

MEMORANDUM

To: Mr. B. R. Davis
Bridge Engineer
Bridge Division
Admin. Bldg.

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

Date: September 26, 1967

Our File Ref.

In Reply To

Subject:

FOUNDATION INVESTIGATION REPORT
for
Proposed Subway Hwy. #2 & C.P.R.
Newcastle
District #7 (Port Hope)
M.J. 67-P-73 -- M.P. 50-65-1

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

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

AGS:mt
Attach.

A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
G. K. Hunter (2)
F. Allen
W. Melnyshyn
T. J. Kovich
B. A. Singh
Foundation Files
General File

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FOUNDATION INVESTIGATION REPORT
for
Proposed Subway Hwy. #2 & C.P.R.
Newcastle
District #7 (Port Hope)
W.J. 67-P-73 -- W.P. 50-65

1. INTRODUCTION:

In a memo dated August 19, 1967 a request to carry out a foundation investigation at the crossing of Hwy. #2 by C.P.R. was received by this section from the Regional Bridge Location Engineer, Mr. W. S. Melnychyn.

Subsequently, an investigation was carried out at the proposed site to determine the subsoil conditions. Presented in this report are the results of field and laboratory work, together with discussion and recommendations pertaining to the design of the foundations of the new structure, proposed detour and the stability of the approach embankments.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site is located in the Township of Clarke, County of Durham on Hwy. #2 at the eastern limits of the town of Newcastle. At the site the C.P.R. traverses in a north-west south-east direct and is built on an embankment some 32 ft. higher than the existing grade of Hwy. #2. A concrete arch subway (24' clear span) accomodates Hwy.#2 traffic through the embankment.

The site is located in the physiographic region known as the "Iroquois Plains", the lowlands bordering Lake Ontario which were inundated in the Pleistocene times by Lake Iroquois. The Iroquois Plain extends around the western part of Lake Ontario for a distance of 190 miles, its width varying from a few hundred yards to about eight miles.

The terrain in the vicinity of the site is undulating and the surrounding land is developed for growing of cash crops.

3. DESCRIPTION OF FIELD AND LABORATORY WORK:

The field work was carried out by means of a conventional diamond drill adapted for sampling purposes.

A total of 7 sampled boreholes and 7 dynamic cone penetration tests were carried out during the investigation.

From ground level downwards disturbed samples were recovered by means of a standard split spoon sampler driven according to the specification of the Standard Penetration Test.

Recovered samples were visually examined in the field and subsequently identified in the laboratory. Laboratory tests were carried out on selected representative samples to determine where applicable, atterberg limits, grain size distribution and natural moisture contents.

Results of the laboratory and field tests, together with the locations and elevations of the boreholes, are presented in the appendix of this report.

4. SUBSOIL CONDITIONS:

4.1) General:

The subsoil at the site consisted of deep heterogeneous mixture of clayey silt, sand and gravel with occasional seams of sand (glacial till).

In BH # 2 & 4 some 18 to 20 ft. of fill material, of the same composition as the glacial till overlay the natural deposit.

The depths as determined in the boreholes are shown on the accompanying borelog sheets. The estimated stratigraphical profile contained on Drawing 67-P-73A is based on this information.

4. SUBSOIL CONDITIONS:

4.2) Fill Material (Mixture of clayey silt, sand and gravel):

The fill material was intersected in BH #2 and 4 to depth of 18 and 20 ft. respectively, and consisted essentially of a mixture of clayey silt, sand and gravel.

The 'N' values (No. of blows/ft obtained on the Standard Penetration Test) ranged from 6 blows/ft. to 15 blows/ft. indicating a consistency of firm to compact.

4.3) Heterogeneous Mixture of clayey silt, sand and gravel (Glacial Till):

This deposit was intersected in all boreholes and extended from ground level downwards with the exception of BH #2 & 4, where this stratum was ~~covered~~ by fill material. The deposit consisted of a heterogeneous mixture of clayey silt, sand and gravel in the following average proportions: 5% gravel; 36% sand; 46% silt; 13% clay.

The physical properties as determined from laboratory tests are summarized as follows:

Liquid Limit	12% - 19%
Plastic Limit	11% - 17%
Moisture Content	5% - 24%

The 'N' values ranged in general from 10 blows/ft. to greater than 100 blows/ft. indicating a consistency of stiff to very hard.

5. GROUNDWATER:

The groundwater level was observed to range between elev. 325 and elev. 306.5 or some 10 ft. below ground level.

The water level in Graham Creek which is located some 200 ft. west of the proposed site was observed to be at elev. 299.5.

6. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct a new subway structure to replace the existing concrete arch subway at the crossing of Hwy. #2 by C.P.R. at the eastern limits of the town of Newcastle. Present proposals call for a three span (50' - 72' - 50') structure having approach fills up to 32 ft. above the existing Hwy. #2 grade.

Subsoil at the site consists of an extensive deposit of glacial till extending at least 40 ft. below the ground surface. In certain areas the glacial deposit is overlain by railway embankment up to a maximum height of 32 ft. above the existing Hwy. #2 grade with side slopes of 1½:1.

At present two possibilities are being considered for the construction of the new structure. One scheme is to employ a railway detour with a temporary trestle during the construction; the second is to construct the new subway in stages. Our recommendation pertaining to the new subway structure and the temporary trestle for the detour are as follows:

6.1) Structure Foundations:

Two alternatives exist for the structure foundations.

The entire structure may be supported on end-bearing piles driven to practical refusal into the very dense glacial till stratum. For estimating purposes practical refusal may be considered to occur at approximate elev. 290.0. Allowable loads will depend on the pile section chosen (e.g. 14BP74 steel H piles may be designed for 90 tons per pile). Alternatively the pier footings may be founded on spread footing type foundations within the very dense glacial till stratum at or below elev. 300.0. A safe bearing pressure of 3.5 tons/ft. may be assumed for design purposes. This would necessitate the pier footing area to be excavated some 14' - 16' below the existing Hwy. #2 grade.

6. DISCUSSION AND RECOMMENDATIONS:(cont'd)

6.1) Structure Foundations: (cont'd)

Some dewatering problems may be expected in the event that excavations are carried out in the glacial till stratum. The deposit is predominately cohesive, consisting of a heterogeneous mixture of clayey silt, sand and gravel, but it contains occasional layers of sand which would probably be water-bearing. Therefore, a dewatering scheme will be necessary.

6.2) Detour Structure:

Since it is required to maintain C.P.R. traffic at all times along the existing tracks, it will be necessary to provide a detour. If a temporary trestle is employed for the railway detour it is recommended that the trestle be supported on timber piles driven to approximate elev. 302 with a safe design load of 25 tons/pile.

No stability problems are anticipated for the proposed widening of approach embankments if standard 2:1 side slopes are adopted.

7. SUMMARY:

A foundation investigation at the site of a proposed subway at the crossing of Hwy. #2 by the C.P.R. near Newcastle is reported.

Subsoil consists of a very hard Glacial Till (heterogeneous mixture of clayey sil, sand and gravel).

It is recommended that the entire structure be founded on piled foundations or alternatively the piers be founded on spread footings with a design bearing capacity of 3.5 t.s.f.

It is recommended that the detour structure be supported on timber piles driven to elev. 302.

Some dewatering problems may arise for the construction of pier footings.

No stability problems are anticipated for approach fill with standard 2:1 slopes.

8. MISCELLANEOUS:

The field work for this project was carried out during the period August 18 to September 7, 1967 under the supervision of Mr. D. Katauskas, Project Foundation Engineer, who also prepared this report. The report was reviewed by Mr. H. Devata, Supervising Foundation Engineer.

The equipment used was owned and operated by Master Soils Investigation Ltd.

September 1967.

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 67-F-73

LOCATION Sta. 150 + 46 o/s 80' Rt.

ORIGINATED BY DK

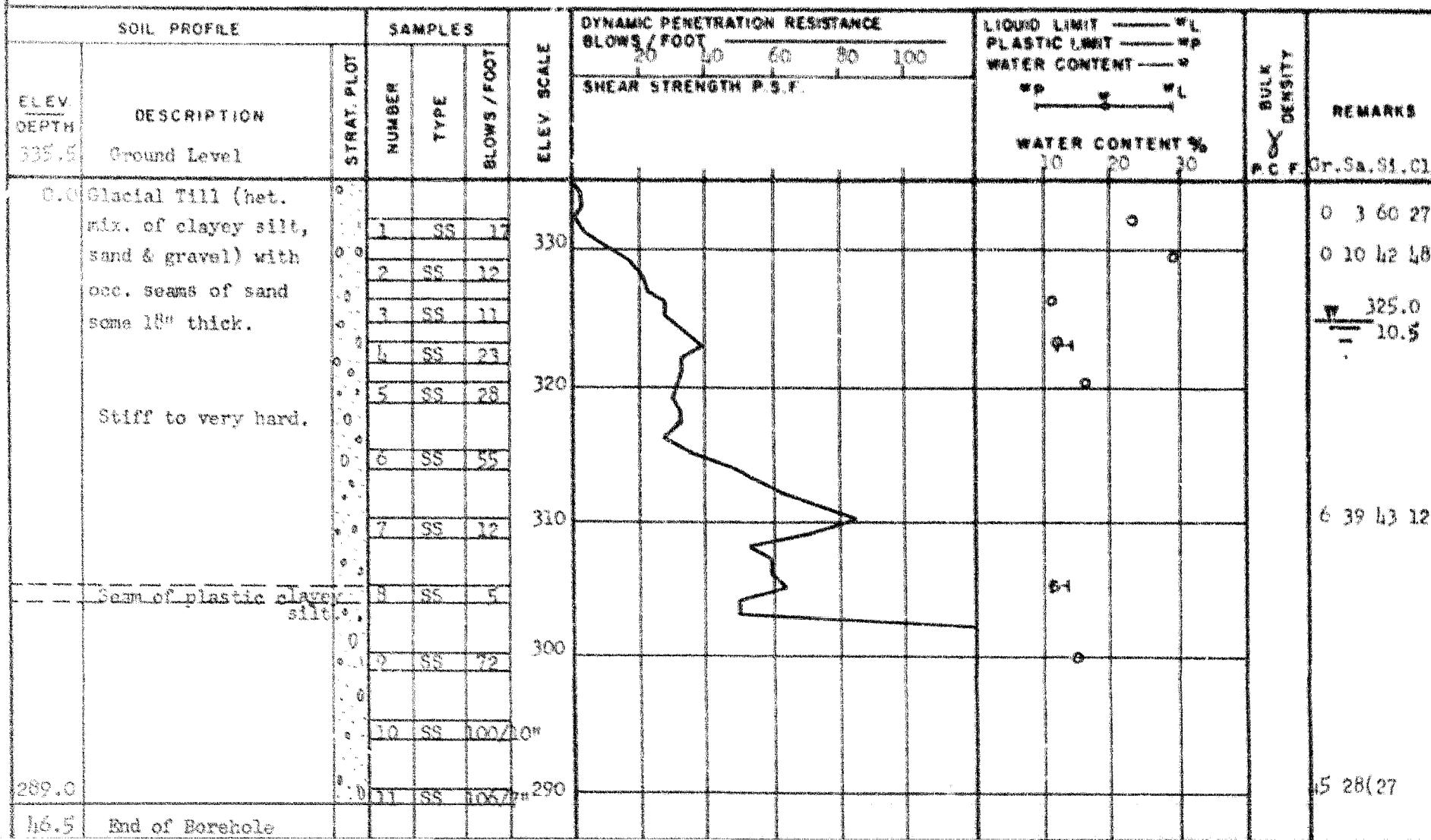
W P 50-65

BORING DATE August 21, 1967

COMPILED BY DK

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY *DK*

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

67-8-73

LOCATION Sta. 150 + 52 o/s 20.3rd Rt.

ORIGINATED BY ELK

50-85

BORING DATE September 5 & 6, 1967

COMPILED BY

Geodetic DATUM _____

BOREHOLE TYPE Waterbore

CHECKED BY _____

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 67-E-73

LOCATION Sta. 149 + 02 o/s 81' Lt.

ORIGINATED BY DK

W.P. 50-65

BORING DATE August 23 & 24, 1967

COMPILED BY DK

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY LL

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	20	40	60	80	100	wp	wl	
333.6	Ground Level													
0.0	Fill Material (mixture of sand & gravel). Stiff		1	SS	9	330								
			2	SS	13									
			3	SS	11									
			4	SS	15	320								
			5	SS	15									
313.6														
20.0	Glacial Till (bet. mix. of clayey silt, sand & gravel) with occ. seams of sand some 18" thick. Stiff to very hard.		6	SS	9	310								
			7	SS	15									
			8	SS	51									
			9	SS	105 8"	300								
			10	SS	113 3"									
288.6						290								
45.0	End of Borehole													

3 40 44 13
311.6
22.0
8' 40 42 10

MATERIALS & TESTING DIVISION

FOUNDATION SECTION

ORIGINATED BY LB

COMPILED BY

CHECKED BY _____

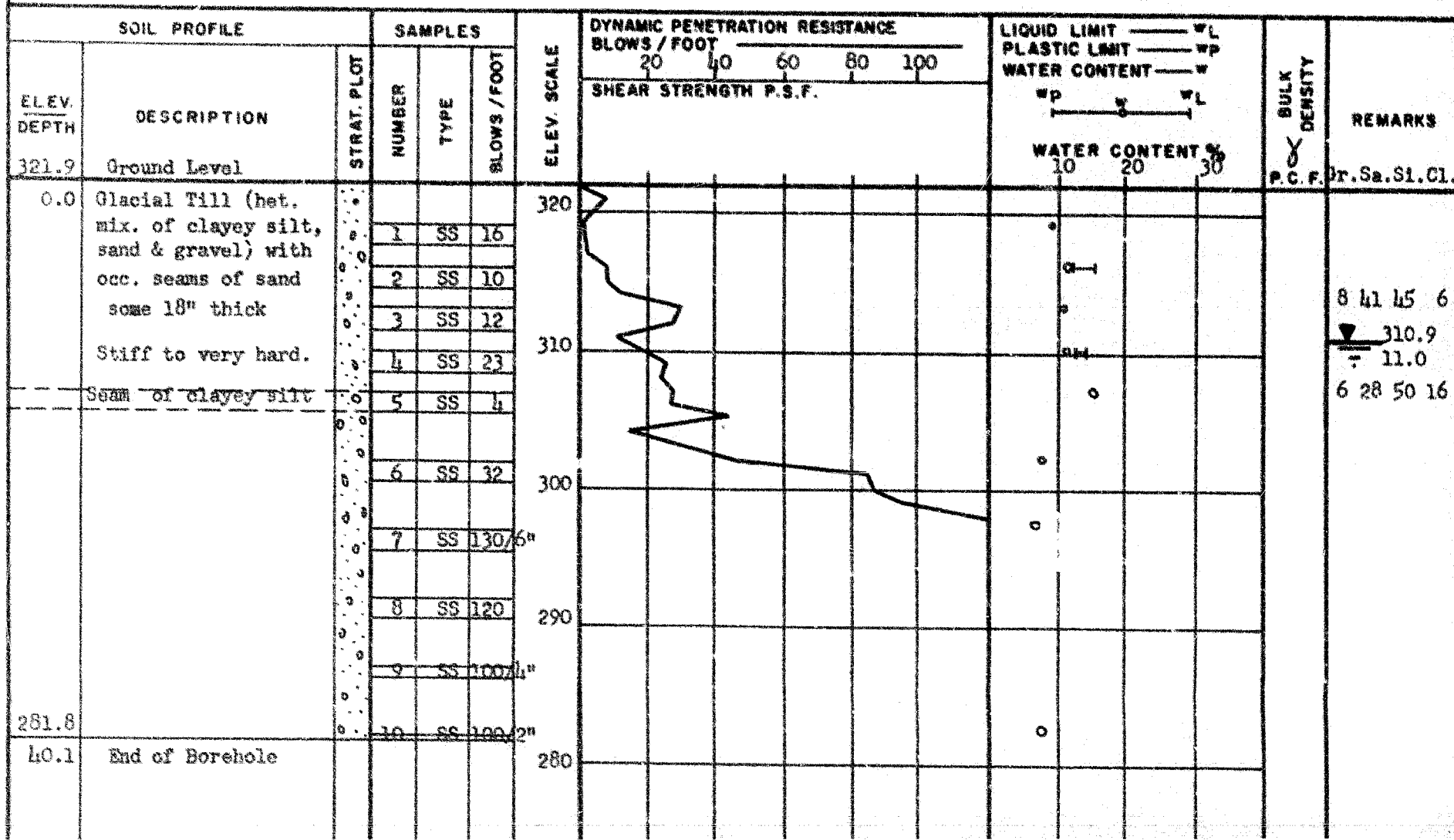
SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W		BULK DENSITY P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	20 40 60 80 100	WP WL	WATER CONTENT %		
316.0	Ground Level										Gr. Sa. Sl. Cl
0.0	Glacial Till (het. mix clayey silt, sand & gravel) with occ. seams of sand some 18" thick.										
			1	SS	15	310					
			2	SS	5						
			3	SS	10						
			4	SS	41						
			5	SS	79	300					
	Firm to very hard.		6	SS	70 1/4"						
			7	SS	108	390					
			8	SS	100 1/4"						
			9	SS	110 1/3"	280					
			10	SS	100 1/4"						
272.0											
44.0	End of Borehole					270					

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 67-F-73LOCATION Sta. 150 + 14.5 o/s 49 Lt.ORIGINATED BY DKW. P. 50-65BORING DATE September 1, 5 & 6, 1967COMPILED BY DKDATUM GeodeticBOREHOLE TYPE WashboringCHECKED BY SK

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO.7

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

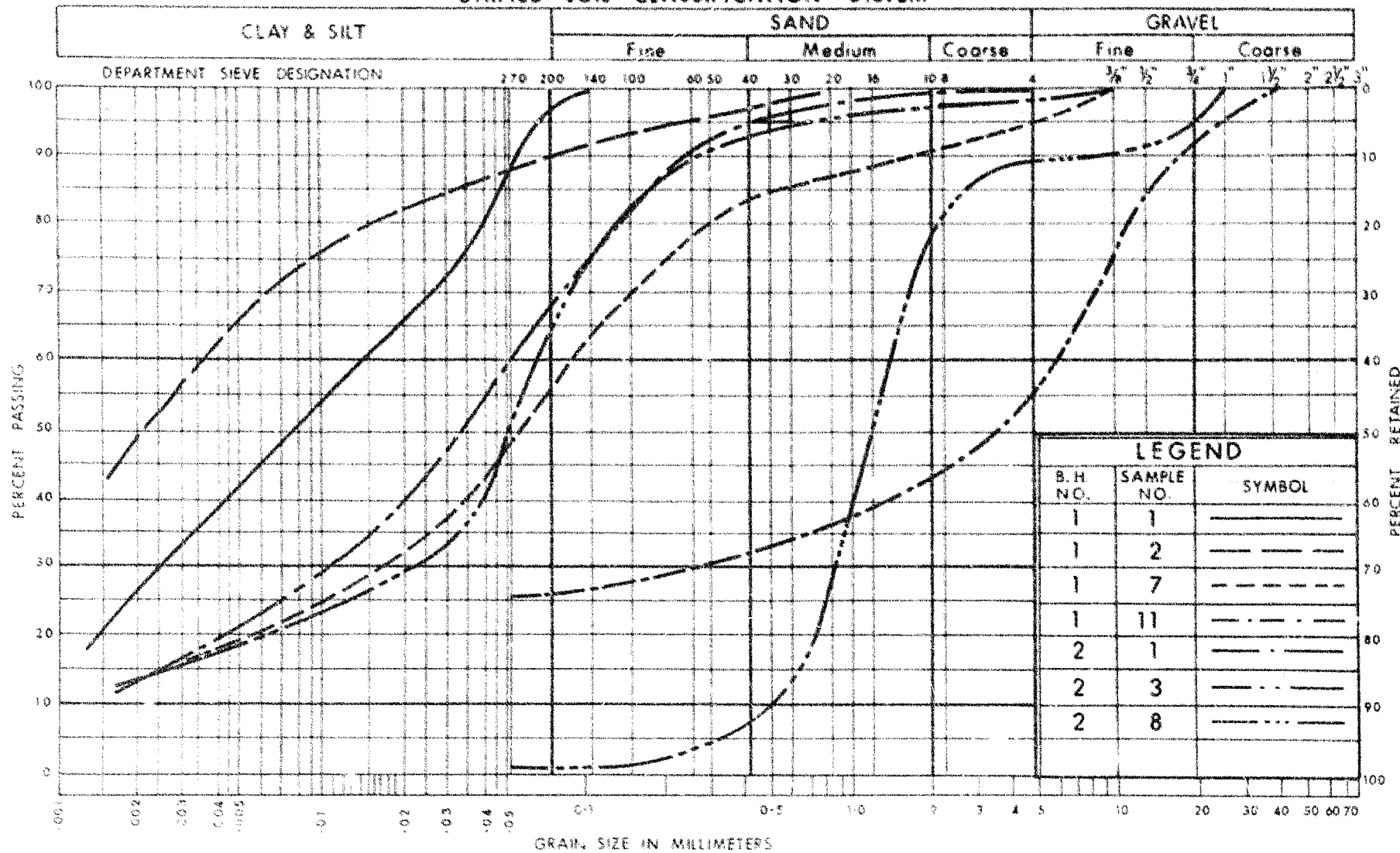
JOB 67-F-73LOCATION 149 + 03 o/s 22' Lt.ORIGINATED BY DKW.P. 50-65BORING DATE September 6 & 7, 1967COMPILED BY DKDATUM GeodeticBOREHOLE TYPE WashboringCHECKED BY SL

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	20	40	60	80	100	PLASTIC LIMIT — WP		
313.0	Ground Level														
0.0	Glacial Till (het. mix. of clayey silt, sand & gravel) with occ. seams of sand some 16" thick. Firm to very hard.		1	SS	5	310									
			2	SS	19										
			3	SS	7 1/2										
			4	SS	100 1/2"	300									
			5	SS	100 1/2"										
292.9			6	SS	100 1/2"										
20.1	End of Borehole					290									

100/8

2 34 55 9
 308.0
 5.0
 4 43 46 7

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

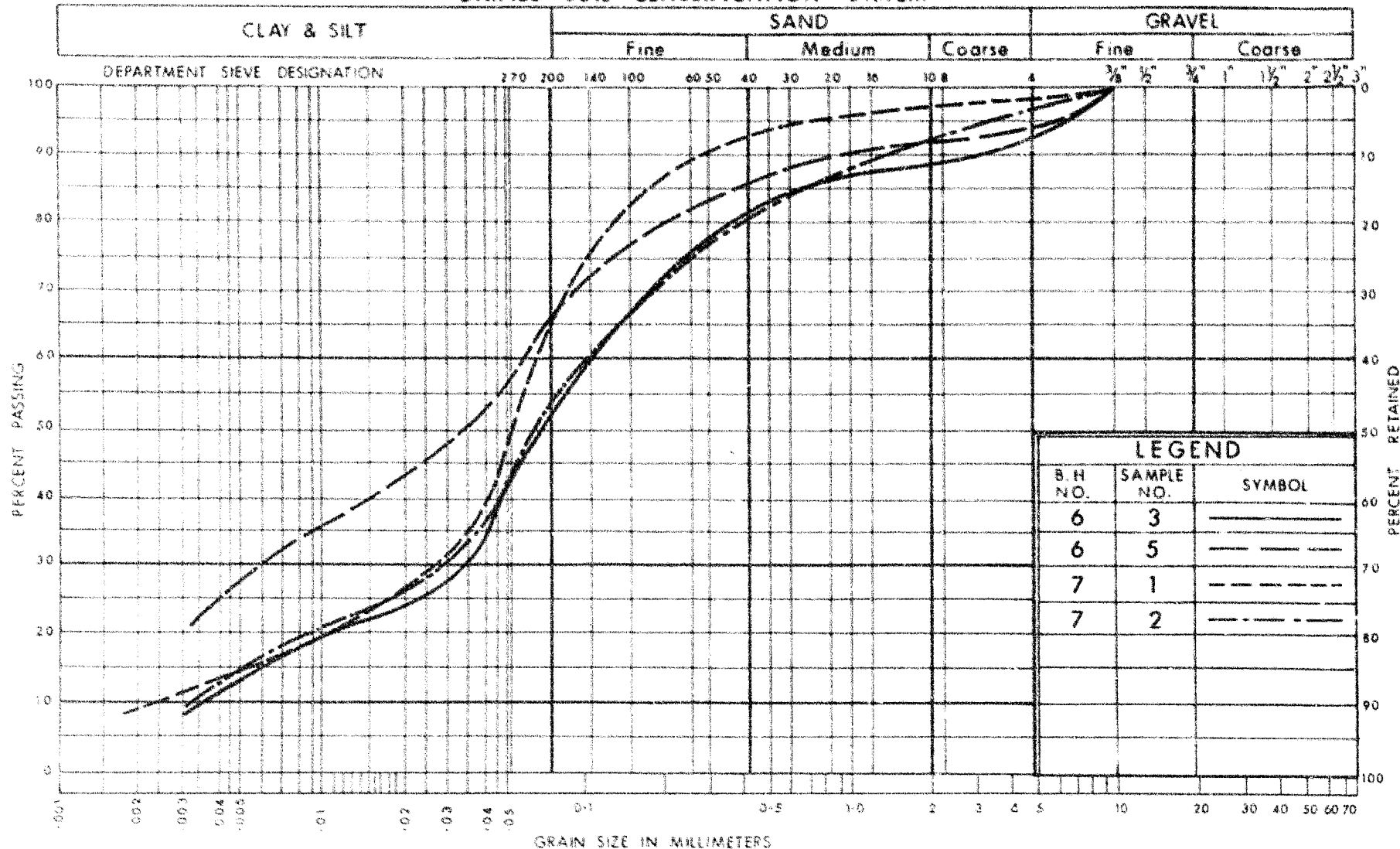
GRAIN SIZE DISTRIBUTION

W.P. No.

JOB No.

67-F-73

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

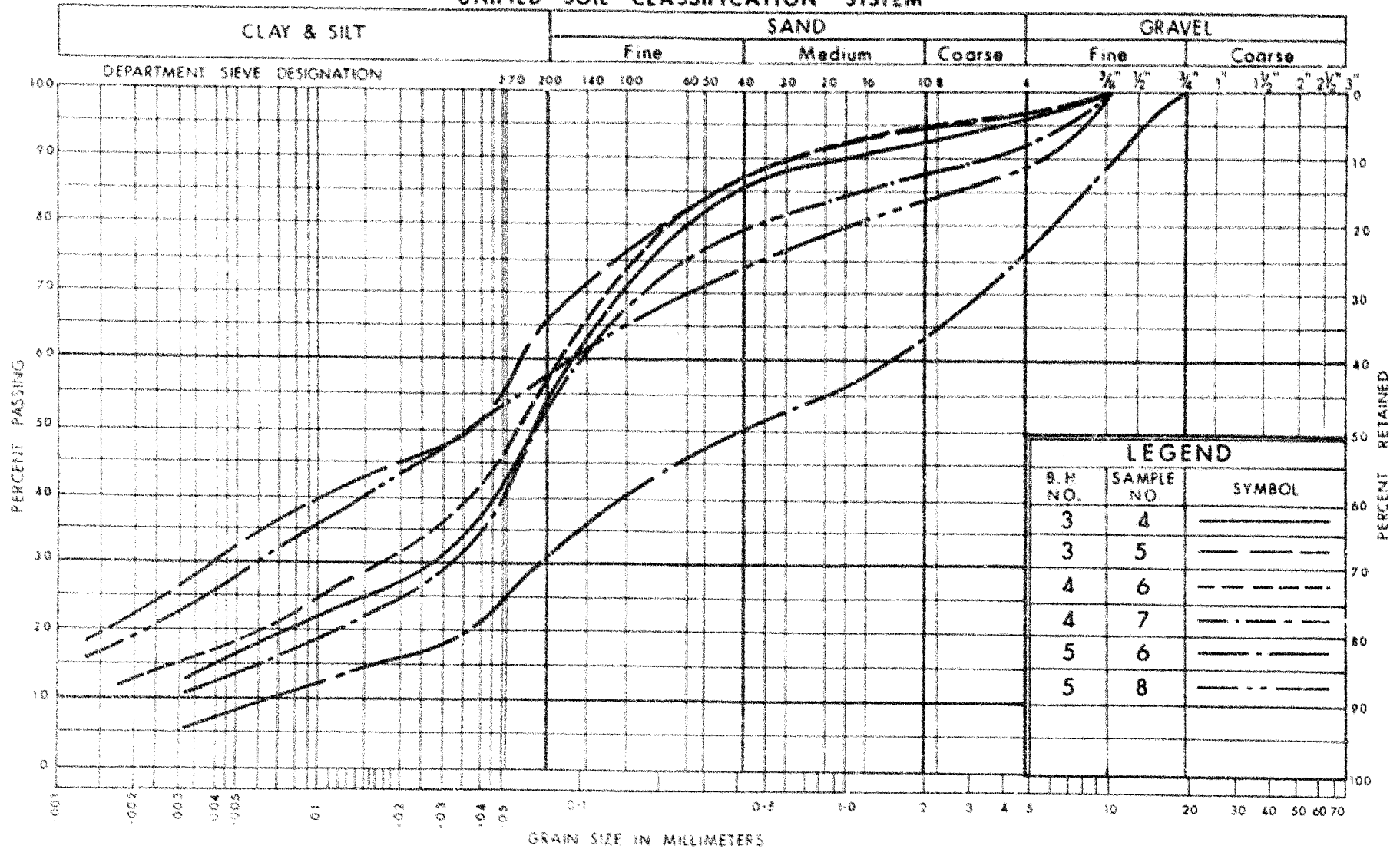
GRAIN SIZE DISTRIBUTION

W.P. No.

JOB No.

67-F-73

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

GRAIN SIZE DISTRIBUTION

W.P. No.

JOB No.

67-F-73

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, 10 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

SS	SPLIT SPOON	TW	THINWALL OPEN
WS	WASHED SAMPLE	TP	THINWALL PISTON
SB	SCRAPER BUCKET SAMPLE	OS	OESTERBERG SAMPLE
AS	AUGER SAMPLE	FS	FOIL SAMPLE
CS	CHUNK SAMPLE	RC	ROCK CORE
ST	SLOTTED TUBE SAMPLE		
	PH	SAMPLE ADVANCED HYDRAULICALLY	
	PM	SAMPLE ADVANCED MANUALLY	

SOIL TESTS

Qu	UNCONFINED COMPRESSION	LV	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	FV	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 (BUCK 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 $= \frac{e_{max} - e}{e_{min} - e_{max}}$
	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_s	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_s	SENSITIVITY

GENERAL

π	$= 3.1416$
b	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e \sigma$ OR $\ln \sigma$	NATURAL LOGARITHM OF σ
$\log_{10} \sigma$ OR $\log \sigma$	LOGARITHM OF σ 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

z	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

67-F-73

Mr. A. Starnes,
Principal Foundation Engineer,
Room 107, Lab. Bldg.

From: Bridge Division,
Downsview, Ontario.

Date: August 9th, 1967.

Our File Ref.

In reply to

Subject: W.P. 50-65,
Site 21-190,
C.P.R. Subway at Newcastle,
Hwy. 2, District 7.

Please find enclosed the Preliminary Structure Site Report and two copies of plan E 4776-1 on which we have marked the proposed location of the above subway, the temporary trestle detour and the location of the additional track.

Two copies of plan B-6-5 are also attached showing the proposed railway detour lines.

Presently there are two possibilities considered to construct the subway and no decision has been reached as yet.

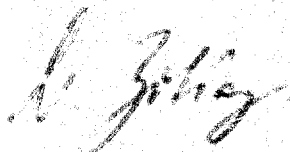
One of the schemes is to employ a railway detour with a temporary trestle during the construction. This scheme is shown on the plan in red.

One other alternative solution is to construct the new subway in stages. In view of the fact that the C.P.R. requires an additional track on the south side, the south portion of the bridge could be erected first maintaining the railway traffic on the existing line. In the second stage the railway traffic would be diverted to the completed south part of the subway during which time the north portion would be completed.

Would you please make the necessary arrangements for foundation investigation for the above subway and temporary trestle and also make as many boreholes as you feel is necessary on the railway detour lines. (red and green)

RE: W.P. 50-65,
Site 21-190.

This structure is in the close vicinity of the Graham Creek structure (W.P. 129-67-1) and the two projects will be awarded under the same contract.



N. Zoltay,
for W. S. Melinyahyn,
Regional Bridge Location Engineer.

NZ/co
Encl.

c.c. R. Forrest

17 AUG 17 - 01 9:11

UP

P

PTMP DOWN 1 AUG 17/67 904A VR

D P COLLINS DIST ENGR

ATTN S C WILSON MTCE ENGR

COPY TO T J KOVICH RGN MAT ENGR DOWNSVIEW

RE GRAHAM CREEK CULVERT ON HWY 2 WP129-67-1 WJ67-F-73

CPR SUBWAY AT NEWCASTLE HWY 2 WP50-65 WJ67-F-74

THE FIELD INVESTIGATION WORK FOR THE ABOVE MENTIONED PROJECTS
WILL COMMENCE ON AUG 18/67. THIS IS FOR YOUR INFORMATION.

M DEVATA FOR A G STERMAC MAT AND TEST

BB

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T
Y
P
E

401 & Keele St.
Downsview, Ontario

August 17, 1967

Master Soil Investigation Ltd.
104 Kenhar Drive
Weston, Ontario

Dear Sirs:

This is to confirm our request of August 16, 1967 for the supply of a Diamond Drill together with all necessary equipment, as specified under the terms of our Contract Agreement, at Newcastle, Ontario on August 18, 1967.

These projects bear Job Numbers 67-P-73 and 67-P-74.

Yours truly,

MD:st

A. Devata
A. Devata
Supervising Foundation Engineer
for: A. C. Sternac
Principal Foundation Engineer

cc: H. Konings
Foundation Files A.C.
General File

Department of Highways Ontario

Copy for the information of

Mr. A. Stermac

Mr. W. Melinyshyn,
Reg. Bridge Location Engineer,
Central Region,
Administration Building

Bridge Division,
Downsview, Ontario

January 15, 1968

C.F.R. Subway at Newcastle
W.P. 90-65, Site 21-190
Highway 2, District No. 7

17-F-73

Attached herewith are prints of the Preliminary Bridge
Plan Drawing D-6367-P1 for the above-mentioned structure.

The estimated cost of the proposed structure is \$115,000.
This cost includes tender, materials, engineering and sundry
construction.

Any comments or revisions you may have should be submitted
within three weeks.

CSG:rd

C.S. Grehek, Jr.,
Bridge Design Engineer

Attach.

c.c. S. McCombie
A. Stermac (2)
J. Anderson

Discussion with Mr. ^{Brian} ~~Brian~~ Richardson,
Bridge Designer

revised drawing D-6367-P2 will be submitted
to us at a later date. Do not ~~to~~ answer this
letter until P2 has been received and
checked/reviewed.

B.T. Darch

Jan. 17, 1968 (1)

re. CPR Subway at Yonkers
W.P. 65 W.S. 67-1-73
Highway 2, District 7

Conversations with Mr. ~~Richardson~~ Richardson
Bridge Design Engineer
N.Y. State Thruway Authority (B511)

- ① Temporary access to be provided by existing cut with fill embankment. - a no trestle structure to be provided.
- ② If spread footings were used at the abutments excavations would be required within the embankment fill. This would require the use of cribbing to retain the fill. Mr. Richardson informed me that this cribbing would be relatively expensive. For this reason piling has been recommended (at least H-piles).
- ③ - At the pier location report 67-P-73 recommended that spread footings would have to be carried down to elev. 306. At this elevation some dewatering measures would be required. - If allowable bearing value for footings at this elevation is 3.5 tons/sq. ft. - Dewatering would be expensive and, thus, make this solution uneconomical. Consideration should be given to raising the foundation grade to, say, elev. 316. At this elevation an allowable bearing value of about 4.5 tons/sq. ft. could be used. Mr. Richardson informed me that the value would be too low. - Piling has therefore been specified (at least H-piles). This piling should be economical because the pile length is only about 22 to 24 feet. cost of \$6 per foot.

③
C Mr. Richardson would like us to
compare the cost of piccons and
pilling for carrying the load.

B.T. Darch.

Department of Highways Ontario

Copy for the information of

Mr. A. Stermac

Mr. W. Melinyskyn,
Eng. Bridge Location Engineer,
Central Region,
Administration Building

Bridge Division,
Downsview, Ontario

February 2, 1968

C.F.R. Subway at Newcastle
W.P. 50-65, Site 01-150
Highway 3, District No. 7

Attached herewith are prints of the revised Preliminary
Bridge Plan Drawing D-6367-P2 for the above-mentioned structure.
This plan was revised to include stage construction.

The estimated cost of the proposed structure is \$195,000.
This cost includes tender, materials, engineering and sundry
construction.

Any comments or revisions you may have should be submitted
within three weeks.

CSG:rd

C.S. Grebski,
Bridge Design Engineer

Attach.

c.c. S. McCombie
A. Stermac (2)
J. Anderson

WESTERN CAISSONS LTD.

FOUNDATION SPECIALISTS

46 Credit Stone Road
Maple, Ontario

February 12, 1965

Department of Highways of Ontario
Material & Research Division
Foundation Section
Downsview, Ontario

Attention: Mr. M. Devata, P. Eng.

Dear Sir:

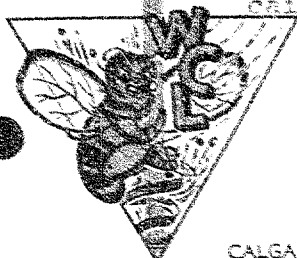
RE: Proposed Foundations
CPR Subway at Newcastle
Your M.P. 300-65

We would like to herewith submit for your consideration the following design and cost analysis for proposed caissons on the above project. We would recommend that the caissons be founded in the dense glacial till at elevation 293'0". However, if refusal is encountered to the Hughes Williams drilling equipment within a couple of feet of this level, then this could be accepted as suitable material. We feel that a value of 25 tons per square foot end bearing on this material would be a reasonable design allowance, which should give a factor of safety of from 2 to 3. On this basis, the following loading could be obtained for the caissons of the sizes shown.

Caisson Diameter	End Area (Sq. ft.)	Capacity based on end bearing allowance of 25 tons per sq. ft.
30"	4.9	122 tons
36"	7.05	175 tons
42"	9.6	240 tons
48"	12.5	312 tons

Estimated costs for these caissons, based on the caissons being approximately 21' in length for the piers and

...../2



February 12, 1968

42' in length for the abutments are as follows: -

<u>Caisson Diameter</u>	<u>Cost per Caisson for pier</u>	<u>Cost per Caisson for abutment</u>
30"	\$190.00	\$380.00
36"	\$270.00	\$540.00
42"	\$380.00	\$760.00
48"	\$480.00	\$970.00

Reinforcing steel could be supplied and placed at an extra charge of 15¢ per lb. which would also cover the cost of fabrication.

The above quotation is understood that access for our truck mounted drilling equipment would be provided, as well as all caisson hole locations and cut-off elevations. The above estimate is based on making one trip to the site. In the above costs we have included for supply and placing of 3,000 p.s.i. concrete. Our quotation has not allowed for running of a caisson load test, taking of concrete test cylinders, nor removal of cuttings from the site. We also have not provided for forming of caissons above grade.

Should additional information be required, please feel free to contact us.

As requested, we are herewith returning your Drawing #D-6367-P-1.

Yours very truly,

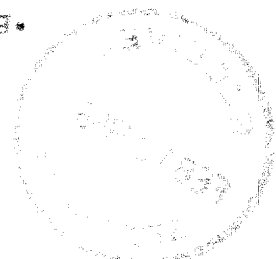
WESTERN CAISSONS LIMITED



PK/sf

P. Kozicki, P. Eng.

Enclosure



afs

Mr. C. S. Grebski,
Bridge Design Engineer,
Bridge Division,
Admin. Bldg.

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

February 20, 1968

-- C.P.R. Subway at Newcastle --
Hwy. #2 - District #7 (Port Hope)
W.P. 50-65 - Site 21-190 - W.J. 67-P-72

We have reviewed the Preliminary Bridge Plan Drawing D-6367-P2 for the above mentioned structure, and submit the following comments:

Pile tip elevations for the pier and abutment footings are not shown on the drawing. The same comment also applies to the temporary piles for Stage I of the pier construction.

As an alternative, the entire structure can be supported on concrete caissons founded in the very dense glacial till stratum. We feel that the caisson foundations are more suitable for this structure, since the till stratum is at a relatively shallow depth and, also, the pier footings may be completely eliminated. In order to make a cost comparison between caisson foundations and piled foundations for the above mentioned structure, we are enclosing the letters we have received from Western Caissons Ltd. and Franki of Canada, outlining the cost of various concrete caissons.

MD/ndef
Encls. (2)

cc: Messrs. S. McCombie
W. S. Melinshyn
Foundations Files
Gen. Files

A. Devata
A. Devata,
SUPERVISING FOUNDATION ENGR.
For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

WESTERN CAISSONS LTD.

FOUNDATION SPECIALISTS

46 Credit Stone Road
Maple, Ontario

February 12, 1968

Department of Highways of Ontario
Material & Research Division
Foundation Section
Downsview, Ontario

Attention: Mr. M. Devata, P. Eng.

Dear Sir:

RE: Proposed Foundations
CPR Subway at Newcastle
Your W.P. #50-65

We would like to herewith submit for your consideration the following design and cost analysis for proposed caissons on the above project. We would recommend that the caissons be founded in the dense glacial till at elevation 295'0". However, if refusal is encountered to the Hughes Williams drilling equipment within a couple of feet of this level, then this could be accepted as suitable material. We feel that a value of 25 tons per square foot end bearing on this material would be a reasonable design allowance, which should give a factor of safety of from 2 to 3. On this basis, the following loading could be obtained for the caissons of the sizes shown.

Caisson Diameter	End Area (Sq. ft.)	Capacity based on end bearing allowance of 25 tons per sq. ft.
30"	4.9	122 tons
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48"	12.5	312 tons

Estimated costs for these caissons, based on the caissons being approximately 21' in length for the piers and

...../2

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Reinforcing steel could be supplied and placed at an extra charge of 15¢ per lb. which would also cover the cost of fabrication.

The above quotation is understood that access for our truck mounted drilling equipment would be provided, as well as all caisson hole locations and cut-off elevations. The above estimate is based on making one trip to the site. In the above costs we have included for supply and placing of 3,000 p.s.i. concrete. Our quotation has not allowed for running of a caisson load test, taking of concrete test cylinders, nor removal of cuttings from the site. We also have not provided for forming of caissons above grade.

Should additional information be required, please feel free to contact us.

As requested, we are herewith returning your Drawing #D-6367-P-1.

Yours very truly,

WESTERN CAISSONS LIMITED



P. Kozicki, P. Eng.

PK/sf

Enclosure

FRANKI

CANADA LIMITED

THORNCLIFFE SQUARE, UNIT NO 3

P.O. BOX 129

STATION "R"

TORONTO, 17, ONT.



Our Reference:
X.2168

TEL. NO.
02-2159
CABLEGRAMS
"FRANKIFILE"
TELEPHONE
421-7710

February 12, 1968

Department of Highways, Ontario,
Foundation Section,
Materials & Testing Division,
Room 107, Lab. Building,
Hwy. 401 & Keele
Downsview, Ontario

ATTENTION: Mr. M. Devata, P.Eng.
Foundation Engineer

Dear Sir:

Re: Proposed Subway, Hwy.#2 & C.P.R.
Newcastle

Having examined your Soil Report dated Sept 26/67,
we are pleased to submit budget prices for churndrilled caissons
at this location.

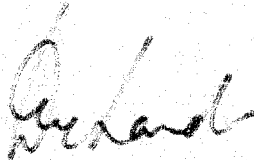
For installation & removal of equipment	- \$3,000.00
36" diameter caissons	- \$2,500.00/each
48" diameter caissons	- \$3,500.00/each

The prices have been calculated to include a per-
manent steel casing of $\frac{1}{2}$ " wall thickness but with no allowance
for the supply of reinforcing steel or dowels. It has been
assumed that the founding elevation will be approximately 295,
and that the work would have to be carried out on two separate
occasions to permit re-location of the existing track.

...../2

Enclosed herewith is the copy of the Soil Report.

Yours very truly,
FRANKI CANADA LIMITED



W. E. Lardner, P.Eng.
Vice President

WEL/eh
enclosure

Note: A safe bearing pressure of 20+2.1 may be used for the design of foundation.

MEMORANDUM

To: Mr. A. Sternac,
Principal Foundation Engineer,
Room 107, Lab. Building

From: Bridge Office,
Downsview, Ontario

ATTENTION:

DATE: January 7, 1969

OUR FILE REF.

IN REPLY TO

SUBJECT: C.P.R. Subway at Newcastle
W.P. 50-65, Site 21-190
Highway 2, District No. 7

17-F-73

Attached herewith we are submitting the final bridge drawings which show the foundation design for this structure.

Kindly give us your comments at your earliest convenience.



C.S. Grebski,
Bridge Design Engineer

CSG:rd

Attach.

c.c. Foundation Section

cc comments

DR Berna

18th Jan 69

Sheet piling will be driven to allow excavation for south half of structure

Railroad grade is $348 \pm$

Bottom of stage I excavation will be @ $334 \pm$

Sheet piling will be driven $20'$ below

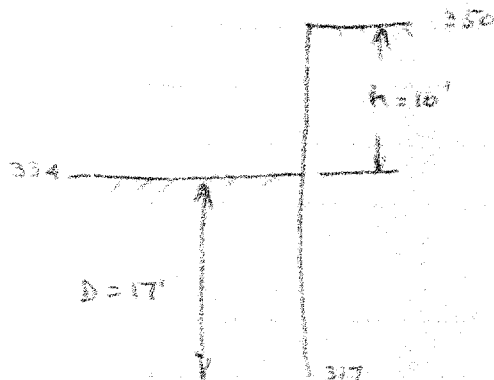
top of fill i.e. $337 - 20 = 317 \pm$ ($337 =$ top of fill (abutment) or top of pile cap for here).

Fill material for this embankment extends to about elevation $310 - 315$. Piling will be in fill.

Consider fill as having $\gamma = 115$, $\phi = 30$

since $N_{ave} = 15$ blows/ft.

~~Surcharge~~ ~~but~~ Backfill behind pile slope @ $1\frac{1}{2}$ to 1. In order to simplify computations, give a horizontal surface to the backfill at elevation 350 (the surcharge taking care of the loading etc.)



From Teng, [Page 341 Eq 12.10]

for $r = 115$ (w. below piling, case I)
 & for $\phi = 30^\circ$

$$D/h = 0.87 \therefore D = 16 \times 0.87 = 13.9' \approx 14' \therefore$$

depth of penetration adequate.

$$R = \frac{13}{3} = 33 \text{ ft}$$

$$M = \frac{33 \times 16^3}{6} = 3.3 \times 16 \times 16 \times 16 = \approx 25,600 \text{ ft-lb}$$

$$\frac{M_{max}}{M} = F 1.7 \therefore M_{max} = 1.7 \times 25,600 = 43,520 \text{ ft-lb/well}$$

for 2P30 piling, $S = 48 \text{ in}^3$ ~~in^2~~

$$f_{max} = \frac{M_{max}}{S} = \frac{43,520 \times 12}{48} = 11,000 \text{ psi} < 20,000$$

:- ok



Hwy. 401 & Keele St.,
Downsview, Ontario.

Tel. 248-3282
(Area Code 416)

DEPARTMENT OF HIGHWAYS
Materials and Testing Office

July 7, 1969

Mr. D. H. Brown,
Division Engineer,
Room 318, Union Station,
Toronto 116, Ontario.

Re: C.P.R. Suoway at Newcastle
Mi. 157.49 Belleville
Subdivision, W.P. 50-65,
Site 21-90, Hwy. 2,
District No. 7. --

Dear Sir:

Referring to your letter of June 19, 1969, to
Mr. E. A. Fletcher, Project Design Engineer, Department of
Highways, regarding the above mentioned structure, we wish
to make the following comments.

The present fill is performing satisfactorily and,
therefore, we feel that the material is competent to carry
safely the relocated tracks. However, we would recommend
that the standards regarding the width of the shoulder along
the tracks be adhered to, and that the embankment side slopes
be 2:1. According to the available topographic information,
there should be no major adjustments necessary to meet the
above requirements.

Very truly yours,

A. G. Stermac
A. G. Stermac

Principal Foundation Engineer

AGS/mdeF

cc: Messrs. W. S. Melinyshyn
E. A. Fletcher
B. S. Richardson
T. J. Kovich
D. P. Collins
Foundations Files
Gen. Files

MEMORANDUM Telephone: 248-3415

TO: Mr. A. Sternac,
Principal Foundation Engineer,
Materials & Testing Office,
Lab Building.

ATTENTION:

FROM: E.A. Fletcher,
Toronto Regional Road Design.

DATE: July 2, 1969.

OUR FILE REF.

IN REPLY TO

SUBJECT: RE: W.P. 50-65, Highway 2,
C.P.R. Subway at Newcastle,
District 7, Port Hope.

Enclosed herewith are copies of correspondence from Mr. B.S. Richardson in the Bridge Office and Mr. D.H. Brown, C.P.R. Division Engineer.

Would you please advise Mr. Brown as to the ability of the existing subgrade to support the detour track as shown on the attached plan.

E.A. Fletcher
E.A. Fletcher
Sr. Project Design Engineer
For:
G.K. Hunter
Regional Road Design Engineer

EAF/mj
Encl.

c.c. D.H. Brown
B.S. Richardson
D.P. Collins
T. Kovich

Canadian Pacific

OFFICE OF THE SUPERINTENDENT

D. H. Brown
Room 318 Union Station
Toronto 116, June 19, 1969

File: D-32-157.49

Mr. E. A. Fletcher,
Project Design Engineer,
Department of Highways Ontario,
Downsview, Ontario

Dear Sir:

Mr. Richardson's Letter - June 4th
Subject - CPR Subway at Newcastle,
Mi. 157.49 Belleville
Subdivision, W.P. 50-65,
Site 21-90, Hwy. 2,
District No. 7.

With regard to the last paragraph of Mr. Richardson's letter, would you kindly obtain from the Soils Consultants their report as to the ability of the existing subgrade to carry the track in its diverted location five feet to the north of the existing track as per Stage I of the reconstruction.

Yours truly,



Division Engineer

Department of Highways, Ontario

Copy for the information of
Mr. E.A. Fletcher,
Regional Road Design

Bridge Office,
Downsview, Ontario,
June 4, 1969

Mr. D.H. Brown,
Division Engineer,
Canadian Pacific Railway,
Room 313, Union Station,
Toronto, Ontario

RE: C.P.R. Subway at Newcastle
W.F. 50-05, Site 21-90
Highway 2, District No. 7
Mileage 157.49 Belleville
Subdivision

Dear Sir:

Your letter of May 9, 1969, to Mr. E.A. Fletcher was forwarded to me. The requested changes have been made and two sets of drawings are included for your approval. We require at this time conditional approval of the drawings and details subject to your subsequent approval of the calculations and specifications.

The following comments refer to the numbered items in your letter:

- 1) The calculations will be sent, together with the specifications, shortly after we have finalized the drawings.

A copy of the soils report is enclosed.

Loading and design specifications are now given on the drawings.

- 2) Rails are not part of the contract and were not shown in detail. However, we have indicated Jordan Guard Rails.

..... 2

RE: C.F.R. Subway at Newcastle
N.P. 50-65, Site 21-90
Highway 2, District No. 7

- 3) Abutment concrete is now shown as 4,000 p.s.i. in 28 days.
- 4) The slab thickness has been changed to 12 inches.
- 5) The piers have not been changed. About 80 cubic yards of additional concrete would be required to make them solid. This dead weight would in turn lead to an increase in the number of piles. The solid shaft would be more subject to cracking.
- 6) The note has been changed.
- 7) The styrofoam thickness has been increased to 1". Keys and dowels have been added to provide lateral restraint.

Further items:

- 1) Curve elevation has been shown. Please check to see that it is as you require.
- 2) Our original understanding was that 8'-4 $\frac{1}{2}$ " lateral clearance was requested as compared with 8'-0" required by C.S.A. S.I. We have been able to provide 8'-10" only by using a lighter handrail.
- 3) A dimension has been added.

With regard to the ability of the embankment to support the track in its Stage 1 position, the track will be entirely on your existing embankment. We would not advise you as to the ability of the embankment to carry your loading. If you require information concerning the embankment however, Mr. Fletcher will obtain it for your use.

Yours truly,

B.S. Richardson,
Regional Bridge Project Engineer

BSR:rd

c.c. W. Melnyshyn
E.A. Fletcher

TOWNSHIP OF CLARKE

CON. II
LOT 25

CON. I
LOT 25

OFFSETS FROM EXISTING TRACK

STA	X (F)	Y (M)	STA	X (F)	Y (M)
4+00	---	---	18+00	9.00	12.00
4+50	---	0.10	18+50	4.96	14.66
5+00	---	0.40	19+00	4.76	14.69
5+50	---	1.02	19+50	4.34	16.42
6+00	0.04	2.04	20+00	3.96	17.70
6+50	0.12	3.42	20+50	3.32	17.72
7+00	0.22	5.16	21+00	2.72	17.42
7+50	0.35	7.12	21+50	2.02	16.82
8+00	0.70	9.12	22+00	1.18	16.08
8+50	1.34	10.35	22+50	0.56	15.20
9+00	2.24	12.54	23+00	0.20	14.18
9+50	3.24	13.76	23+50	0.06	13.26
10+00	4.18	14.42	24+00	---	12.00
10+50	4.60	14.86	24+50	---	9.96
11+00	5.00	15.00	25+00	---	8.00
11+50	5.00	15.00	25+50	---	6.00
12+00	5.00	15.00			

RAILWAY DETOUR SCHEME "A"
(RECOMMENDED)



Hwy. 401 & Kesler St.,
Downsview 464, Ontario.

Tel. 248-3282
(Area Code 416)

DEPARTMENT OF HIGHWAYS
Materials and Testing Office

July 18, 1969

Mr. D. H. Brown,
Division Engineer,
Office of the Superintendent,
Canadian Pacific,
Room 318, Union Station,
Toronto 116, Ontario.

Re: Proposed Subway - Hwy. #2 and C.P.R.
At Newcastle - Your File: B-32-157.49

Dear Sir:

Thank you for your letter of July 11, 1969, regarding
the above subject.

The foundation investigation for this crossing was
carried out by ourselves and, attached, we are sending you
a copy of this report for your use. In the report we have
considered all the questions and problems connected with our
structure, but have not dealt with the problem of the embank-
ment stability for the case of a 5-ft. movement of the tracks.
We feel that you would be much better qualified and experienced
than we, to deal with this problem once you have the basic
information on the subsoil conditions.

In my letter of July 7th, I have suggested that a geometry,
more or less identical with the present one, be created. However,
I have suggested 2:1 slopes which, I now realize, may not be
required since the present ones, as you mention in your letter of
July 11th, are only 1-1/2:1.

We would hope that with the information contained in the
report, you will be in the position to satisfactorily resolve the
remaining question of embankment stability. Should you require
any additional information, or should you wish to discuss any
part of the report, please feel free to call on this office.

AGS/MdeP
Attach.

cc: Messrs. B. S. Richardson
D. P. Collins
E. A. Fletcher
W. S. Melnyshyn
T. J. Kovich
Foundations Files

Yours truly

A. G. Stermac
A. G. Stermac
Principal Foundation Engineer

Canadian Pacific

OFFICE OF THE SUPERINTENDENT

T. H. Brown
Room 312 Union Station
Toronto 115, July 11, 1969

File: B-32-157.49

Department of Highways
Hwy. 401 & Keelo St.
Downsview, Ontario

Attention: Mr. A. C. Starnes
Principal Foundation Engineer

Dear Sir:

Referring to your letter dated July 7th in connection with the proposed reconstruction of subway, Mileage 157.49, Belleville Subdivision, your W.P. 54-65, Site 21-90, Hwy. 2, District No. 7.

It is agreed that the present fill is performing satisfactorily with the track in its present position. It is, however, our concern that by moving the track to the north a distance of five feet as per Stage I of the reconstruction, the existing embankment may require to be widened to carry the live load of our trains. I gather from your letter that you are suggesting that the bank be widened to attain a top of subgrade width for the relocated track the same as that which exists. Since the existing subgrade now has side slopes of 1½-1, I question the necessity of making the side slopes 3-1.

As requested in my letter dated June 19th, will you kindly advise when I may expect the report from the Soils Consultants in this regard.

Yours truly

D. H. Brown,

Division Engineer

AP

Canadian Pacific

OFFICE OF THE SUPERINTENDENT

D. W. Brown
Room 318 Union Station
Toronto 116, August 14, 1959

File: #32-157.49

Mr. A. G. Starnes
Principal Foundation Engineer
Materials and Testing Office
Department of Highways
Box 401 & Keele St.
Scarborough 150, Ontario

Dear Sir:

Your letter of July 15 in connection with proposed subway at Hwy. 92 and CPR at Newcastle, Mileage 157.49 Belleville Sd.

The contents of the above letter and your soils report have been reviewed and we have arrived at the following conclusions:

1. Steps are required to be dug into the existing railway embankment to ensure that the new fill will not slide from the existing embankment.
2. Since your report recommends the slopes for the new embankment should be 2:1, then that is what they must be. In my letter of March 23 to your Mr. E. A. Fletcher, I pointed out that if 1½:1 slopes were found to be insufficient during or after construction, the slope would be reduced. However, at that time, your soils report had not been reviewed, and it is now required that the slopes be constructed to 2:1.
3. Your office should provide proper specifications for the new fill and for compaction for the new fill.
4. A cross section should be provided at critical locations showing the relationship of the new roadbed and track in its relocated position with the existing roadbed and track.

Yours truly


Division Engineer

Mr. E. A. Fletcher,
Senior Project Design Engineer,
Road Design Office, Regional,
Central Bldg., Downsview.

Foundation Section,
Materials & Testing Office,
Room 107, Lab. Bldg.

August 22, 1969

Re: Proposed Subway, Exp. #2 & C.P.R.,
Newcastle, Ontario,
District #7 (Port Hope)
E.J. 67-P-73 -- E.P. 50-65

This is to confirm our telephone conversation of
August 22, 1969, regarding the above subject.

For simplicity, it is assumed that the railway runs
North-South. During construction the railway tracks have to be
moved east for as much as five feet. This will bring the tracks
closer to the edge of the fill and a more critical condition, as
far as stability is concerned, will be created. It is therefore
recommended that the present embankment be widened as much as the
tracks are moved. The present side slopes are 1-1/2:1, and it
is recommended that the new widened portion of the embankment be
built with the same side slopes. Thus a condition more or less
identical with the present one will be created and the present
factor of safety will be maintained.

The same reasoning and consequently the same recom-
mendations should apply to the West side also, where a temporary,
later permanent location of the tracks is to be carried out.

Afternoon

ACS/ndef

A. G. Staszac
PRINCIPAL FOUNDATION ENGINEER

cc: Mr. B. S. Richardson

Foundations Files
Gen. Files

MEMORANDUM

To: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, Lab. Building

FROM: C.S. Grebski,
Bridge Office

ATTENTION:

DATE: June 13, 1969

OUR FILE REF.

IN REPLY TO

SUBJECT: Graham Creek
Twin Extensions to C.F.I. Arch Culvert
H.P. 50-65-02, Site 21-381
District No. 7

67-F-75

Attached herewith we are submitting the final bridge drawings which show the foundation design for this structure.

Kindly give us your comments at your earliest convenience.

C.S. Grebski
C.S. Grebski,
Bridge Design Engineer

CSG:rd

Attach.

c.c. Foundation Section

*We have not carried out any investigation at this site
and therefore not able to submit any comments*

H.H.

16 June 69

Mr. C. S. Grebaki,
Bridge Design Engineer,
Bridge Division,
Admin. Bldg.

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

February 20, 1968

-- C.P.R. Subway at Newcanille --
Hwy. #2 - District #7 (Port Hope)
W.P. 50-65 - Site 21-190 - W.J. 67-P-72

We have reviewed the Preliminary Bridge Plan Drawing D-6367-P2 for the above mentioned structure, and submit the following comments:

Pile tip elevations for the pier and abutment footings are not shown on the drawing. The same comment also applies to the temporary piles for Stage I of the pier construction.

As an alternative, the entire structure can be supported on concrete caissons founded in the very dense glacial till stratum. We feel that the caisson foundations are more suitable for this structure, since the till stratum is at a relatively shallow depth and, also, the pier footings may be completely eliminated. In order to make a cost comparison between caisson foundations and piled foundations for the above mentioned structure, we are enclosing the letters we have received from Western Caissons Ltd. and Franki of Canada, outlining the cost of various concrete caissons.

MD/EdsP
Encls. (2)

cc: Messrs. S. McCombie
W. S. Melnyshyn
Foundations Files
Gen. Files

M. Devata
M. Devata,
SUPERVISING FOUNDATION ENGR.
For:
A. C. Sternac,
PRINCIPAL FOUNDATION ENGR.

60P

WESTERN CAISSONS LTD.

FOUNDATION SPECIALISTS

46 Credit Stone Road
Maple, Ontario

February 12, 1968

Department of Highways of Ontario
Material & Research Division
Foundation Section
Downsview, Ontario

Attention: Mr. M. Davata, P. Eng.

Dear Sir:

RE: Proposed Foundations
CPR Subway at Newcastle
Your W.P. #50-65

We would like to herewith submit for your consideration the following design and cost analysis for proposed caissons on the above project. We would recommend that the caissons be founded in the dense glacial till at elevation 295'0". However, if refusal is encountered to the Hughes Williams drilling equipment within a couple of feet of this level, then this could be accepted as suitable material. We feel that a value of 25 tons per square foot end bearing on this material would be a reasonable design allowance, which should give a factor of safety of from 2 to 3. On this basis, the following loading could be obtained for the caissons of the sizes shown.

Caisson Diameter	End Area (Sq. ft.)	Capacity based on end bearing allowance of 25 tons per sq. ft.
30"	4.9	122 tons
36"	7.05	175 tons
42"	9.6	240 tons
48"	12.5	312 tons

Estimated costs for these caissons, based on the caissons being approximately 21' in length for the piers and

...../2

February 12, 1968

42' in length for the abutments are as follows: -

<u>Caisson Diameter</u>	<u>Cost per Caisson for pier</u>	<u>Cost per Caisson for abutment</u>
36"	\$190.00	\$380.00
36"	\$270.00	\$540.00
42"	\$380.00	\$760.00
48"	\$480.00	\$960.00

Reinforcing steel could be supplied and placed at an extra charge of 15¢ per lb. which would also cover the cost of fabrication.

The above quotation is understood that access for our truck mounted drilling equipment would be provided, as well as all caisson hole locations and cut-off elevations. The above estimate is based on making one trip to the site. In the above costs we have included for supply and placing of 3,000 p.s.i. concrete. Our quotation has not allowed for running of a caisson load test, taking of concrete test cylinders, nor removal of cuttings from the site. We also have not provided for forming of caissons above grade.

Should additional information be required, please feel free to contact us.

As requested, we are herewith returning your Drawing #D-6367-P-1.

Yours very truly,

WESTERN CAISSONS LIMITED



P. Kozicki, P. Eng.

PK/sf

Enclosure

FRANKI



THORNCLIFFE SQUARE, UNIT NO 3

~~1000 SHEPPARD AVE. E. TORONTO, ONT.~~

P.O. BOX 185

STATION "H"

TORONTO, 17, ONT.

TELEX NO.

23-1129

CABLEGRAMS

"FRANKFILE"

TELEPHONE:

~~431-7718~~

431-7718

Our Reference:

X.2168

February 12, 1968

Department of Highways, Ontario,
Foundation Section,
Materials & Testing Division,
Room 107, Lab. Building,
Hwy. 401 & Keele
Downsview, Ontario

ATTENTION: Mr. M. Devata, P.Eng.
Foundation Engineer

Dear Sir:

Re: Proposed Subway, Hwy.#2 & C.P.R.
Newcastle

Having examined your Soil Report dated Sept 26/67,
we are pleased to submit budget prices for churndrilled caissons
at this location.

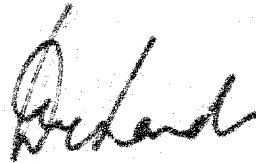
For installation & removal of equipment - \$3,000.00
36" diameter caissons - \$2,500.00/each
48" diameter caissons - \$3,500.00/each

The prices have been calculated to include a per-
manent steel casing of 4" wall thickness but with no allowance
for the supply of reinforcing steel or dowels. It has been
assumed that the founding elevation will be approximately 295,
and that the work would have to be carried out on two separate
occasions to permit re-location of the existing track.

...../:

Enclosed herewith is the copy of the Soil Report.

Yours very truly,
FRANKI CANADA LIMITED



W. E. Lardner, P.Eng.
Vice President

WEL/eh
enclosure

Note - A safe bearing pressure of 20 ± 2 f may be used for the design
of caissons

Mr. S. A. Fletcher,
Senior Project Design Engineer,
Road Design Office, Regional,
Central Bldg., Downsview.

Foundation Section,
Materials & Testing Office,
Room 107, Lab. Bldg.

August 22, 1969

Re: Proposed Subway, Hwy. #8 & C.P.R.,
Newcastle, Ontario,
District #7 (Port Hope)
H.J. 67-P-73 -- W.P. 50-65

This is to confirm our telephone conversation of
August 22, 1969, regarding the above subject.

For simplicity, it is assumed that the railway runs
North-South. During construction the railway tracks have to be
moved east for as much as five feet. This will bring the tracks
closer to the edge of the fill and a more critical condition, as
far as stability is concerned, will be created. It is therefore
recommended that the present embankment be widened as much as the
tracks are moved. The present side slopes are 1-1/2:1, and it
is recommended that the new widened portion of the embankment be
built with the same side slopes. Thus a condition more or less
identical with the present one will be created and the present
factor of safety will be maintained.

The same reasoning and consequently the same recom-
mendations should apply to the West side also, where a temporary,
later permanent location of the tracks is to be carried out.

AGS/XdeP

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

cc: Mr. B. S. Richardson

Foundations Files
Gen. Files

OK

67-F-73

W.P. # 50-65-01

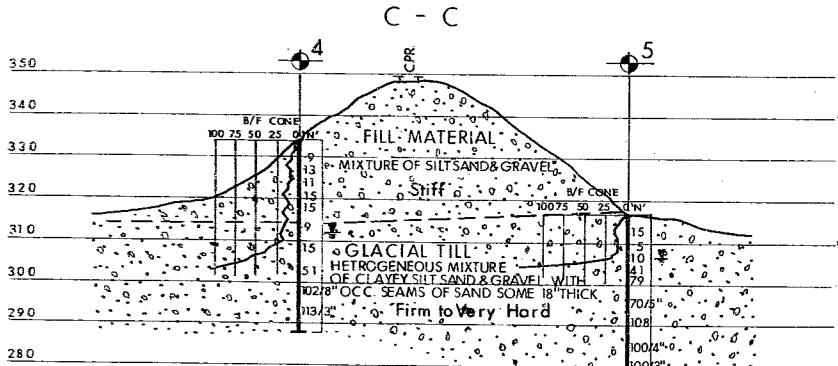
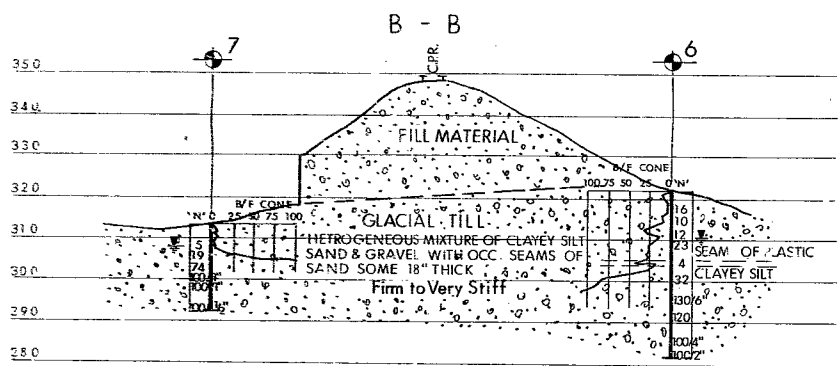
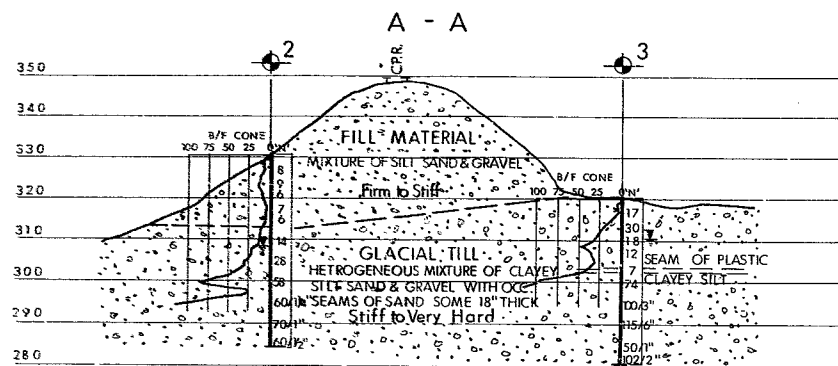
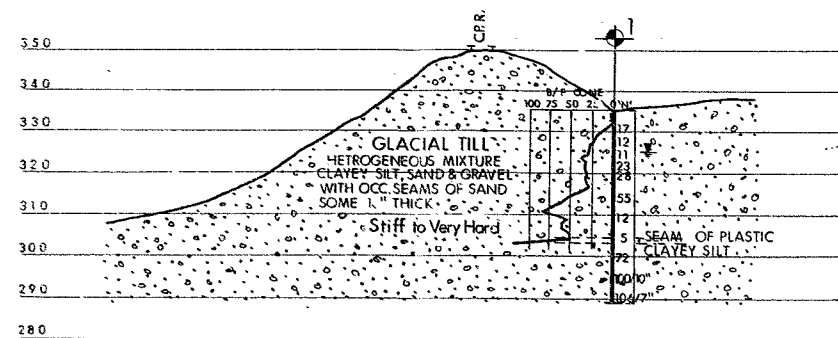
W.P. # 50-65

W.P. # 50-65-03

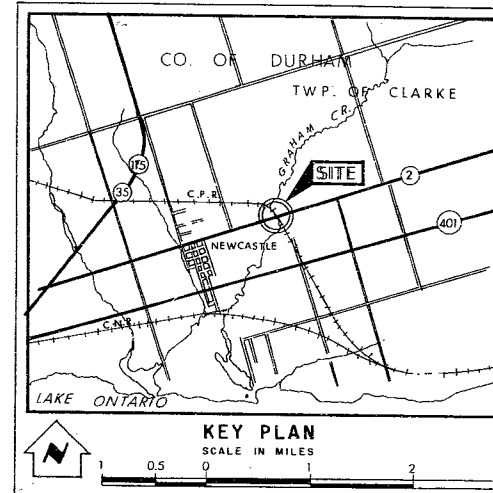
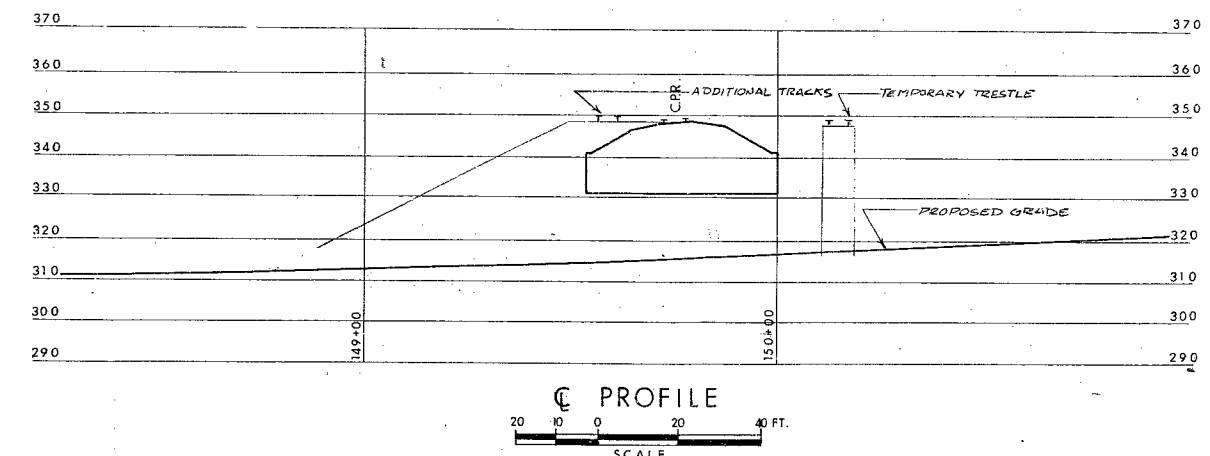
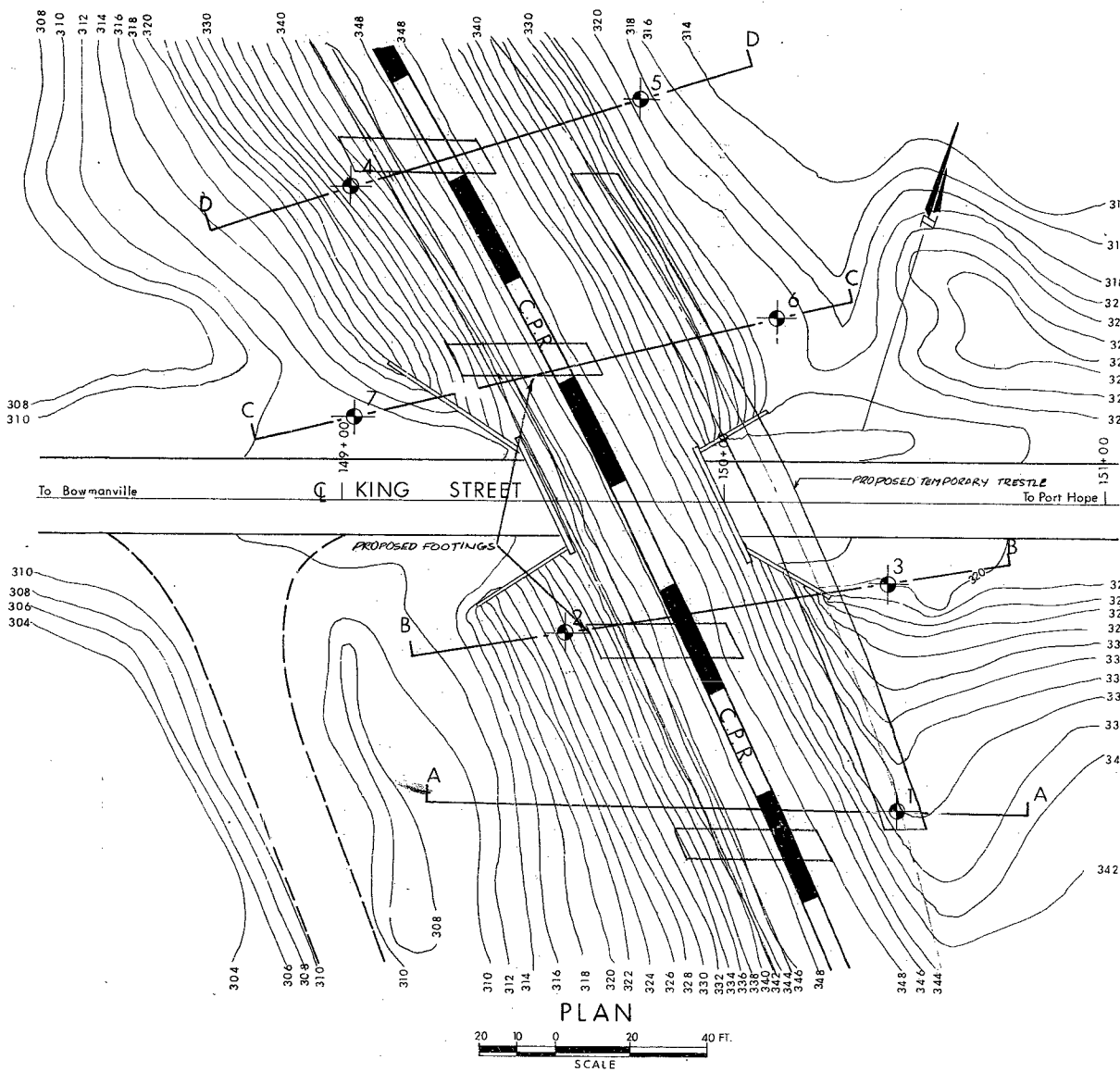
Hwy. # 2

C.P.R. Subway

NEWCASTLE



SECTIONS
SCALE
20 10 0 20 40 FT.



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation. AUG & SEPT 1967		

NO.	ELEVATION	STATION	OFFSET
1	335.5	150+46	80' RT
2	330.2	149+57	34' RT
3	320.5	150+52	203' RT
4	333.6	149+02	81' LT
5	316.0	149+77	107' LT
6	321.9	150+14.5	49' LT
7	313.0	149+03	22' 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.

REVISIONS	DATE	BY	DESCRIPTION

WP#50-65 AND WP#50-65-3
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION - FOUNDATION SECTION

CANADIAN PACIFIC RAILWAY

KING'S HIGHWAY NO. 2 DIST. NO. 7
CO. DURHAM VILLAGE OF NEWCASTLE
TWP. CLARKE LOT 25 CON. I & II

BORE HOLE LOCATIONS & SOIL STRATA

SUBMITTED BY	CHECKED BY	W.P. NO. 50-65-01	M.B.T. DRAWING NO.
DRAWN BY	CHECKED BY	JOB NO. 67-F-73	67-F-73A
DATE 26 SEPT. 1967	SITE NO.		BRIDGE DRAWING NO.
APPROVED BY	CONT. NO.		

REF. NO. E-4776-1

TO CONDITION OF ORIGINAL DOCUMENTS

