

February 10, 1960.
D.H.C. Foundation Investigation
Proposed Retaining Walls,
Hwy. #10 & C.N.R. Subway
at Port Credit - Dist. #6

U.S. 7 59-59 (A).

AKGH
(A. E. Loh,
Project Foundation Inst.)

SUBSOIL INVESTIGATION

for

Proposed Retaining Walls
Hwy. #10 & C.N.R. Subway
at Port Credit - Dist. #6.
W.J. F 59-55 (R).

INTRODUCTION:

Presented herein are the results of a subsoil investigation carried out for the retaining walls at the above noted site where a subway structure is proposed. It is understood that the proposed retaining walls will be located at an offset distance of approximately 24 ft. East and West of the existing Hwy. #10 centre line.

A preliminary exploration programme consisting of 8 borings carried out by hand augering equipment, was completed for the retaining wall West of the existing Hwy. #10, in October, 1959. The locations of these holes, as well as the subsoil profile as defined by them, are shown in the accompanying Drawing No. F-59-55 (R) B.

A detailed investigation, consisting of 4 sampled boreholes, was carried out for the retaining wall East of the existing Hwy. #10 during the period of the 10th and 15th of December, 1959. The locations of the boreholes, as well as their subsoil profile, are shown in the accompanying Drawing No. F-59-55 (R) A.

In addition, subsoil information from Borings 3, 8 & 9 of F-59-55 (reported on July 22, 1959), which were initially carried out for the proposed storm sewer in the immediate vicinity of the proposed retaining walls, has also been included and is shown in the accompanying Drawing No. F-59-55 (R) A.

This investigation was requested by Giffels & Vallet, Ltd., Consulting Engineers responsible for the design of the project.

SITE INVESTIGATION:

1. East Retaining Wall:

Field work, consisting of 4 sampled boreholes - (B.H. No. 10, 11, 12 & 13) was carried out by a trailer-mounted continuous flight auger adapted for soil sampling. Conventional auger boring procedures were followed and samples were recovered at depths required, by means of 2" O.D. split barrelled spoon sampler. The dimensions of the spoon sampler and the energy used in driving it, conform to the requirements of the Standard Penetration Test.

Samples recovered were visually examined, classified at the site, and placed in moisture proof containers immediately upon recovery. Upon receipt in the laboratory, samples were visually examined and identified. Routine index tests were performed on selected representative samples. Results of field and laboratory tests have been presented in the borehole logs and summarized in Table No. 1, and are included in this report under Appendix I. The locations of the boreholes as well as their subsoil profile, are shown in the accompanying Drawing No. - F 59-55 (B) A.

2. West Retaining Wall:

Due to inaccessibility to the proper location and existing utilities in the ground, hand augering was employed to determine the subsoil conditions above the till stratum. Eight hand auger borings were put down in order to determine the overlying material above the glacial till. Drawing No. F 59-55 (B) B shows the location of the hand auger borings as well as their subsoil profile.

SOIL TYPES ENCOUNTERED:

(A) East Retaining Wall:

Reference to the detailed boring logs appended to this report shows that the dense glacial till of silty clay with sand and gravel at the retaining wall structure location, is overlain by a shallow layer of brown, fine silty sand. Near the C.N.R. crossing, the embankment fill material consists of sand and gravel with cinders.

1) Fill Material:

This material was encountered in borings numbered 11 & 12. Samples obtained in these borings were subjected to routine laboratory tests and the following index values are considered representative:-

Moisture Content Range = 16% - 21%

Average Unit Weight = 128 p.c.f.

The embankment fill is composed of predominantly granular material with very little traces of cohesive material.

2) Med. to Dense Grey-Brown Fine Sand:

The natural stratum of granular material was encountered immediately below the fill material in Borings 11 & 12 and below the topsoil in Borings 3, 10 & 13. The upper portion of the sand stratum has been subjected to oxidation, resulting in its present brownish colour. Below the oxidized zone the colour is predominantly grey-brown to grey. Representative unit weight and moisture content values are as follows:-

Natural Unit Weight of Med. Sand = 128 p.c.f.

" " " " Dense Sand = 140 p.c.f.

Moisture Content = 16% - 22%.

N Values (ranging from med. to dense layer) = 10 - 44

SOIL TYPES ENCOUNTERED: (cont'd.) ...

(A) East Retaining Wall: (cont'd.) ...

3) Dense Glacial Till:

Dense glacial till is composed of grey, sandy clay to silty clay with gravel. This was encountered in each of the sampled boreholes at approximately Elevations 263.0' to 265.0'. In general, the content of gravel, as well as the penetration resistance, increases with depth. The dense, silty clay till stratum is competent to provide satisfactory foundation support for the proposed retaining wall structure. The representative index properties of the till are as follows:-

Natural Unit Weight	=	145 p.c.f.
Moisture Content	=	3% - 12%.
N Value Range	=	40 - 90.

(B) West Retaining Wall:

In general, the soil types encountered at this West retaining wall location, were similar to those encountered at the East retaining wall location. Subsoil consists of a layer of granular fill with organic matter, approximately 1' to 3' in thickness, overlying a layer of fine, silty sand, underlain by the dense glacial till stratum. Due to "cave-in" of the fine silty sand, it was not feasible to explore the underlying dense till stratum in every boring during the hand augering operations. In view of the similarity in subsoil conditions, it is felt justified to assume that the dense till stratum at this location would be contacted at approximately the same elevations as at the locations of the East retaining wall.

GROUND WATER OBSERVATIONS:

Field observations and measurements carried out during the exploration programme indicate that the ground water level was at approximately Elev. 269.0' - 271.0'.

In Boring 10, a slight artesian water condition was noted when a thin layer of water-bearing sand was encountered at Elev. 260.0'. The excess hydrostatic head reached Elev. 264.0'. This was not encountered in any of the other boreholes.

During the boring operations, seepage inflow into the boreholes from the upper sand layers was observed. Reference to the ground water conditions encountered at the location of the proposed storm sewer (F-59-55, reported on July 22, 1959) shows that this amount of inflow can be readily handled by low-capacity pumps.

FOUNDATION CONSIDERATIONS:

The dense till stratum is competent to provide adequate foundation support for the proposed retaining walls. It can be seen from the accompanying Drawings that the proposed profile grade of Hwy. #10 will be at or below the dense till stratum. Simple spread footing support for the retaining walls can be obtained in the till stratum. The recommended footing placement elevations is 265.0' or below. For footings typically 5' to 6' in width, a safe allowable bearing pressure of at least 3 t.s.f. can be used for design. Settlements consequent upon application of this footing pressure, will be within tolerable limits.

SUMMARY:

1. Subsoil consists of a layer of granular fill material overlying a stratum of fine, silty sand, underlain by dense glacial till of sandy clay to silty clay with gravel.

SUMMARY: (cont'd.) ...

2. Simple spread footings are recommended for the retaining wall structures. It is recommended that footings be founded in the dense till stratum at Elev. 265.0' or below. A safe allowable footing pressure of at least 3 t.s.f. can be used for design. Settlements are considered tolerable.
3. Ground water seepage inflow during footing excavations, will be local and can be readily handled by low-capacity pumps. Shoring operations appear to be necessary during construction. A slight artesian water condition was noted in Boring 10, but, in view of the fact that this condition was not encountered in any of the other boreholes, it is believed to be a localized condition, only.
4. For earth pressure computations, the following can be used:-

Fine Silty Sand:	Unit Weight	=	128 - 140 p.c.f.
	ϕ	=	30°
Dense Glacial Till:	Unit Weight	=	145 p.c.f.
	K_a	=	0.3

February 1960

for *AKK*
M. Devata,
PROJECT FOUNDATION ENGINEER.

APPENDIX I.

SUMMARY OF FIELD & LABORATORY TESTS

JOB F59-55

W.P. Retaining Wall

[illegible]

SUMMARY OF FIELD & LABORATORY TESTS

JOB F59-55

W.P. Retaining Wall

Page 2.

HOLE NO.	SAMP. NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
13	S1	3'-4.5'	Medium brown clayey fine sand.	27	18.8	-	-	-	-	
	S2	6'-7.5'	Grey brown silty clay with pockets of clay at 6.0 -6.5'	56	11.2	-	-	-	150.8	
	S3	10'-11.5'	Glacial till (Grey silty clay)	59	7.9	-	-	-	150.0	
	S4	15'-16'	"	90	6.5	-	-	-	-	
			S denotes split spoon							

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. Retaining Wall BORE HOLE NO. 10

JOB E59-55 STATION 10+50 (23' Rt.)

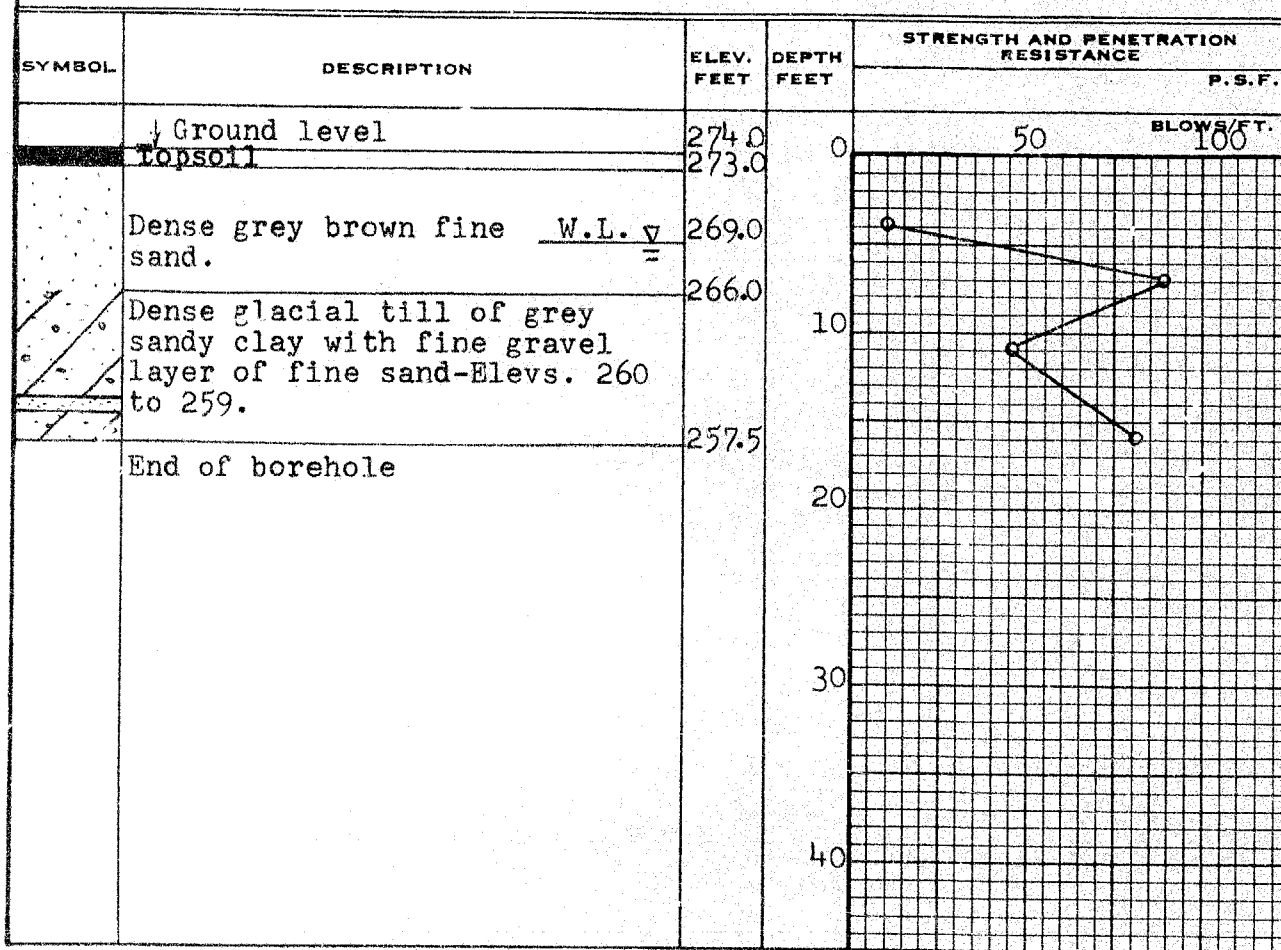
DATUM 274.0 COMPILED BY B.K.

BORING DATE Dec. 10/59 CHECKED BY M.D. & A.L.

2" DIA. SPLIT TUBE -----
2" SHELBY TUBE -----
2" SPLIT TUBE -----
2" DIA. CONE -----
2" SHELBY -----
CASING -----

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) _____	O
VANE TEST (C) AND SENSITIVITY (S) _____	+ S
NATURAL MOISTURE AND LIQUIDITY INDEX _____	L
LIQUID LIMIT _____	X
PLASTIC LIMIT _____	



CONSISTENCY			SAMPLE	NATURAL UNIT WT P.C.F.
MOIST. CONTENT- % DRY WT.				
10	20	30		
			S1	-
			S2	-
			S3	-
			S4	-

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. Retaining Wall BORE HOLE NO. 11
 JOB F59-55 STATION 12+00(23'Rt.)
 DATUM 275.0 COMPILED BY B.K.
 BORING DATE Dec. 11/59 CHECKED BY M.D. & A.L.

2" DIA. SPLIT TUBE _____
 2" SHELBY TUBE _____
 2" SPLIT TUBE _____
 2" DIA. CONE _____
 2" SHELBY _____
 CASING _____

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u) _____
 VANE TEST (C) AND SENSITIVITY (S) _____
 NATURAL MOISTURE AND LIQUIDITY INDEX _____
 LIQUID LIMIT _____
 PLASTIC LIMIT _____

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P. S. F.	
	↓ Ground level	275.0	0	50	BLOWS/FT.
	Gravel, sand & Cinders (fill Material)	273.0			
	Med. to Dense brown fine sand. W.L. ∇	270.0			
	Dense brown glacial till of sandy clay with fine gravel	268.0	10		
	Dense grey glacial till of silty clay with fine gravel.	265.0			
	End of borehole	256.0	20	38 for 6"	
			30		
			40		

CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT- % DRY WT.			
10	20	30	

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

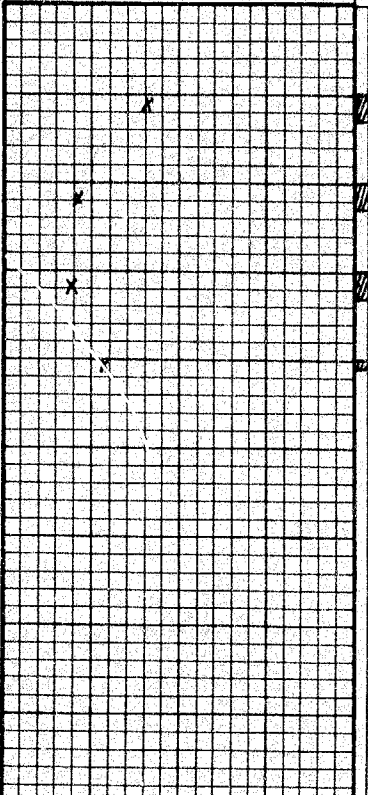
W.P. Retaining Wall BORE HOLE NO. 12JOB F59-55 STATION 14+00 (20' Rt.)DATUM 276.0' COMPILED BY B.K.BORING DATE Dec. 14/59 CHECKED BY M.D. & A.L.

2" DIA. SPLIT TUBE _____ ☒
 2" SHELBY TUBE _____ ☒
 2" SPLIT TUBE _____ ☐
 2" DIA. CONE _____ ☐
 2" SHELBY _____ ☐
 CASING _____ ☒ ☒

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u) _____ ☐
 VANE TEST (C) AND SENSITIVITY (S) _____ ☒
 NATURAL MOISTURE AND LIQUIDITY INDEX _____ ☒
 LIQUID LIMIT _____ ☐
 PLASTIC LIMIT _____ ☐

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
					P.S.F.
	↓ Ground level	276.0	0	50	BLOWS/FT. 100
	Sand, gravel and cinders (fill material)	272.0			
	Dense brown fine to med. sand.	270.0			
	Dense glacial till of brown sandy clay with fine gravel.	267.0	10		
	Dense glacial of grey silty clay with fine gravel				
		255.5	20		
	End of borehole				

CONSISTENCY			SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT- % DRY WT.				
10	20	30		
			S1	127.5
			S2	141.0
			S3	148.6
			S4	152.0

DEPARTMENT OF HIGHWAYS - ONTARIO

W.P. Retaining Wall BORE HOLE NO. 13

JOB F59-55 STATION 16+00 (22' Rt.)

DATUM 276.0' _____ COMPILED BY B.K. _____

BORING DATE Dec. 15/59 CHECKED BY M.D. & A.L.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

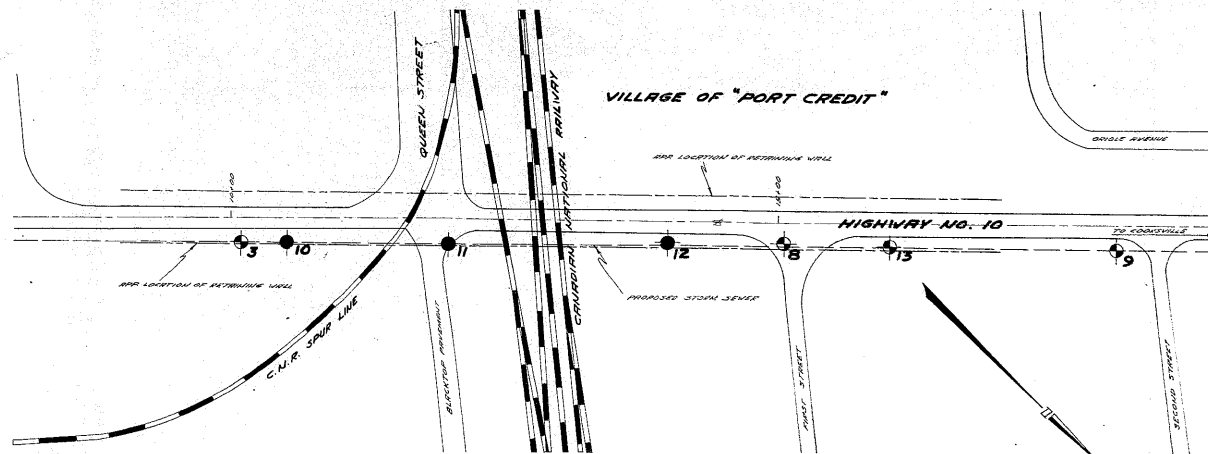
LEGEND

1/2 UNCONFINED COMPRESSION (Qu) _____	O
VANE TEST (C) AND SENSITIVITY (S) _____	+ S
NATURAL MOISTURE AND	
LIQUIDITY INDEX _____	L
LIQUID LIMIT _____	X
PLASTIC LIMIT _____	

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P.S.F.	
	↓ Ground level	276.0	0		
	Topsoil with sand & gravel	274.5			
	Medium to dense fine sand.				
		W.L. = 271.0			
	Grey brown silty clay with SAND	270.0			
	pockets of fine sand.	268.0			
	Dense glacial till of silty clay with fine gravel.				
	End of borehole	260.0			
Penetration resistance profile shown; obtained by driving a 2" dia. cone from ground level to depth noted with an energy of 350 ft. lb. per blow.					

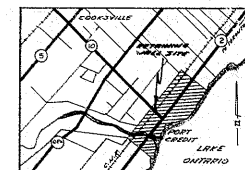
CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.			
10	20	30	
		S1	-
		S2	150.8
		S3	150.0
		S4	-

#59-F-55R
Hwy. #10 &
C.N.R. SUBWAY
RETAINING
WALLS (PROP.)
PORT CREDIT



PLAN
SCALE 1 IN. = 50 FT.

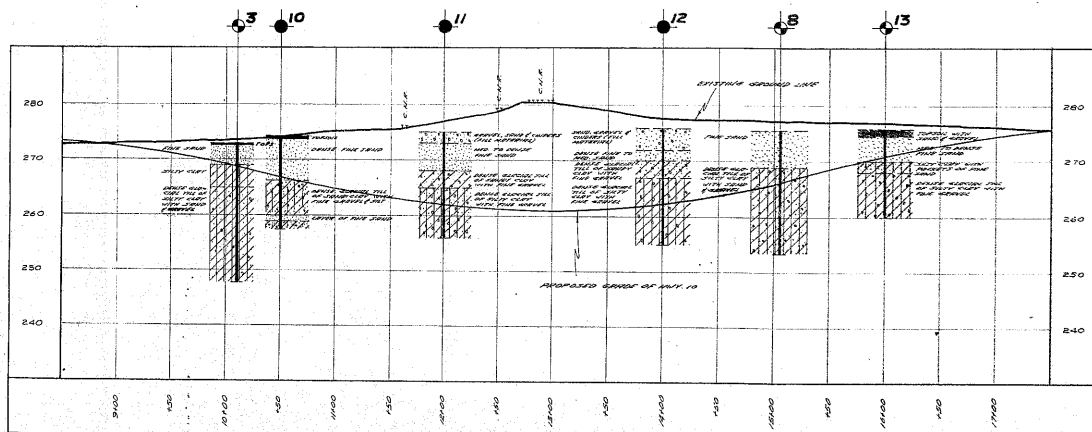
LEGEND			
BORE HOLE			
PROJECTION HOLE			
BORE/PROJECTION HOLE			
NO.	ALTIMETER	STATION	APPROXIMATE DEPTH
3	275.3	10+60	23' 1/2"
8	274.1	15+05	19' 5/8"
9	275.2	18+05	23' 1/2"
10	274.0	10+50	23' 1/2"
11	273.0	12+00	23' 1/2"
12	274.0	11+00	23' 1/2"
13	274.0	16+00	22' 1/2"



KEY MAP
SCALE 1 IN. = 1 MI.

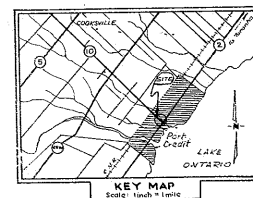
NOTE: INFORMATION ON SHEETS 3 & 4 WAS OBTAINED FROM AVAILABLE RECORDS FOR 1974.

NOTE -
THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BORE HOLE LOCATIONS. BETWEEN BORE HOLES THE BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE AND MAY BE SUBJECT TO CONSIDERABLE ERROR.




PROFILE
SCALE VERTICAL 1 IN. = 10 FT.
HORIZONTAL 1 IN. = 50 FT.

DEPARTMENT OF HIGHWAYS - ONTARIO			
MATERIALS & RESEARCH SECTION			
RETRAINING WALL NEAR C.N.R. SUBWAY			
SHOWING POSITIONS & ELEVATIONS OF HOLES			
HWY 10	DISTRICT 4	COUNTY 4	SSSE
TOWNSHIP 10 NORTH	RANGE 10	CON.	
LOCATION ST. PORT CREDIT	CHECKED BY: M. L.	W.P.	
DRAWN BY: J. M. L. G. S.	CHECKED BY: M. L.	W.P.	
DATE FEB. 1, 1974	APPROVED BY: M. L.	W.P.	
SCALE 1/2" = 1' HORIZ.	F33-SS101A		

[illegible]

PROFILE SCALE: HORIZONTAL 1 in = 20 feet.
VERTICAL 1 in = 2 feet.

LEGEND			
SCORE HOLE (AND AUGER)			
HOLE NO	APPR. ELEVATION	STATION	DISTANCE FROM 
1.	272.60	8+50	33° LT.
2.	272.60	9+20	30° LT.
3.	273.30	9+40	28° LT.
4.	273.80	10+10	30° LT.
5.	274.30	10+40	28° LT.
6.	274.50	10+60	28° LT.
7.	274.80	10+90	25° LT.
8.	275.50	11+20	34° LT.

- NOTE -

THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BORE HOLE LOCATIONS. BETWEEN BORE HOLES THE BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE AND MAY BE SUBJECT TO CONSIDERABLE ERROR.

DEPARTMENT OF HIGHWAYS - ONTARIO			
MATERIALS & RESEARCH SECTION			
RETAINING WALL			
INVESTIGATION FOR SLOPE STABILITY			
SHOWING POSITIONS & ELEVATIONS OF HOLES			
HWY. 10	DISTRICT 6	COUNTY PEEL	
TOWNSHIP TORONTO			
LOCATION PORT CREDIT	L.O.T. CON.		
DATE 16 OCT 1969	DRAWN BY AKK	W.P. 101-58	
SCALE AS SHOWN	APPROVED BY AKK	DRAWING NO. FSD-55(R)	