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57-F-203C

W.P. # 558-56

#

Hwy 5

C.P.R. OVERHEAD

COOKSVILLE

BA 508

H. P. CONNOR  
I. M. WALLACE

C. C. PARKER  
W. D. PROCTOR

D. C. CRAMM  
J. S. R. BECK

C. C. PARKER AND ASSOCIATES LIMITED  
CONSULTING ENGINEERS

HAMILTON

LONDON

OUR REFERENCE: JOB NO. H 464

YOUR REFERENCE NO. WP558-56

795 Main Street West,  
Hamilton, Ontario,  
April 8, 1957.

Bridge Design Office,  
Department of Highways, Ontario,  
Parliament Buildings,  
Toronto, Ontario.

Attention: Mr. S. McCombie

Dear Sir,

Re: C.P.R. Overhead,  
Highway No 5 at Cooksville

Enclosed please find, for your reference, two copies  
of a report on soil investigations at the site of the above  
noted bridge. Borings were made, and the report prepared, by  
Universal Geotechnique Ltd.

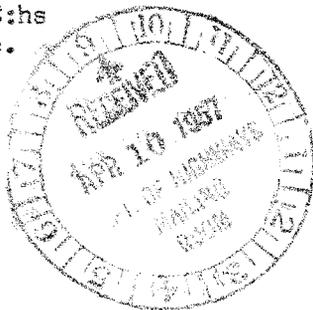
Yours very truly,

C. C. PARKER & ASSOCIATES LIMITED



D. C. Cramm

DCC:hs  
Enc.



DA 500

UNIVERSAL  
**GEOTECHNIQUE**  
LIMITED



REPORT  
  
on  
  
SUBSURFACE EXPLORATION  
  
for  
  
C.P.R. OVERHEAD  
  
HIGHWAY N° 5  
  
at  
  
COOKSVILLE, ONTARIO

2924 Bloor Street West,  
Toronto 18, Ontario.

REPORT

on

SUBSURFACE EXPLORATION

for

C.P.R. OVERHEADHIGHWAY N° 5

at

COOKSVILLE, ONTARIOINTRODUCTION

The Department of Highways, Province of Ontario, propose to construct a bridge to carry the existing Highway N° 5 over the C.P.R. tracks at Cooksville to designs being prepared by C. C. Parker & Associates Limited, Consulting Engineers of Hamilton and London, Ontario.

This Report describes the results of a subsurface exploration carried out at the proposed site in accordance with instructions issued by the Consulting Engineers on behalf of the Department of Highways. The work was performed during the period 7th to the 14th of March, 1957.

THE SITE

The site of the proposed bridge is at the existing crossing of the C.P.R. tracks and Highway N° 5, just East of Cooksville C.P.R. Station.

SUBSURFACE EXPLORATION

Subsurface exploration comprised a total of 8 exploratory borings located in positions as shown on drawing N° 1 accompanying this Report and which has been reproduced from the Consulting Engineers' plan dated 6th of March, 1957.

Exploration commenced with borehole BH.7 and after the first few borings had disclosed the presence of shale comparatively close to the ground surface, this information was communicated to the Engineers and it was agreed that the original programme of 8 borings should be completed so as to determine the depths of the shale at these various positions.

Soil samples were obtained from the overburden at approximately every 5 feet and where noticeable changes of strata occurred the elevation of such changes were recorded.

The state of compaction and consistency of the overburden was determined by the standard penetration test carried out during the operation of soil sampling. (The standard penetration test, as referred to in this Report, involves the recording of the number of blows (N) of a 140 lb. hammer falling 30 inches that are required to drive a 2 inch diameter split barrel sampler 1 foot into the soil at the bottom of the borehole).

Details of the strata encountered in all the boreholes and the results of standard penetration tests, together with section A-A' and the borehole location plan, form part of this Report.

Subsurface conditions given in this Report are those indicated by material encountered in the boreholes. The accuracy of extrapolation to obtain the soil profile should be associated directly with the geological conditions and inversely with the spacing of the boreholes.

## DISCUSSION

From the information derived from the boreholes, it can be concluded that the material down to the explored depths can be divided into the following categories:

(a) TOP SOIL

(b) FILL

This material comprises sand, gravel, clay and ashes together with some organic matter.

(c) SAND

Included in this category are the sands and silty sands that generally exist immediately above the weathered surface of the bedrock.

(d) CLAY

This material was encountered in boreholes BH.3, BH.4, BH.6 and BH.8; in BH.3 the material consisted of a thin seam of black silty organic clay and again in boreholes BH.6 and BH.8 organic clay was encountered. In borehole BH.4 a hard grey silty clay was found immediately above the bedrock.

(e) SHALE

This material comprises the bedrock underlying the area and in this category is included the upper zone of weathered rock.

Physiographically the site is to be included in the sand plain typical of the locality and the underlying bedrock is the Dundas formation sometimes referred to as the Lorraine Shale of the Ordovician System. It will be observed from section A-A' on drawing N<sup>o</sup> 2 that the shale exhibits the characteristic gentle North-West dip of the palaeozoic rocks of the Toronto and Hamilton area.

Referring now to the engineering properties of the sedimentary deposits, it will be observed that the sand generally exists in a compact state although at the location of both borehole BH.6 and BH.7 the material is not so dense. The underlying shale shows some variation in the depth to which it is weathered, as can be seen from the detailed descriptions on the borehole logs. This variation in weathering as

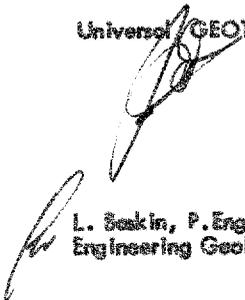
observed from the isolated points covered by borings would indicate that if foundations were taken to the shale, the surface of the formation should be observed after excavation to ensure that no erratic condition occurs.

The elevations of the boreholes have been related to an assumed datum of 100.00 at the top of the South rail of the C.P.R. tracks at the centre of the existing highway, and if foundations for the bridge are located at say about elevation 87.00 the safe bearing capacity for spread footings deriving support from the sand is assessed as 5000 lbs. per square foot. It will, however, be observed that elevation 87.00 would occur in the shale in the vicinity of boreholes BH.6 and BH.7. As the two materials have differing characteristics it would be generally undesirable to locate a continuous footing partly on one material and partly on the other.

If the foundations to the bridge are taken to the shale, and this would possibly appear desirable to obtain uniformity and practicable because of the relatively close proximity of the rock to the ground surface, the safe bearing capacity for design purposes is assessed as ten tons per square foot near the upper surface of the unweathered shale.

Due to the high water table that existed and the generally fine sand which constituted the overburden, any excavations for the foundations of the bridge would probably have to be close sheeted and a cut-off obtained in the rock.

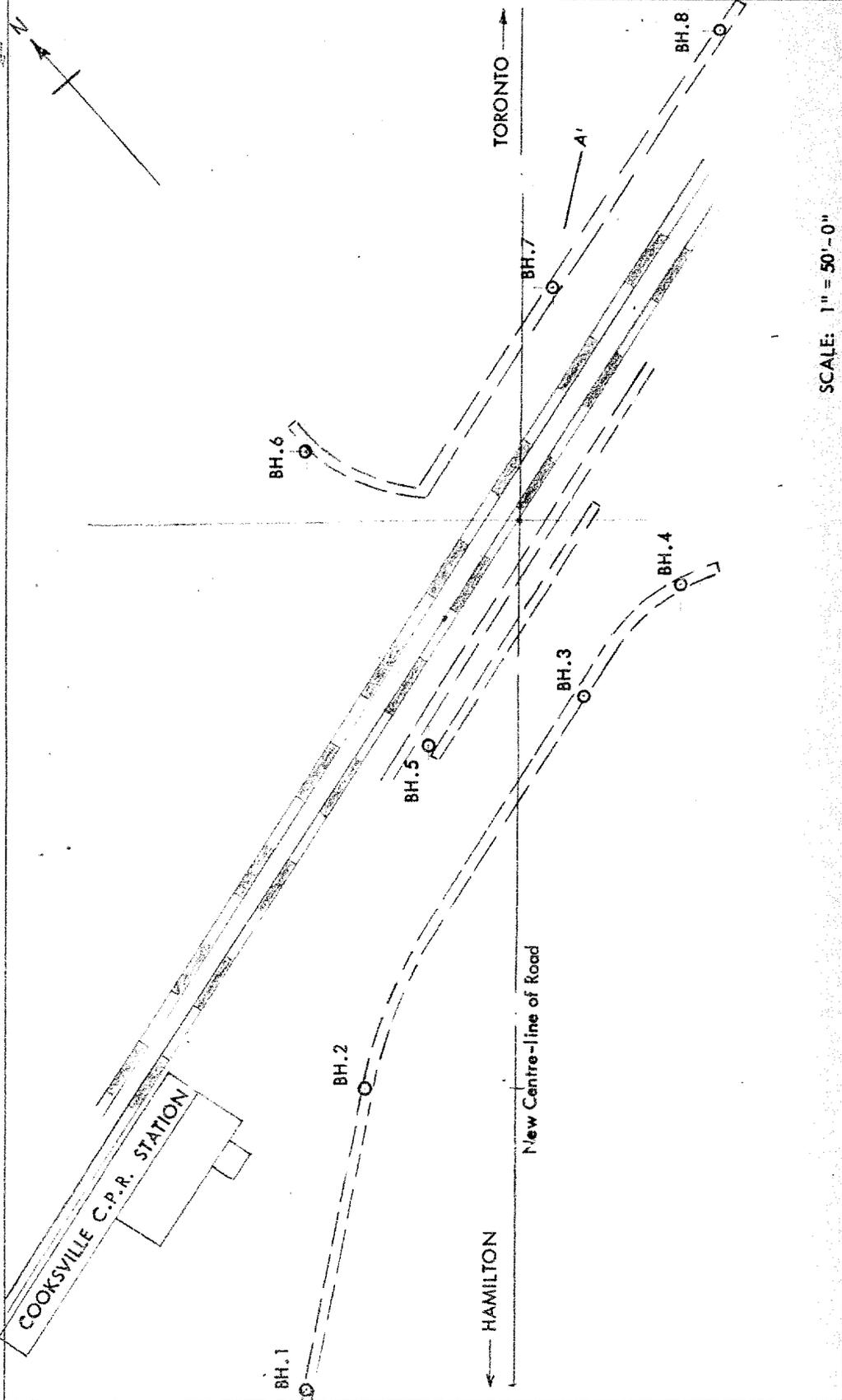
Universal GEOTECHNIQUE Limited,



L. Siskin, P. Eng.  
Engineering Geologist.

Report N° T.203/57

April, 1957.

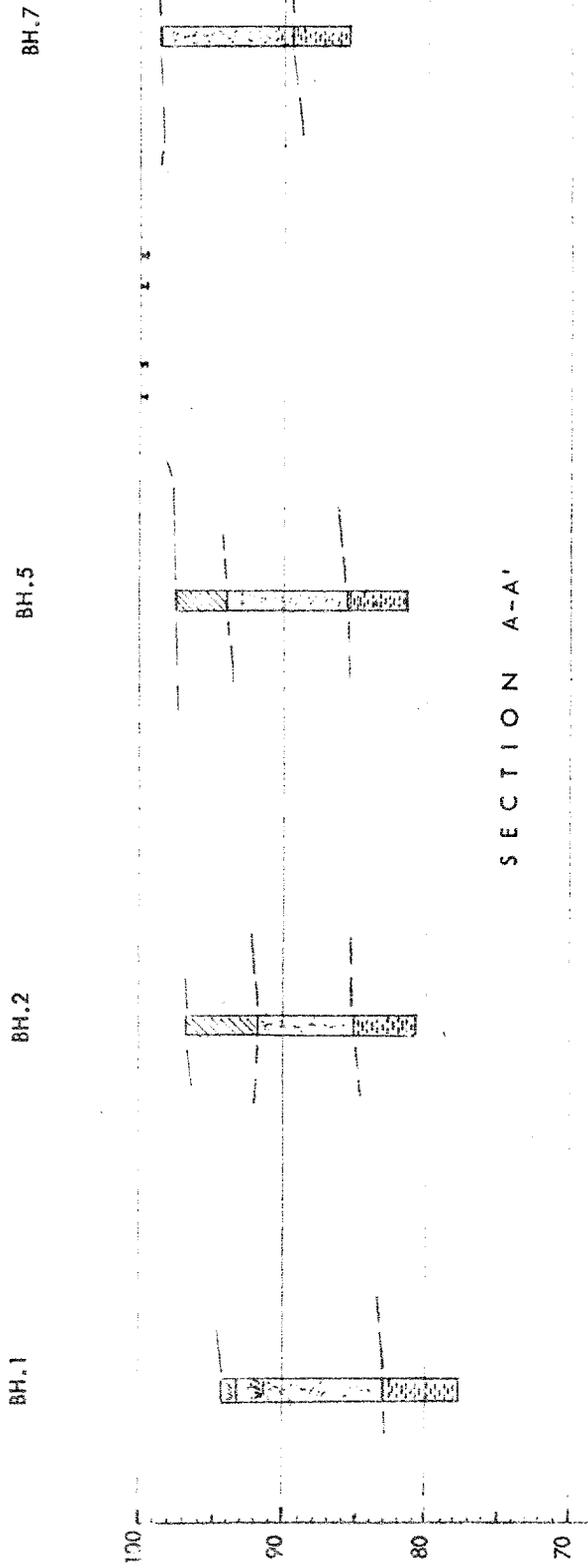


PROJECT C.P.R. Crossing, Highway 14° 5, Cooks-  
TITLE Borehole Location Plan ville.  
DRG. NO. 1 ORDER NO. T.203/57



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LIMITED

A



SECTION A-A'

LEGEND

-  TOP SOIL
-  FILL
-  SAND
-  SHALE

SCALE  
 Horizontal 1" = 50'-0"  
 Vertical 1" = 10'-0"

PROJECT C.P.R. Crossing, Highway N° 5, Cooks-  
ville.  
 TITLE Borehole Section  
 DRG. NO. 2 ORDER NO. T.203/57



UNIVERSAL  
**GEOTECHNIQUE**  
 LIMITED

SOIL MECHANICS LABORATORY

**BOREHOLE LOG**

PROJECT C. P. R. Crossing, Highway N° 5, Cooksville, Ontario. ORDER NO. T.203/57

CLIENT C. C. Parker & Associates Limited, Hamilton, Ontario.

BOREHOLE NO. BH. 1 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING ---

FORM G-1A (800-41-84)  
L. SHEPHERDSON, J.O.

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAM	DEPTH	THICKNESS	N	REMARKS
TOP SOIL	94.2			Zero	Water Table		
				1'-0"			
Loose brown fine silty SAND with traces of organic matter.			• 1			5	Wet
Firm grey brown silty fine SAND. Some slight iron staining, occasional gravel.			• 2			25	do High dry strength.
Very dense medium to coarse SAND with fine to medium subangular gravel.			• 3	6'-5"		56	do
Very dense grey calcareous fine silty SAND.			• 4	8'-0"		73	Wet Low dry strength.
Soft grey weathered shale.			• 5	11'-5" 11'-9"		50 (3")	Damp
Grey argillaceous limestone. Broken rock.							12'-4" - 14'-4" Core Recovery 33%
Bands of grey calcareous shale and argillaceous limestone. Some jointing parallel to core length.							14'-4" - 16'-4" Core Recovery 63%
				16'-4"			End of Borehole

SCALE: 1 cm. = 1 ft. \* DISTURBED SAMPLE

UNDISTURBED SAMPLE

SOIL MECHANICS LABORATORY

**BOREHOLE LOG**

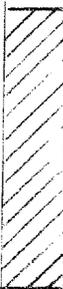
PROJECT C. P. R. Crossing, Highway N° 5, Cookville, Ontario. ORDER NO. T.203/57

CLIENT C. C. Parker & Associates Limited, Hamilton, Ontario.

BOREHOLE NO. BH.2 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING     

FORM G-1A 500-6-54  
UNIVERSAL LTD.

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
Firm brown fine to coarse sand and fine to medium broken gravel. Traces of clay. FILL.	96.75		• 1	Zero			
						14	Moist
							Water Table 
Firm brown fine sand with layers of grey clay, some iron staining and traces of ashes. FILL.			• 2	5'-0"		16	Wet High dry strength.
Firm brown fine SAND.				7'-0"			
Dense grey calcareous silty fine SAND.			• 3	8'-10"		55	Wet Low dry strength.
Dense grey fine to coarse SAND and fine to medium GRAVEL, generally subangular to subrounded.			• 4			72	Wet
Soft grey weathered shale.			• 5	11'-9"		60 (3")	
Dark grey laminated shale with calcareous bands.							12'-0" - 14'-0" Core Recovery 85%
do							14'-0" - 16'-0" Core Recovery 80%
				16'-0"			End of Borehole

SOIL MECHANICS LABORATORY

**BOREHOLE LOG**

PROJECT C. P. R. Crossing, Highway N<sup>o</sup> 5, Cookville, Ontario. ORDER NO. T.203/57

CLIENT C. C. Parker & Associates Limited, Hamilton, Ontario.

BOREHOLE NO. BH.3 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING ---

FORM G-11A 300-6-54  
UNIVERSAL STATIONERS CO. *Canada*

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
Firm grey-brown-black coarse sand, gravel and ashes. FILL.	96.4		• 1	Zero		26	Moist
					Water Table		
Black silty organic CLAY.				3'-4"			
Firm brown fine silty SAND with some broken gravel. Slight iron staining.			• 2	3'-9"		24	Wet Medium dry strength.
				4'-11"			
Dense grey brown fine to coarse SAND and fine to medium GRAVEL, clayey concentrations.			• 3			36	Wet Medium dry strength.
				8'-8"			
Dense grey calcareous fine silty SAND.			• 4			62	Wet Low dry strength.
Soft grey weathered shale.			• 5	11'-9"		60 (3")	
Broken grey somewhat calcareous shale with bands of limestone.				12'-0"			12'-0" - 14'-0" Core Recovery 50%
Soft grey laminated shale with bands of limestone. Limestone exhibits some solution cavities.							14'-0" - 16'-0" Core Recovery 67%
				16'-0"			End of Borehole

SOIL MECHANICS LABORATORY

**BOREHOLE LOG**

PROJECT C. P. R. Crossing, Highway N° 5, Cooksville, Ontario. ORDER NO. T.203/57

CLIENT C. C. Parker & Associates Limited, Hamilton, Ontario.

BOREHOLE NO. BH.4 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING ---

FORM G-1A 500-G-84  
UNIVERSITY OF TORONTO

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
TOP SOIL	94.0			Zero	Water Table		
Loose brown fine silty SAND.			● 1	0'-6"		5	Wet
Dense grey brown fine silty SAND with occasional fine gravel. Some iron staining.			● 2	3'-7"		61	Wet Low dry strength.
Hard grey silty CLAY with lenses of brown sand and fragments of shale. Soft grey weathered shale.			● 3	5'-10"		58 (6")	Damp Medium dry strength
Broken grey somewhat calcareous shale.			● 4	7'-11" 8'-2"		50 (3")	8'-2" - 10'-2" Core Recovery 50%
Grey argillaceous limestone. Bands of calcareous shale.				12'-2"			10'-2" - 12'-2" Core Recovery 70%
				End of Borehole			

SOIL MECHANICS LABORATORY

**BOREHOLE LOG**

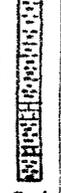
PROJECT C. P. R. Crossing, Highway N<sup>o</sup> 5, Cooksville, Ontario. ORDER NO. I.203/57

CLIENT C. C. Parker & Associates Limited, Hamilton, Ontario.

BOREHOLE NO. BH.5 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING \_\_\_\_\_

FORM G-1A 506-6-54  
UNITED STATIONERY CO.

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
	97.4			Zero			
Firm dark brown sandy clay with broken gravel and little organic matter. FILL.			● 1			5	Moist
					Water Table 		
Firm brown clayey SAND. Some iron staining.			● 2	3'-5"		12	Wet Medium to high dry strength.
Dense grey brown calcareous fine silty SAND with occasional subrounded gravel. Traces of bedding.			● 3	5'-3"		32	Wet Low dry strength.
Very dense fine to coarse SAND and fine to medium GRAVEL. Generally subrounded.			● 4	8'-4"		80	
Soft grey weathered shale.				12'-0"			12'-2" - 14'-2"
Soft grey laminated shale joints parallel to core length.				12'-2"			Core Recovery 50%
Dark grey laminated shale with bands of grey limestone. Joints about 20° to core length.				16'-2"			14'-2" - 16'-2"
				End of Borehole			Core Recovery 71%

SOIL MECHANICS LABORATORY

**BOREHOLE LOG**

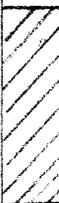
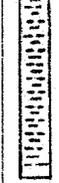
PROJECT C. P. R. Crossing, Highway N° 5, Cooksville, Ontario. ORDER NO. T.203/57

CLIENT C. C. Parker & Associates Limited, Hamilton, Ontario.

BOREHOLE NO. BH.6 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING     

FORM G-1A 2006-84  
UNIVERSAL LIMITED

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
Loose dark brown clayey fine to coarse sand with gravel, ashes and some organic matter. FILL.	98.2		● 1	Zero			
					Water Table	6	Moist
Firm dark brown to black sandy silty CLAY with organic matter.			● 2	3'-5"		10	Wet
Firm grey fine to coarse SAND with fine to medium subrounded GRAVEL.			● 3	5'-7"		25	Damp
Soft grey weathered shale.			● 4	8'-6" 8'-10"		58 (2")	
Soft grey laminated shale							8'-10" - 10'-10" Core Recovery 58%
do							10'-10" - 12'-10" Core Recovery 83%
				12'-10"			End of Borehole

SCALE: 1 cm. = 1 ft. ● DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

SOIL MECHANICS LABORATORY

**BOREHOLE LOG**

PROJECT C. P. R. Crossing, Highway N<sup>o</sup> 5, Cooksville, Ontario. ORDER NO. T.203/57

CLIENT C. C. Parker & Associates Limited, Hamilton, Ontario.

BOREHOLE NO. BH.7 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING     

FORM G-1A REVISION 10-1-57

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
	98.6			Zero			
Firm brown sand with broken gravel and fine subrounded gravel.			● 1			8	Damp
Loose brown fine sand and grey-brown silty clay.			● 2	4'-6"	Water Table ▽	3	Moist Low to medium dry strength.
Firm brown clayey fine to coarse SAND with fine to medium subrounded gravel.			● 3			18	do Medium dry strength.
Soft grey weathered SHALE.			● 4	9'-0" 9'-3"		50 (2-1/2")	
Dark grey laminated broken SHALE with thin calcareous bands.							9'-3" - 11'-3" Core Recovery 45%
do							11'-3" - 13'-3" Core Recovery 90%
				13'-3"			End of Borehole

SOIL MECHANICS LABORATORY

**BOREHOLE LOG**

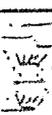
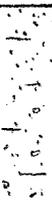
PROJECT C. P. R. Crossing, Highway N° 5, Cooksville, Ontario. ORDER NO. T.203/57

CLIENT C. C. Parker & Associates Limited, Hamilton, Ontario.

BOREHOLE NO. BH.8 DIAMETER 2-1/2" CASING 2-1/2"

BOREHOLE LOCATION See Plan INCLINATION Vertical BEARING ---

FORM G-1A 800-6-84  
UNIVERSITY OF TORONTO

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
	93.4			Water Table 			
				Zero			
Soft grey to black sandy CLAY with organic matter.			● 1	2'-0"		4	Moist
Dense grey clayey fine to coarse SAND and fine to medium generally subrounded gravel.			● 2	5'-7"		55	Moist
Hard grey silty CLAY with considerable grey shale fragments.			● 3			55	Moist
do			● 4	9'-10"		50 (2")	
Dark grey laminated SHALE with calcareous bands.				12'-10"			9'-10" - 12'-10" Core Recovery 55%
				End of Borehole			