

cc: Mr. P. F. Weber

Mr. A. M. Poye,  
 Bridge Engineer.  
 Materials & Research Section.

July 22, 1959.

FOUNDATION REPORT - Hwy. 400 Rd.  
 All'ce. between Twp. of N. York  
 & Vaughn - W.P. 266-59, 7-59-58.

Attention: Mr. S. McCosbie.

This memo accompanies our report containing the results of a foundation investigation recently completed at the above proposed structure location.

Your attention is drawn to the following comments pertaining to the foundation structure support at this site:-

- (1) The subsoil at this site consists of a dense stratum of glacial till, composed of silty sand or sand covered by silty clay to clay. The sand and gravel content of this till stratum increases with depth. The ground water table was determined at elevation 598' (i.e., Approx. - 22 ft. below existing ground surface). Layers of sand and gravel were also encountered at this elevation.
- (2) Due to the ground water condition and the permeable nature of the sand and gravel layers encountered at elevation 598', it would appear that an underpass structure would be best suited for this intersection. The footings for an underpass structure can be founded at or below elevation 615'. At this recommended footing depth, an allowable bearing pressure of 3 tons/sq.ft. is permissible.
- (3) From existing ground surface to elevation 586' the impermeable nature of the till material and the noted absence of water-bearing sand seams indicate that construction excavations for the footings to be placed at elevation 615' will be sensibly dry.
- (4) No approach fill stability problems are anticipated for an underpass structure. If an overpass structure is designed, the slopes of the cutting should not be steeper than 2:1.

If we can be of further assistance with regard to the above structure location, please contact our office.

LGS/MSF

Encl.

cc: Messrs. A. M. Poye

R. A. Gregashok

C. G. Ramsay

J. Ford

L. G. Soderman

PRINCIPAL SOILS &amp; FOUNDATIONS ENGINEER.

C. Fraser

A. Watt

P. F. Weber

Foundation Section

Gen. Files

# FOUNDATION REPORT

ON

Hwy. #400 Rd. All'ce between  
Twp. of N. York & Vaughan.

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Plan No: (143-73)  
(400A-27)

Profile No: (C 1616)  
(400A-27)

Chainage: Sta. 207+44.97 (N. York)  
+ C+00 (Vaughan)

## Distribution:

Mr. A. X. Toye, Bridge Engineer.	(2)
Mr. H. A. Tregaskes, Construction Engineer.	(1)
Mr. D. G. Ramsay, Road Design Engineer.	(1)
Mr. J. Ford, Project Design Engineer.	(1)
Mr. C. Fraser, District Engineer, Toronto.	(1)
Mr. P. F. Weber, Regional Soils Engineer.	(1)
Mr. A. Watt, Ont. Water Resources Commission.	(1)
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W.J. F 59-58.

W.F. 266-59.

## INTRODUCTION

Presented in this report are the results of a subsoil investigation carried out at a structure location approximately 1 mile south of Hwy. #7 where Hwy. #400 crosses the gravel road between Twp. of S. York and Vaughan (Sta. 207+44.97 (S. York) = 0+00, (Vaughan) profile No. C 1616 & 400A-26). This report contains the field and laboratory findings and recommendations for the foundation of the structure.

The field work commenced on June 11th, 1959 and was completed on June 20th, 1959.

## DESCRIPTION OF THE SITE & GEOLGY

The site is located on a moderately level ground. The areas on both sides of the gravel road are presently uncultivated and in pasture.

The site under consideration is located on the south slope. This region is characterized by a level or gently undulating topography dipping gradually toward the south. The soil type consists of a shallow surface of clay overlying dense silty sand to sand.

## DESCRIPTION OF FIELD & LABORATORY WORK

Field work consisted of 4 sampled boreholes carried out by a standard diamond drill adapted for soil sampling conventional wash boring procedures were followed and samples were recovered at depths required. Samples were obtained by means of 2" I.D. thin-walled Shelby tube sampler or a 2" O.D. split barreled spoon sampler. The dimensions of this spoon sampler and the energy used in driving it conform to requirements of the standard penetration test. In addition to the sampled boreholes, a dynamic cone profile was obtained adjacent to each hole. Upon receipt in the laboratory, samples were visually examined and identified. Routine index tests were carried out on selected representative samples.

Laboratory and field test results have been summarized in table No. 1 and are included in this report under Appendix 1.

Drawing No. F 59-588 shows the borehole locations and the estimated subsoil stratigraphy.

#### SUBSOIL CONDITIONS

The site is underlain by grey dense silty sand or sand covered by silty clay to clay.

In each of the sampled boreholes the topsoil was found to be underlain by a layer of brown medium clay to sandy clay extending approximately to Elevation 605'. The clay strata is underlain by a thin layer of silty clay to sandy clay about 5 to 8 ft. Below this deposit, the stratum of grey fine silty sand or sand was encountered between elevations 597' and 560' to 557'.

In the order of stratigraphic succession, the following soil types are defined:

#### Brown medium clay:

This material extends below the highway fill for approximately 2 feet and has been subjected to oxidation resulting in its present brownish colour. The average unit weight and moisture content were found to be 135 p.c.f. and 12% respectively. Standard penetration tests carried out during sampling, gave average "N" values varying from 20 to 40 blows.

#### Brown silty clay to sandy clay:

Underneath the medium clay crust the thick layer of medium to hard silty clay to sandy clay extending from elevation 612' to 600' and 595'. The upper zone of the silty clay to clay sand has been subjected to oxidation resulting to its brown colour. Below the oxidized zone the colour is predominantly gray. The silty clay

contains approximately 30% of silt, 25% of sand and 8% of fine to medium gravel; the sandy clay contains 30% of silt, 35% of sand and 6% of fine gravel. The average unit weight and moisture content were found to be 145 p.c.f. and 10%, respectively. Liquid and plastic limits averaged 20% and 14%. Laboratory shear strength tests show an average of 3000 p.s.f. The standard penetration tests carried during sampling, gave average "N" values ranging from 40 to 100 blows.

#### Grey Silty Sand and Sand:

Layers of silty sand and sand were encountered underneath the stratum of silty clay to sandy clay. Occasional bands of silty clay and clay silt were encountered throughout. The colour is predominantly gray. The silty sand contains 35% of silt, 55% of sand and 20% of gravel medium to fine. The sand is saturated and contains 15% of silt and 15% of gravel. The average moisture content was found to be 15%.

Laboratory and field test results have been summarized in Table 1 and are included in this report under Appendix I.

#### WATER CONDITIONS

Observations and measurements carried out during exploration programs indicate that the ground water table is approximately at Elev. 598'. In view of the fact that no artesian water conditions were encountered during exploration programs, seepage in-flow during footing excavation will be local and of minor quantities only.

#### FOUNDATION CONSIDERATIONS

The stiff upper crust of medium clay is competent to provide adequate foundation support for the proposed structure. Laboratory and field test results are such that spread footing support can be obtained in the stiff crust of medium clay to silty clay between Elevations 615' to 613'. At this elevation or below, for footings

2' to 9' wide, an allowable bearing pressure of 3t.s.f. incorporating a safety factor of 2.5 can be used for footing design.

No excessive seepage problems with respect to footing excavation are anticipated.

No approach fill stability problems are anticipated, either for an overpass or underpass structure.

CONCLUSIONS AND RECOMMENDATIONS.

(1) The site is underlain by stiff medium clay to silty clay, followed by a deep deposit of medium to hard silty sand and sand.

(2) Subsoil conditions are such that an allowable bearing pressure of 3 t.s.f. incorporating a safety factor of 2.5 can be used for footing design at elevation 615' to 613' or below. For the contemplated structure at the relocated gravel road, footings should be founded at sufficient depth below the ground surface (i.e. 3 ft.) in order to provide adequate frost protection.

(3) No excessive seepage problems are anticipated with respect to footing excavation.

(4) No approach fill stability problems are anticipated for an overpass or an underpass. Prior to placing any embankment fill, all topsoil shall be removed.

A. Devata.  
Foundation Engr.

APPENDIX I.

# SUMMARY OF FIELD & LABORATORY TESTS

JOB F59-58

W.P. 266-59

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.t.	REMARKS
1	S1	7'-8.5'	Light brown clay sand with fine gravel	48	11.7	---	---	---	---	
	S2	10'-11.5'	Brown clay sand - sandy silt	60	9.7	---	---	---	150.0	
	S3	13'-14.5'	Brown silty sand with large medium gravel	155	8.4	---	---	---	156.7	
	S4	16'-17.5'	Dense brown sand with clay and gravel	110	9.6	---	---	---	155.4	
	S5	20'-21.5'	Dark brown clay silt with gravel	151	10.0	---	---	---	146.0	
	S6	25'-26.7'	Brown silty sand	>160	12.6	---	---	---	---	
	S7	30'-31.5'	Brown - grey silty sand	167	18.6	---	---	---	---	
	S8	33'-34.5'	Grey sandy silt	>160	14.5	---	---	---	---	
	S9	36'-37.5'	Grey sand with fine gravel	>160	---	---	---	---	---	
	S10	40'-41'	Grey sandy silt	>170	10.1	---	---	---	162.2	
	S11	48'-49.5'	Grey silty sand	---	---	---	---	---	---	
	S12	50'-51'	Grey silty sand	>160	10.3	---	---	---	---	
	S13	60'-61'	Grey sand with gravel	>135	---	---	---	---	---	
2	S1	5'-6.5'	Brown clay with fine to medium gravel	44	13.9	13.4	15.8	---	151.5	
	S2	7'-8.5'	Brown clay with gravel	75	14.3	---	---	---	---	
	S3	10'-11.5'	Brown sandy silt	89	10.3	---	---	---	152.7	
	S4	13'-13.5'	Brown silty sand	>125	9.0	---	---	---	159.2	
	S5	16'-16.5'	Brown sandy clay - silty clay	>110	10.5	---	---	---	---	
	S6	20'-21.5'	Grey clay silt	157	9.9	13.3	16.6	---	149.3	
	S7	25'-26'	Grey sandy silt with gravel	133	11.2	---	---	---	---	
	S8	30'-31'	Grey sandy silt with gravel	145	15.5	---	---	---	---	
	S9	35'-36'	Grey saturated sand	158	17.9	---	---	---	---	
	S10	40'-41'	Grey saturated coarse sand with gravel	163	9.2	---	---	---	---	
	S11	45'-46'	Grey sandy silt with fine gravel	172	14.0	---	---	---	---	
	S12	50'-50.5'	Grey sandy silt or silty sand	> 90	14.3	---	---	---	---	
	S13	60'-61.5'	Grey sandy silt	151	16.5	---	---	---	---	





# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 266 - 59 BORE HOLE NO. 1  
 JOB F59 - 58 STATION 207+08 (68' LT.)  
 DATUM 621.3 COMPILED BY B. K.  
 BORING DATE June 11/59 CHECKED BY H. D.

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) +  
 NATURAL MOISTURE AND LIQUIDITY INDEX LI  
 LIQUID LIMIT X  
 PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P.S.F.	BLOW/FT.
	↓ Ground level	621.3	0		
	Fill	617.3			
	Brown silty clay with sand & gravel	612.3	10		
	Brown clay sand to silty sand	605.3			
	Brown dense sand with fine gravel	601.3	20		
	Dark brn. clay silt with sand & gravel	598.0			
		596.3	30		
	Brown sand	588.3	40		
	Grey sandy silt or silty sand		50		
		569.3	60		
	Grey sand with fine to medium gravel		70		
		560.3	80		
	End of borehole				

CONSISTENCY			SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT- % DRY WT.				
10	20	30		
			S1	----
			S2	150.0
			S3	156.7
			S4	155.4
			S5	146.0
			S6	----
			S7	----
			S8	----
			S9	----
			S10	162.2
			S11	----
			S12	----
			S13	----

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS AND RESEARCH SECTION

W.P. 266-59 ----- BORE HOLE NO. 2  
JOB F-59-58 ----- STATION 0+22 (74' LT)  
DATUM 619.0 ----- COMPILED BY B. K.  
BORING DATE June 11/59 ----- CHECKED BY M. D.

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)	---	+*
NATURAL MOISTURE AND		LI
LIQUIDITY INDEX	---	X
LIQUID LIMIT	-----	●
PLASTIC LIMIT	-----	●

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P.S.F.	
	↓ Ground level	619.0	0	0	
	Fill	616.0		50	
	Brown clay with fine gravel	610.0	10	100	
	Brown sandy silt	604.0		150	
	Greyish brown sandy to silty clay	600.0	20	200	
	W.L. ▽	597.0			
	Grey sandy silt		30		
		587.0			
	Grey saturated sand with fine to medium gravel		40		
		573.0			
	Grey sandy silt or silty sand with fine gravel		50		
		557.5	60		
	End of borehole		70		
			80		

CONSISTENCY			SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT- % DRY WT.				
10	20	30		
			S1	151.5
			S2	152.7
			S3	159.2
			S4	---
			S5	---
			S6	149.2
			S7	---
			S8	---
			S9	---
			S10	---
			S11	---
			S12	---
			S13	---

# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 266-59 BORE HOLE NO. 3  
 JOB F59-58 STATION 0+45 (67' RT)  
 DATUM 618.91 COMPILED BY B. K.  
 BORING DATE June 18/59 CHECKED BY M. D.

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

### LEGEND

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			
				2000	4000	5000	8000
	↓ Ground level	618.9	0	50	100	150	200
	Fill	615.9					
	Brown sandy clay with some fine gravel	605.9	10				
	Grey silty sand or sandy silt	598.0	20				
	Grey silty clay with some sand and fine gravel	587.9	30				
	Grey silty sand with fine gravel	584.9	40				
	Grey medium to coarse sand with fine gravel	568.9	50				
	Grey silty sand or sandy silt	557.9	60				
	End of borehole		80				

CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.			
10 20 30		T1	135.1
		T2	133.0
		T3	149.1
		S4	154.5
		S5	151.6
		T6	139.5
		S7	
		S8	
		S9	
		S10	
		S11	

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS AND RESEARCH SECTION

W.P. 266-59 BORE HOLE NO. 4  
JOB F59-58 STATION 207+21 (71' RT)  
DATUM 619.1 COMPILED BY R. K.  
BORING DATE June 18/59 CHECKED BY M. J.

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	619.1	0		
	Fill	616.1			
	brown medium clay with fine gravel	609.1	10		
	Grey clay sand with fine gravel	603.1			
	Grey silty clay with sand <u>W.L.</u> and fine gravel	598.1	20		
	Grey silty sand with some gravel	594.1			
		589.1	30		
	Grey saturated sand with full of medium to fine gravel		40		
		569.1	50		
	Grey silty sand or sandy silt with some fine gravel		60		
		557.6	60		
	End of borehole		70		
			80		

BLOWS/FT.

0 50 100 150 200

0 10 20 30 40 50 60 70 80

CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT- % DRY WT.			
10	20	30	
		S1	136.7
		T2	140.4
		T3	149.9
		S4	158.3
		S5	142.1
		S6	144.0
		S7	-----
		S8	-----
		S9	-----
		S10	-----
		S11	-----
		S12	-----

#  
59-F-58

#  
W.P. 266-59

#  
Hwy 400  
&

STEELE'S AVE

