



ONTARIO  
DEPARTMENT OF HIGHWAYS

to Mr. A. M. Toye, Date June 22, 1960.  
Bridge Engineer. Subject D.H.O. FOUNDATION INVESTIGATION  
Materials & Research Section. W.P. 99-60 & W.P. 100-60  
W.J. 60-F-35.

Attention: Mr. S. McCombie.

Re: C.N.R. & C.P.R. Overhead,  
Chedoke Expressway - Dist. 4.

Note:- Attached, please find slip reading:-

"Concrete for the footings should be poured  
so as to fill the footing excavation completely."

Would you kindly place this additional sentence  
before sentence reading: "This method would eliminate  
the need for backfilling with an impermeable type of  
material." (Attach to top of Page 2.)

Thank You.

GGC/MdeF  
Attach.

*for Mr. McCombie*  
G. G. Cherrington,  
PROJECT FOUNDATIONS BNCH.

cc: Messrs. A. M. Toye (2)  
H. A. Tregaskes  
D. G. Ramsay  
I. Campbell  
R. E. Richardson  
T. J. Kovich  
Foundations Office  
Gen. Files.



ONTARIO  
DEPARTMENT OF HIGHWAYS

memo to Mr. A. M. Tove, Date June 9, 1960.  
Bridge Engineer. Subject FOUNDATION INVESTIGATION -D.H.O.  
om Materials & Research Section. W.P. 99-60 & W.P. 100-60)  
Attention: Mr. S. McCombie. W.J. 60-F-35.

Re: C.N.R. & C.P.R. Overhead,  
Chedoke Expressway - Dist.4.

This Section has recently completed a foundation investigation at the C.N.R. & C.P.R. overhead (Chedoke Expressway). The site is located about 500 ft. N.W. of Mercer's Glen on a high grassy plain which dips down sharply to the South and to the East, towards Mercer's Glen.

There are two parallel tracks (C.N.R. & C.P.R.) running in an E.-W. direction across the site. The C.P.R. track to the South runs directly along the edge of the plateau, while the C.P.R. track to the North is situated in a 20-ft. cut.

Our results indicate that the soil stratigraphy consists of a thin clay overburden of approximately 5 ft. in thickness.

This stratum is underlain by the parent material which is a red shale. The upper 5-foot layer of the shale is soft due to weathering, but below this depth, the shale can be defined as medium-hard.

At and below the proposed profile grade, the shale was found to be sound with core recovery between 90 and 100%.

It is recommended that spread footings with a permissible loading of 6 tons/sq.ft. be employed at any suitable elevation below the frost penetration depth.

If the footings are not poured immediately after excavation, a thin concrete pad should be poured to ensure against deterioration of the clay shale when in contact with the atmosphere.

cont'd./2...

*Concrete for the footings should be poured as so to fill the footing  
excavation completely.*

- 2 -

*(see attached letter)*

This method would eliminate the need for backfilling with an impermeable type of material.

At the time of the investigation, it was not possible to accurately determine the true ground water level. This was due to surface water seepage and wash water being trapped in the relatively impermeable shale.

With reference to the ground water elevations quoted in the foundation investigation report for W.P. 100-60 and W.P. 99-60, prepared by E. M. Peto & Associates, it would appear that the ground water elevation is approx. between elevations 290 and 300.

Since the bottom of the excavation may be at or below the ground water level, there may be some flow through the permeable layers in the shale, but should be easily handled by a low-capacity pumping system.

Additional information on boreholes situated near the investigation conducted by this Section, can be obtained by referring to the above mentioned report by E.M. Peto & Associates.

Borehole logs and Site Plan No. 60-F-35A, are enclosed under Appendix I.

If we can be of any further assistance in connection with this project, please contact our Office.

GGC/MdeF  
Attach.

cc: Messrs. A. M. Towe (2)  
H. A. Tregaskes  
D. G. Ramsay  
I. Campbell  
R. E. Richardson  
T. J. Kovich  
A. Watt

Foundations Office  
Gen. Files.

C.C. PARKER - 4/20/60

(4 - copies)

L. G. Soderman,  
PRINCIPAL FOUNDATIONS ENGR.  
Per:

*G. G. Cherrington*  
(G. G. Cherrington,  
PROJECT FOUNDATION ENGR.)

Report Prepared by: -

G.G. Cherrington,  
Project Fdn. Engr.

Report Approved by: -

A. Stermac,  
Foundations Office Engr.

**APPENDIX I.**

# SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-35

W.P. 100-60 & 99-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
1	RC1	0' - 6'	Very stiff red clay with seams of green clay.	-	-	-	-	-	-	Ran BX casing.
	RC2	6' - 11'	Soft red shale with seams of soft green shale.	-	-	-	-	-	-	Ran AXT core. 100% core recovery.
	RC3	11' - 16'	Medium Hard red shale with seams of hard green shale.	-	-	-	-	-	-	AXT core. 93% core recovery.
	RC4	16' - 21'	Medium hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
	RC5	21' - 26'	Medium hard red shale with seams of hard green shale. 1" clay seam at 23'5".							AXT core. 97% core recovery.
	RC6	26' - 31'	Medium hard red shale with seams of hard green shale. 1" clay seam at 28'6".							AXT core. 97% core recovery.
	RC7	31' - 36'	Medium hard red shale with seams of hard green shale. 2" mud seam at 34.5.							AXT core. 97% core recovery.
	RC8	36' - 41'	Medium hard red shale with seams of hard green shale.							AXT core. 97% core recovery.
	RC9	41' - 46'	Medium hard red shale with seams of hard green shale.							AXT core. 98% core recovery.
	RC10	46' - 51'	Medium hard red shale with seams of hard green shale.							AXT core. 98% core recovery.

# SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-35

W.P. 100-60 & 99-60.

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
1	RC11	51' - 56'	Medium hard red shale with seams of hard green shale.							AXT core. 92% core recovery.
	RC12	56' - 61'	Medium hard red shale with seams of hard green shale. 3" clay seam at 60'5".							AXT core 98% core recovery.
	RC13	61' - 66'	Medium hard red shale with seams of hard green shale.							AXT core. 85% core recovery.
2	RC1	0' - 6'	Stiff red clay	-	-	-	-	-	-	-
	RC2	6' - 9.5'	Soft red shale with seams of soft green shale.							AXT core. 100% core recovery.
	RC3	9'6"-14'6"	Medium hard red shale with seams of hard green shale. 3" clay seam 9'6"-9'9".							AXT core. 97% core recovery.
	RC4	14'6"-19'6"	Medium Hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
3	RC1	0'-5'	Stiff red clay							
	RC2	5'-10'	Soft red shale with seams of green shale.							AXT core. 92% core recovery.
	RC3	10'-15'	Medium hard red shale with seams of hard green shale.							AXT core. 95% core recovery.
	RC4	15'-17'10"	Medium hard red shale with seams of hard green shale.							AXT core. 94% core recovery.

# SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-35

W.P. 100=60 & 99-60.

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
4	RC1	0'-2'	Stiff red clay with presence of organic materials.							
	RC2	2'-5'	Soft red shale							Ran BX casing - no core.
	RC3	5'-10'	Medium hard red shale with seams of hard green shale. Presence of mud seams in shale.							AXT core. 80% core recovery.
	RC4	10'-15'	Medium hard red shale with seams of hard green shale. 9" seam of soft shale from 13'3" to 14'0".							AXT core. 90% core recovery.
	RC5	15'-20'	Medium hard red shale with seams of hard green shale. 15" seam of soft shale from 15-16'3.							AXT core. 85% core recovery.
	RC6	20'-25'	Medium hard red shale with seams of hard green shale.							AXT core. 92% core recovery.
	RC7	25'-30'	Medium hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
	RC8	30'-35'	Medium hard red shale with seams of hard green shale.							AXT core. 97% core recovery.
	RC9	35'-40'	Medium hard red shale with seams of hard green shale.							AXT Core. 95% core recovery.
	RC10	40'-45'	Medium hard red shale with seams of hard green shale.							AXT core. 90% core recovery.
	RC11	45'-50'	Medium hard red shale with seams of hard green shale.							AXT core. 100% core recovery.

# SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-35  
W.P. 100-60 & 99-60.

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
4	RC12	50'-55'	Medium hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
	RC13	55'-60'	Medium hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
	RC14	60'-65'	Medium hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
	RC15	65'-68'6"	Medium hard red shale with seams of hard green shale.							AXT core. 93% core recovery.
5	RC1	0'-5'	Stiff red clay with fine to coarse sand and gravel.							BX casing shoe
	RC2	5'-6'	Medium hard green shale.							BX casing shoe
	RC3	6'-11.0'	Medium hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
	RC4	11'-17'7"	Medium hard red shale with seams of hard green shale.							AXT core. 97% core recovery.
			RC denotes rock core samples.							

# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 100-60 &amp; 99-60 BORE HOLE NO. 1

JOB 60-F-35 STATION See drawing

DATUM Geodetic 339.9 COMPILED BY G.G.C. &amp; B.K.

BORING DATE April 29/60 CHECKED BY G.G.C.

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

## LEGEND

1/2 UNCONFINED COMPRESSION (C<sub>u</sub>)  
VANE TEST (C) AND SENSITIVITY (S)  
NATURAL MOISTURE AND  
LIQUIDITY INDEX  
LIQUID LIMIT  
PLASTIC LIMIT

DEPTH FEET	ELEV. FEET	DESCRIPTION	STRENGTH AND PENETRATION RESISTANCE				CONSISTENCY	NATURAL MOISTURE CONTENT - %	NATURAL UNIT WT. P.C.F.	RECOVERY in %
			P.S.F.							
			GLOWE.F.T.							
	339.9	↓ Groundlevel								
	333.9	Stiff red clay with green clay seams.								
	328.9	Seams of soft red & soft green shale								
		Medium hard red shale with seams of hard green shale.								
	273.9									
		End of borehole.								

RC1	-
RC2	100
RC3	93
RC4	100
RC5	97
RC6	97
RC7	97
RC8	97
RC9	98
RC10	98
RC11	92
RC12	98
RC13	88

RC1 -  
RC2 100  
RC3 93  
RC4 100  
RC5 97  
RC6 97  
RC7 97  
RC8 97  
RC9 98  
RC10 98  
RC11 92  
RC12 98  
RC13 88

# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 100-60 &amp; 99-60

BORE HOLE NO. 2

JOB 60-E-35

STATION See drawing

DATUM Geodetic 336.4

COMPILED BY G.G.C. &amp; B.K.

BORING DATE May 2/60.

CHECKED BY G.G.C.

2" DIA. SPLIT TUBE

2" SHELBY TUBE

2" SPLIT TUBE

2" DIA. CONE

2" SHELBY

CAS NO.

## LEGEND


25% UNCONFINED COMPRESSION (Q<sub>u</sub>)VANE TEST (G<sub>v</sub>) AND SPINNING TEST

NATURAL MOISTURE AND

LIQUIDITY INDEX

LIQUID LIMIT

PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE
	↓ Ground level	336.4	0	
	Stiff red clay	W.L. 331.4 330.4		
	Seams of soft red & green shale.	326.9	10	
	Medium hard red shale with seams of hard green shale.	316.9	20	
	End of borehole.		80	

UNCONFINED COMPRESSION Q <sub>u</sub>	NATURAL MOISTURE W <sub>n</sub>	LIQUIDITY INDEX I <sub>L</sub>	LIQUID LIMIT W <sub>L</sub>	PLASTIC LIMIT W <sub>P</sub>	RECOVERY in %
					RC1 -
					RC2 100
					RC3 97
					RC4 100

# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 100-60 &amp; 99-60

BORE HOLE NO. 3

JOB 60-F-35

STATION See drawing

DATUM Geodetic 338.4

COMPILED BY C.R.C. &amp; B.K.

BORING DATE May 3/60.

CHECKED BY G. G. C.

2 DIA SPLIT TUBE

2 SHELBY TUBE

2 SPLIT TUBE

2 DIA CONE

2 SHELBY

CASING

## LEGEND

UNCONFINED COMPRESSION (Q)  
 VANE TESTS AND PENETRATION  
 NATURAL MOISTURE AND  
 LIQUID LIMIT  
 PLASTIC LIMIT

DEPTH FEET	DESCRIPTION	FEET FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	CONSIDERED	NATURAL MOISTURE CONTENT	RECOVERY in %
	Groundlevel	338.4	0				
	Red Clay	WL 335.4					
	Soft red shale with seams of soft green shale.	333.4					
	Medium hard red shale with seams of hard green shale.	328.4	10				
	End of borehole.	320.5	20				
			30				
			40				
			50				
			60				
			70				
			80				

# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W + 190-60 &amp; 99-60

BORE HOLE NO. 4

JOB 60-F-35

STATION See drawing






DATUM Geodetic 348.4

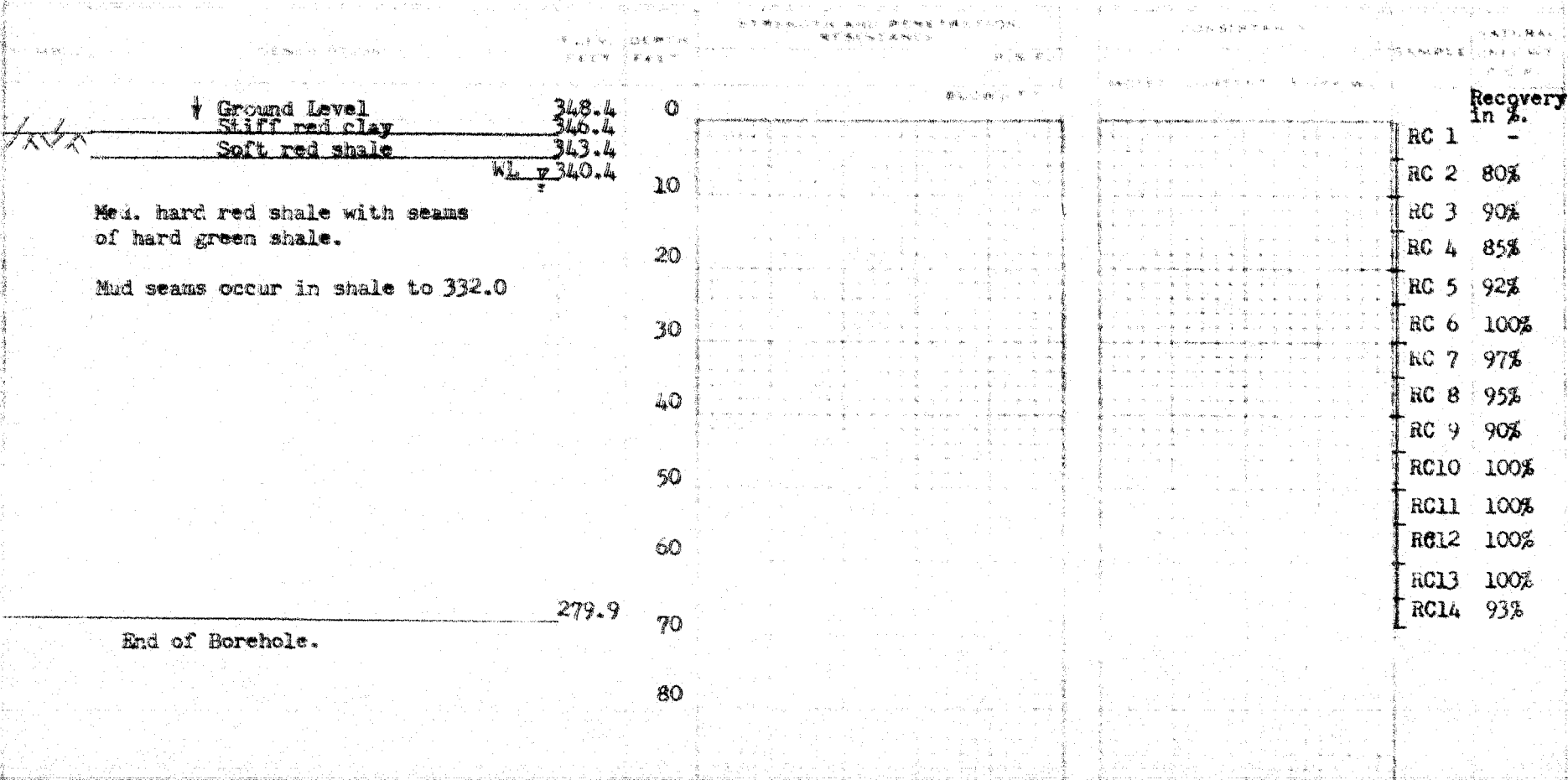
COMPILED BY G. G. C. &amp; B.K.

BORING DATE May 5/60

CHECKED BY G.G.C.

## LEGEND

UNCONFINED COMPRESSION (QU)   
VANE TEST (C) AND SENSITIVITY (S)   
NATURAL MOISTURE AND LIQUIDITY INDEX   
Liquidity Limit   
PLASTIC LIMIT 



# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 100-60 &amp; 99-60 BORE HOLE NO. 5

JOB 60-F-35 STATION See drawing

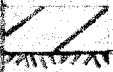
DATUM Geodetic 327.0 COMPILED BY G.G.C. &amp; B.K.

BORING DATE May 10/60. CHECKED BY G.G.C.

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

## LEGEND

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

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P.S.F.	BLOWS/FT.
	↓ Ground level	W.L. 327.0	0		
	Stiff red clay	322.0			
	Medium hard red shale with seams of green shale.		10		
		309.4	20		
	End of borehole.		30		
			40		
			50		
			60		
			70		
			80		

CONSISTENCY		NATURAL MOIST. WT. %	RECOVERY IN %.
MOIST. CONTENT - % DRY WT.	LIQUIDITY INDEX		
		RC1	-
		RC2	-
		RC3	100%
		RC4	97%

Mr. A. M. Toys,  
Bridge Engineer.  
Materials & Research Section.  
Attention: Mr. E. McCosbie.

June 9, 1960.

FOUNDATION INVESTIGATION - D.H.C.

W.P. 99-60 & W.P. 100-60

W.J. 60-F-35.

Re: C.N.R. & C.P.R. Overhead,  
Chedoke Expressway - Dist. 4.

This Section has recently completed a foundation investigation at the C.N.R. & C.P.R. overhead (Chedoke Expressway). The site is located about 500 ft. S.W. of Mercer's Glen on a high grassy plain which dips down sharply to the south and to the east, towards Mercer's Glen.

There are two parallel tracks (C.N.R. & C.P.R.) running in an E.-W. direction across the site. The C.P.R. track to the south runs directly along the edge of the plateau, while the C.N.R. track to the north is situated in a 20-ft. cut.

Our results indicate that the soil stratigraphy consists of a thin clay overburden of approximately 5 ft. in thickness.

This stratum is underlain by the parent material which is a red shale. The upper 5-foot layer of the shale is soft due to weathering, but below this depth, the shale can be defined as medium-hard.

At and below the proposed profile grade, the shale was found to be sound with core recovery between 90 and 100%.

It is recommended that spread footings with a permissible loading of 6 tons/sq.ft. be employed at any suitable elevation below the frost penetration depth.

If the footings are not poured immediately after excavation, a thin concrete pad should be poured to ensure against deterioration of the clay shale when in contact with the atmosphere.  
cont'd./s....

This method would eliminate the need for backfilling with an impermeable type of material.

At the time of the investigation, it was not possible to accurately determine the true ground water level. This was due to surface water seepage and wash water being trapped in the relatively impermeable shale.

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Since the bottom of the excavation may be at or below the ground water level, there may be some flow through the permeable layers in the shale, but should be easily handled by a low-capacity pumping system.

Additional information on boreholes situated near the investigation conducted by this section, can be obtained by referring to the above mentioned report by E.M. Pete & Associates.

Borehole logs and site plan No. 60-P-35, are enclosed under appendix 1.

If we can be of any further assistance in connection with this project, please contact our office.

GEC/adel

Attach.

cc: Messrs. E. M. Loya (2)  
H. A. Tregaskes  
W. C. Mansay  
I. Campbell  
J. E. Richardson  
T. J. Kovich  
A. Watt

Foundations Office  
Gen. Files.

L. C. Modernan,  
PRINCIPAL FOUNDATION ENGINEER.  
(encl)

*[Signature]*  
(G. C. Cherrington,  
PROJECT FOUNDATION ENGR.)

Report prepared by: -

G. C. Cherrington,  
Project Engr.

Report approved by: -

*[Signature]*  
Foundations Office Engr

**APPENDIX I.**

## SUMMARY OF FIELD &amp; LABORATORY TESTS

JOB 40-E-35  
W P 100-60 & 99-60

LOG NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETIN RESIST. BLOWS/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH PSI	UNIT WEIGHT PCF	REMARKS
1	EC1	0' - 6'	Very stiff red clay with seams of green clay.	-	-	-	-	-	-	Ran BX casing.
	EC2	6' - 11'	Soft red shale with seams of soft green shale.	-	-	-	-	-	-	Ran AXT core. 100% core recovery.
	EC3	11' - 16'	Medium Hard red shale with seams of hard green shale.	-	-	-	-	-	-	AXT core. 93% core recovery.
	EC4	16' - 21'	Medium hard red shale with seams of hard green shale.	-	-	-	-	-	-	AXT core. 100% core recovery.
	EC5	21' - 26'	Medium hard red shale with seams of hard green shale. 1" clay seam at 23'5".	-	-	-	-	-	-	AXT core. 97% core recovery.
	EC6	26' - 31'	Medium hard red shale with seams of hard green shale. 1" clay seam at 28'6".	-	-	-	-	-	-	AXT core. 97% core recovery.
	EC7	31' - 36'	Medium hard red shale with seams of hard green shale. 2" mud seam at 34.5.	-	-	-	-	-	-	AXT core. 97% core recovery.
	EC8	36' - 41'	Medium hard red shale with seams of hard green shale.	-	-	-	-	-	-	AXT core. 97% core recovery.
	EC9	41' - 46'	Medium hard red shale with seams of hard green shale.	-	-	-	-	-	-	AXT core. 98% core recovery.
	EC10	46' - 51'	Medium hard red shale with seams of hard green shale.	-	-	-	-	-	-	AXT core. 98% core recovery.

108 60-E-35

W.P. 1-17-1964

## SUMMARY OF FIELD & LABORATORY TESTS

HOLE NO	SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST. BLOWS/FT	MOIST CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH PSI	UNIT WEIGHT PCF	REMARKS
1	RCL1	51' - 56'	Medium hard red shale with seams of hard green shale.							AXT core. 92% core recovery.
	RCL2	56' - 61'	Medium hard red shale with seams of hard green shale. 3" clay seam at 60'5".							AXT core. 98% core recovery.
	RCL3	61' - 66'	Medium hard red shale with seams of hard green shale.							AXT core. 88% core recovery.
2	RC1	0' - 6'	Stiff red clay	-	-	-	-	-	-	-
	RC2	6' - 9.5'	Soft red shale with seams of soft green shale.							AXT core. 100% core recovery.
	RC3	9'6"-14'6"	Medium hard red shale with seams of hard green shale. 3" clay seam 9'6"-9'9". Medium							AXT core. 97% core recovery.
	RC4	14'6"-19'6"	Hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
3	RC1	0'-5'	Stiff red clay							
	RC2	5'-10'	Soft red shale with seams of green shale.							AXT core. 92% core recovery.
	RC3	10'-15'	Medium hard red shale with seams of hard green shale.							AXT core. 95% core recovery.
	RC4	15'-17'10"	Medium hard red shale with seams of hard green shale.							AXT core. 94% core recovery.

JOB 60-F-35

W P 100-60 & 99-60.

# SUMMARY OF FIELD & LABORATORY TESTS

SAMPLE NO	SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETR RESIST. BLOWS FT	MOIST CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH DLY	UNIT WEIGHT PCF	REMARKS
4	RC1	0'-2'	Stiff red clay with presence of organic materials.							Ran BX casing - no core.
	RC2	2'-5'	Soft red shale							AXT core. 80% core recovery.
	RC3	5'-10'	Medium hard red shale with seams of hard green shale. Presence of mud seams in shale.							AXT core. 90% core recovery.
	RC4	10'-15'	Medium hard red shale with seams of hard green shale. 9" seam of soft shale from 13'3" to 14'0".							AXT core. 85% core recovery.
	RC5	15'-20'	Medium hard red shale with seams of hard green shales. 15" seam of soft shale from 15-16'3."							AXT core. 92% core recovery.
	RC6	20'-25'	Medium hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
	RC7	25'-30'	Medium hard red shale with seams of hard green shale.							AXT core. 97% core recovery.
	RC8	30'-35'	Medium hard red shale with seams of hard green shale.							AXT Core. 95% core recovery.
	RC9	35'-40'	Medium hard red shale with seams of hard green shale.							AXT core. 90% core recovery.
	RC10	40'-45'	Medium hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
	RC11	45'-50'	Medium hard red shale with seams of hard green shale.							

JOB 60-F-32

WP 100-60-6-99-60.

## SUMMARY OF FIELD &amp; LABORATORY TESTS

WELL NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET. RESIST. BLOWS/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH PSI	UNIT WEIGHT PCF	REMARKS
4	RC12	50'-55'	Medium hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
	RC13	55'-60'	Medium hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
	RC14	60'-65'	Medium hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
	RC15	65'-68'6"	Medium hard red shale with seams of hard green shale.							AXT core. 93% core recovery.
5	RC1	0'-5'	Stiff red clay with fine to coarse sand and gravel.							BM casing shoe
	RC2	5'-6'	Medium hard green shale.							BM casing shoe
	RC3	6'-11.0'	Medium hard red shale with seams of hard green shale.							AXT core. 100% core recovery.
	RC4	11'-17'7"	Medium hard red shale with seams of hard green shale.							AXT core. 97% core recovery.
			RC denotes rock core samples.							

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

February 5, 1960.  
FOUNDATION INVESTIGATION  
E.M. Peto Associates, Ltd.

Attention: Mr. S. McGeehan.

Re: Chedoke Expressway  
at  
C.N.R. & C.P.R. Tracks  
District 4

This memo accompanies a report on the foundation conditions at the above proposed subway location submitted by E. M. Peto Associates, Ltd. The information contained in this report is primarily factual, and if the Design Group have any comments with respect to the information contained therein, or the interpretation of data presented, we would be pleased to discuss this with you.

As a result of a meeting held in C.C. Parker's Office, Hamilton, Thursday, February 4th, the alignment at the location of these two structures, as given in this report, was confirmed. Also, a result of this committee meeting was that the median width at the subway location would be reduced to 30 feet.

C.C. Parker have been handed their copy of this report and it will not be necessary for you to forward one to them.

L.C.oder  
Attach.

*L. C.oder*  
L. C.oderman,

PRINCIPAL CIVIL & FOUNDATION ENGINEER

cc: Messrs. A. M. Toys (2)  
E. A. Tregaskes  
B. J. Ramsay  
I. Campbell  
A. A. Richardson  
A. F. Weber  
Foundation Section  
Gen. Files.

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS AND RESEARCH SECTION

W P 100-60 & 99-60

BORE HOLE NO 1

JOB 60-F-35

STATION See drawing

DATUM Geodetic 339.9

COMPILED BY G.G.C. & B.K.

BORING DATE April 29/60

CHECKED BY G.G.C.

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

LEGEND

1/2 UNCONFINED COMPRESSION LOAD  
VANE TEST (7 AND 14 INCHES)  
NATURAL MOISTURE AND  
LIQUID LIMIT  
PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE P.S.F. BLOW/FT	CONSISTENCY	NATURAL MOISTURE PERCENT RECOVERY IN %
	Groundlevel	339.9	0			
	Stiff red clay with green clay seams.	333.9				
	Seams of soft red & soft green shale.	328.9	10			RC1 -
			20			RC2 100
	Medium hard red shale with seams of hard green shale.		30			RC3 93
			40			RC4 100
			50			RC5 97
			60			RC6 97
			70			RC7 97
			80			RC8 97
						RC9 98
						RC10 98
						RC11 92
						RC12 98
						RC13 88
	End of borehole.	273.9				

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS AND RESEARCH SECTION

W.P. 100-60 & 99-60

BORE HOLE NO. 2

JOB 60-E-35

STATION See drawing

DATUM Geodetic 336.4

COMPILED BY G.G.C. & B.K.

BORING DATE May 2/60.

CHECKED BY G.G.C.

LEGEND

UNCONSOLIDATED COMPRESSION (C<sub>u</sub>)  
VANE TEST (C<sub>v</sub>) AND SENSITIVITY (S<sub>v</sub>)  
NATURAL MOISTURE AND  
LIQUIDITY INDEX  
LIQUID LIMIT  
PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE P.S.F. BLOWS/FT	UNSATURATED WATER CONTENT (%)	NATURAL MOISTURE (%)	LIQUIDITY INDEX	LIQUID LIMIT	PLASTIC LIMIT	RECOVERY in %
	↑ Ground level	336.4	0							
	Stiff red clay	W.L. 331.4								
	Seams of soft red & green shale.	330.4	10							
	Medium hard red shale with seams of hard green shale.	326.9	20							
	End of borehole.	316.9	30							
			40							
			50							
			60							
			70							
			80							

RC1 -  
RC2 100  
RC3 97  
RC4 100

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS AND RESEARCH SECTION

P 100-60 / 99-60

BORE HOLE NO 3

DB 60-F-35

STATION See drawing

ATUM Geodetic 338.4

COMPILED BY G.G.C. &amp; B.K.

BORING DATE May 3/60

CHECKED BY G. G. C.

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

LEGEND

1. LINE VENE CLAY (HARD) IN CL  
 2. NATURAL GROUND SURFACE  
 3. HARD CLAY  
 4. PLASTIC CLAY

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	REMARKS
	Groundlevel	338.4	0		
	Red Clay	335.4			
	Soft red shale with seams of soft green shale.	328.4	10		
	Medium hard red shale with seams of hard green shale.	320.5	20		
	End of borehole.		30		
			40		
			50		
			60		
			70		
			80		

Recover  
in %

RC1 92  
 RC2 92  
 RC3 95  
 RC4 94

DEFECTS IN NEGATIVE DUE TO  
 CONDITION OF ORIGINAL DOCUMENT

# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W 100-60 & 99-60

BORE HOLE NO. 4

JOB 60-F-35

STATION See drawing

DATUM Geodetic 348.4

COMPILED BY G. G. C. & B. K.

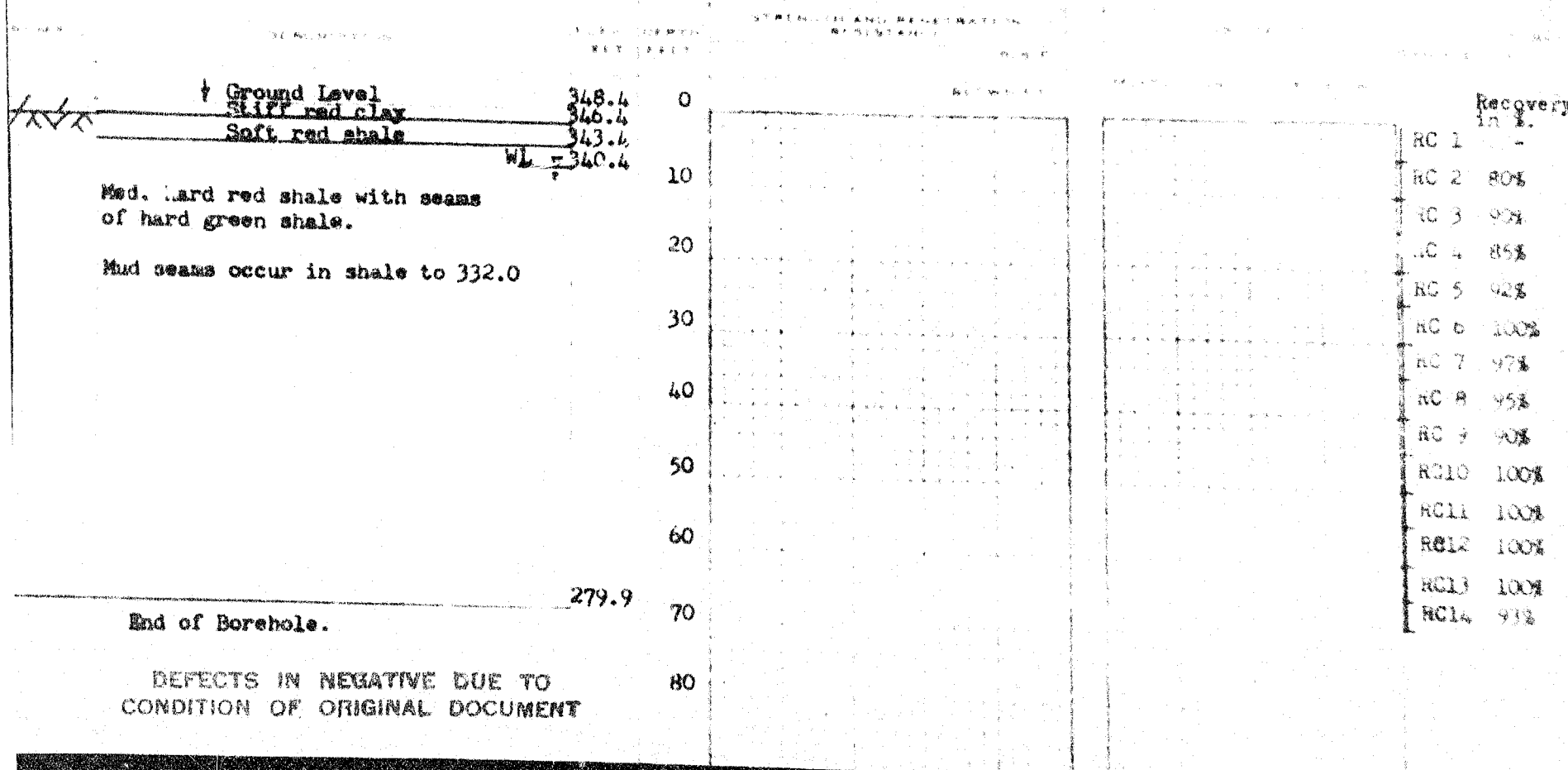
BORING DATE May 5/60

CHECKED BY G.G.C.

2" DIA. SPLIT TUBE  
2" SHELLEY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELLEY  
C4519

### LEGEND

2" DIA. SPLIT TUBE  
2" SHELLEY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELLEY  
C4519



DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 100-60 & 99-60

BORE HOLE NO 5

JOB 60-P-35

STATION See drawing

DATUM Geodetic 327.0

COMPILED BY G.G.C. & B.K.

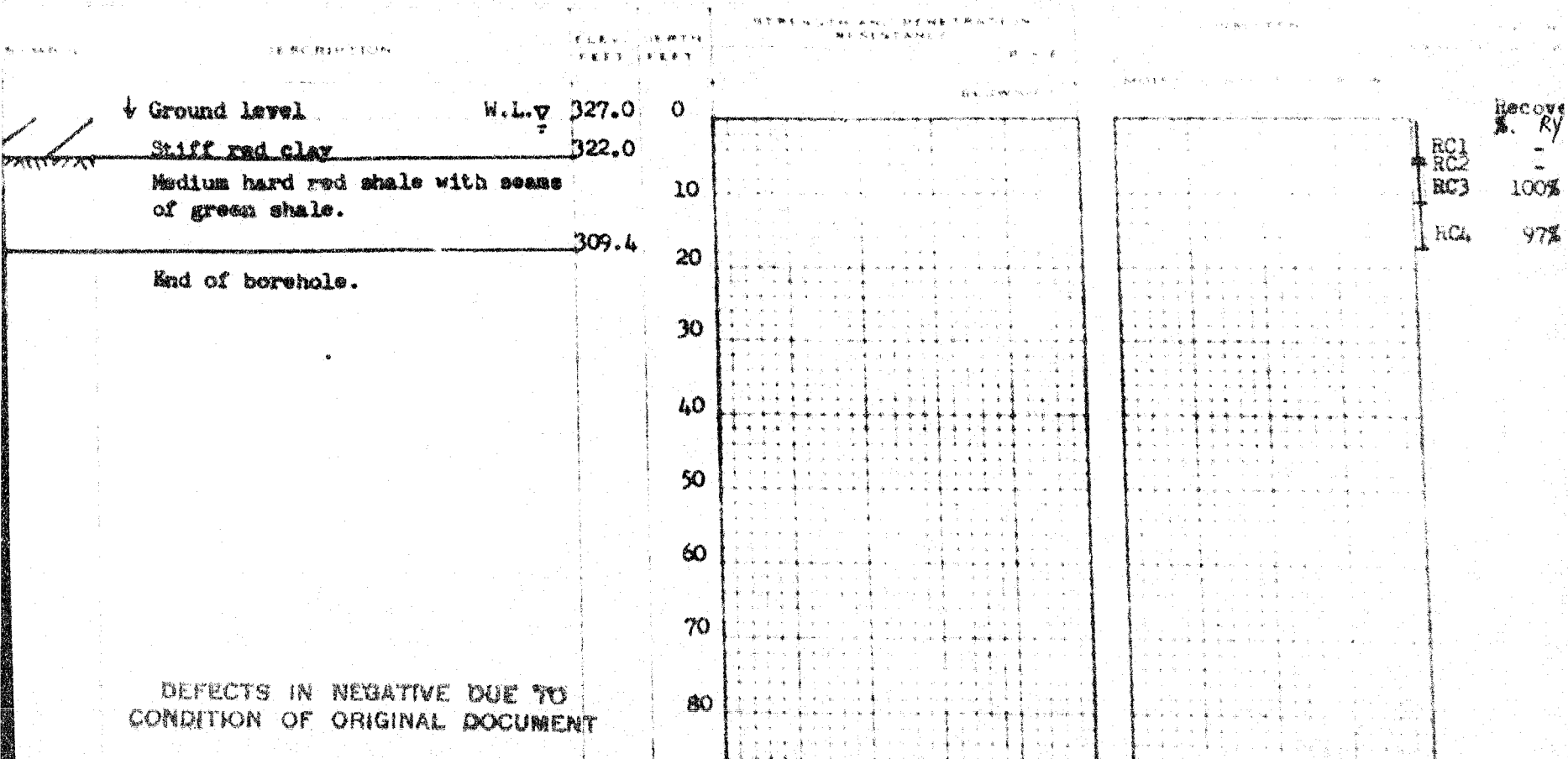
BORING DATE May 10/60.

CHECKED BY G.G.C.

LEGEND

2 DIA SPLIT TUBE  
2 SHELBY TUBE  
2 SPLIT TUBE  
2 DIA CONE  
2 SHELBY  
CASING

2 DIA SPLIT TUBE  
2 SHELBY TUBE  
2 SPLIT TUBE  
2 DIA CONE  
2 SHELBY  
CASING







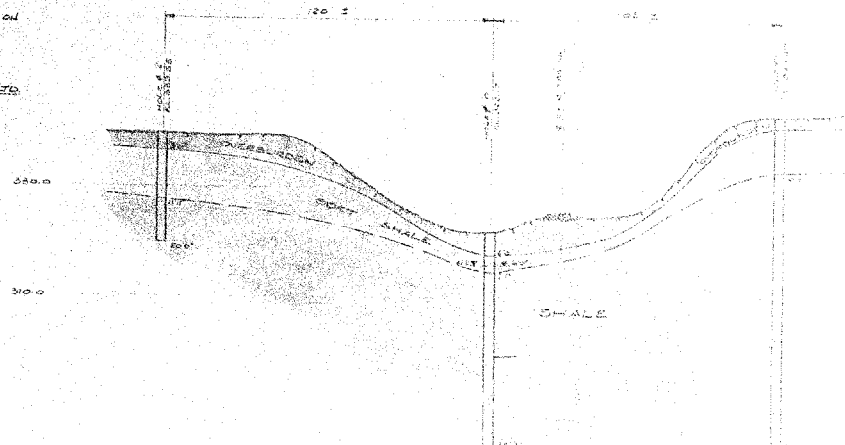
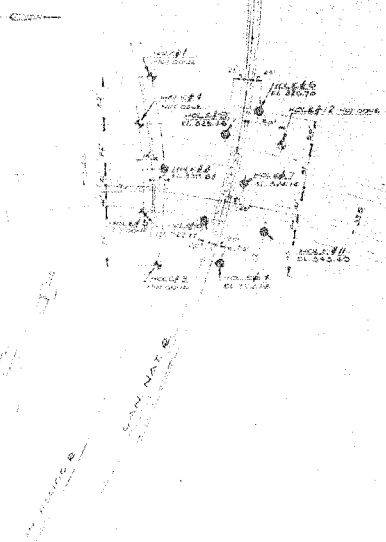
3-61-174-C



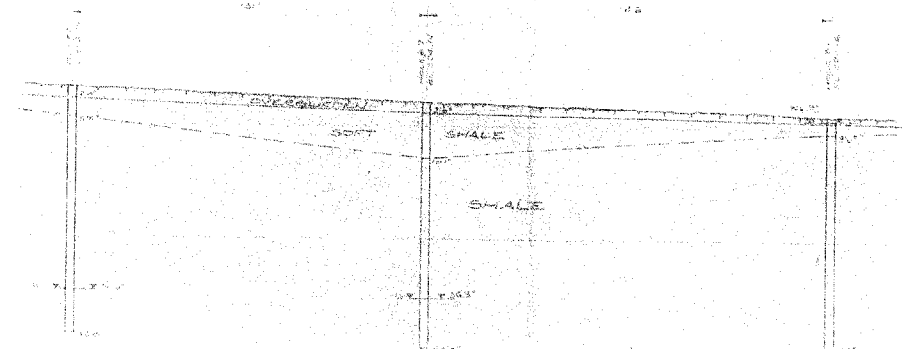
BASELINE POINT OF NORTH-EAST ADJ. ON  
CONCRETE BASE OF C.N.R. LIGHT SIGNAL  
(100 FT. BY 50 FT. 335.00 E.L.)

BASELINE POINT OF NORTH-EAST ADJ. ON  
CONCRETE BASE OF C.N.R. LIGHT SIGNAL  
(30 FT. BY 50 FT. 335.00 E.L.)

NOTE:  
SEASON MARKS SUPPLIED BY  
C. J. PACE & SONS, BRUNSWICK, N.J.



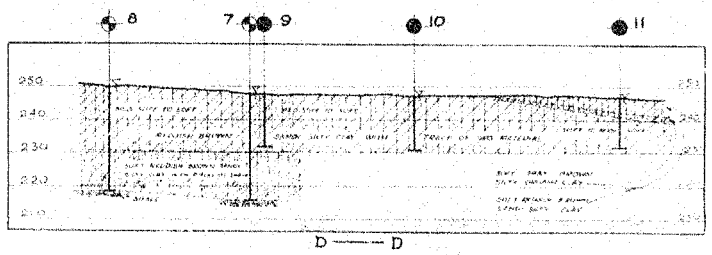
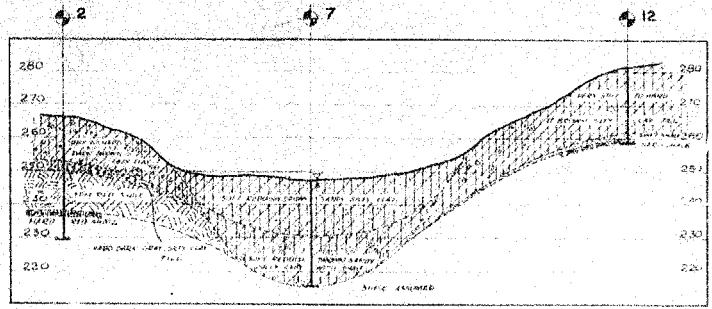
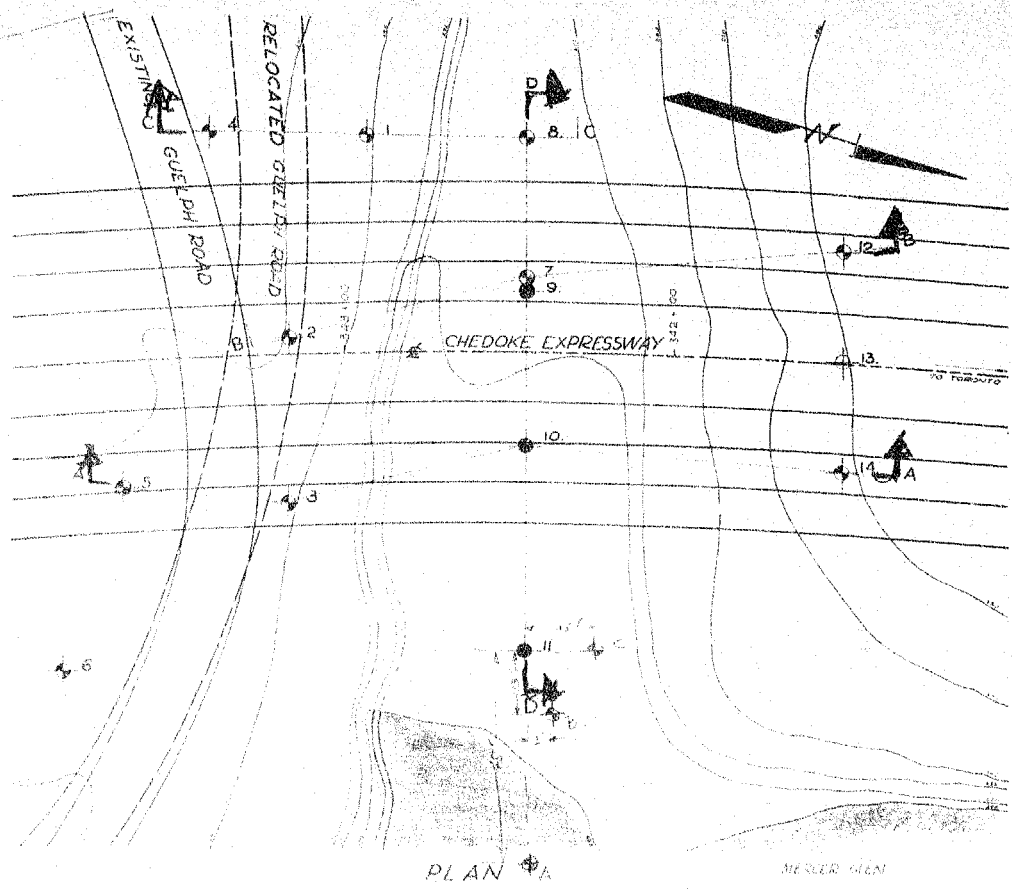
SECTION ON LINE 1, 100 FT. BY 50 FT.  
SCALE: HORIZ. 1" = 20 FT. VERT. 1" = 10 FT.



SECTION ON LINE 2, 100 FT. BY 50 FT.  
SCALE: HORIZ. 1" = 20 FT. VERT. 1" = 10 FT.



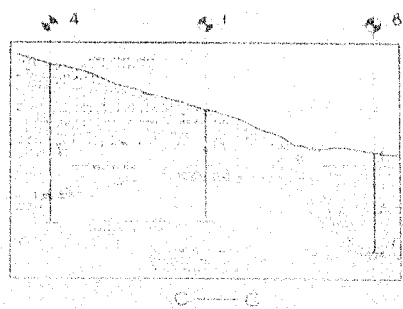
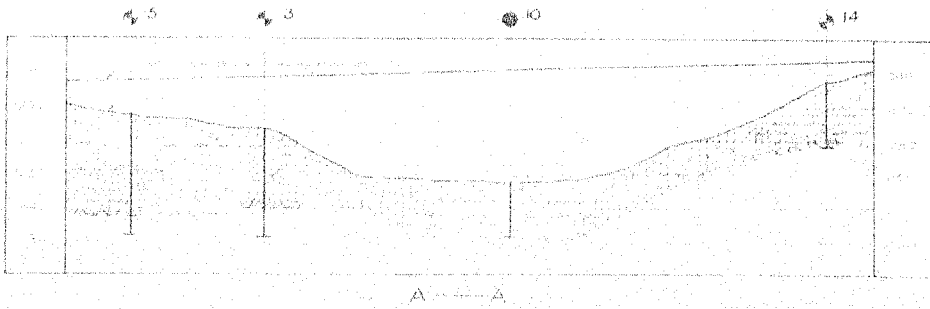
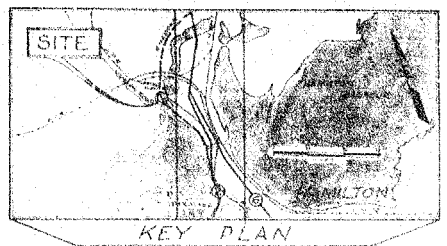
SEAL OF THE PROFESSIONAL ENGINEER  
STATE OF NEW YORK  
JAMES H. HARRIS  
No. 12345  
Exp. 12/31/1917



**LEGEND**

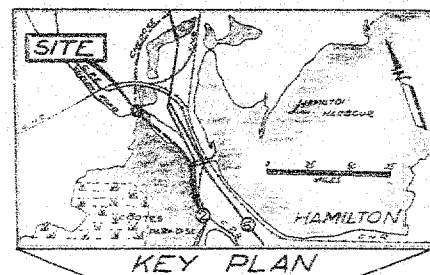
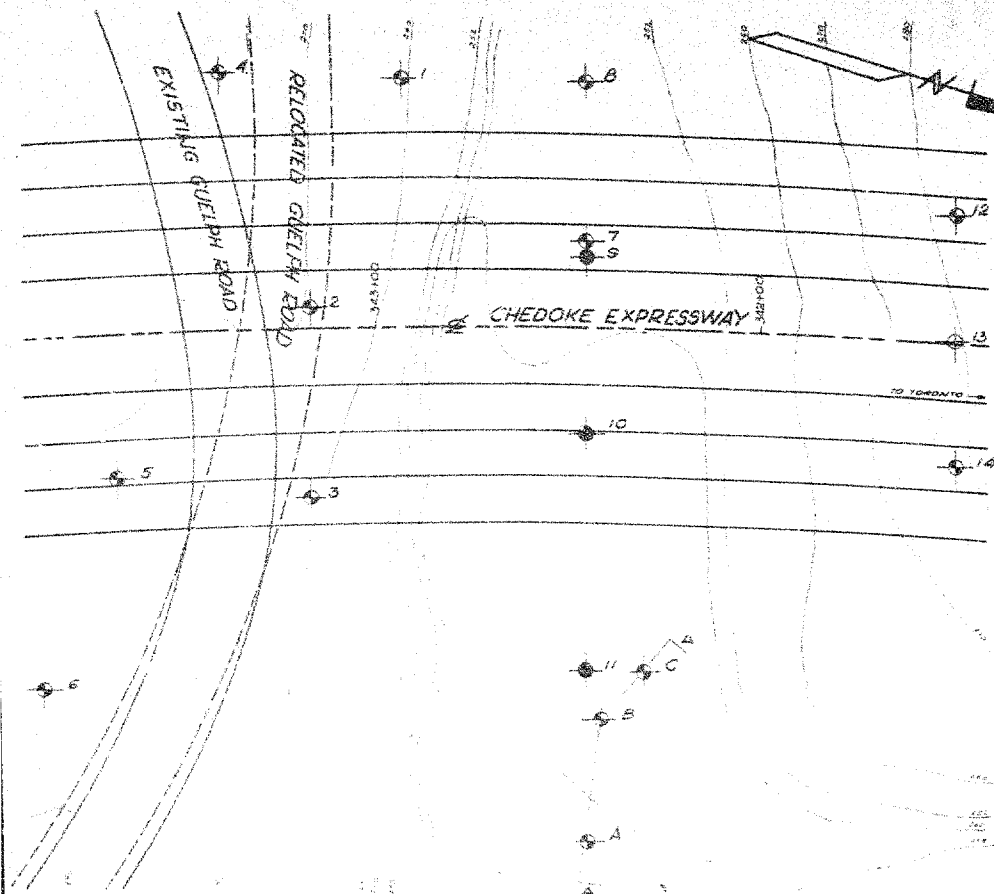
ROAD HOLE  
PENETRATION HOLE  
ROAD & PENETRATION HOLE

NO.	ELEVATION	STATION	DISTANCE
1	266.9	342+70	25 FT
2	266.1	343+17	2 FT
3	263.6	343+27	40 FT
4	271.7	343+68	67 FT
5	267.6	343+68	48 FT
6	267.1	343+68	22 FT
7	247.6	342+43	22 FT
8	248.1	342+43	42 FT
9	247.8	342+43	16 FT
10	247.1	342+43	26 FT
11	247.1	342+43	20 FT
12	250.0	342+43	53 FT
13	250.9	342+43	2 FT
14	250.4	342+43	41 FT



EXTRACTED FROM THE GUELPH ROAD CROSSING (CHEDOKE EXPRESSWAY)

GUELPH ROAD CROSSING (CHEDOKE EXPRESSWAY)

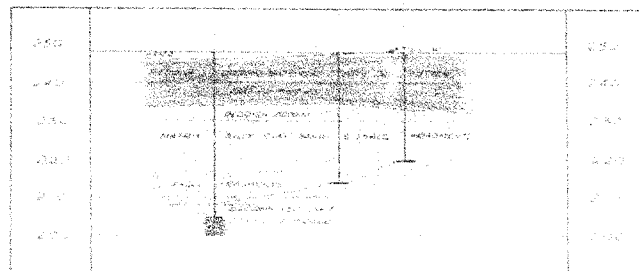


### LEGEND

- BORE HOLE
- ⊕ PENETRATION HOLE
- ⊕ BORE & PENETRATION HOLE
- 1 - 14 HOLES MADE MAY 1960
- A B & C HOLES MADE JULY 1960

HOLE	ELEVATION	STATION	DISTANCE FROM HOLE
A	248.0	342+45	35 FT
B	248.0	342+42	103 FT
C	248.0	342+30	80 FT

23-61-174-G



NOTE:  
THE DIMENSIONS SHOWN ON THIS PLAN HAVE BEEN KEPT TO THE BEST OF OUR KNOWLEDGE AND BELIEF. THEY ARE NOT GUARANTEED AND ARE NOT TO BE USED FOR ANY OTHER PURPOSE THAN THAT FOR WHICH THEY WERE PREPARED.

DEPARTMENT OF HIGHWAYS - ONTARIO  
1960

GUELPH ROAD CROSSING  
(CHEDOKE EXPRESSWAY)

60-434A

# e. m. peto associates ltd.

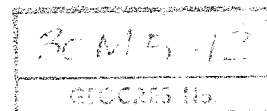
YOUR REFERENCE:-

OUR REFERENCE:- 6002 and 6003

1287 caledonia road,  
TORONTO 19, ONTARIO.  
RUssell 9-1126

26 January 1960

The Soil and Foundation Engineering Dept.,  
Department of Highways of Ontario,  
c/o Parliament Buildings,  
Toronto 2, Ontario.



Attention: Mr. L. Soderman, P. Eng.

Re: Soil Investigation for Chedoke Expressway  
at C.N.R. and C.P.R. tracks.

Gentlemen:

In accordance with a verbal request by Mr. L. Soderman, a soil investigation was carried out at the above site. We have pleasure in forwarding herewith ten copies of our final borehole logs and a covering letter. The covering letter includes:

1. Programme of Work
2. General information
3. Soil and water conditions
4. Observations and conclusions

## PROGRAMME OF WORK

Jan. 5th 1960	The equipment and the drilling units were moved onto the site.
Jan. 6th 1960	The equipment and the machines were set up. Unit no. 4 drove a dutch cone adjacent to borehole 9.
Jan. 7th 1960	Unit no. 1 started borehole 10. Unit no. 4 started borehole 9. Unit no. 6 drove a dutch cone adjacent to borehole 7 and started borehole 7.
Jan. 8th 1960	Unit no. 1, advancing borehole 10, delayed by breakdown. Unit no. 4 advanced borehole 9. Unit no. 6 completed borehole 7.

# PROGRAMME OF WORK (continued)

- January 9 1960 Machine no. 1 under repair; unit no. 4 completed work at borehole 9 and started at borehole 11. Unit no. 6 started work at borehole 6.
- January 11 1960 Unit no. 1 completed work at borehole 10. Unit no. 4 advanced borehole 11. Unit no. 6 completed borehole 6.
- January 12 1960 Unit no. 1 started work at borehole 2. Unit no. 4 advanced borehole 11. Unit no. 6 started borehole 8.
- January 13 1960 Unit no. 1 advanced borehole 2. Units 4 and 6 completed work at boreholes 11 and 8 respectively. Following instructions issued by Mr. K. Peaker all the work at this location was stopped and the equipment and the drilling units were moved to Mercer Glen site.

## GENERAL INFORMATION

(a) The boreholes were put down in accordance with our standard procedure. The attached borehole logs contain detailed descriptions of the recovered samples along with all the other pertinent data.

(b) The boreholes were put down at locations staked out by representatives of C. C. Parker and Parsons, Brinckerhoff Ltd. A 60<sup>0</sup>-2 ins. diameter Standard Dutch cone was driven at four locations. These were:

- P2 - 2 ft. north of borehole 2  
P7 - 4 ft. east of borehole 7  
P9 - 6 ft. east of borehole 9  
P11 - 7 ft. west of borehole 11.

The results of these tests have been included in the Observations and Conclusions as Section (e).

(c) Details of the holes put down were:

<u>Hole no.</u>	<u>Ground level elevation</u>	<u>Depth</u>	<u>Casing</u>
2	339.65	18' +	BX (and AXT non-coring bit)
P 2	339.61	12'	
6	326.70	44'	BX (and AXT coring bit)
7	324.14	44'	BX (and AXT coring bit)
P 7	324.40	2'5"	
8	322.16	41'5"	BX (and AXT coring bit)
9	325.46	47'3"	BX (and BX coring bit)
P 9	325.02	5'3"	
10	322.17	38'9"	BX (and AXT coring bit)
11	343.39	59'	BX (and BX coring bit)
P 11	343.39	8'	

## GENERAL INFORMATION (continued)

(d) The elevations given above are related to Bench Marks supplied by C.C. Parker and Parsons, Brinckerhoff Ltd. These were BM 338+98 (Elevation 341.63) top of north-east bolt on concrete base of C.P.R. light signal 100 ft. RT Sta. 338+98 E.B.L. and B.M. 337+60 (Elev. 325.39) top of north-east bolt on concrete base of C.N.R. light signal 62 ft. LT Sta. 337+60 E.B.L.

(e) Holes were put down without the use of wash water to virtual refusal, from this point downwards water was used to advance the holes with either a chopping bit, a non coring diamond bit or a coring diamond bit.

(f) The site is located at the C.N.R. and C.P.R. tracks about 1/4 mile west of Highway 2 and Highway 6 and just north-west of Mercer Glen in Hamilton.

Geologically the site is located on the east edge of the Niagara Escarpment just west of Hamilton. At this point the escarpment is made up of the Queenston shale which is Ordovician in age.

## SOIL CONDITIONS

In general the material revealed by this investigation can be divided into two strata, an upper stratum of overburden and a lower stratum of soft to medium hard shale, reddish-brown in colour.

### (a) Overburden

This stratum extended to the following depths in the borehole put down.

<u>Borehole no.</u>	
2	0' - 3'
6	0' - 2'
7	0' - 2'
8	0' - 1'
9	0' - 5'
10	0' - 4'
11	0' - 2'

The material in this stratum consisted of topsoil or fill underlain by silty clay with sand and gravel. Detailed investigation of the material in this stratum can be seen on the borehole logs.

### (b) Soft to medium hard shale

The colour of this stratum was reddish-brown with green-grey bands and specks. The upper part of this stratum is soft turning medium hard at the following depths in the boreholes put down.

## SOIL CONDITIONS (continued)

### Borehole No.

2	11 ft. 11 ins.
6	5 ft. 5 ins.
7	8 ft. 0 ins. approximately
8	3 ft. 0 ins.
9	7 ft. 0 ins.
10	7 ft. 1 in.
11	10 ft. 0 ins.

Lithologically the stratum is made up of a thinly bedded shale with sandy and possibly calcareous layers.

In addition to the upper soft part, the stratum contains several other soft layers of a minor nature. These were observed at:

<u>Borehole no.</u>	<u>Depth</u>	<u>Thickness of layers</u>
6	35 ft.	1 in.
	36 ft. 9 ins.	1 in.
	38 ft.	1 in.
	41 ft. 6 ins.	1 in.
7	38 ft. 10 ins.	2 ins.
9	16 ft. 6 ins.	3 ins.
	38 ft. 6 ins.	1/2 in.
	40 ft.	2 ins.
	41 ft. 10 ins.	3 ins.

Other soft layers may be present in the sections where the core recovery was poorer.

## WATER CONDITIONS

The following is a table of water level readings taken at the time of the investigation:

WATER CONDITIONS (continued)

<u>Borehole 6</u>						
<u>Date</u> (1960)	<u>Time</u>	<u>Depth of</u> <u>Casing</u>	<u>Hole</u>	<u>Depth to water</u>	<u>Remarks</u>	
Jan. 9		nil	2'	1'1"	Seepage from ditch Hole filled up	
11	2.52pm	5' 5"	44'	0		
	2.54pm	5' 5"	44'	7'8"		
	2.56pm	5' 5"	44'	15'1"		
	3.00pm	5' 5"	44'	28'8"		
	3.05pm	5' 5"	44'	32'6"		
	3.55pm	5' 5"	44'	36'2"		
	6.35pm	5' 5"	44'	36'5"		
12	7.43am	5' 5"	44'	36'6"		
 <u>Borehole 7</u>						
Jan. 7	6.00pm	9'	10'	9'9"	Hole bailed out to 9'9"	
Jan. 8	7.40am	9'	10'	9'9"		
	7.00pm	9'	44'	Water level in hole dropped after pump shut off.		
	7.15pm	9'	44'	35'6"		
Jan. 9	8.00am	9'	44'	36'3"		

After pulling casing water from ditch filled up hole.

<u>Borehole 8</u>					
Jan. 12		nil	2'	9"	Seepage from ditch
At 37'5" depth only about half the wash water, pumped down returned to the surface; the other half was lost through permeable layers.					
Jan. 8		6'	37'	Hole filled up with water	
9	7.30am	6'	37'	6'6"	
	1.00pm	nil	47'6"	6'6"	
11	7.30am	nil	47'6"	5'6"	
12	9.15am	nil	44'	4'10"	

<u>Borehole 10</u>					
11	4.05pm	7'	38'10"	0	Hole filled up
	4.07pm	7'	38'10"	11'2"	
	4.09pm	7'	38'10"	15'11"	
	4.14pm	7'	38'10"	19'5"	
	4.24pm	7'	38'10"	21'1"	
	5.00pm	7'	38'10"	23'2"	
	5.20pm	7'	38'10"	23'2"	
12	8.00am	nil	38'10"	6'	
					Surface water entered hole.

## WATER CONDITIONS (continued)

As a result of the above water level readings, the following conclusions can be drawn: water can be expected to arise from two sources (a) surface (b) permeable layers in the shale.

1. A considerable amount of water was flowing in the north ditch along the C.N.R. tracks during the period of our investigation. This water may not exist during the dry summer months.

2. Although at the time of our investigation wash-water was being lost through permeable layers in the shale, these permeable layers can be expected to be water-bearing during the wetter climatic periods. These layers were noted at the following approximate depths in the boreholes shown.

<u>Borehole no.</u>	<u>Depth</u>
6	36 ft. 6 ins. (290.2)
7	36 ft. 3 ins. (287.9)
8	37 ft. 5 ins. (284.7)
9	5-6 ft. (325.0 <sup>±</sup> ) (very minor seepage)
10	23 ft. 2 ins. (299.0)
11	10 - 13 ft (333.4 - 330.4)
	16 ft (327.4)
	28 ft. (315.4)

## OBSERVATIONS AND CONCLUSIONS

- (a) The soil at this site consists of a stratum of overburden underlain by a stratum of shale bedrock. The upper portion of the shale is soft, changing to a medium hard shale with depth. Surface water seepage and possible water from permeable layers in the shale may have to be controlled.
- (b) We are of the opinion that the overburden and the softer upper portion of the shale could be excavated by normal excavating equipment; whereas the medium hard shale may have to be drilled and blasted.
- (c) Apart from the softer upper 10 ft. or so, the shale core was of relatively good quality. Shale is, of course, generally unsuitable as a bulk fill since it deteriorates and reverts to a clay on exposure to air.

In the absence of an adequate supply of superior fills, it may be used under very carefully controlled circumstances as a bulk fill, either as "rock" ballast under water, or as "core" embankment fill where the shale is to be well covered and protected from the atmosphere by superior fill material. Recent experience in Hamilton has confirmed that the shale must be used in the dry summer months, since it will

OBSERVATIONS AND CONCLUSIONS (continued)

take up moisture readily and will roll and heave during compaction effort if it becomes too wet.

(d) Since we understand that this site is to be abandoned as the crossing for the expressway, we have not carried out any strength tests on the rock core. In the absence of such tests we would suggest an allowable bearing value for this shale of 6.0 tons per square foot. This figure is, in our opinion, quite conservative.

(e) As stated previously, Dutch cones were driven at boreholes 2, 7, 9 and 11. The following table gives the results:

P-2

<u>Depth</u>	<u>Blows per foot</u>
0 - 1'	12
1 - 2'	6
2 - 3'	17
3 - 4'	26
4 - 5'	49
5 - 6'	60
6 - 7'	67
7 - 8'	130
8 - 9'	100
9 - 10'	133
10 - 11'	160
11' - 11' 11"	240
11' 11" - 12'	103

P-7

0 - 1'	1
1 - 2'	79
2' - 2' 5"	100
2' 5" - 2' 5"	100

P - 9

0 - 1'	1
1 - 2'	1
2 - 3'	1
3 - 4'	23
4 - 5'	140
5' - 5' 2"	100
5' 2" - 5' 3"	300

OBSERVATIONS AND CONCLUSIONS (continued)

P - 11

<u>Depth</u>	<u>Blows per foot</u>
0 - 1'	3
1 - 2'	1
2 - 3'	21
3 - 4'	41
4 - 5'	47
5 - 6'	50
6 - 7'	80
7 - 8'	309

We trust that the information supplied briefly herewith may be useful in review of conditions existing at any adjacent site now under examination. Should you require any supplementary information concerning this investigation, we shall be pleased to be of further service.

Yours very truly,

E. M. PETO ASSOCIATES LTD.



C. F. Freeman, P. Eng.  
Chief Engineer





UJV/jn

HOLE DISCONTINUED AT APPROXIMATELY 20 FT.

**e. m. peto associates ltd.**  
SOIL ENGINEERING SERVICE - TORONTO, ONTARIO  
BOREHOLE LOG

Name Chedoke Expressway, C.N.R. Job No. 6003 Borehole No. 6  
ient Dept. of Highways, Ontario Casing BX (AX core) Boring Date Jan. 9 & 11 1960  
atum Client's Compiled By P.M. & A.M. Checked By E.M.P.

**SAMPLE CONDITION**

 UNDISTURBED  
 FAIR  
 DISTURBED  
 LOST

**SAMPLE TYPE**

A.S. AUGER SAMPLE  
C.S. CASING SAMPLE  
S.S. 2" STANDARD SPLIT TUBE SAMPLE  
S.L. SPLIT BARREL WITH LINERS  
S.T. THIN-WALLED SHELBY TUBE SAMPLE  
W.S. WASH SAMPLE  
R.C. ROCK CORE

**ABBREVIATIONS**

V.T. IN SITU VANE SHEAR TEST  
C. SOIL SHEAR STRENGTH LBS/SQ.FT.  
W.L. WATER LEVEL IN CASING  
W.T. GROUND WATER TABLE IN SOIL  
W.T.P.L. WETTER THAN PLASTIC LIMIT  
D.T.P.L. DRIER THAN PLASTIC LIMIT

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft.	Natural Moisture Content	WATER LEVELS & REMARKS
Ground surface			0'0"						
Gravelly silty clay, roots	Dk red-brown		320.70			C.S.			Sat.
Clay shale	Red-brn & grn-grey		2'0"			C.S.			Dry
Shale	Reddish-brn.					S.S.	127/1"	5.4	Dry
Transitional shale	Reddish-brn & band of grn-grey		5'5"			S.S.	100/8"	8.2	
Reamed hole from 5'5" to 25'0" with concave bit									
(No attempt to recover core)									
Core recovered below 25'0"			25'0"						
Red -brown shale with 3 bands of grey shale 1/4" to 3" thick						R.C.			Longest piece 6-3/4" 38 fractures
			30'0"						4'8 1/2" recovery 94%
Red-brown shale with 6 bands of grey shale 1/4" to 1 1/2" thick						R.C.			Longest piece 3-1/4" 36 fractures 100% recovery
			34'0"						Core v. moist to wet from 34' to 35'8"
Red-brown shale with 3 bands of grey shale 1/2" to 7" thick						R.C.			Longest piece 2-3/4" Very badly fractured 100% recovery
			39'0"						
Red-brown shale with 3 bands of grey shale 1/4" to 1 1/2" thick									(Wet seam 40'9" to 41'3" approx.) Longest piece 3-3/4". 47 fractures 4'9" Recovery 45%
			44'0"						
Borehole terminated at 44'0"									Wash water returned during diamond drilling but W.L. dropped to 34' on completion.

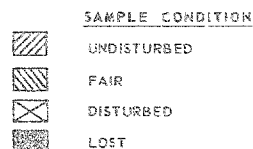
# e. m. peto associates ltd.

## SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

### BOREHOLE LOG

Job Name Chedoke Expressway C.N.R. Job No. 0003  
 Client Dept. of Highways, Ontario Casing BX & AX  
 Datum Client's Compiled By J.N.

Borehole No. 7  
 Boring Date Jan 7th and 8th, 1960  
 Checked By E.M.P.



**SAMPLE TYPE**  
 A.S. AUGER SAMPLE  
 C.S. CASING SAMPLE  
 S.S. 2" STANDARD SPLIT TUBE SAMPLE  
 S.L. SPLIT BARREL WITH LINERS  
 S.T. THIN-WALLED SHELBY TUBE SAMPLE  
 W.S. WASH SAMPLE  
 R.C. ROCK CORE

**ABBREVIATIONS**  
 V.T. IN SITU VANE SHEAR TEST  
 C. SOIL SHEAR STRENGTH LBS/SQ.FT.  
 W.L. WATER LEVEL IN CASING  
 W.T. GROUND WATER TABLE IN SOIL  
 W.T.P.L. WETTER THAN PLASTIC LIMIT  
 D.T.P.L. DRIER THAN PLASTIC LIMIT

SOIL DESCRIPTION	COLOR	Density or Consistency	Depth Elevation	Legend	Sample No and Condition	Sample Type	No. of Blows per Ft	Fracture Velocity (feet)	WATER LEVELS & REMARKS
Ground surface			0'0"						
Silty clay, some sand & gravel. Grey			2'0"			C.S.			Much W.T.P.L.
Soft shale, grey shale frag. Reddish-brown.			2'0"			C.S.			
Soft shale " and grey						S.S. 200/3 1/2	8.8		Softening by top water
Very soft shale Reddish-brown						S.S. 200/3 1/2			Wet
Soft shale " "						S.S. 300/2 1/2	6.2		A. dry
			10'1"			S.S. 100/2 3/8			
Ran casing from 10'1" to 24'									
using concave bit									
(No attempt to recover core)									
Axt core recovery below 24'0"									
Red-brown shale with 2 bands of grey shale 3/4" and 2" thick			24'0"			R.C.			Longest piece 4" 35 fractures
			29'0"						100% recovery but 6" of core dropped out & grd. over.
Red-brown shale, 3 bands of grey shale 1/4" to 1 1/2" thick			34'0"			R.C.			Longest piece 2 1/2" 37 fractures 100% recovery
Red-brown shale, 4 bands of grey shale 1/4" to 1 1/2" thick			39'0"			R.C.			Longest piece 2 1/2" 38 fractures 4'6" Recovery 90%
Red-brown shale, 6 bands of grey shale 1/4" to 1 1/2" thick			44'0"			R.C.			Longest piece 2 1/2" 47 fractures 4'10" recovery 80%

[illegible]







**e. m. peto associates ltd.**  
**SOIL ENGINEERING SERVICE - TORONTO, ONTARIO**  
**BOREHOLE LOG**

Job Name Chedoke Expressway, C.N.R. Job No. 6003  
 Client Department of Highways, Ont. Casing BX  
 Datum Client's Compiled By J.N.

Borehole No. 10  
 Boring Date January 7, 8th, 1960  
 Checked By E.M.P.

**SAMPLE CONDITION**

 **UNDISTURBED**  
 **FAIR**  
 **DISTURBED**  
 **LOST**

**SAMPLE TYPE**

A.S. AUGER SAMPLE  
 C.S. CASING SAMPLE  
 S.S. 2" STANDARD SPLIT TUBE SAMPLE  
 S.L. SPLIT BARREL WITH LINERS  
 S.T. THIN-WALLED SHELBY TUBE SAMPLE  
 W.S. WASH SAMPLE  
 R.C. ROCK CORE

**ABBREVIATIONS**

V.T. IN SITU VANE SHEAR TEST  
 C. SOIL SHEAR STRENGTH LBS/SQ.FT.  
 W.L. WATER LEVEL IN CASING  
 W.T. GROUND WATER TABLE IN SOIL  
 W.T.P.L. WETTER THAN PLASTIC LIMIT  
 D.T.P.L. DRIER THAN PLASTIC LIMIT

SOIL DESCRIPTION	COLOR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft.	Natural Moisture Content	WATER LEVELS & REMARKS
Ground surface			0'0"						
Silty clay, sand & gravel	Red-brwn.to blk.		322.17		X	C.S.			Sat.
Coarse sand to grvl.some clay	Blk-gr to blk				X	C.S.			
content (Fill)			4'0"		X	S.S.	2	45.3	Sat.
Shale	Red-brn.to grey				X	C.S.			Dry
Shale & frag.of grey shale	Red.-brn.				X	S.S.	180/6"	5.6	Dry
			7'1"			S.S.	200/1"		
Ran casing from 7'1" to 24'0"									
using concave bit									
(No attempt to recover core)									

Checked By ..... U. J. V.

## ABBREVIATIONS

V.T. IN SITU VANE SHEAR TEST

C. SOIL SHEAR STRENGTH LBS/SQ.FT.

W.L. WATER LEVEL IN CASING

W.T. GROUND WATER TABLE IN SOIL

W.T.P.L. WETTER THAN PLASTIC LIMIT

**D.T.P.L. DRIER THAN PLASTIC LIMIT**

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft.	Natural Moisture Content	WATER LEVELS & REMARKS
Ground surface			0'0"						
Topsoil	Dk. brown		343.39			C.S.			3" frost Sat.
Clay shale, organic matter	reddish-brn					C.S.			W.T.P.L.
Clay shale, frag. of gr. shale	Reddish brn		2'0"			C.S.			D.T.P.L.
Soft shale	Lt. olive-grey					S.S.	24	4.6	S. moist
Soft shale	As above					C.S.			Dry
Soft shale	As above		5'0"			C.S.			Dry
Soft shale, frag. of gr. shale	Red-brown					S.S.	47	11.2	A. dry
As above	As above					S.S.	130	11.4	A. dry
As above	As above					R.C.	cone from 8'-5' 7" (47% recovery)		
Soft shale	As above		10'0"			S.S.	130/5"	7.7	Longest unbroken pce. 5"
Med. hard shale with layers of sandy shale	As above with gr-green layers								Turns denser at 10'
with holes in it 10-13')						R.C.			10-15' 4' 4" recovery (87%)
									2 gr-green layers 2" thick
			15'0"						longest unbroken pce. 11"
As above	Reddish-brown					S.S.	100/2"		No sample in S.S.
									15-20' 4' 4" recovery (87%)
						R.C.			Loosing wash water at 16'
			20'0"						Longest unbroken pce. 12"
As above	As above with gr-green layers					S.S.	100/1"		No sample in S.S.
									20-25' 4' 7" recovery (92%)
						R.C.			2 gr-green layers 2" thick
			25'0"						Longest unbroken pce. 9"
As above	reddish-brown					S.S.	100/2"		No sample in S.S.
As above	As above					R.C.			25-26' 7 1/2" recovery (67%)
									Longest unbroken pce. 3"
						R.C.			26'-28' 2" 2 1/2" recovery 100%
									Longest unbroken pce. 3"
As above	As above with grey-green layers		30'0"						28' 2" 33' 5" 5 1/3" recovery 100%
						R.C.			Poss. perm. layer at 100'
									1 gr-green layer 1' thick
									30-31'
									Longest unbroken pce. 6"
As above	As above		35'0"			S.S.	100/1"		No sample in S.S.
									33' 3"-39' recovered
									4' 11" (88%)
									Longest unbroken pce. 5"
						R.C.	3 gr		3 gr-green layers 2"-6" thick
			40'0"						34'-44' 3" recovered 5' 3" 100%
As above	As above					R.C.			Longest unbroken pce. 4"
									3 gr-green layers 2"-4" thick
			45'0"						44' 3"-49' 6" recov. 5' 3" (100%)
As above	As above					R.C.			Longest unbroken pce. 6"
									2 grey-green layers 2" thick
As above	As above		50'0"						49' 6" - 54' 0" recovered 5' 3" (100%)

Checked By U. J. V.

## ABBREVIATIONS

V.T.	IN SITU VANE SHEAR TEST
C.	SOIL SHEAR STRENGTH LBS/SQ.FT.
W.L.	WATER LEVEL IN CASING
W.T.	GROUND WATER TABLE IN SOIL
W.T.P.L.	WETTER THAN PLASTIC LIMIT
D.T.P.L.	DRIER THAN PLASTIC LIMIT

SOIL DESCRIPTION	COLOR	Density or Consistency	Depth Elevation	Legend	Sample No and Condition	Sample Type	No. of Blows per Ft	Natural Moisture Content	WATER LEVELS & REMARKS
Ground surface			0'0"						
Topsoil	Dk. brown		343.39			C.S.			3" frost Sat.
Clay shale, organic matter	Reddish-brn					C.S.			W.T.P.L.
Clay shale, frag. of gr shale	Reddish brn		2'0"			C.S.			D.T.P.L.
Soft shale	Lt. olive-grey					S.S.	24	4.6	S. moist
Soft shale	As above					C.S.			Dry
Soft shale	As above		5'0"			C.S.			Dry
Soft shale, frag. of gr. shale	Red-brown					S.S.	47	11.2	A. dry
As above	As above					S.S.	130	11.4	A. dry
As above	As above					R.C.	cone from 8'-9'7" (47% recovery)		
Soft shale	As above		10'0"			S.S.	130/5"	7.7	Longest unbroken pc. 5"
Med. hard shale with layers of sandy shale with holes in it 10-13')	As above with gr-green layers					R.C.			Turns denser at 10' 10-15' 4'4" recovery (87%) 2 gr-green layers 2" thick longest unbroken pc. 11"
			15'0"			S.S.	100/1"		No sample in S.S. 15-20' 4'4" recovery (87%) Loosing wash water at 10' Longest unbroken pc. 12"
As above	Reddish-brown					R.C.			No sample in S.S. 20-25' 4'7" recovery (92%) 2 gr-green layers 2" thick Longest unbroken pce 9"
			20'0"			S.S.	100/4"		No sample in S.S. 25-26' 7 1/2" recovery (67%) Longest unbroken pce. 3"
As above	As above with gr-green layers					R.C.			20' 28' 2" 2'2" recovery 100% Longest unbroken pc. 4" 28' 2" 3' 5" 5'3" recovery Poss. perm. laygs. at 100% 1 gr-green layer 1" thick 30-31' Longest unbroken pce. 6"
As above	reddish-brown		25'0"			S.S.	100/1"		No sample in S.S. 33' 5" 39' recovered 4'11" (88%) Longest unbroken pc. 5" 3 gr-green layers 2"-6" thick
As above	As above					R.C.	3 gr		34'-44'3" Recovered 5'3" 100% Longest unbroken pc. 4" 3 gr-green layers 2"-4" thick
			40'0"			R.C.			44'3"-49'6" recov. 5'3" (100%) Longest unbroken pce. 6" 2 grey-green layers 2" thick
As above	As above		45'0"			R.C.			49'6" - 51'1" Recovered 5'3" (100%) Longest unbroken pc. 5" 1 grey-green layer 2" thick
			50'0"			R.C.			49'6" - 59' recovered 2'4" (55%) 55'2" 2" laygs. grey-green Longest unbroken piece is 3"
As above	As above 56'-59' grey green		55'0"			R.C.			
			59'0"						Hole terminated at 59'0"

30M5-12

GEOCREC No.

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

February 5, 1960.

FOUNDATION INVESTIGATION - by  
L.M. Peto Associates, Ltd.

Attention: Mr. E. McCombie.

Re: Chedoke Expressway  
at  
C.N.R. & C.P.R. Tracks  
District 4

This memo accompanies a report on the foundation conditions at the above proposed subway location submitted by L. M. Peto Associates, Ltd. The information contained in this report is primarily factual, and if the Design Group have any comments with respect to the information contained therein, or the interpretation of data presented, we would be pleased to discuss this with you.

As a result of a meeting held in C.C. Parker's Office, Hamilton, Thursday, February 4th, the alignment at the location of these two structures, as given in this report, was confirmed. Also, a result of this committee meeting was that the median width at the subway location would be reduced to 30 feet.

C.C. Parker have been handed their copy of this report and it will not be necessary for you to forward one to them.

*L. G. Soderman*

LGS/def  
Attach.

L. G. Soderman,

PRINCIPAL SOILS & FOUNDATIONS ENGINEER

cc: Messrs. A. M. Toye (2)  
H. A. Tregaskes  
D. G. Ramsay  
I. Campbell  
A. L. Richardson  
E. P. Weber  
Foundation Section  
Gen. Files.

30M5-12

## MEMORANDUM

FILE WITH  
PETO'S REPORT

TO: H. Amor

DATE: August 17, 1962

FROM: I. M. Wallace

SUBJECT: Canadian Pacific Railway Subway - Highway 403 - Bridge No. 9

Excavation at the east abutment has shown that the wing walls will not rest on hard shale, but instead on old fill material placed for the old railway roadbed. Also it was necessary to excavate deeper at the south-east corner of the abutment footing to reach rock or hard shale.

The abutment and wing wall construction will remain as shown on the plans with the following changes:

1. 15 - 2" dia. x 6'0" long dowels are to be drilled 4 feet into the shale and grouted, spaced about 6' each way, to dowel the main abutment footing to the shale bed.
2. The additional excavation will be filled with concrete of 2,000 p.s.i. minimum strength at 28 days.
3. The wing walls will be built as shown on the plans but the tie beam is to be lowered so that the underside of tie beam is resting on the footing pad of the back 9'0" section of wingwall or 13'0" above elev. 316.56.

Mr. K. Selby has viewed the site and has approved the above changes.

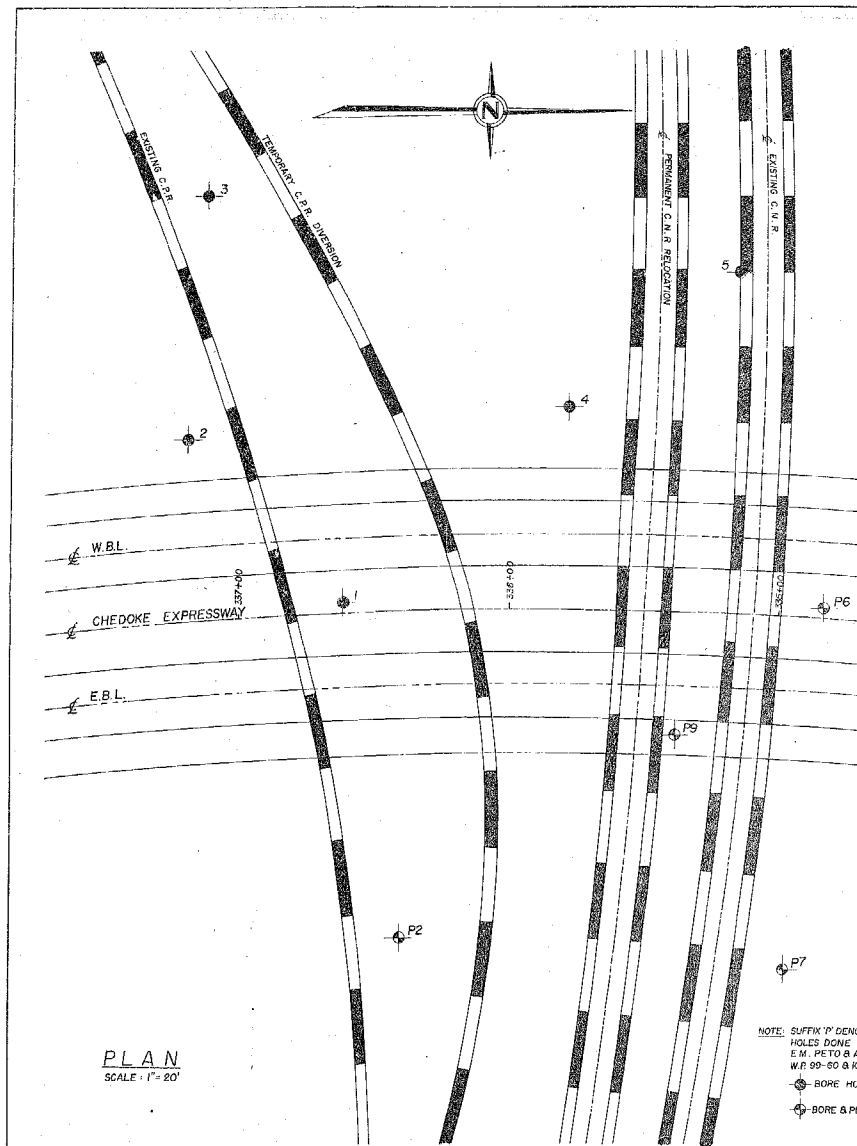


I. M. Wallace.

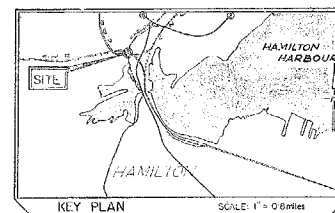
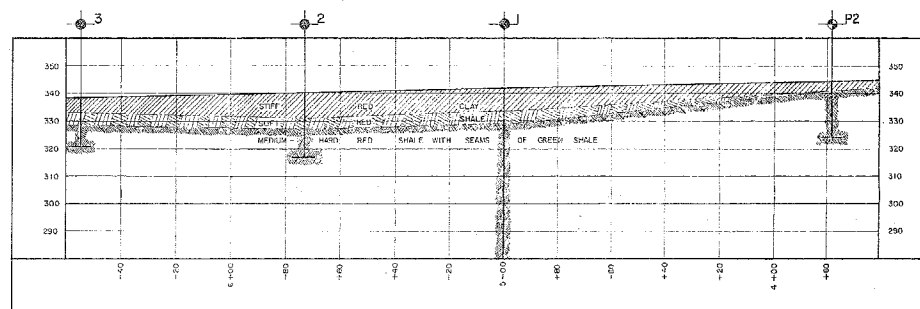
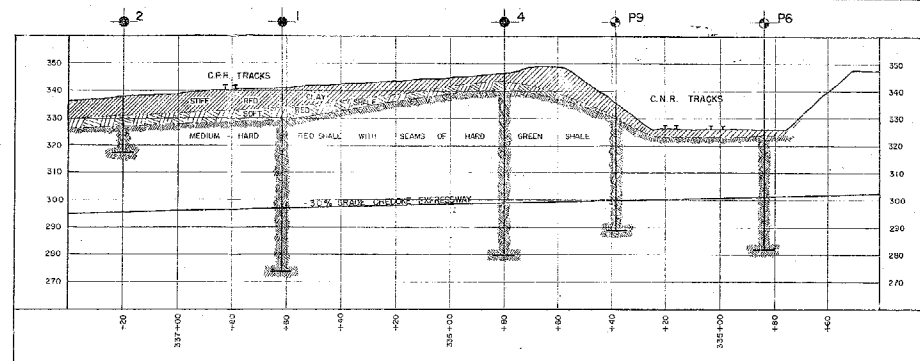
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c.c.: Mr. K. Selby, D.H.O. Soils Division ✓  
Mr. H. C. Nixon

2001 10 23 01 03 00



NOTE: SUFFIX "P" DENOTES  
HOLES DONE BY  
E.M. PETO & ASSOCIATES  
W.P. 99-60 & 100-60  
● BORE HOLE  
● BORE & PENETRATION HOLE



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

NOTE: ALL ELEV. REFER TO GEODETIC

DEPARTMENT OF HIGHWAYS — ONTARIO			
MATERIALS & RESEARCH SECTION			
C.N.R. & C.P.R. CROSSINGS			
SHOWING POSITIONS & ELEVATIONS OF HOLES			
HIGHWAY 403 DISTRICT 4		COUNTY WENTWORTH	
LOCATION HAMILTON			
DRAWN BY: J. J. JONES	CHECKED BY: J. J. JONES	W.P. 99-60 & 100-60	
DATE: 8 JUNE 1960	APPROVED BY: J. J. JONES	SCALE: 1" = 20'	
60-F-35A			

