

MEMORANDUM

CC: GEN. FILES / 23-69-05 Re
Found. Sewer

TO: Mr. G. K. Hunter,
Regional Road Design Engineer,
Regional Office (Toronto),
Central Bldg.

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

DATE: May 19, 1967

OUR FILE REF.

IN REPLY TO

MAY 29 1967

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
The Proposed Trunk Sewer Project
At Hwy. #401 and Hwy. #27
District #6 (Toronto)
W.J. 67-F-35 -- W.P. 201-62

Attached, we are forwarding to you, our detailed foundation investigation report on the subsoil conditions existing at the above structure site.

We believe that you will find the factual data and recommendations contained therein, adequate for your design requirements. Should additional information be required, please feel free to contact our Office.

AGS/MdeF
Attach.

cc: Messrs. G. K. Hunter (3)
H. A. Tregaskes
D. W. Farren
B. R. Davis (2)
F. Allen
W. S. Melinyshyn
T. J. Kovich
B. A. Singh

Foundations Files
Gen. Files

A. G. Sternac
A. G. Sternac
PRINCIPAL FOUNDATION ENGINEER

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FOUNDATION INVESTIGATION REPORT
For
The Proposed Trunk Sewer Project
At Hwy. #401 and Hwy. #27
District #6 (Toronto)
W.J. 67-F-35 -- W.P. 201-62

1. INTRODUCTION:

A foundation investigation was requested by Mr. T. J. Kovich, Regional Materials Engineer, at the site of the proposed trunk sewer, south of Hwy. #401, near Hwy. #27. The verbal request was confirmed by a memo, dated April 19, 1967.

The trunk sewer project is part of the proposed Hwy. #27, Hwy. #401 and Richview Expressway interchange and improvement.

According to the request, a field investigation and laboratory test program were undertaken by this Section, the results of which are delineated in this report, together with recommendations pertaining to the excavations and dewatering.

2. DESCRIPTION OF THE SITE:

The roughly 6,000-ft. long trunk sewer will be located between the existing Hwy. #401 and Richview sideroad, west and east of Hwy. #27. The site of the project is generally occupied by farmlands, intercepted by highways and ramps. The area in question is partly flat, partly undulating, belonging to the physiographic region known as the "South Slope". The surficial landforms within this terrain consist of ground moraines with irregular knolls and hollows, having been deposited by the glacials of the Wisconsin epoch.

3. FIELD INVESTIGATION PROCEDURE:

Some 18 boreholes were carried out during the field investigation. The borings were performed by means of three

3. FIELD INVESTIGATION PROCEDURE: (cont'd.) ...

continuous flight augers and one skid-mounted diamond drill adapted for soil sampling purposes. Soil samples were taken at regular intervals, recovered by 2" O.D. split-spoon samplers. The standard penetration 'N' values were recorded, using a driving energy of 350 ft.-lbs. per hammer blow.

Locations and elevations of the boreholes as well as the stratigraphical profile, are shown on Drawing #67-F-35A.

4. SOIL CONDITIONS:

4.1) General:

The subsoils along the proposed trunk sewer may be divided into two main bodies. The upper layers appear to be of glacio-fluvial and/or lacustrine deposits, consisting of sandy and clayey silts and sandy gravels. These strata are underlain by hard and very dense grey clayey and sandy silts with fragments of shale and limestone (glacial till), which in turn, changes to shale bedrock. A brief description of the soils follows:

4.2) Sandy Silts:

In the majority of the borings, the uppermost layer was identified to be sandy silt with some gravel and traces of clay. Occasionally, however, the silt was found to be clayey rather than sandy, exhibiting a higher degree of plasticity; hence, lower permeability. The relative density of the sandy portion of the stratum is very dense, corresponding to penetration 'N' values of 100 blows per ft. and above; in a few borings, compact relative density was also observed. The consistency of the cohesive portion may be taken to be hard. The overall depth of this deposit ranges from 10 ft. to 25 ft., with values of natural moisture content of 8 - 15%.

cont'd. /3 ...

4. SOIL CONDITIONS: (cont'd.) ...

4.3) Gravel and Sand:

West of Borehole #10 up to the westerly end of the field investigation, underlying the sandy silts, a deposit of sandy coarse to fine gravel was observed. In Borehole #14, however, this stratum was missing. The thickness of this layer varies, averaging roughly 10 ft., the constituent materials being well sorted gravels and sands horizontally bedded. West of Borehole #14 this stratum displays no cohesion, lacking any kind of fines; consequently, it is a free-draining material, carrying a large amount of groundwater. East of Borehole #14, the gravel appeared to have considerable fines. The relative density was found to be very dense.

4.4) Sandy Silt and Clayey Silt (Glacial Till):

The glacial till was revealed at almost every borehole location, underlying the sandy gravels. The characteristic grey colour of the material forms a well defined upper boundary of the deposit, which was classified to be sandy or clayey silt, containing some gravel and large fragments of shale. The transition between the till and the underlying shale bedrock is rather difficult to pinpoint due to the extremely dense nature and the similar appearance of the grey till.

The values of plastic limits of the layer range from 12% to 22%, and those of liquid limits from 16% to 35%. The natural moisture contents fall usually below the plastic limits, confirming the preconsolidated state of the deposit.

4.5) Shale Bedrock:

The upper surface of the shale bedrock was established around El. 502 ft. at the westerly limit of the investigation - (B.H. #19) and it was found to dip towards the east. Between Sta. 540+95 and Sta. 570+70 (B.H.'s #1 to #9), there was no bedrock encountered within the investigated depth.

cont'd. /4 ...

4. SOIL CONDITIONS: (cont'd.) ...

4.5) Shale Bedrock: (cont'd.) ...

The shale bedrock belongs to the Dundas formation, having greenish-grey colour. It is rather soft with well defined horizontal seams and flaky texture. Some embedded thin layers of limestone were evident.

5. GROUNDWATER CONDITIONS:

The groundwater level lies quite high within the area investigated. The average depth of the water table may be taken to be 1 - 2 ft. below ground surface, except around the existing Hwy. #27 where it is somewhat depressed to lower elevations. Due to the slight plasticity within the sandy and clayey silt deposits, slow seepage is anticipated. Within the sandy gravel, however, considerable water flow will enter the excavations.

6. CONCLUSIONS:

Between Sta. 540+90 and Sta. 560+00, the proposed trunk sewer will be placed near or above the existing ground surface. From Sta. 560+00 to Sta. 570+80, the invert elevation is within the clayey and sandy silt and the glacial till. It is believed that between Sta. 570+70 and Sta. 570+90, the excavation will reach the bedrock and the pipe will partly or entirely lie within the shale up to around Sta. 610+00. From this point on to the westerly limit of the investigation, the excavation will be once again above the bedrock. It is anticipated that in the lower portion of the very dense and hard grey till, large fragments of shale and limestone will be encountered.

Within the uppermost deposit, slow seepage is foreseen; within the sand and gravel layer, however, a large quantity of water will flow into the trench. Appropriate dewatering has to be provided within this area. No 'quick' condition is likely to occur at the bottom of the excavation, inasmuch as it will be either

cont'd. /5 ...

6. CONCLUSIONS: (cont'd.) ...

within the slightly cohesive till or in the shale bedrock. By commencing the excavation and laying the pipe from the east end, the drainage of the trench through the pipe will be facilitated.

7. MISCELLANEOUS:

The field work was undertaken during the period April 24 - 28, 1967, by Messrs. A. M. Seppala and A. Prakash, Project Foundation Engineers, under the supervision of Mr. A. K. Barsvary, Senior Foundation Engineer, who also prepared this report.

Equipment used was owned and operated by Canadian Longyear Ltd., and Dominion Soil Investigation Ltd., Toronto.

This report was reviewed by Mr. A. G. Stermac, Principal Foundation Engineer.

May 1967

APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-35

LOCATION 868,570 N. 981,510 E.

ORIGINATED BY SKB

W. P.

BORING DATE April 27, 1967

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Bombardier Flight Auger

CHECKED BY

SOIL PROFILE		STRAT. PLOT	SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — WL PLASTIC LIMIT — wp WATER CONTENT — w		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION		NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.		WATER CONTENT % 10 20 30			
454.6	GROUND LEVEL											
0.0	Sandy silt with gravel & traces of clay.		1	SS	6	450						WL. 452.1
	Compact		2	SS	17							Gr. 25, Sa. 36 Si. 29, Cl. 10
441.6												
13.0	Grey clayey silt with sand & fragments of shale. (Glacial Till)		3	SS	100/5"	440						Gr. 14, Sa. 26 Si. 41, Cl. 19
	Hard		4	SS	100/2"							
431.4			5	SS	200/2"							
23.2	End of Borehole					430						

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 67-F-35

LOCATION 868.716 N; 981,245 E.

ORIGINATED BY AKB

W. P.

BORING DATE April 27, 1967

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Continuous Flight Auger

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.			WATER CONTENT % 10 20 30					
458.7	GROUND LEVEL														
0.0	Sandy silt with gravel & traces of clay.		1	SS	45	450								WL 455.0	
	Very dense.		2	SS	61										Gr. 15, Sa. 16 Si. 65, Cl. 4
			3	SS	100	445"									
			4	SS	100	440"									
435.7															
23.0	Grey sandy silt with shale fragments & clay.		5	SS	100	430								Gr. 35, Sa. 29 Si. 25, Cl. 11	
428.5	Hard		6	SS	100	420									
30.2	End of Borehole														

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 67-E-35 LOCATION 868,747 N; 980,941 E. ORIGINATED BY AKB
W.P. BORING DATE April 27, 1967 COMPILED BY AKB
DATUM Geodetic BOREHOLE TYPE Bombardier Flight Auger CHECKED BY JK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE				LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.				WATER CONTENT % 10 20 30				
456.3	GROUND LEVEL														
0.0	Sandy silt to silty sand with traces of gravel & clay.		1	SS	9	450									
	Very dense.		2	SS	50										
			3	SS	64	440									
			4	SS	139										
432.8			5	SS	100/4"	430									
23.5	Grey clayey silt with shale. Hard.														
428.3															
28.0	End of Borehole					420									

Gr. 16, Sa. 75
Si. & Cl. 9
Gr. 9, Sa. 40
Si. 46, Cl. 5

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 67-F-35 LOCATION 868,631 N; 980,141 E. ORIGINATED BY AKB
W.P. BORING DATE April 24, 1967 COMPILED BY AKB
DATUM Geodetic BOREHOLE TYPE Continuous Flight auger CHECKED BY AKB

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.				WP	W	WL		
481.7	GROUND LEVEL														
0.0	Sandy silt to silt with traces of gravel & clay. Very dense.		1	SS	26	480									
			2	SS	45										
			3	SS	40										
			4	SS	127	470									
			5	SS	74										
461.7															
20.0	Grey silty sand with some clay. Very dense.		6	SS	87	460									
			7	SS	135/5"										
451.7															
30.0	Shale fragments		8	SS	125/5"	450									
31.5	End of Borehole														
						440									

WL 462.7
Gr. 8, Sa. 57
Si. & Cl. 35

Gr. 12, Sa. 21
Si. 45, Cl. 22

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 67-F-35

LOCATION 868.534 N: 979.844 E.

ORIGINATED BY AMS

W. P.

BORING DATE April 24, 1967

COMPILED BY AKB

DATUM _____ Geodetic

BOREHOLE TYPE Continuous Flight Auger

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

JOB 67-F-35

LOCATION 868,417 N; 979,646 E.

ORIGINATED BY AP

W. P. _____

BORING DATE April 25, 1967

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Washboring Bx Casing

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— WL		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT ——— WP	WATER CONTENT ——— W		
493.7	GROUND LEVEL											
0.0	Clayey silt with traces of gravel Hard.		1	SS	50	490						
			2	SS	100/10"							
480.7						480						
13.0	Grey Clayey silt with sand. Glacial Till. Hard.		3	SS	67							
			4	SS	40							
			5	SS	85	470						
462.2			6	SS	50/1.5"							
31.5	End of Borehole					460						

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-35

LOCATION 868,252 N; 979,072 E.

ORIGINATED BY AMS

W. P.

BORING DATE April 25, 1967

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Continuous Flight Auger

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 9

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-F-35

LOCATION 868,179 N; 978,883 E.

ORIGINATED BY AMS

W. P. _____

BORING DATE April 25, 1967

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Continuous Flight auger

CHECKED BY AK

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-35

LOCATION 868,033 N; 978,429 E.

ORIGINATED BY AMS

W. P.

BORING DATE April 26, 1967

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Continuous Flight Auger

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE			LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F.			WATER CONTENT % 10 20 30				
499.2	GROUND LEVEL													
0.0	Sandy silt to silt with some clay. Very dense.		1	SS	67	490								WL.497.1
488.4			2	SS	50/2"									Gr.14, Sa.20 Si.50, Cl.16
10.8	Grey. clayey silt, glacial till.		3	SS	100/1"									
483.2	Hard.		4	SS	150/1"	480								
16.0	Shale Bedrock		5	SS	200/1"									Gr.25, Sa.30 Si.33, Cl.12
473.7														
25.5	End of Borehole					470								

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 11

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-E-35 LOCATION 867,948 N; 978,035 E. ORIGINATED BY AMS
W.P. BORING DATE April 26, 1967 COMPILED BY AKB
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger CHECKED BY LR

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE				LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT				WP	W	WL		
510.7	GROUND LEVEL					510									
0.0	Sandy silt to silt.														WL. 508.5
505.2			1	SS	100/8"										
5.5	Gravel, sand & silt.														
500.2	Very dense.		2	SS	50/1"	500									
10.5	Grey clayey silt to sandy silt.														
	Glacial till.		3	SS	150/4"										
492.2															
18.5	Shale bedrock with limestone.		4	SS	100/1"	490									
			5	SS	140/1"										
479.2															
			6	SS	100/2"	480									
31.5	End of Borehole														Gr. 3, Sa. 36 Si. 40, Cl. 21

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-35

W. P.

DATUM Geodetic

RECORD OF BOREHOLE NO. 12

LOCATION 867,779 N; 977,559 E.

BORING DATE April 27, 1967

BOREHOLE TYPE Cont. Flight Auger

FOUNDATION SECTION

ORIGINATED BY AMS

COMPILED BY AKB

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-35

LOCATION 867,690 N; 972,214 E.

ORIGINATED BY AKB

W.P. _____ BORING DATE April 26, 27, 1967

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Cont. Flight Auger

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 14

FOUNDATION SECTION

JOB 67-F-35

LOCATION 867.502 N: 976.820 E.

ORIGINATED BY AKB

W.P.

BORING DATE April 26, 1967

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Cont. Flight Auger

CHECKED BY ✓

[illegible]

FOUNDATION SECTION

ORIGINATED BY AP

COMPILED BY AKB

BOREHOLE TYPE Washboring BX Casing

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-35

LOCATION 866,915 N; 975,539E

ORIGINATED BY AKB

W.P.

BORING DATE April 25, 1967

COMPILED BY AKE

DATUM Geodetic

BOREHOLE TYPE Cont. Flight Auger

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE		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	ELEV. SCALE	SHEAR STRENGTH P.S.F.	WATER CONTENT % 10 20 30				
533.2	GROUND LEVEL											
0.0	Sandy silt.					530						
	Very dense.		1	SS	101							
			2	SS	121							
517.7						520						
15.5	Sandy gravel.	0.0	3	SS	100	3"						
515.2	Very dense.	0.0										
18.0	Clayey silt with sand, fragments of shale, Glacial Till.		4	SS	96							
506.2	Hard.		5	SS	100	2"						
27.0	End of Borehole		6	SS	102	2"						

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-35

W. P. ~~REDACTED~~

DATUM _____ Geodetic

RECORD OF BOREHOLE NO. 18

LOCATION 866,780 N; 975,270 E.

BORING DATE April 24, 25, 1967

BOREHOLE TYPE Cont. Flight Auger

FOUNDATION SECTION

ORIGINATED BY AP

COMPILED BY AKB

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F.	WATER CONTENT % 10 20 30				
530.1	GROUND LEVEL											
0.0	Sandy silt. Very dense.		1	SS	57							WL. 526.
517.1			2	SS	100/4"	520						
13.0	Sandy gravel Very dense.		3	SS	100/4"	510						Gr. 32, Sa. 55 Si. & Cl. 13
508.1			4	SS	100/4"							
22.0	Clayey silt with sand and shale fragments.		5	SS	100/2"							Gr. 9, Sa. 27 Si. 39, Cl. 25
502.1	Glacial Till. Hard.											
28.0	End of Borehole					500						

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F-35

LOCATION 866,619 N; 974,930 E.

W. P.

BORING DATE April 24, 1967

DATUM Geodetic

BOREHOLE TYPE Cont. Flight Auger

FOUNDATION SECTION

ORIGINATED BY AKB

COMPILED BY AKB

CHECKED BY

[illegible]

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 :-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
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

Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	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
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
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 $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION 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 (YOUNG'S 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_0	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

MEMORANDUM

To: Mr. A. Stermac,
Principal Foundation Engr.,
Materials & Testing Division.

From: Materials & Testing Division,
Central Region,
Room 134, Lab. Bldg.

Date: April 19, 1967.

Our File Ref.

IN REPLY TO

SUBJECT:

Trunk Sewer Project
Hwys. 27 and 401

67-F-35

This memorandum will confirm our meeting of April 17th during which I had requested that you carry out the necessary investigations and prepare a Foundation report.

During the regular weekly committee meeting (April 18th) at the office of Fenco, at which Alex Barsvary was present, the following points were made:

- (1) Staking would be done by District 6 personnel.
- (2) Verification of the location of utilities would be the responsibility of your office.
- (3) A target date of June 1, 1967 was set for receipt of the Foundation report.

The Program Section has advised me that a work project number will be assigned. As soon as I get it I will pass it on to your office.

TJK/js.


T. J. Kovich,
REGIONAL MATERIALS ENGINEER.

401 & Keele Str.
Downsview, Ontario

June 19, 1967

Canadian Longyear Limited
35 Brydon Drive
Rexdale, Ontario

Dear Sirs:

This is to confirm our request of April 24, 1967 for the supply of a Penn Drill and Bombadier together with all necessary equipment, as specified under the terms of our Contract Agreement, at Hwy. 401 & 27, Trunk Sewer, Toronto, Ontario.

This project bears Job Number 67-F-35.

Yours truly,

K. Selby

KS:mt

K. Selby
Supervising Foundation Engineer
for A. G. Sternac
Principal Foundation Engineer

401 & Keele St.
Downsview, Ontario

June 19, 1967

Dominion Soil Investigation Ltd.
77 Crockford Blvd.
Scarborough, Ontario

Dear Sirs:

This is to confirm our request of April 24, 1967 for the supply of a Penn and Core Drill together with all necessary equipment, as specified under the terms of our Contract Agreement, at Hwy. 401 & 27, Toronto, Ontario, Trunk Sewer.

This project bears Job Number 67-P-35.

Yours truly,

K. L. Selby

KS:mt

K. Selby
Supervising Foundation Engineer
for A. G. Stermac
Principal Foundation Engineer

MEMORANDUM

Mr. A. Sternac,
Principal Foundation Engr.,
Materials & Testing Division.

FROM: Materials & Testing Division,
Central Region,
Room 134, Lab. Bldg.

Attn: Mr. K. Selby

DATE: September 26, 1967.

FILE REF.

IN REPLY TO

SUBJECT: Sub-Trunk Sewers
W.P. 201-62
Highway 401/27 Interchange
Toronto District

67-F-35

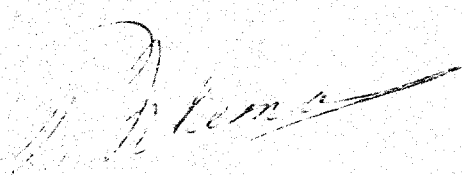
This memorandum confirms our verbal request at a short meeting on Friday September 22, 1967 for a Foundation investigation for eight sub-trunk sewers with a total length of about 7,400 feet. These sub-trunk sewers will empty into the large trunk sewer for which the investigation was done in the spring of this year and which is now under contract 67-129.

The required depth of the borings ranges from 12 feet to 40 feet as indicated on the 100 feet to one inch scale plan, which was handed to you.

Yesterday we received profiles of the sub-trunk sewer lines from Fenco, the design consultants for the project, and one copy was delivered to your office.

The Property Section is obtaining permission to enter on the Smith Estate property and has already contacted the lawyer of the estate.

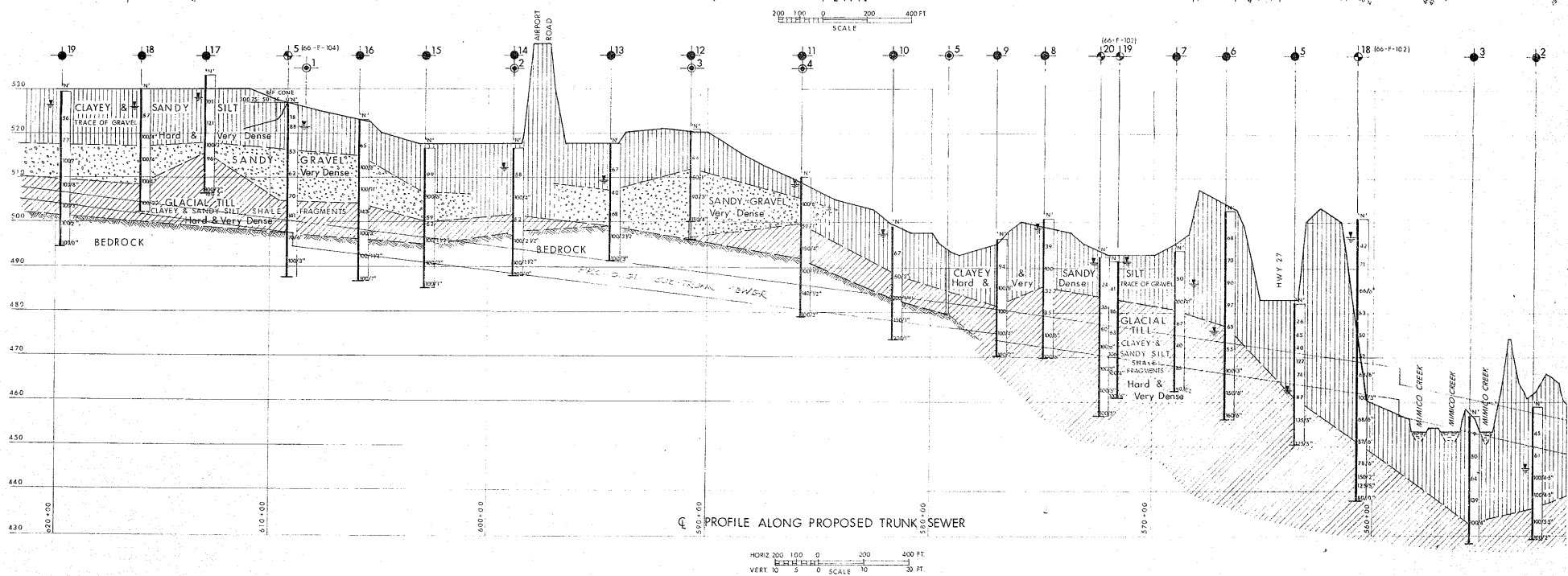
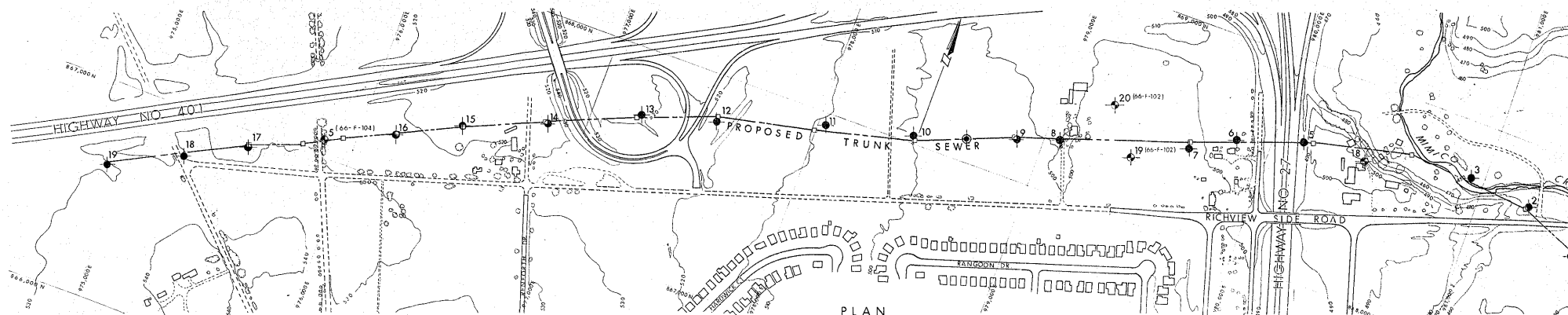
In order to complete their design in time, Fenco would appreciate receiving the information not later than October 23, 1967 as far as the "red contract" is concerned; the others could follow later.

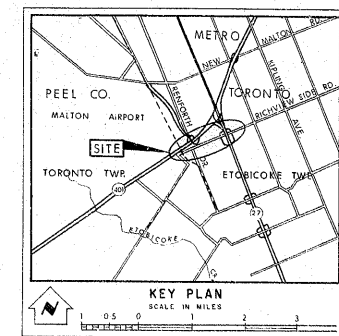
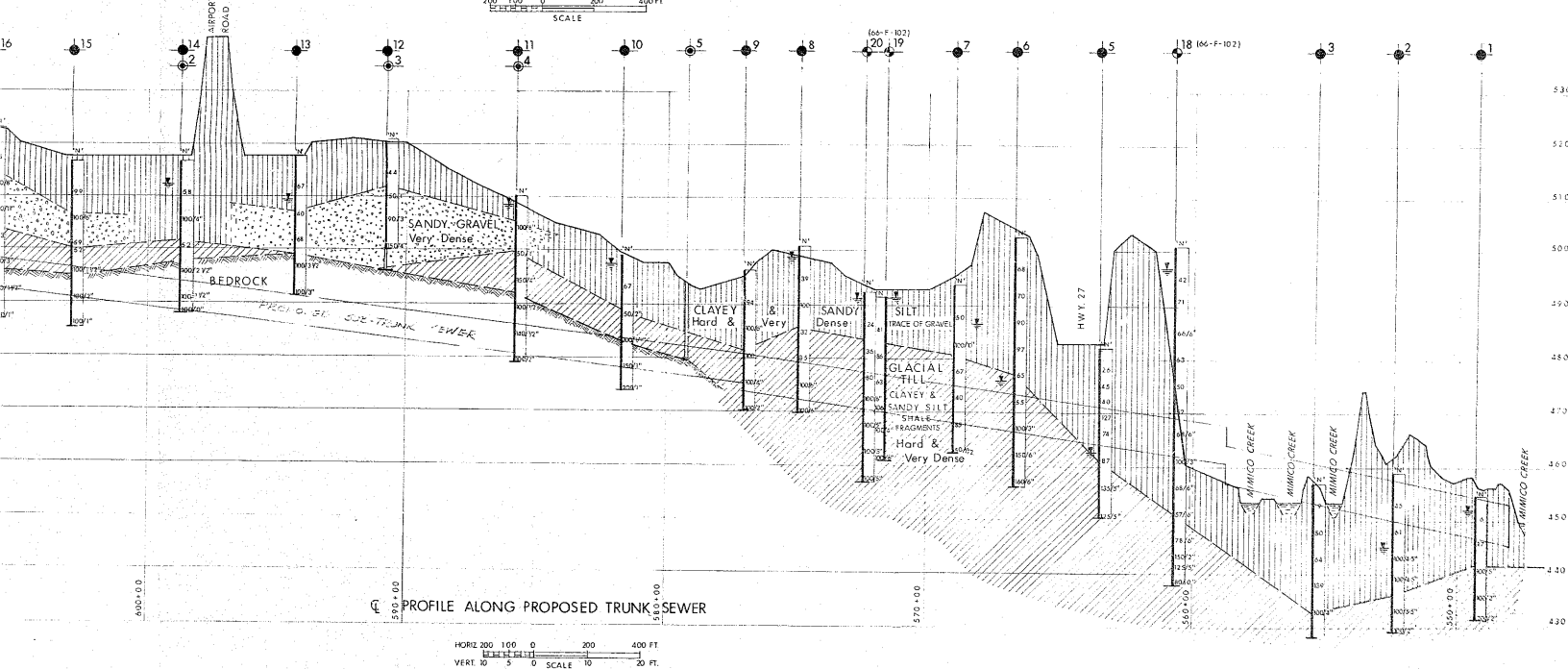
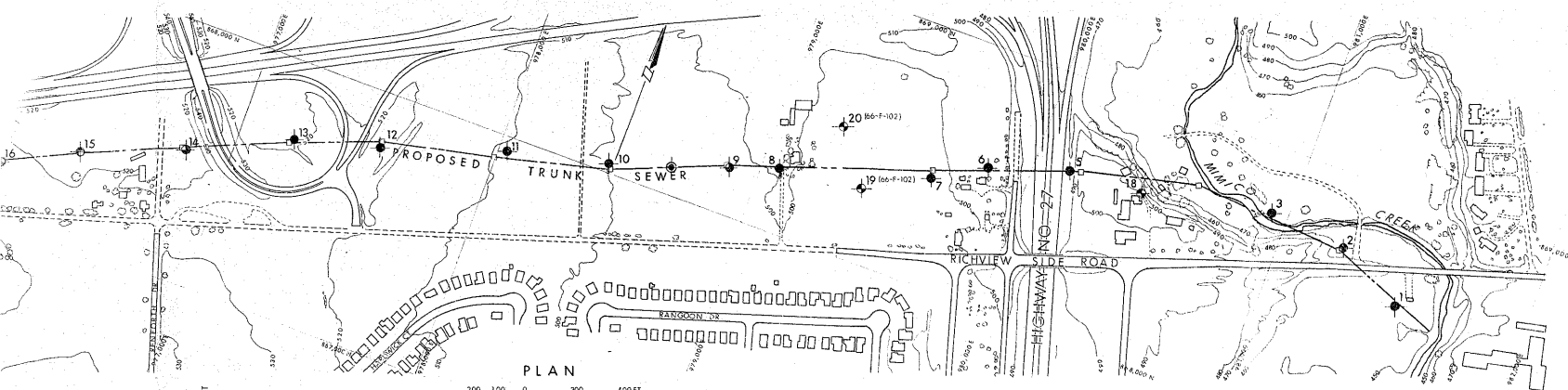


PA/js.

P. Arkema,
SR. PROJECT SOILS ENGINEER.

#67-F-35
W.P.#201-62
HWY#401 & #27
PROPOSED
TRUNK
SEWER.





- LEGEND**
- Bore Hole
 - ⊕ Cone Penetration Hole
 - ⊕ Bore & Cone Penetration Hole
 - ⬆ Water Levels established at time of field investigation
 - Manhole
 - ⊙ Test Pit

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	454.2	868,370	981,510
2	458	868,716	981,245
3	456.3	868,727	980,941
4	481.7	868,631	980,141
5	502.2	868,534	979,844
6	493.4	868,417	979,648
7	500.8	868,252	979,022
8	498.5	868,174	978,853
9	499.9	868,035	978,419
10	510	867,928	978,035
11	520.4	867,779	977,559
12	517.6	867,690	977,214
13	516.4	867,502	976,820
14	516.5	867,352	976,435
15	523.0	867,209	976,165
16	530.7	866,915	975,539
17	530.1	866,780	975,270
18	524.6	866,619	974,950

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.

DATE	BY	DESCRIPTION

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

PROPOSED TRUNK SEWER

KING'S HIGHWAY NO. 401 & 27 INTERCHANGE DIST. NO. 6
CO. YORK METRO TORONTO
TWP. ETOBICOKE LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBNO. A.B.	CHECKED	W.P. NO. 201-62	M.B.T. DRAWING NO.
DRAWN M.D.	CHECKED	JOB NO. 67-F-35	67-F-35A
DATE 19 MAY 1967	SITE NO.	BROGGE DRAWING NO.	
APPROVED	POINT NO.		