

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 40J14-32

DIST. 2 REGION Southwestern

W.P. No. 88-69-11

CONT. No. 79-20

W.C. No. 73-11018

STR. SITE No. _____

HWY. No. _____

LOCATION Retaining walls along
proposed St. Thomas Expressway

OVERALL DRAWINGS TO BE INCLUDED WITH THIS REPORT. 3

REMARKS: documents to be unfolded
before microfilming

FOUNDATION INVESTIGATION REPORT
For
Proposed Retaining Walls
Along Proposed St. Thomas Expressway
City of St. Thomas, Co. of Elgin
District No. 2 (London)
W.O. 73-11018 - W.P. 88-69-11

1. INTRODUCTION:

The Foundations Office was requested by Mr. A. P. Watt, Regional Structural Planning Engineer, Southwestern Region, to carry out a foundation investigation at the locations of the proposed retaining walls along St. Thomas Expressway and adjacent to Flex-O-Lite plant (Retaining Wall #1) and adjacent to the St. Michael's Separate School (Retaining Wall #2). The request was contained in a memo dated March 29, 1973.

Subsequently, a field investigation was carried out by this Office to determine the subsoil and groundwater conditions prevailing at the sites of the proposed retaining walls. Presented in this report are the results of the investigations, together with recommendations pertaining to the foundations for the proposed retaining walls.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

Retaining Wall #1 is located approximately 100 ft. south of the Flex-O-Lite plant building and north of the expressway. It runs from a point some 80 ft. west of Ontario Road for a distance of 435 ft. to the east, between Stations 225+85 and 230+20 parallel to the expressway centre-line. The surrounding area is flat. To the west of Ontario Road is an abandoned apple orchard and to the east of Ontario Road the land immediately south of the Flex-O-Lite is grassy and barren.

Retaining Wall #2 is located north of the St. Michael's Separate School and south of the expressway. The wall is approximately 150 ft. long and runs between Stations 214+00 and 215+00 parallel to the expressway centre-line. The wall is situated on top of a grass and tree covered ravine, some 200 to 250 ft. wide and about 20 ft. deep. At this location the expressway runs through the ravine.

Physiographically, both sites are located in the region referred to as the Mount Elgin Ridges.

3. FIELD AND LABORATORY INVESTIGATIONS:

A total of six sampled boreholes and five dynamic cone penetration tests were put down during the course of the field work; one sampled borehole (#R6) accompanied by a dynamic cone penetration test being put down under a related project (W.O. 73-11017). Boreholes R1, R2, R3 and R4 were placed at the location of the proposed Wall #1 and Boreholes R5 and R6 were placed at the location of proposed Wall #2. All boreholes were advanced using a continuous hollow stem C.M.E. augering machine. Disturbed samples were obtained using a 2-inch O.D. split spoon sampler driven according to the specifications for the Standard Penetration Test. Where possible field vane tests were carried out at elevations 12 inches below sample depths.

Dynamic cone penetration tests were carried out adjacent to five sampled boreholes. Driving energy to advance the cones was 350 ft.-lbs. per blow.

Samples were examined visually in the field and again in the laboratory. Tests were performed on selected samples to determine the following physical properties:

- (1) Natural Moisture Content
- (2) Atterberg Limits
- (3) Grain-Size Distribution

The results of the field and laboratory tests are given on the Record of Borehole sheets and Figures 1 to 4 which are contained in the Appendix of this report.

The locations and elevations of the boreholes and cone

tests, together with the estimated stratigraphical profiles are given on Drawing No. 73-11018A, which is also contained in the Appendix to this report. The borehole locations and elevations were surveyed in the field by personnel from Southwestern Region Engineering Surveys Office, London.

4. SUBSOIL CONDITIONS:

4.1) Retaining Wall #1:

4.1.1) General:

A total of four sampled boreholes were put down for Retaining Wall #1 (B.H.'s R1, R2, R3 & R4). In general, the subsoil at the site consists of a deposit of silty clay underlain by a deep deposit of clayey silt, which was in turn underlain by glacial till. A 9-10 ft. thick surficial layer of sand and gravel was encountered in two boreholes put down in the west half portion of the wall.

The boundaries between the various soil types are shown on the Record of Borehole sheets contained in the Appendix. The estimated stratigraphical profile shown on Drawing No. 73-11018A is based on this information.

From ground level downward, the various strata are described in some detail with regard to soil types and soil properties as follows:

4.1.2) Sand and Gravel Mixture and Silt and Clay:

This 9 to 11 ft. thick deposit was found in Boreholes R3 and R4 only. Standard Penetration Tests carried out within this stratum resulted in 'N' values of 12-38 blows/foot, indicating a compact to dense relative density. Grain-size analyses indicated the following distributions and are plotted on Figure 3.

			<u>Average</u>
Gravel	%	18 - 58	38
Sand	%	9 - 40	24
Silt & Clay	%	23 - 64	48

4.1.3) Silty Clay, Traces of Sand and Gravel:

This material was found in all boreholes. In Boreholes R1 and R2 it extended downward from ground level for 30 ft. and 29.0 ft. (to elevation 733) respectively. In Borehole R3 and R4 it was overlain by the sand and gravel layer and was 23-24 ft. in thickness, extending down to elevation 732 and 729, respectively.

The material consists of silty clay with traces of sand and gravel. During the field work, numerous randomly distributed silt and sand seams were discovered within this deposit. 'N' values ranged from 15 to 40 blows/foot indicating a very stiff to hard consistency, but in general, the consistency was very stiff.

Physical properties of this material as determined from laboratory tests are as follows and are plotted on Figure 1:

		<u>Average</u>
Natural Moisture Content %	16 - 29	22
Liquid Limit %	36 - 46	41
Plastic Limit %	18 - 24	21

The grain size analyses indicate the following distributions and are plotted on Figure 3:

Gravel %	0 - 3
Sand %	0 - 2
Silt %	31 - 62
Clay %	33 - 66

4.1.4) Clayey Silt, Some Sand and Traces of Gravel:

This material was found in every borehole below the silty clay and extending down to 89.0 ft., (elevation 674.9) below ground surface in Borehole R3. All other boreholes were terminated within this stratum. The material consists of clayey silt with some sand and traces of gravel and is of glacial origin. During the field investigation, occasional seams or pockets of silt were discovered within the main deposit. These random silt seams could act as water bearing seams.

Standard penetration test 'N' values within the stratum ranged from 17-88 blows/foot with an average value of 38 blows/foot indicating a very stiff to hard consistency.

Physical properties of the stratum as determined from laboratory tests are as follows and are plotted on Figure 1.

			<u>Average</u>
Natural Moisture Content	%	13 - 16	14
Liquid Limit	%	24 - 27	25
Plastic Limit	%	14 - 15	14

Grain size analyses indicate the following distributions and are also plotted on Figure 3.

Gravel	%	1 - 9
Sand	%	18 - 22
Silt	%	42 - 54
Clay	%	24 - 39

4.1.5) Heterogeneous Mixture of Sand Silt Clay and Gravel (Glacial Till):

This material was encountered in Borehole R3 only, at a depth of 89.0 ft. (elevation 674.9), immediately underlying the clayey silt stratum. Borehole R3 was terminated in this material. The material consists of a heterogeneous mixture of sand, silt gravel and clay (glacial till) and can be described as very dense. A standard penetration test within this stratum gave an 'N' value of over 100 blows/foot. A single grain-size analysis indicated the following distribution: (see Figure 3) Gravel - 3%, Sand - 34%, Silt - 52%, Clay - 11%.

4.2) Retaining Wall #2:

4.2.1) General:

Two sampled boreholes (R5 and R6) were put down for this retaining wall. Borehole R6 was done under a related project (W.O. 73-11017). Relatively uniform subsoil conditions were found to prevail across the site area. The subsoil consists of a 20 to 24 ft. thick deposit of silty clay underlain by a deep deposit of clayey silt. The lower boundary of the deposit was not determined, since the borings were terminated in this stratum, but extends to a minimum depth of 66.5 ft. (elevation 689.7).

The boundaries between the soil types are shown on the Record of Borehole sheets contained in the Appendix of this report. The estimated stratigraphical profile shown on Drawing No. 73-11018A is based upon this information.

From ground level downward, the various strata are described in some detail with regard to soil types and soil properties as follows:

4.2.2) Silty Clay, Traces of Sand and Gravel:

This 20 to 24 ft. thick stratum consists of silty clay with traces of sand and gravel. Although no conspicuous silt seams were intersected, it is possible that randomly distributed silt and/or sand seams could be present in the main deposit of silty clay and these could act as water bearing seams. The upper 4-5 ft. of this stratum is brown, due probably to oxidation, while below the material is grey in colour.

Standard penetration test 'N' values obtained in this stratum ranged from 15 to 30 blows/ft. indicating a very stiff to hard consistency for the stratum. Based on these 'N' values, the undrained shear strength appears to be everywhere greater than 2000 p.s.f. A field vane test was attempted in this stratum in Borehole R5, but could not be turned, further indicating an undrained shear strength in excess of 2000 p.s.f.

Physical properties of the deposit as determined from the laboratory tests on a single representative sample from this stratum, are as follows (Figure 2):

Natural Moisture Content %	25
Liquid Limit %	46
Plastic Limit %	24

A single grain size analysis on the same samples indicate the following distribution (Figure 4):

Gravel and Sand %	0
Silt %	42
Clay %	58

4.2.3) Clayey Silt, Some Sand, Traces of Gravel:

This stratum was intersected in both boreholes which were

terminated in this deposit. It is a minimum of 46 ft. thick and is composed of clayey silt with some sand and traces of gravel. As with the overlying silty clay stratum, thin seams of silt and/or sand partings could be present and could act as water bearing seams.

Standard penetration test 'N' values within this stratum ranged from 16 to 51 blows/foot indicating a very stiff to hard consistency. Based on these 'N' values, the undrained shear strength appears to be greater than 2000 p.s.f. everywhere.

Physical properties of this deposit as determined from the laboratory tests are as follows and are plotted on Figure 2:

		<u>Average</u>
Natural Moisture Content %	15 - 25	20
Liquid Limit %	25 - 45	35
Plastic Limit %	14 - 20	17

The grain size analyses indicate the following distributions and are plotted on Figure 4:

Gravel %	0 - 3
Sand %	0 - 18
Silt %	47 - 49
Clay %	34 - 53

5. GROUNDWATER CONDITIONS:

The water levels in various boreholes at the time of the investigation were as follows:

Retaining Wall #1

<u>Borehole No.</u>	<u>Elevation</u>
R1	727.5
R2	760.1
R3	760.0
R4	760.8

From the above table it is seen that relatively high water levels were observed in Boreholes #R2, R3 & R4. It is believed that this water came from the pervious layer near the ground surface.

Retaining Wall #2

Borehole No.

Elevation

R5

Hole Dry

R6

Hole Dry

6. DISCUSSION & RECOMMENDATIONS:

6.1) Retaining Wall No. 1:

It is proposed to construct the St. Thomas Expressway through a cut to the south of the Flex-O-Lite Plant. This will necessitate constructing a retaining wall with an exposed height varying between approximately 11 and 18 ft. (east to west) to the north of an E-NS ramp. The retaining wall will be a cut wall some 435 ft. long (between Stations 225+85_± and 230+20_± parallel to the expressway centre-line).

In view of the encountered subsoil conditions it is recommended that the entire or part of the wall be supported on spread footing type foundations. A safe bearing capacity of 2.0 t.s.f. may be used for design purposes. The sliding resistance can be computed assuming a value of 0.4 for the coefficient of friction between the base of the footing and the underlying subsoil.

As an alternative, the retaining wall may be supported on end-bearing piles driven to approximate elevation 665 - 670 in the very dense glacial till deposit. The maximum allowable load for the particular pile type chosen may be assumed for design purposes.

As a further alternative, the entire or part of the wall may be supported on timber friction piles. In this case an allowable load of 0.5 tons/foot length of pile embedment in the original ground may be used for design purposes.

It is believed that the groundwater level in the area of the retaining wall is in general well below the proposed base of the footings. The relatively high water levels found in Boreholes R2, R3 and R4 are probably the result of surface water contained in the permeable 9 - 11 ft. thick sand and gravel deposits found at these boring locations. During construction it

may be necessary to remove the water runoff from the granular deposit by means of pumping but in general, no major dewatering problems are anticipated.

A minimum cover of 4 ft. should be provided for frost protection.

The backfill to the wall should conform with current M.T.C. standards. In this case, the coefficient of active earth pressure (K_a) can be taken as 0.33.

6.2) Retaining Wall No. 2:

It is proposed to carry the new St. Thomas Expressway under the First Avenue in the City of St. Thomas. A W-NS ramp will provide access from the westbound lanes of the expressway to First Avenue. The construction of this ramp will require an approximately 3 - 6 ft. high retaining wall on the south side of ramp. The wall will be a cut wall approximately 150 ft. long running between Stations 214+00 and 215+50.

In view of the encountered subsoil conditions it is recommended that the entire or part of the wall be supported on spread footing type foundations placed at least 4.0 ft. below the finished ground elevation in front of the retaining wall. A safe bearing capacity of 2.0 t.s.f. may be used for design purposes. For computations of sliding resistance a friction coefficient of 0.4 may be assumed to apply between the base of the footing and the underlying soil.

Alternatively the entire or part of the wall may be supported on timber friction piles. A load of 0.5 tons/foot of pile length may be used for design purposes.

At the time of the field work, the groundwater level was well below the base of the proposed footing elevations. As such no dewatering problems are anticipated. As mentioned previously, the randomly distributed silt seams and/or sand partings within the main overburden deposit could act as water bearing seams.

A minimum of 4 ft. of earth cover should be provided for frost protection.

The backfill to the wall should conform with current M.T.C. standards. In this case, the coefficient of active earth

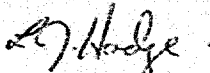
pressure (K_a) can be taken as 0.33.

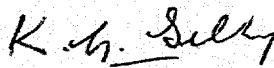
7. MISCELLANEOUS:

The field investigation was carried out during the period from May 23, 1973, under the supervision of Mr. L. J. Hodge, Project Foundations Engineer, who also prepared this report. The entire project was under the supervision of Mr. A. Prakash, Senior Foundations Engineer.

Equipment used, was owned and operated by Dominion Soils Investigations Co. Ltd.

This report was reviewed by Mr. K. G. Selby, Supervising Foundations Engineer.


L. J. Hodge


K. G. Selby, P. Eng.

LJH/ao

August 30, 1973.

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO R1

JOB 73-11018

LOCATION Co-ords. 15,517,209 N; 1,356,792 E.

ORIGINATED BY LJR

W.P. 89-60-11

BORING DATE May 24, 1973

COMPILED BY LJR

DATUM Geodetic

BOREHOLE TYPE Auger & Core

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT	BLOWS / FOOT	20	40	60	80	100	W _p	W _L		
762.9	Ground Level														
0.0	Silty clay <u>Brown</u> occasional seams or pockets of silt. Hard to Very Stiff Grey		1	SS	34										
			2	SS	25										0 0 36 64
			3	SS	21										
			4	SS	19										0 0 53 47
			5	SS	18										
732.9			6	SS	28										3 17 45 56
30.0	Clayey silt, some sand, traces of gravel. occasional silt pockets or seams. Very Stiff to Hard Grey		7	SS	27										727.5
			8	SS	13										
			9	SS	27										7 22 47 24
			10	SS	35										
			11	SS	28										
681.1			12	SS	88										1 20 54 25
81.5	End of Borehole														

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO R 2

JOB 73-11018

LOCATION Co-ords. 15,549,596 N; 1,356,658 E.

ORIGINATED BY L.J.H.

W.P. 85-69-11

BORING DATE May 23, 1973

COMPILED BY L.J.H.

DATUM Geodetic

BOREHOLE TYPE Auger & Cone

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	w_p	w	w_L		
761.8	Ground Level															
0.0	Brown		1	SS	16											GR. SA. SI. CL.
	Silty clay, occasional silt seams or pockets.		2	SS	40	750										3 2 62 35
	Very Stiff to Hard		3	SS	16											0 0 37 63
	Grey		4	SS	16	740										0 0 40 60
732.8			5	SS	17											
29.0	Clayey silt, some sand, traces of gravel.		6	SS	32	730										2 19 49 30
	Hard. Grey		7	SS	34											
720.3			8	SS	47	720										
41.5	End of Borehole															
						710										

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO R3

JOB 73-11018

LOCATION Co-ords. 15,549,607 N; 1,356,495 E.

ORIGINATED BY LJH

W.P. 89-69-11

BORING DATE May 23, 1973

COMPILED BY LJH

DATUM Geodetic

BOREHOLE TYPE Auger & Cone

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — W_L PLASTIC LIMIT — W_P WATER CONTENT — W			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W_P	W_L		
763.9	Ground Level														
0.0	Sand & gravel mixture with silt & clay.					760									760.0
754.9	Compact Brown		1	SS	12										22 40 (38)
9.0	Silty clay, traces of sand, occ. seams or pockets of silt.		2	SS	17										0 1 36 63
	Very Stiff		3	SS	20										
	Grey		4	SS	19										0 0 39 61
			5	SS	17										
731.9			6	SS	25										0 0 46 54
32.0	Clayey silt, some sand, traces of gravel		7	SS	31										
	occasional silt seams		8	SS	51										9 17 43 31
	Very Stiff to Hard														
	Grey		9	SS	27										
			10	SS	40										2 20 48 30
			11	SS	43										
			12	SS	37										
674.9	Fin. mix. sa. si. clay, 10% grav. Dense. 111		13	SS	100/6"										3 34 52 11
673.5															
90.6	End of Borehole					670									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO R4

JOB 73-11018

LOCATION Co-ords. 15,549,626 N; 1,316,356 E.

ORIGINATED BY LJH

W.P. 85-69-11

BORING DATE May 24, 1973

COMPILED BY LJH

DATUM Geodetic

BOREHOLE TYPE Auger & Cone

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	w_p	w	w_L		
762.9	Ground Level															
0.0	Sand and gravel mixture with silt and clay.		1	SS	38	760										760.8
752.4	Brown Very Dense		2	SS	31											58 9 24 9
10.5			3	SS	19	750										18 18 24 40
	Silty clay, traces to some sand and traces of gravel		4	SS	15											0 0 37 63
	occasional silt seams or pockets.		5	SS	17	740										
	Very Stiff. Grey		6	SS	18											1 2 31 66
728.9			7	SS	17	730										
34.0	Clayey silt, some sand, traces of gravel		8	SS	51											1 18 42 39
721.4	Very Stiff to Hard Grey															
715.5	End of Borehole					720										
						710										

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO R5

JOB 73-11018

LOCATION Co-ords. 15,549,164 N; 1,355,227 E.

ORIGINATED BY LJH

W.P. 89-69-11

BORING DATE May 30, 1973

COMPILED BY LJH

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE 1000 2000			WATER CONTENT %				
763.3	Ground Level													
0.0	Silty clay, traces of sand and gravel.		1	SS	26	760								
	Very Stiff		2	SS	30									
	Brown Grey		3	SS	21	750								
			4	SS	16									
739.3	Clayey silt, some sand, traces of gravel.		5	SS	15	740								
24.0	Very Stiff to Hard		6	SS	20									
726.8	End of Borehole		7	SS	51	730								Dry Hole
36.5						720								

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO R 6 (S18 - 73-11017)

JOB 73-11018

LOCATION Co-ords. 15,549,280 N; 1,355,315 E.

ORIGINATED BY MY

W.P. 89-69-11

BORING DATE May 14, 1973

COMPILED BY LJH

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger & Cone

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		w_p — w — w_L	WATER CONTENT % 20 40 60		
756.2	Ground Level											
0.0	Silty clay, traces of sand.		1	SS	21	750						
	Very Stiff		2	SS	16							0 0 42 58
	Grey		3	SS	15	740						
736.2			4	SS	16							
20.0	Clayey silt, some sand, traces of gravel.		5	SS	21	730						0 18 47 35
	Very Stiff		6	SS	29							
			7	SS	26	720						3 14 49 34
			8	SS	31							
	Silty Clay		9	SS	12	710						0 0 47 53
			10	SS	21							
			11	SS	28	700						Water level not establi
			12	SS	17							
689.7			13	SS	18	690						5 25 44 26
66.5	End of Borehole											
						680						

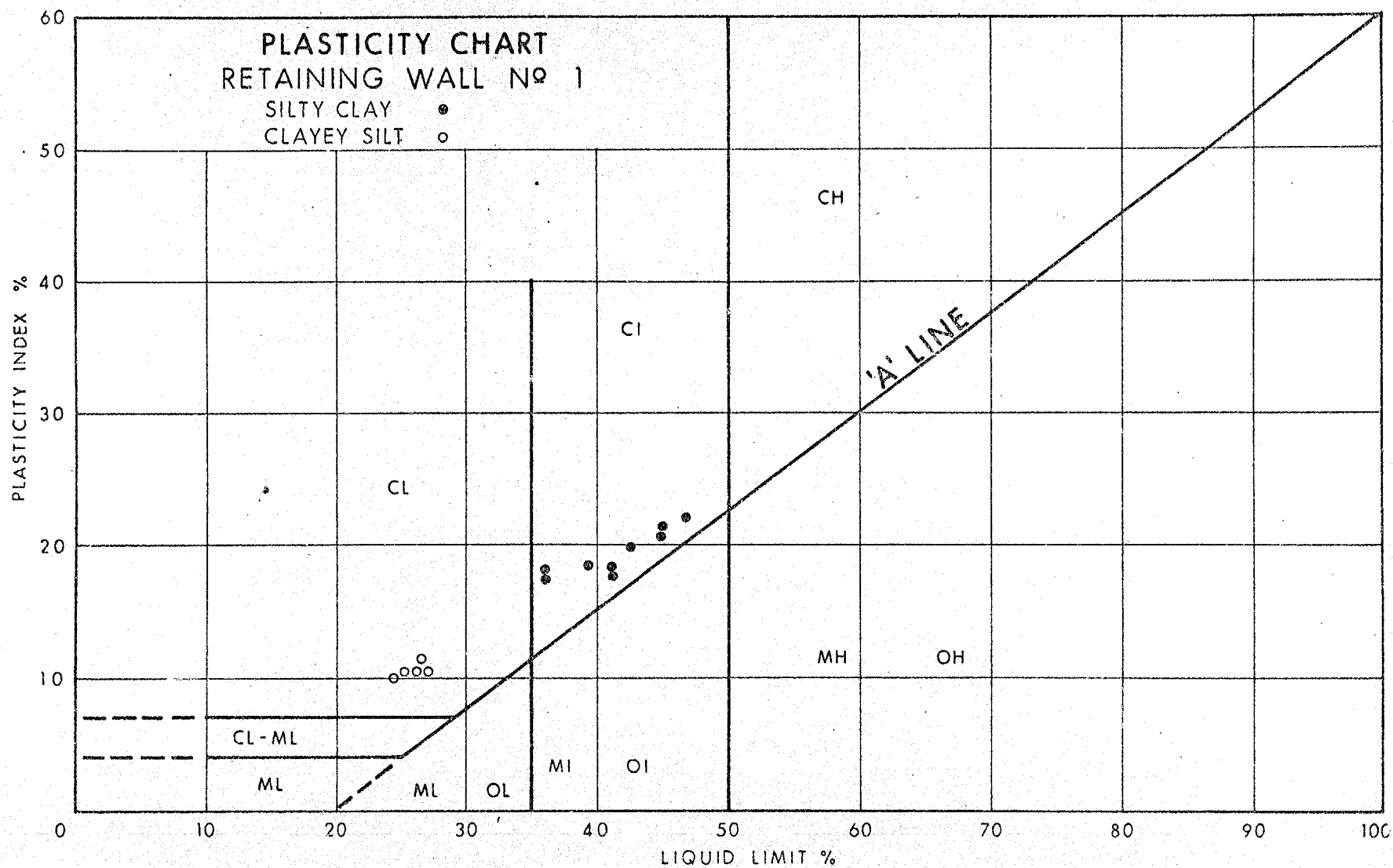


FIG. 1

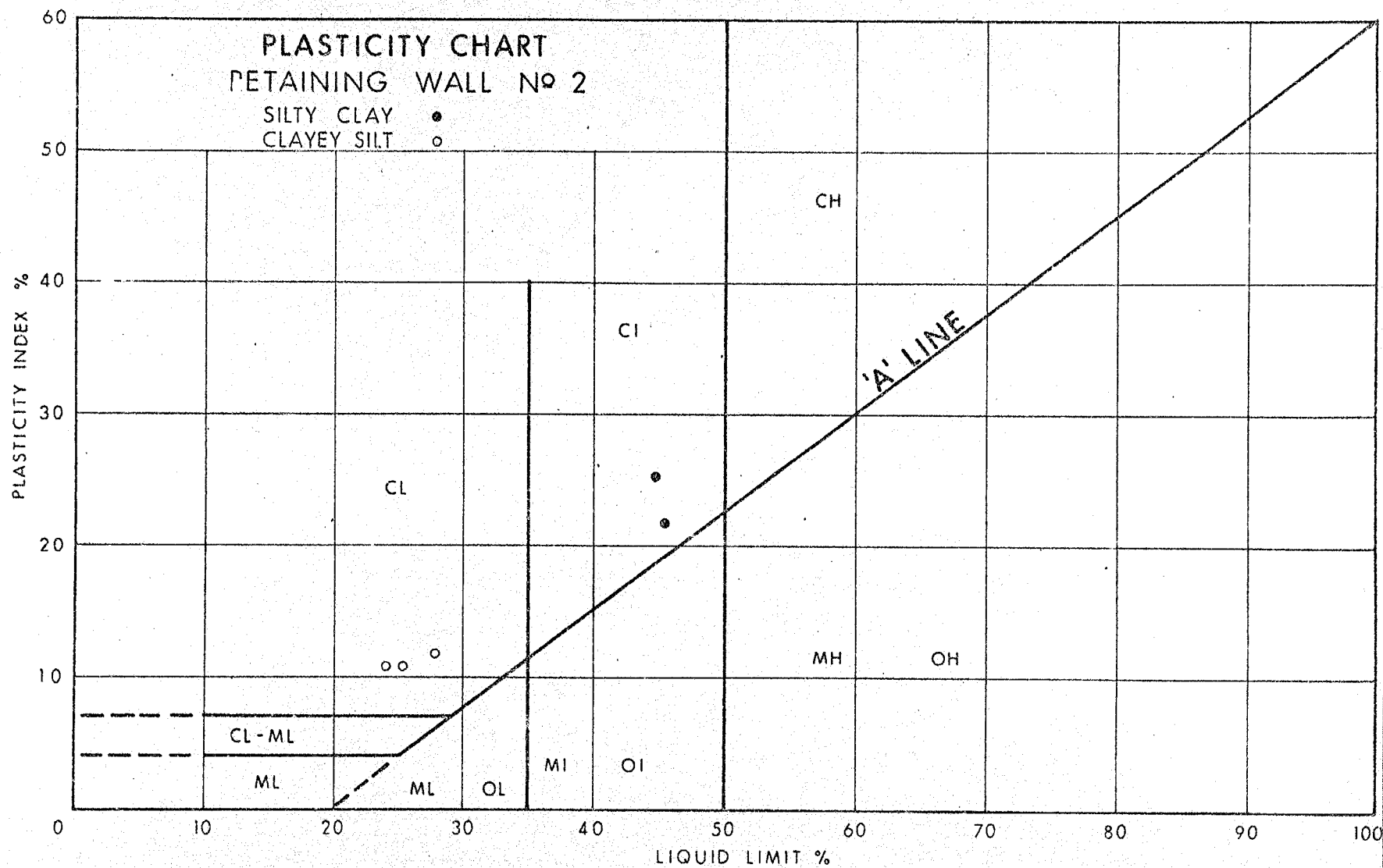
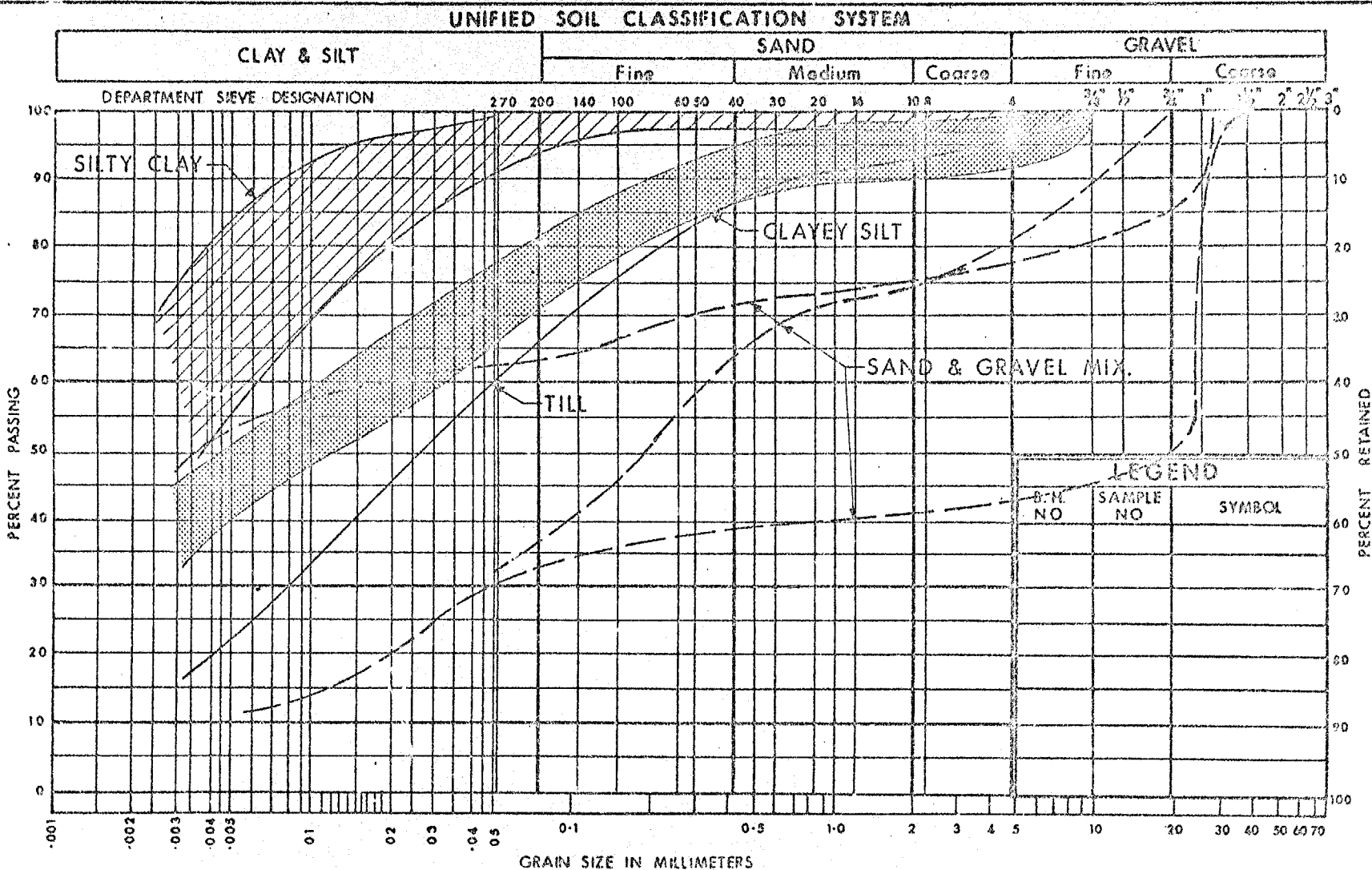


FIG. 2



DESIGN SERVICES
BRANCH

GRAIN SIZE DISTRIBUTION

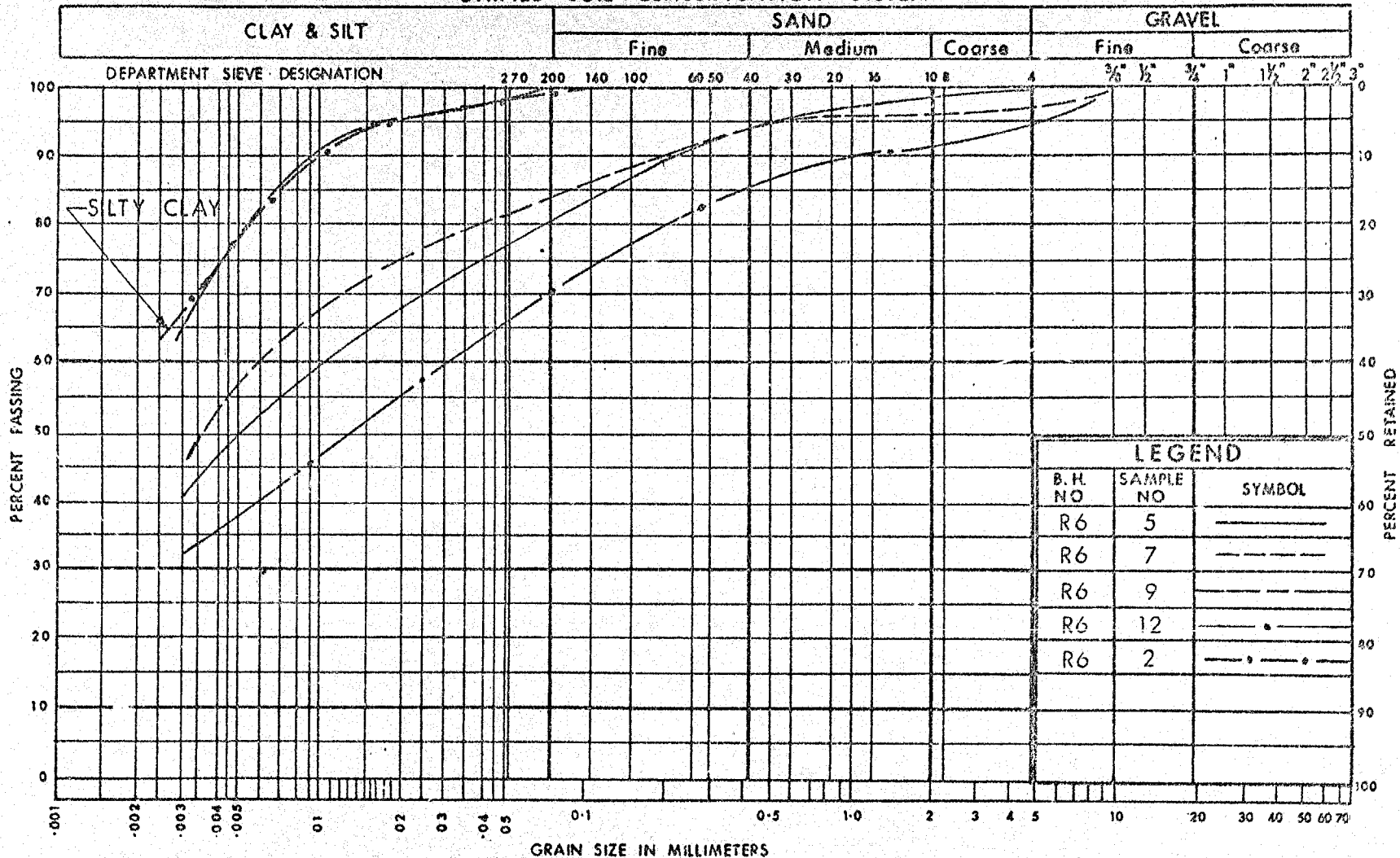
RETAINING WALL NO 1

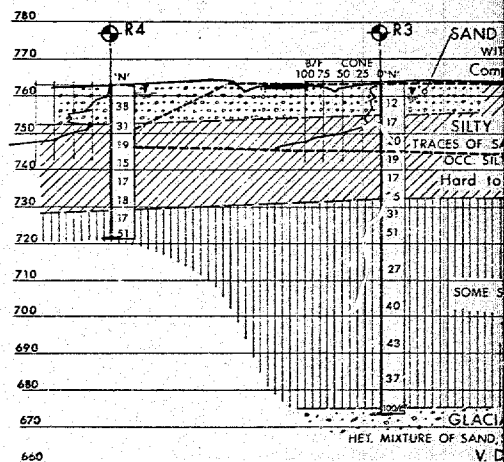
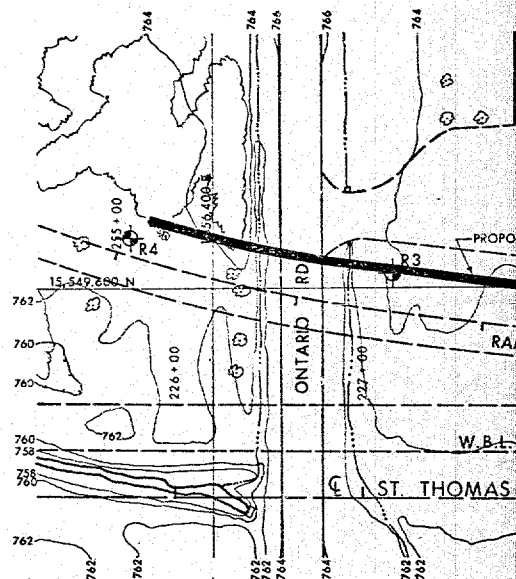
W.P. No. 89-69-11

JOB No. 73-11018

FIGURE 3

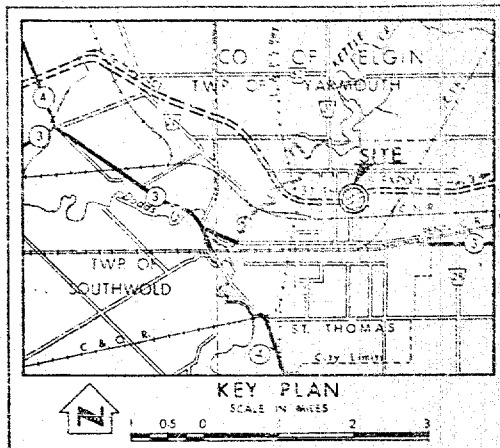
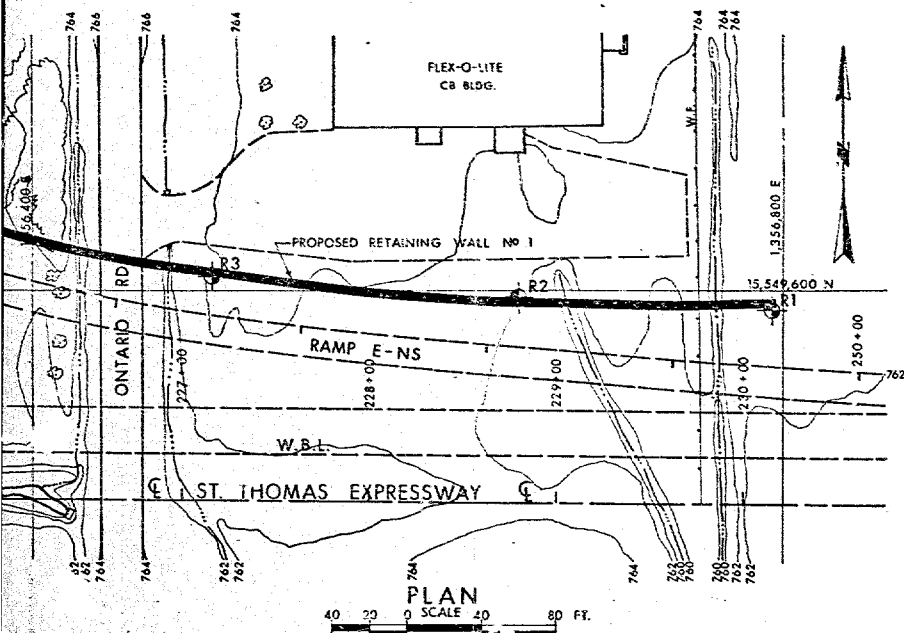
UNIFIED SOIL CLASSIFICATION SYSTEM



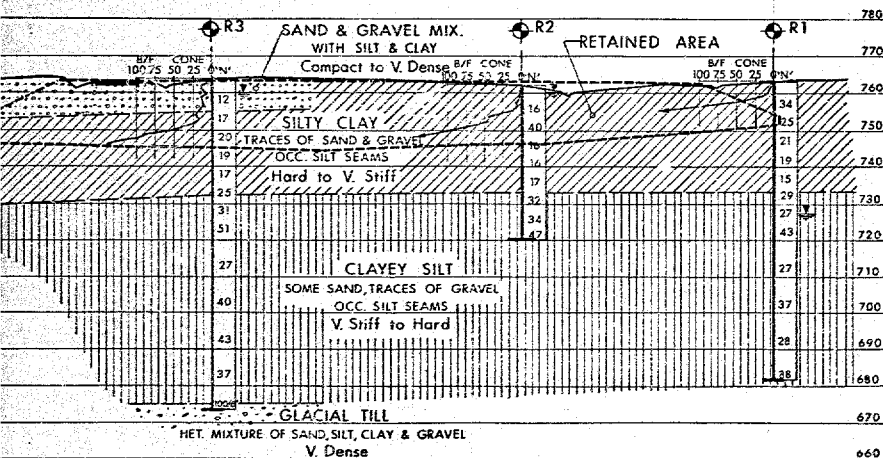


RETA





LEGEND			
	Bore Hole		
	Cone Penetration Test		
	Bore Hole & Cone Test		
	Water Levels established at time of field investigation, MAY 1973. Water level not established for borehole NO R6.		
NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
R1	762.0	15,549,589	1,356,794
R2	761.8	15,549,596	1,356,658
R3	763.9	15,549,607	1,356,495
R4	762.9	15,549,626	1,356,356
R5	763.3	15,549,134	1,355,227
R6	756.2	15,549,280	1,355,315



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

REVISIONS	DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
DESIGN SERVICES BRANCH—FOUNDATIONS OFFICE

RETAINING WALLS

NO 1 (FLEX-O-LITE) NO 2 (ST. MICHAELS)

HIGHWAY NO. PROP. ST. THOMAS EXPW. DIST. NO. 2

CO. ELGIN, CITY OF ST. THOMAS

TWP. YARMOUTH LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD. A.P.	CHECKED <input checked="" type="checkbox"/>	W.P. NO. 85-69-11	DRAWING NO.
DRAWN M.S.	CHECKED <input checked="" type="checkbox"/>	W.C. NO. 73-11018	73-11018 A
DATE AUG. 21, 1973	SITE NO.	BRIDGE DRAWING NO.	
APPROVED	CONT. NO.		
PRINCIPAL FOUNDATION ENGINEER			

REF. NO FENCO 3802-SK-17 & 24

FENCO

1 Yonge Street
Toronto Canada
416-361-4722
Cable 'Foundationeng'
Telex 02 2814

May 2nd., 1973

Mr. K. Selby
Supervising Foundations Engineer
Ministry of Transportation and
Communications
DOWNSVIEW 464, Ontario

Dear Sir:

ST. THOMAS EXPRESSWAY
FOUNDATION INVESTIGATION FOR
RETAINING WALL AT FLEX-O-LITE

In response to your recent telephone query regarding the alignment details for the above location. The following comments pertain:-

1. On profile 3802-SK-25 the ramp should be noted as 'E-NS' not 'W-NS'.
2. The chainage on the profile 3802-SK-25 matches the chainage on plan 3802-SK-24, note that these are ramp chainages only - not main alignment chainage for the St. Thomas Expressway.
3. Subsequent to the issuance of plans 3802-SK-24 and -25, the ramp chainages were changed to an 800' series to differentiate it from the main alignment and from the other ramp. The 40 scale overall plan submitted previously may have an 800 series chainage on the ramp.

Enclosed are two sets of prints of drawings 3802-SK-24 and -25, revised to show the new chainages.

Yours very truly,
FOUNDATION OF CANADA ENGINEERING
CORPORATION LIMITED



R.C. Treftlin, P. Eng.,
SUPERVISING ENGINEER, HIGHWAYS

RCT/jar
Encl.
3802-101-1
cc: D. King
MTC, London

Foundation of Canada Engineering Corporation Limited

Vancouver · Calgary · Edmonton · Hamilton · Toronto · Ottawa · Montreal · Fredericton · Saint John · Halifax · St. John's



Mr. A. P. Watt,
Regional Structural Planning Eng.,
Southwestern Region,
London, Ontario.

Foundations Office,
Design Services Branch,
West Building.

July 6, 1973.

Proposed Storm Sewer Along St. Thomas Expressway
H.O. 78-11017 -- W.P. 88-69-01

We have recently completed our field investigation of the above-mentioned project. This letter contains recommendations relating to the design of sewer, etc. at four locations; i.e., Burwell Road, First Ave., Balaclava St. and C.N.R. Subway as requested in your memo of June 12, 1973.

The subsoil at the above four sites, in general, consists of stiff to hard clayey silt to silty clay.

Sewer

The following table provides particulars of the sewer at the four sites under consideration.

Location	Invert Elev.	Finished Grade of S.T.E.	GWL	OGI
Burwell Rd.	743	757	714	769
First Ave.	724	741	705	761
Balaclava St.	719	736	708-25	750
C.N.R. Subway	695	716	717	748

As is seen from the above table the groundwater is below the invert elevation of the sewer except at the C.N.R. Subway.

Since the future performance of the sewer pipe is dependant to a very great extent on the type and quality of the bedding used, it is essential that the latter be placed and compacted under dry conditions. Because of the relatively impermeable nature of the subsoil, no major dewatering problems are anticipated.

However, some seepage from the sides may occur because of the presence of layers of non-cohesive material.

With regard to bedding for the proposed sewer, the following recommendations are made:

- (i) Soil at or slightly below the invert level should be assumed to be of yielding nature for the entire length of sewer.
- (ii) Bedding for sewer pipes should be provided as per M.T.C. Standard DD-823.
- (iii) Backfill for sewer pipes should be provided as per M.T.C. Standard DD-813-B.

An allowable bearing capacity of 2 t.s.f. may be assumed for the design of sewer manhole foundations.

Excavations in the cohesive overburden, with side slopes of 1:1 should remain stable during the course of the work, provided the depth of the sloping portion does not exceed about 25 ft. Vertical slopes must be sheeted and adequately braced at all times.

Retaining Walls

Flexolite

This retaining wall is about 435 ft. long and has a maximum clear height of 22 ft. The footings will be at approximate elevation 737.

The wall can be supported on spread footings. A safe allowable bearing pressure of 2 t.s.f., and an adhesion value of 1500 p.s.f. between the underside of the footing and the underlying soil may be assumed for design purposes.

Alternatively, the wall can be supported on friction piles driven to elevations necessary to achieve the required pile capacity. In determining the safe capacity of a timber pile, the following equation may be used.

$$Q = 0.5L \text{ (tons)}$$

where Q = Safe capacity of one pile (tons)

L = Embedded length in original ground (ft.)

As a second alternative, the retaining wall may be supported on steel H-piles driven to refusal. It is estimated that refusal will be achieved at elevation 660. A maximum allowable load of up to 95 tons may be used for design purposes.

St. Michaels School

This retaining wall is about 150 long and has a maximum clear height of 4 ft. The footings will be at approximate elevation 755.

It is recommended that the wall be supported on spread footing type foundations. A maximum allowable pressure of 2 t.s.f. an an adhesion value of 1500 p.s.f. between the base of the footing and the underlying subsoil may be used for design purposes.

A minimum cover of 4 ft. should be provided for frost protection.

The backfill to the walls should conform with current M.T.C. standards. In this case, the coefficient of active earth pressure (K_a) can be taken as 0.33.

Our complete foundation report will follow in due course.

AP/ao

c.c. R. Adachi (Fenco)

Foundations Files ✓

Documents

J. L. Keen

A. Wittenberg

A. Crowley

A. Prakash

For: A. Prakash,
Senior Foundations Engineer,
K. G. Selby,
Supervising Foundations Engineer.

DOCUMENT NO. _____ DATE _____

GEOCRES No. 40314-32

DIST 2 REGION Southwestern

W.P. No. 88-69-11

CONT. No. 79-20

W. O. No. 73-11018

STR. SITE No. _____

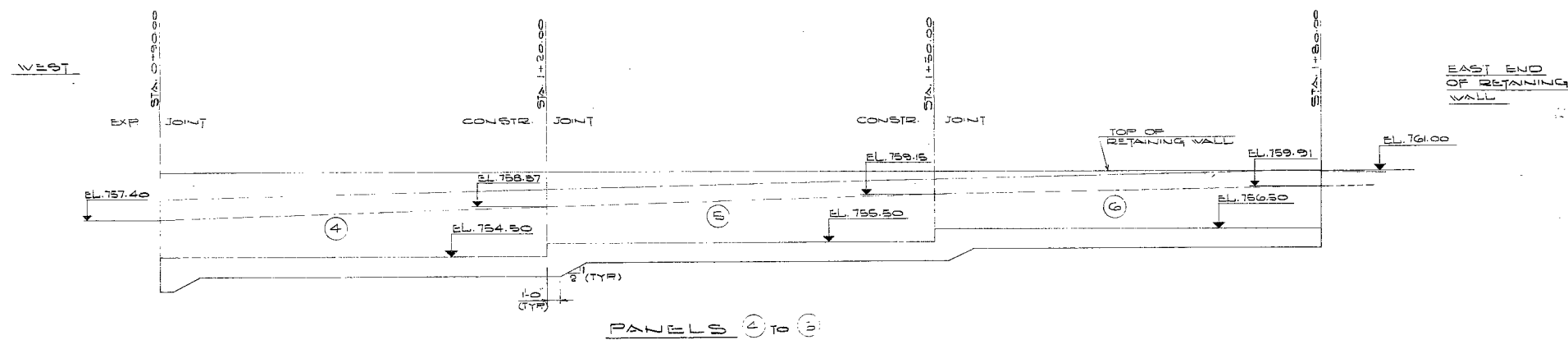
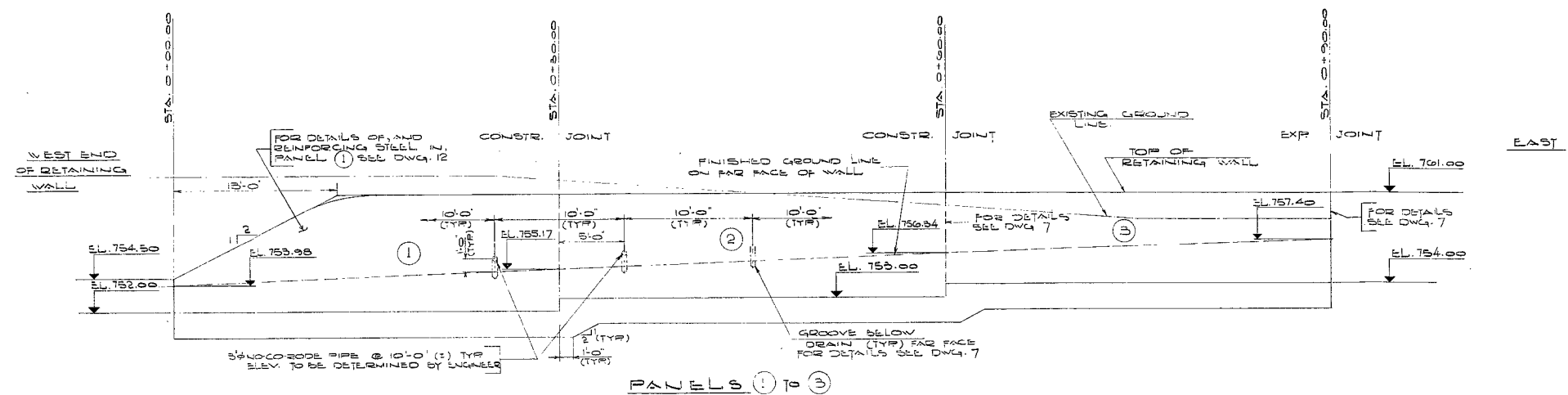
HWY. No. _____

LOCATION Retaining Walls along

proposed St. Thomas Expressway

OVERSIGHT DRAWING NO. _____ DATE _____

REMARKS: _____



ELEVATION OF RETAINING WALL - LOOKING NORTH
SCALE: 4" = 1'-0"

NOTES

- CLASS OF CONCRETE
3000 PSI.
- CLEAR COVER TO REINFORCING STEEL
3' IN FOOTINGS AND WALLS

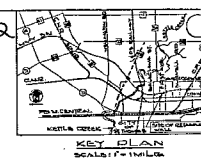
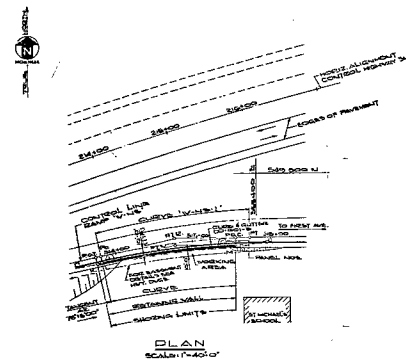


FOR REDUCED PLAN.



SECTIONS			
DATE	BY	DESCRIPTION	
40I14-32			
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO			
FOUNDATION OF CANADA ENGINEERING CORPORATION LIMITED			
RETAINING WALLS NO.1 (FLEXO-LITE) NO.2 (ST. MICHAEL'S KING'S HIGHWAY NO.26 (ST. THOMAS EXPRESSWAY) DIST. NO. 2 CO. OF ELGIN CITY OF ST. THOMAS TWP. OF YARMOUTH LOT CON.			
NO.2 - ELEVATION			
APPROVED		CONTRACT NO.	
TECHNICAL ENGINEER			
DESIGN	S.S. CHECK	W.R.	88-69-11
DRAWING	M.L.C. CHECK	REV	
DATE	APR 1992	SITE NO.	5-RW SHEET 10
	LOADING		

40714-32



- LIST OF DRAWINGS:
- 1 GEOMETRICAL ALIGNMENT
 - 2 BOSSHOLE LOCATIONS OF SOIL STRATA
 - 3 ELEVATION AND DETAILS
 - 4 CONSTRUCTION TABLE
 - 5 PANEL ①

[illegible]

TO BE USED FOR ESTIMATING PURPOSES
ONLY Date: AUG - 4 1968.

[illegible]

