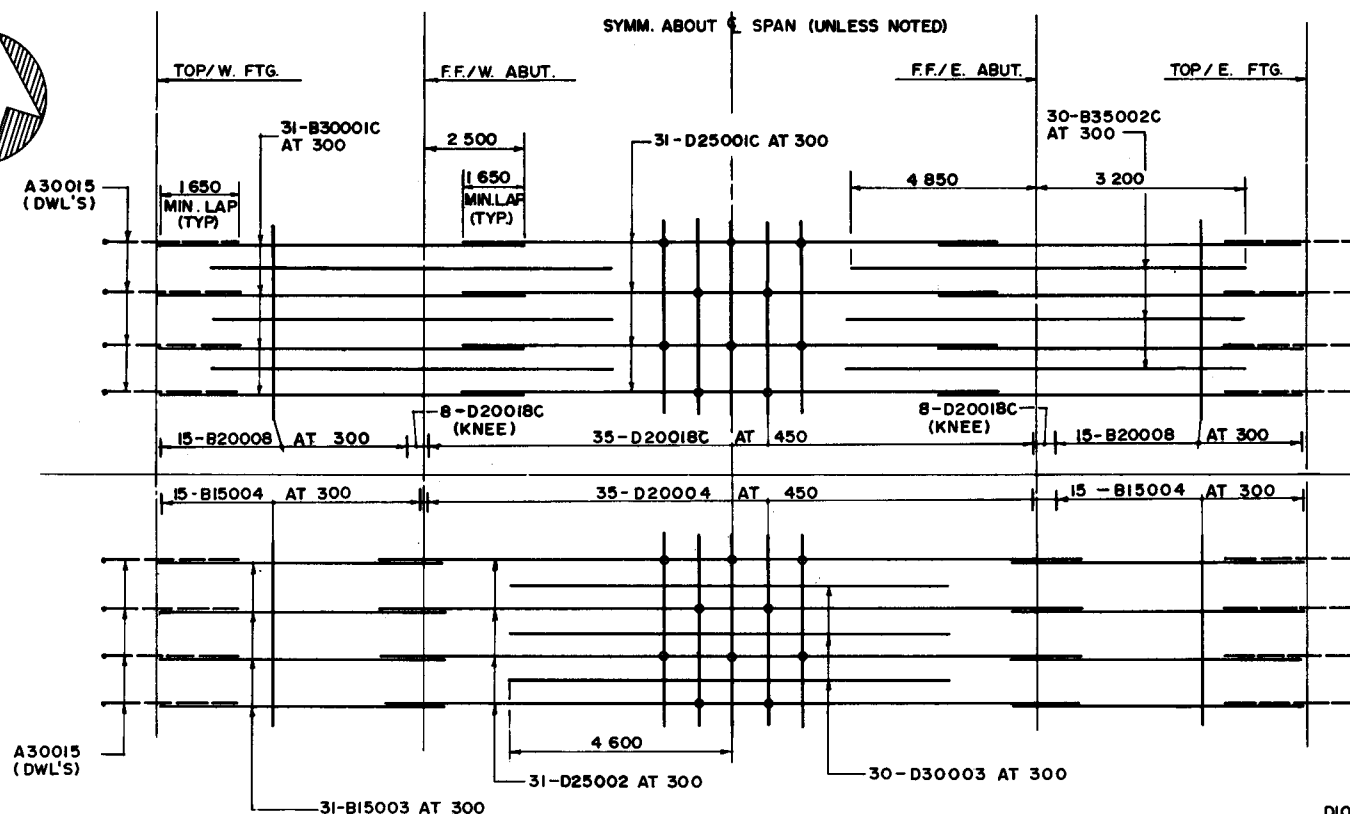
## DURHAM REGION AT GRADE GUIDEWAY

LYNDE CREEK STRUCTURE - FOOTINGS  
STA. 21 + 650

CONTRACT NO  
EGG-320

DWG NO  
S-025

REV	SHEET
0	99



**METRIC**

ALL DIMENSIONS SHOWN ARE IN METRES AND/OR MILLI-METRES UNLESS OTHERWISE NOTED.

SYMM. ABOUT 50 ALRT REF. LINE (UNLESS NOTED)

**NORTH** **SOUTH**

Dimensions and components shown in the diagram include:

- Top dimensions: B3000IC, D2500IC, B35002C, D20018C, D10008C, D10017C, D20004, D30003, D25002.
- Vertical dimensions: 150, 150, 150, 150.
- Labels: (A), (B), (C), SEE DETAIL 'A' (TYP.), D20018C, D10008C, D10017C, D20004, D30003, D25002.
- Location markers: AT ABUTMENT, AT MIDSPAN.
- Scale: SCALE 1:50.
- Bottom dimensions: 150, 250, 700.

**CROSS SECTION**

SCALE 1:50

WATERPROOFING SYSTEM  
(SEE LONGITUDINAL SECTION)

CUT-OFF VIBRAFLEX  
6mm FROM VERTICAL  
FACE OF PARAPET WALL

COLD APPLIED  
PLASTIC CEMENT

2 LAYERS OF  
13 mm THICK  
VIBRAFLEX

EMBECCO  
GROUT

CORNER SPLICE IN  
BUTYL MEMBRANE

3 mm THICK  
BUTYL MEMBRANE

150 250 700

E10003C

VARIES  
908 MAX.  
772 MIN.

E15002C

150 300

59-DI5006C AT 300  
2X59-DI5007C AT 300  
(DWL'S)

**DETAIL 'A'**

SCALE 1:25

**WATERPROOFING SYSTEM**  
 2 LAYERS @ 13 mm EACH  
 VIBRAFLEX TYPE 350 ASPHALTIC PANELS  
 OVER 3 mm THICK BUTYL RUBBER  
 WATERPROOFING MEMBRANE

**CORNER JOINT IN BUTYL MEMBRANE**

**T/ RAIL**

**F.F./ W. ABUT.**

**SPAN (NOTED)**

**D10012C AT 450**  
**D10011C AT 450**  
**D10009C AT 450**  
**D10008C AT 450**  
**D10013C - D10017C AT 450 = 1800**

**F.F./E. ABUT.**

**BY CONTRACTOR**  
 25 mm VEE GROOVE CAULK WITH FLINTSEAL 570-05

**0-064 m<sup>3</sup> CLEAR STONE (20 mm MIN.) (TYP)**

**GRANULAR BACKFILL**

**WEST**  
**EAST**

**5132**  
**5208**

**1**  
**1.5**

**2200**

**1050**  
**8675**  
**5 EQUAL SPACES AT 1525 = 7 625**

**198**  
**852**  
**698**  
**588**  
**522**  
**544**  
**569**

**PARABOLIC CURVE OFF-SETS INCLUDE DEAD LOAD DEFLECTIONS**

**75 mm Ø NON-METALLIC ABUT. DRAIN INV. EL. 77.280 (TYP) (SLOPE AS SHOWN)**

**ONLY**

**29 97**

**SYMM. ABOUT (UNLESS NOTED)**

**D20018C**  
**B35002C**  
**D20004**  
**D30003**  
**D25002**  
**B30001C**  
**D25001C**  
**B15004**  
**B15003**  
**B20008**  
**B35002C**  
**B30001C**  
**A30015**

**STIRRUP**  
**N.T.S.**

**DIMENSIONS**

**REINFORCEMENT**

**T/FTG. EL. 74.500 (TYP)**

3 mm THICK BUTYL MEMBRANE

SPAN

STA 11+648-500

90°

GQ ALRT REF. LINE

W.P. No. 1  
STA. 11+640-875

W.P. No. 2  
STA. 11+656-125

① ② ③ ④ ⑤ ⑥

5 EQUAL SPACES = 15.250

4.500

4.500

A B C

SCREED		ELEVATIONS	
No.	A	B	C
1	79.632	79.632	79.632
2	79.650	79.650	79.650
3	79.678	79.678	79.678
4	79.694	79.694	79.694
5	79.696	79.696	79.696
6	79.708	79.708	79.708

- SCREED ELEVATIONS INCLUDE ALLOWANCE FOR GRADE AND DEAD LOAD DEFLECTION
- CONTRACTOR TO MAKE ALLOWANCE FOR FALSEWORK CREEP.
- SCREED ELEVATIONS ARE GIVEN TO TOP OF CONCRETE DECK.

CONTRACT NO EGG-320	DWG NO S-026	REV 0	SHEET 100
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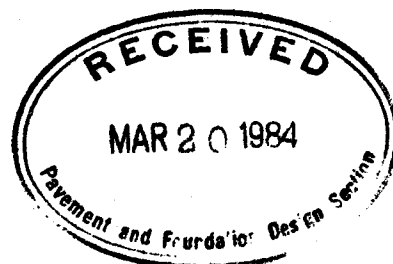


# FOUNDATION INVESTIGATION REPORT

CONTRACT NO. EGG 320



Ministry of  
Transportation and  
Communications



1

INDEX

PAGE NO.

1	Index
2	Abbreviations and Symbols
3- 12	Foundation Investigation Report For Project 470-711-606 Lynde Creek Structure, GO-ALRT

Note: For purposes of the contract these reports supercede  
all other foundation reports prepared by or for GO-ALRT  
in connection with the above-mentioned project.

## EXPLANATION OF TERMS USED IN REPORT

2

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

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

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

**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
$\sigma$	kPa	TOTAL NORMAL STRESS
$\sigma'$	kPa	EFFECTIVE NORMAL STRESS
$\tau$	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
$\epsilon$	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
$\mu$	1	COEFFICIENT OF FRICTION

### MECHANICAL PROPERTIES OF SOIL

$m_v$	$\text{kPa}^{-1}$	COEFFICIENT OF VOLUME CHANGE
$C_c$	1	COMPRESSION INDEX
$C_s$	1	SWELLING INDEX
$C_\alpha$	1	RATE OF SECONDARY CONSOLIDATION
$c_v$	$\text{m}^2/\text{s}$	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
$T_v$	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
$\sigma'_{vo}$	kPa	EFFECTIVE OVERBURDEN PRESSURE
$\sigma'_p$	kPa	PRECONSOLIDATION PRESSURE
$\tau_f$	kPa	SHEAR STRENGTH
$c'$	kPa	EFFECTIVE COHESION INTERCEPT
$\phi'$	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
$c_u$	kPa	APPARENT COHESION INTERCEPT
$\phi_u$	-°	APPARENT ANGLE OF INTERNAL FRICTION
$\tau_R$	kPa	RESIDUAL SHEAR STRENGTH
$\tau_r$	kPa	REMOULDED SHEAR STRENGTH
$S_t$	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

### PHYSICAL PROPERTIES OF SOIL

$\rho_s$	$\text{kg}/\text{m}^3$	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	$e_{\min}$	1, %	VOID RATIO IN DENSEST STATE
$\gamma_s$	$\text{KN}/\text{m}^3$	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	$I_D$	1	DENSITY INDEX = $\frac{e_{\max} - e}{e_{\max} - e_{\min}}$
$\rho_w$	$\text{kg}/\text{m}^3$	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
$\gamma_w$	$\text{KN}/\text{m}^3$	UNIT WEIGHT OF WATER	$S_r$	%	DEGREE OF SATURATION	$D_n$	mm	n PERCENT - DIAMETER
$\rho$	$\text{kg}/\text{m}^3$	DENSITY OF SOIL	$w_L$	%	LIQUID LIMIT	$C_u$	1	UNIFORMITY COEFFICIENT
$\gamma$	$\text{KN}/\text{m}^3$	UNIT WEIGHT OF SOIL	$w_p$	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
$\rho_d$	$\text{kg}/\text{m}^3$	DENSITY OF DRY SOIL	$w_s$	%	SHRINKAGE LIMIT	q	$\text{m}^3/\text{s}$	RATE OF DISCHARGE
$\gamma_d$	$\text{KN}/\text{m}^3$	UNIT WEIGHT OF DRY SOIL	$I_p$	%	PLASTICITY INDEX = $w_L - w_p$	v	m/s	DISCHARGE VELOCITY
$\rho_{\text{sat}}$	$\text{kg}/\text{m}^3$	DENSITY OF SATURATED SOIL	$I_L$	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
$\gamma_{\text{sat}}$	$\text{KN}/\text{m}^3$	UNIT WEIGHT OF SATURATED SOIL	$I_C$	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
$\rho'$	$\text{kg}/\text{m}^3$	DENSITY OF SUBMERGED SOIL	$e_{\max}$	1, %	VOID RATIO IN LOOSEST STATE	j	$\text{KN}/\text{m}^2$	SEEPAGE FORCE
$\gamma'$	$\text{KN}/\text{m}^3$	UNIT WEIGHT OF SUBMERGED SOIL						

FOUNDATION INVESTIGATION REPORT  
For  
Lynde Creek Structure, GO ALRT  
Project No. 470-711-606  
District 6, Toronto

INTRODUCTION:

This report summarizes the factual information obtained from a foundation investigation carried out on 83 05 31 and 83 06 01 at the above mentioned structure site. The fieldwork consisted of 2 sampled boreholes, each accompanied by dynamic cone penetration tests, and 2 additional cone penetration tests. One borehole was advanced by means of hollow stem augers and the other using solid stem augers. One additional boring was carried out to obtain in situ strength measurements using a field vane. The sampled boreholes were advanced to depths of 12.4 and 13.0 m. Bedrock was cored in both sampled boreholes by obtaining up to 3.1 m of BXL rock core.

SITE DESCRIPTION AND GEOLOGY

The site of the proposed crossing is located just south of Hwy. 401, 2.2 km east of the Brock St. interchange, in the Town of Whitby, Region of Durham.

Land use in the vicinity of Lynde Creek is predominantly agricultural with residential subdivisions encroaching from the northeast. The Toronto-Montreal CNR mainline crosses Lynde Creek 20 m to the south of the proposed structure, and is parallel to the proposed GO ALRT alignment at this location.

Topographically, the surrounding area is generally flat to undulating. Lynde Creek flows in a southerly direction and at the time of the field work, was approximately 15 m wide at the proposed structure site and 1 to 2 m deep. Soft silty clay is exposed at the stream edge.

The site is located in the physiographic region known as the 'Iroquois Plain'. This plain was formed by the inundation of glacial Lake Iroquois which smoothed the ground surface by wave action or lacustrine deposits.

SUBSURFACE CONDITIONS

General

The predominant subsoil across the site is a soft to stiff silty clay with varying amounts of sand and gravel. This deposit extends to a maximum depth of 7.3 m. At approximately the middle portion of this deposit is a 0.9 to 1.7 m layer of sand containing some silt. A 0.7 m thick seam of gravelly sand was encountered below the silty clay on the east side.

Underlying the silty clay deposit and the gravelly sand deposit is shale bedrock.

The boundaries between the various soil types, in situ and laboratory test results are shown on the attached Record of Borehole Sheets. The elevations and locations of the boreholes are shown on Drawing No. 470711606-A, along with estimated stratigraphical sections based on borehole data.

The various soil types encountered are described in the following paragraphs.

#### Silty Clay some Sand trace Gravel

This deposit extends to the bedrock surface on the west side of the site and is underlain by gravelly sand to the east. Occasional sand and silt seams are present in the silty clay stratum. The overall deposit varies in depth from 6.7 to 7.3 m.

Field vane tests indicate undrained shear strengths of 19 to 55 kPa with sensitivities of 2 to 5. These results along with 'N' values ranging from 2 to 11 blows per 0.3 m indicate the consistency of the stratum to vary from soft to stiff.

Two consolidation tests were conducted on samples taken from this deposit and the following results were obtained: Compression Index ( $C_c$ ) values of 0.134 and 0.191 and Initial Void ratio ( $e_0$ ) values of 0.715 and 0.652 and one Preconsolidation Pressure of 96 kPa, which indicate the soil to be moderately compressible.

A grain size distribution test completed on a sample from this stratum is plotted on Figure 1.

#### Sand some Silt trace of Gravel

This stratum of material is found sandwiched within the silty clay deposit. The deposit is relatively thin, varying in thickness from 0.9 to 1.7 m.

Grain size distribution tests conducted on samples taken from this layer are plotted on Figure 2 and indicate that the deposit consists of sand some silt with a trace of gravel.



The denseness of this stratum is estimated as very loose based on 'N' values of 2 blows per 0.3 m.

#### Gravelly Sand some Silt trace Clay

This 0.7 m thick deposit is sandwiched between the silty clay and the bedrock on the east side of the site.

The results of a grain size distribution test performed on a sample taken from this layer are plotted on Figure 1.

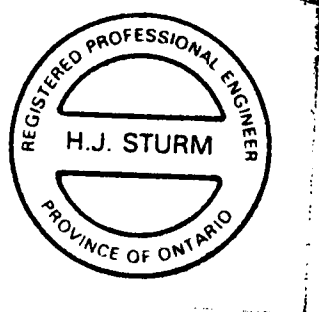
One 'N' value of 19 blows per 0.3 m indicates this layer is compact.

#### Shale Bedrock

Bedrock is a grey shale of the Whitby Formation, which was found to be relatively level with an approximate elevation of 70.8. The bedrock was cored for a maximum depth of 3.1 m. The shale is highly weathered in the upper 1.0 to 1.5 m zone, becoming less weathered with depth, and sound at elevation 67.0. Rock core recovery rates varied from 73 to 100%.

#### Groundwater Conditions

The groundwater elevations measured in open boreholes 1 and 2 indicate a groundwater elevation of 77.1. This was approximately 0.5 m higher than the water level in the creek during the time of investigation.



A handwritten signature in black ink, appearing to read "H. Sturm", written over a horizontal line.

H. Sturm, P. Eng.  
Project Foundations Engineer

M. Devata, P. Eng.  
Senior Foundations Engineer

APPENDIX



# RECORD OF BOREHOLE No 1

METRIC 7

W P 470-711-606 LOCATION Co-ords N 4 858 357.4; E 347 957.9 ORIGINATED BY RM  
DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger, BXL Rock Core, Cone Test COMPILED BY HS  
DATUM Geodetic DATE 83 05 31 CHECKED BY SP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
78.8	Ground Surface												
0.0	Silty Clay Some Sand Trace Gravel Occasional Sand and Silt Seams		1	SS	11		78						
			2	SS	3								
			3	SS	9								
75.0	Soft to Stiff		4	SS	4		76						
3.8			5	SS	2								
73.3	Sand some Silt with Seams of Silty Clay V. loose		6	SS	2		74						2 71 25 2
5.5													
71.5	Firm		7	SS	4		72						
70.8	Gravelly Sand Compact		8	SS	19								29 47 19 5
8.0	Shale Bedrock Highly weathered		9	SS	93		70						
	moderately weathered		10	RC BXL	REC 73%		68						
	sound		11	RC BXL	REC 100%		66						
65.8													
13.0	End of Borehole												

## RECORD OF BOREHOLE No 2

METRIC <sup>8</sup>

W P 470-711-606 LOCATION Co-ords N 4 858 350.6; E 347 960.1 ORIGINATED BY RM  
DIST 6 HWY GO ALRT BOREHOLE TYPE Solid Stem Auger, Cone and Vane Tests COMPILED BY HS  
DATUM Geodetic DATE 83 05 31 CHECKED BY CP

[illegible]

+3, x5: Numbers refer to Sensitivity





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# RECORD OF BOREHOLE No 3

METRIC 9

W P 470-711-606 LOCATION Co-ords N 4 858 340.4; E 347 934.3 ORIGINATED BY RM  
DIST 6 HWY GO ALRT BOREHOLE TYPE Solid Stem Auger, BXL Rock Core, Cone Test COMPILED BY HS  
DATUM Geodetic DATE 83 06 01 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	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
77.6	Ground Surface							20 40 60 80 100								
0.0	Silty Clay Some Sand Trace Gravel Occasional Sand and Silt Seams		1	SS	2	*	76						17.76	e = 0.72 C <sub>c</sub> = 0.13 0 27 53 20  12 65 18 5 e <sub>p</sub> = 0.65 σ <sub>p</sub> = 96 kPa C <sub>c</sub> = 0.19		
73.9	Soft to Firm		2	SS	3		74									
3.7	Sand Some Silt		3	TW	PH											
73.0	Some Gravel V. loose		4	SS	2											
4.6	Soft to Stiff	5	TW	PH												
70.9		6	TW	PH												
6.7	Shale Bedrock Highly weathered		7	SS	10		72									
	moderately weathered		8	SS	54		70									
	slightly weathered		9	RC BXL	REC 95%		68									
65.2	sound		10	RC BXL	REC 92%		66									
12.4	End of Borehole															
	*NOTE: Water level not established															

+3, x5 : Numbers refer to  
Sensitivity

20  
15 5 (%) STRAIN AT FAILURE  
10



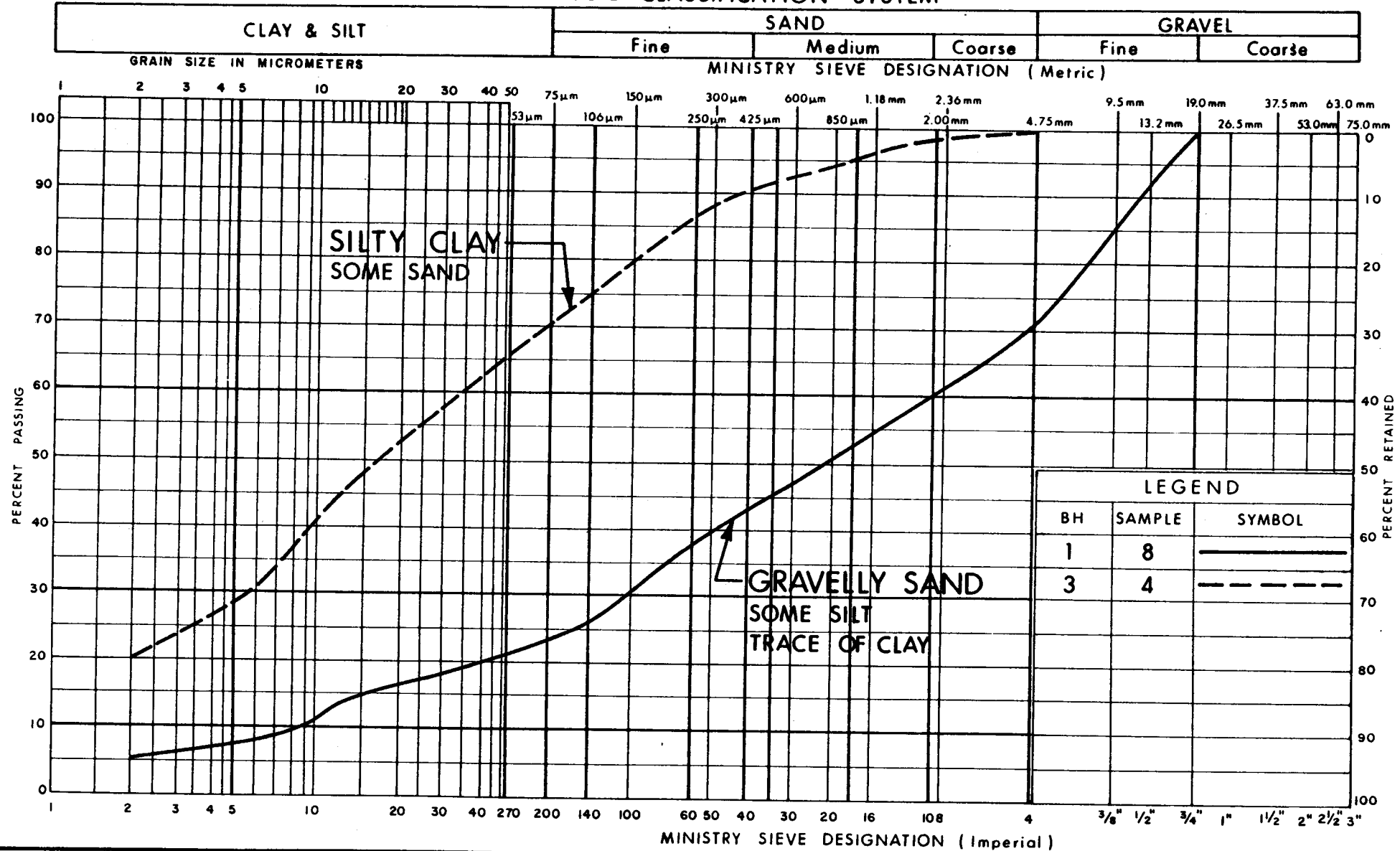
## METRIC 10

W P 470-711-606 LOCATION Co-ords N 4 858 350.6; E 347 933.2 ORIGINATED BY RM  
DIST 6 HWY GO ALRT BOREHOLE TYPE Cone Test COMPILED BY HS  
DATUM Geodetic DATE 83 06 01 CHECKED BY JP

[illegible]

+3, x5: Numbers refer to Sensitivity

## UNIFIED SOIL CLASSIFICATION SYSTEM



Ontario

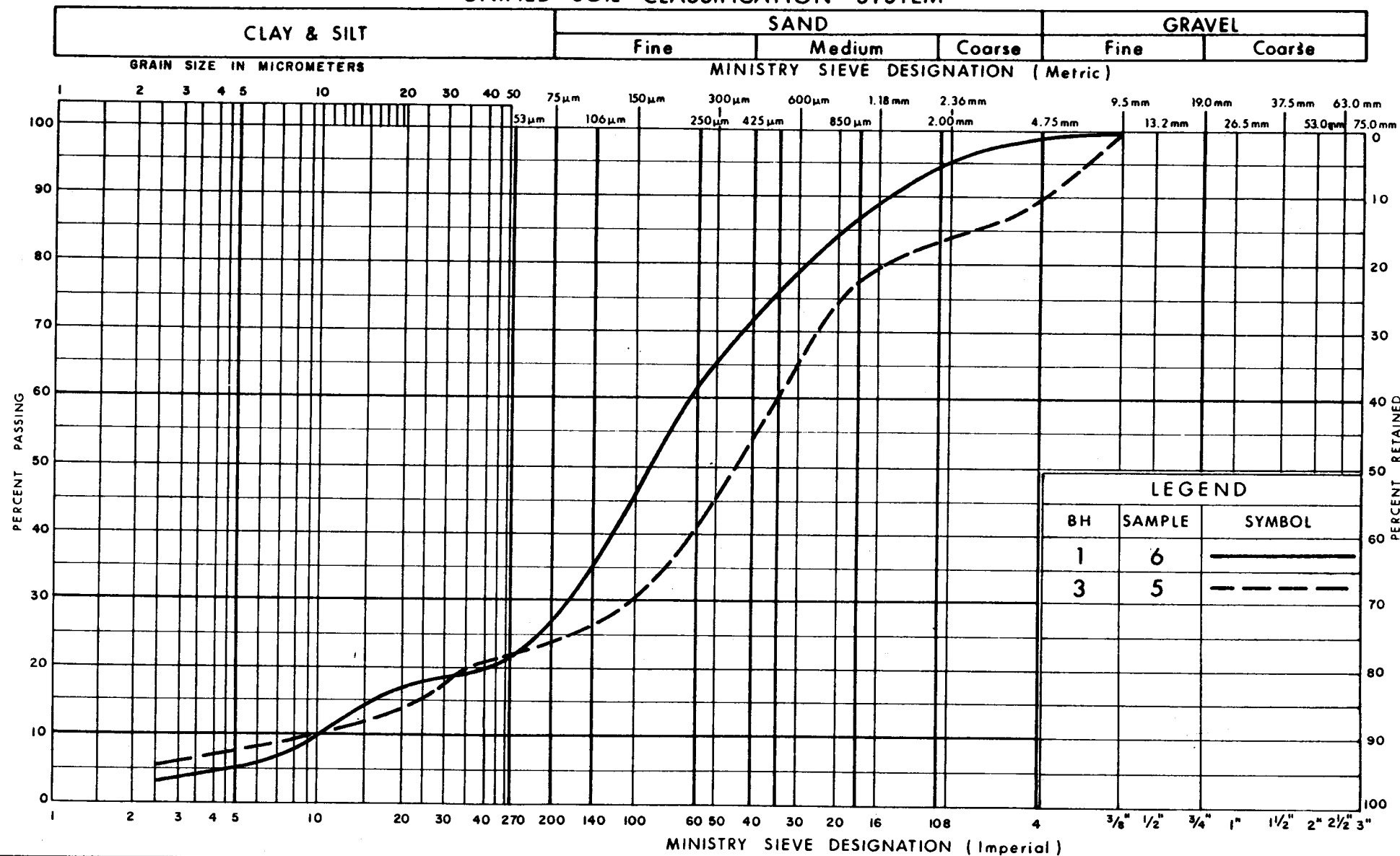
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## GRAIN SIZE DISTRIBUTION

FIG No 1

W P 470-711-606

## UNIFIED SOIL CLASSIFICATION SYSTEM



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GRAIN SIZE DISTRIBUTION  
SAND, SOME SILT

FIG No 2

W P 470-711-606