cc: Cen. Files

23-67-37

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

Mr. A. M. Toye,
Bridge Engineer,
Bridge Division.

Attention: Mr. S. McCombie

FROM: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

DATE: May 13, 1965

OUR FILE REF.

IN REPLY TO

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Proposed New Structure at the Crossing
of Relocated Kipling Avenue and the
Existing Queen Elizabeth Highway and
the New Service Roads, District No. 6.
Toronto, Ont.
W.J. 65-F-37 -- W.P. 276-64-X

It is proposed to construct Service Roads on the north and south sides of the existing Q.E.W. between Islington Avenue and Hwy. #27. The new Kipling Avenue will be relocated some 75 ft. west of the existing centre line. A four-span underpass is proposed at the crossing of relocated Kipling Avenue and the existing Q.E.W. and the new Service Roads. A verbal request from Mr. J. Curtis of the Bridge Office, to carry out a foundation investigation at the above-mentioned site was received by this Section during April 1965.

The subsequent investigation consisted of 7 sampled boreholes and 2 dynamic cone penetration tests, and was carried out during April 15 - 22, 1965.

Subsoil at the site consists of 5 ft. to 9 ft. of loose to dense silty sand followed by shale bedrock. The bedrock, except for a 1-ft. thick weathered zone at the top, was found to be in sound

cont'd. /2 ...

condition. Water level observations in boreholes, carried out during the course of the investigation, indicated the ground water level to be at approximate elevation 357.

Because of the relatively low estimated bearing capacity of the silty sand stratum, it is recommended that the new structure be founded on shale bedrock. A safe bearing pressure of 10 t.s.f. may be used for design purposes for footings placed on sound shale bedrock. No approach fill stability problems are anticipated for standard 2:1 side slopes.

The field work, together with the preparation of this report, was undertaken by Mr. F. Vagi, Project Foundation Engineer. The investigation was carried out under the general supervision of Mr. M. Devata, Senior Foundation Engineer, who also reviewed this report.

Equipment was owned and operated by Master Soil Investigations, Ltd., of Toronto.

We believe the factual data and recommendations contained in this report will suffice for your design requirements. Should there be any queries in connection with this project, please do not hesitate to contact our Office.

K. Y. Lo,
SUPERVISING FOUNDATION ENGINEER

FK/MeeF
Attach.
cc: Messrs. J. M. Faye (2)
H. A. Tiersakes
D. W. Farren
G. M. Hunter (2)
J. C. Thatcher
M. J. Kovich
A. Watt
Foundations Office
Gen. Files ✓

APPENDIX 1.

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' :- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE :- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS :-

CONSISTENCY	'N' BLOWS / FT.	c LB. / SQ FT	DENSENESS	'N' BLOWS / FT.
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

TYPE OF SAMPLE

S.S	SPLIT SPOON	T.W.	THINWALL OPEN
W.S	WASHED SAMPLE	T.P	THINWALL PISTON
S.B	SCRAPER BUCKET SAMPLE	O.S	OESTERBERG SAMPLE
A.S	AUGER SAMPLE	F.S	FOIL SAMPLE
C.S	CHUNK SAMPLE	R.C	ROCK CORE
S.T	SLOTTED TUBE SAMPLE		
	P.H SAMPLE ADVANCED HYDRAULICALLY		
	P.M SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Q_u	UNCONFINED COMPRESSION	L.V	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V	FIELD VANE
Q_{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q_d	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_P	PLASTIC LIMIT
I_P	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX $= \frac{w - w_P}{I_P}$
I_C	CONSISTENCY INDEX $= \frac{w_L - w}{I_P}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX $= \frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE $= \frac{-\Delta e}{(1+e)\Delta \sigma'}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX $= \frac{\Delta e}{\Delta \log_{10} \sigma'}$
T_v	TIME FACTOR $= \frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 3·1416
e	BASE OF NATURAL LOGARITHMS 2·7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	OGARITHM OF a TO BASE 10
t	TIME
g	ACCELE ATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ε	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNGS MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY. DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

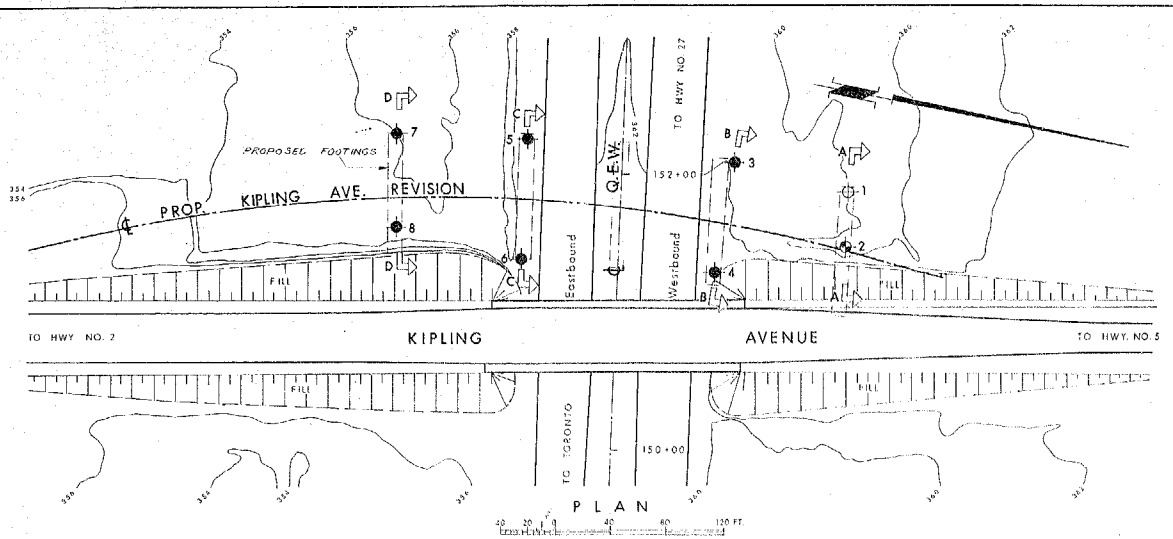
H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL

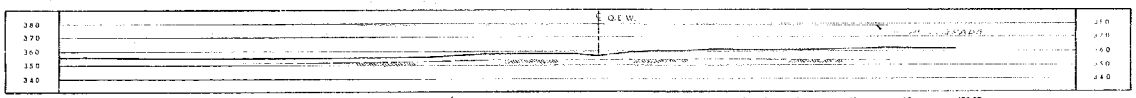
#65-F-37

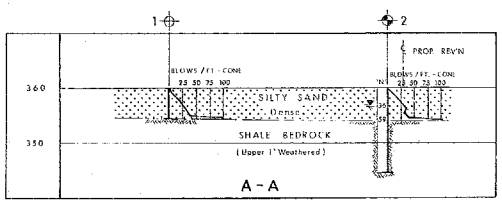
W.P. #276-64

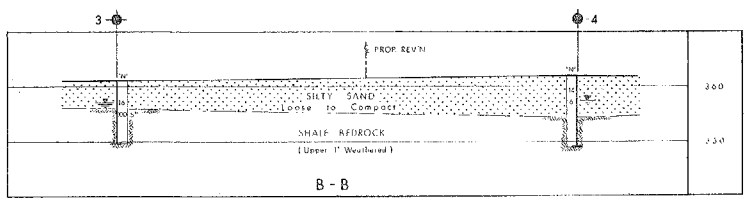
Q.E.W. &

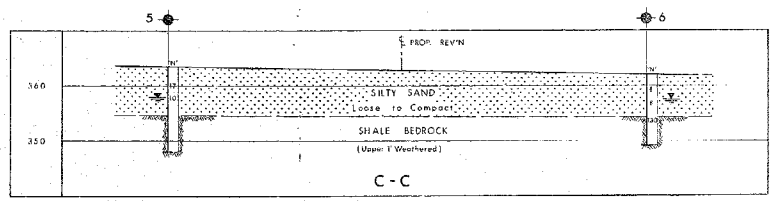
KIPLING AVE.

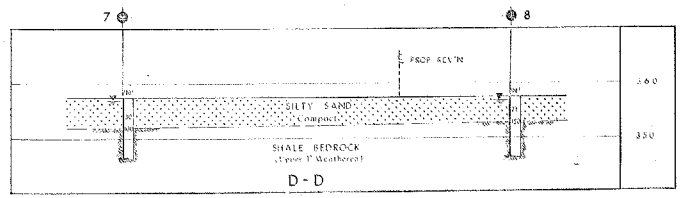




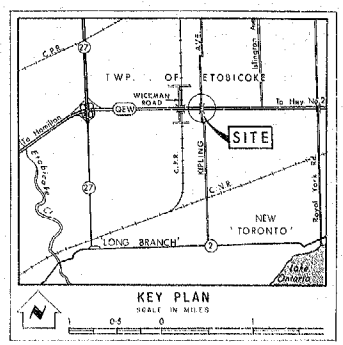








SECTIONS
10 5 0 10 20 30 FT.



LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation. April 15, 1965

NO.	ELEVATION	STATION	OFFSET
1	360·0	151+95	165'RT.
2	360·5	151+55	165'RT.
3	361·0	152+10	80'RT.
4	362·0	151+30	70'RT.
5	363·5	152+22	70'LT.
6	362·0	151+35	70'LT.
7	357·5	152+25	165'LT.
8	357·5	151+55	165'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.

PRINT RECORD		
NO.	FOR	DATE

REVISIONS		
DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION - FOUNDATION SECTION

KIPLING AVENUE - PROPOSED REV'N

KING'S HIGHWAY NO. Q.E.W. DIST. NO. 6
CO. METROPOLITAN TORONTO
TWP. ETOBICOKE LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD. K.N.	CHECKED	W.P. NO. 276-64-X	M.B.T. DRAWING NO. 65-F-37A
DRAWN	CHECKED	JOB NO. 65-F-37	
DATE MAY 5, 1965		SITE NO.	BRIDGE DRAWING NO.
APPROVED		CONT. NO.	

c.c. Foundation Section - room 121

Mr. A. Toye.
Bridge Engineer
Materials & Research.

June 9th, 1958.
Re: Foundation Report.
W.P. 40-58. W.O. 1-58-14.

New Bridge at Highway No.401 and
Hwy. No.25 Crossing one mile north
west of Milton, Esquesing Township.

Two copies of the above Foundation Report are enclosed herewith, which you will find self-explanatory.

F.C. Brownridge.
Materials & Research Engineer.

per:

A. [illegible].
Principal Soils Engineer.

c.c. Mr. A. Toye.
Mr. H. Bregadzus.
Mr. D.D. Kenney.
Mr. Wm. Lindenblatt.
Mr. Wm. Watt.
Mr. R. Morrow.
Foundations Section.
Files.

FOUNDATION REPORT

ON

NEW BRIDGE AT HIGHWAY NO. 401 AND

HIGHWAY NO. 25 CROSSING AT MILE

NORTH WEST OF MILTON, ESQUESING TOWNSHIP

Station No.: 420/64.38

Plan No.: F-3523-10

Distribution:

Mr. A. Loye
Bridge Engineer (2)

Mr. H. Hargakes
Construction Engineer (1)

Mr. L. G. Ramsay
Design Engineer (1)

Mr. K. B. Richardson
Dist.Engr. Hamilton (1)

Mr. A. Watt
Water Resources Commission (1)

Dr. P. Barrow
Department of Mines (1)

Foundation Section (1)

File (1)

W. P. 49-58

W. J. F-58-14

INTRODUCTION.

A subsoil investigation was carried out to determine the bearing values of layers for supporting the foundations of the proposed structure.

The site is located about one mile north west of Milton where the new highway 401 line "A" underpasses the existing Highway no. 25 in Lot 2 (con. II & III), Township of Esquesing (station 420 +64.38, profile no. F 3523-11). The work started on May 2, 1958 and was completed on May 9, 1958.

DESCRIPTION OF SITE AND FIELD WORK.

The site is in the area referrred to as "Peel Plain". The terrain is basically a till, rich in clay containing large amounts of boulders.

The subsoil investigations were carried out by means of a skid mounted coredrill machine. In the course of investigations four boreholes were made. The casings were drilled down by using BX casing shoes. The presence of great many boulders made the driving of the casings impossible. From the boreholes samples were extracted and tested in the laboratory. Also, during the sampling operation Standard Penetration tests were registered. By driving 2 inch diameter cone from ground level down to refusal dynamic cone penetration profile of the site was established.

The boreholes were explored some 36 ft. below the ground elevation and due to the nature of the subsoil encountered were stopped at this depth.

The location of the boreholes is shown on the drawing no. F-58-14A, and their elevations on log sheets under Appendix I.

FIELD AND LABORATORY FINDINGS.

The investigations carried out at the site disclosed the subsoil stratigraphy as made up of one layer of bouldery clay till down to the end of the boreholes.

Under the topsoil down to elevation about 676 the soil has brown colour; while below this elevation down to the end of the boreholes the soil has grey colour.

The samples tested in the laboratory showed the matrix of the soil made up of clay, silt, and fine sand in a loam state. The presence of gravel and boulders varied from 4% to 20%. The liquid limit was calculated to be about 20%, plastic limit 13%. The natural moisture content is about 12%, and density about 140 p.c.f. The soil is inorganic and of low plasticity. The unconfined compression tests gave values of 3000 - 5800 p.s.i.

The water level in the casing was observed at elevation about 687 ft. This is believed to be perched water and the layer is considered to be hard and impervious.

SUPPORT OF ABUTMENTS:

The new highway no. 401 is underpassing the existing Highway no. 25 at this crossing. The new grade line is shown at elevation about 689 ft.

It is presumed that 7 ft. wide footings will be used, and placed at elevation 682 ft. (allowing 7 ft. for ditching and frost)

According to bulb pressure distribution the stressed layer will be between the elevation 682 ft. where the footings will be placed and a depth interval equal to twice the width of the footing (elevation 668 ft.) The average unconfined compression value found in this interval is 3500 ~~ft~~ p.s.f. The calculated bearing value from Meyerhof's formula is:

$$Q = cN_c + D \quad : \quad N_c = 5\left(1+\frac{D}{4B}\right)$$

$$= 5\left(1+\frac{7}{4x}\right)$$

$$= 5x1.25 = 6.25$$

$$Q = 3500 \times 6.25 + 140 \times 7$$

$$= 11.4 \text{ T.S.F.} \quad : \quad \text{with } F_s = 3$$

$$= \frac{11.4}{3} = 3.8 \text{ T.S.F. allowable bearing value.}$$

CONCLUSIONS AND RECOMMENDATIONS:

From the above discussion it will follow that:

1. The subsoil stratigraphy is hard bouldery clay till.
2. It will be convenient to support the proposed structure on spread footing type foundations. The footing could be placed at or below elevation 682 ft. where the layer can provide a bearing value of 3.8 T.s.f. with a safety factor of 3.
3. The approach fills to the new structure do not present any stability problem.

V. Korlu.

Foundation Engineer.

APPENDIX I

FORM OB-ML-126 H.D.R.

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW

OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 54-S OPERATION BORE & PENET'N JOB F-58-14 W.P. 49-58 BORING 1 STA. 420+35 (40 RT)

CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT MAY 1958

SAMPLER HAMMER WT. 250 LBS. DROP 18 INCHES COMPILED BY H.G. CHECKED BY A.L. DATE BORING 3 MAY 1958.

ABBREVIATIONS

V - INSITU VANE SHEAR TEST
M - MECHANICAL ANALYSIS
U - UNCONFINED COMPRESSION
Q_C - TRIAXIAL CONSOLIDATED QUICK
Q - TRIAXIAL QUICK
S - TRIAXIAL SLOW
C - CONSOLIDATION
WL - WATER LEVEL IN CASING
WT - WATER TABLE IN SOIL
K - PERMIABILITY
CA - CASING
γ - UNIT WEIGHT

SAMPLE TYPES

C.S. - CHUNK
D.O. - DRIVE OPEN
D.F. - DRIVE FOOT VALVE
T.O. - THIN WALLED OPEN
S.S. - SLEEVE SAMPLE
P.S. - PISTON SAMPLE
W.S. - WASHED SAMPLE
R.C. - ROCK CORE

SAMPLE CONDITION

- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE

ELEVATION DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT
687.78'		GROUND LEVEL	
687.28' 0.5'		TOPSOIL	
	WL AT ELEV. 686.78 ON MAY 8/58	BROWN CLAY TILL GRAVELLY	
674.78' 13.0'		GREY CLAY TILL GRAVELLY	
651.28' 36.5'		END OF BOREHOLE	

ELEVATION SCALE: 685, 680, 675, 670, 665, 660, 655, 650

SHEAR STRENGTH IN LBS PER SQ. FT. ✳ (2000, 4000, 6000, 8000)

WATER CONTENT W % (0 - NAT, □ - P.W, Δ - L.W.)

PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN. LBS. PER BLOW)

D. CONE PEN. X------X------X STAND. PEN. (50, 100, 150, 200)

CASING BLOWS (ACTUAL): 2, 5, 25, 32, 40

REFUSAL AT ELEV. 679.38'

BX CASING SHOE

END OF CASING AT ELEV. 652.78'

SAMPLES

OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELEV. RECOV. %
					687.78'
γ-138.4 p.c.f.		T.O.	1	46	100
					682.78'
		D.O.	2	117	
					677.78'
γ-139.0 p.c.f.		D.O.	3	41	83
					672.78'
γ-152.2 p.c.f.		S.S.	4	57	67
					667.78'
γ-142.9 p.c.f.		S.S.	5	116	83
					662.78'
γ-135.0 p.c.f.		D.O.	6	69	89
					657.78'
γ-137.2 p.c.f.		D.O.	7	77	100
					652.78'

FORM OB-ML-126

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW

OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 54-5 OPERATION BORE & PENET'N. JOB T-58-14 W.P. 49-58 BORING 2 STA. 420+17 (47' LT

CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT MAY 1958

SAM LER HAMMER WT. 250 LBS. DROP 18 INCHES COMPILED BY H.S. CHECKED BY DATE BORING 6 MAY 1958

ABBREVIATIONS

V - INSITU VANE SHEAR TEST
M - MECHANICAL ANALYSIS
U - UNCONFINED COMPRESSION
Q_c TRIAXIAL CONSOLIDATED QUICK
Q - TRIAXIAL QUICK
S - TRIAXIAL SLOW
WL - WATER LEVEL IN CASING
WT - WATER TABLE IN SOIL
K - PERMIABILITY
C - CONSOLIDATION
CA - CASING
γ - UNIT WEIGHT

SAMPLE TYPES

C.S. - CHUNK
D.O. - DRIVE OPEN
D.F. - DRIVE FOOT VALVE
T.O. - THIN WALLED OPEN
S.S. - SLEEVE SAMPLE
P.S. - PISTON SAMPLE
W.S. - WASHED SAMPLE
R.C. - ROCK CORE

SAMPLE CONDITION

- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE

ELEVATION / DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT
687.58'		GROUND LEVEL	
686.58' / 1.0'	W.L.	TOPSOIL	
	W.L. AT ELEV. 686.13' ON MAY 8/58	BROWN CLAY, TILL	
676.08' / 11.5'		REDDISH GREY CLAY TILL	
671.08' / 16.5'		END OF BOREHOLE	

ELEVATION SCALE: 685, 680, 675, 670

SHEAR STRENGTH IN LBS. PER SQ. FT. * (2000, 4000, 6000, 8000)

WATER CONTENT W % (10, 20, 30, 40) — O - NAT. — □ - P.W. — Δ - L.W.

PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN. LBS. PER BLOW)

D. CONE PEN. X------X------X STAND. PEN. •——•——• (50, 100, 150, 200)

REFUSAL AT ELEV. 677.58'

15" CASING SHOE

END OF CASING AT ELEV. 677.58

CASING BLOWS (ACTUAL)

SAMPLES

OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELEV. RECOV %
					687.58'
7' 1400 p.c.f.		S.S.	1	45	100
					682.58'
7' 138.5 p.c.f.		D.O.	2	87	100
					678.58'
		D.O.	3	51	83
					672.58'

FORM OB-ML-126

H.D.R.

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW

OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 54-5 OPERATION BORE & PENETR'N JOB F-58-14 W.P. 49-58 BORING 3 STA. 420+73 (48' LT)

CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT MAY 1958

SAMPLER HAMMER WT. 250 LBS. DROP 18 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 7 MAY 1958

ABBREVIATIONS

V - INSITU VANE SHEAR TEST
M - MECHANICAL ANALYSIS
U - UNCONFINED COMPRESSION
Q_c - TRIAXIAL CONSOLIDATED QUICK
Q - TRIAXIAL QUICK
S - TRIAXIAL SLOW
WL - WATER LEVEL IN CASING
WT. - WATER TABLE IN SOIL
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D.F. - DRIVE FOOT VALVE
T.O. - THIN WALLED OPEN
S.S. - SLEEVE SAMPLE
P.S. - PISTON SAMPLE
W.S. - WASHED SAMPLE
R.C. - ROCK CORE

SAMPLE CONDITION

- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE

ELEVATION / DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT
687.9'		GROUND LEVEL	
686.9' 1.0'	W.L.	TOPSOIL	
	W.L. AT ELEV. 686.7 ON MAY 8, '58	BROWN CLAY TILL GRAVELLY	
675.9' 12.0'		GREY CLAY TILL GRAVELLY	
671.4' 16.5'		END OF BOREHOLE	

SHEAR STRENGTH IN LBS. PER SQ. FT. * (2000, 4000, 6000, 8000)

WATER CONTENT W % (12, 20, 30, 40) O - NAT. □ - P.W. Δ - L.W.

PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN. LBS. PER BLOW)

O. CONE PEN. X-------X-------X STAND. PEN. (50, 100, 150, 200)

ELEVATION SCALE: 690, 685, 680, 675, 670

CASING BLOWS (ACTUAL)

REFUSAL AT ELEV. 677.9'

BX CASING SHOE

END OF CASING AT ELEV. 672.9'

SAMPLES

OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELEV. RECOV. %
					687.9'
					683.9'
γ=145 S p.c.f.		S.S.	1	34	89
					678.9'
γ=139 p.c.f.		D.O.	2	83	100
					672.9'
γ=139 p.c.f.		D.O.	3	17	100

FORM OB-ML-126 H.D.R.

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW

OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG 54-5 OPERATION BORE & PENET'N JOB F-58-14 W.P. 49-58 BORING 4 STA. 421+08 (45' RT)

CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT MAY 1958

SAMPLER HAMMER WT. 250 LBS. DROP 18 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 8 MAY 1958

ABBREVIATIONS

V - INSITU VANE SHEAR TEST; M - MECHANICAL ANALYSIS; U - UNCONFINED COMPRESSION; Q_C TRIAXIAL CONSOLIDATED QUICK; Q - TRIAXIAL QUICK; S - TRIAXIAL SLOW; W.L. - WATER LEVEL IN CASING; W.T. - WATER TABLE IN SOIL; K - PERMIABILITY; C - CONSOLIDATION; CA. - CASING; γ - UNIT WEIGHT

SAMPLE TYPES

C.S. - CHUNK; D.O. - DRIVE OPEN; D.F. - DRIVE FOOT VALVE; T.O. - THIN WALLED OPEN; S.S. - SLEEVE SAMPLE; P.S. - PISTON SAMPLE; W.S. - WASHED SAMPLE; R.C. - ROCK CORE

SAMPLE CONDITION

D - DISTURBED; F - FAIR; G - GOOD; L - LOST

SOIL PROFILE

ELEVATION DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT	ELEVATION SCALE
688.68'		GROUND LEVEL		
687.68' 1.0'	W.L.	TOPSOIL		
	W.L. AT ELEV. 687.48' ON MAY 12/58	BROWN CLAY TILL GRAVELLY		685
				680
677.68' 11.0'				
		GREY CLAY TILL GRAVELLY		675
				670
				665
				660
658.18' 30.5'		END OF BOREHOLE		

SHEAR STRENGTH IN LBS. PER SQ. FT. (2000, 4000, 6000, 8000)

WATER CONTENT W % (10, 20, 30) 0 - NAT. □ - P.W. Δ - L.W.

PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN. LBS. PER BLOW)

D. CONE PEN. X-------X-------X (80, 100, 150) STAND. PEN. •——•——• (200)

REFUSAL AT ELEV. 678.18'

BX CASING SHOE

END OF CASING AT ELEV. 658.68'

CASING BLOWS (ACTUAL)

SAMPLES

OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELEV. RECOV. %
					688.68
		S.S.	1	39	50
					684.68
f' 137.8 p.c.f.	X	D.O.	2	78	67
					678.68
f' 142.8 p.c.f.	X	D.O.	3	41	83
					673.68
f' 139.0 p.c.f.	X	D.O.	4	42	83
					668.68
	X	D.O.	5	47	78
					663.68
f' 141.3 p.c.f.	X	D.O.	6	51	100