55-F-227C

TRANS-CANADA HWY

MOON RIVER

RACEY, MacCALLUM AND ASSOCIATES LIMITED

BA.439

A COMPANY OWNED, DIRECTED AND OPERATED BY

Consulting Engineers
AND ASSOCIATED STAFF

Directors:
DONALD C. MacCALLUM, B.ENG., M.E.I.C., P.ENG.
H. JOHN RACEY, B.SC., M.E.I.C., P.ENG.
JOHN S. LOCKHEAD, B.ENG., M.E.I.C., P.ENG.
JOHN A. NORLIN, B.A., M.SC.
ROBERT H. QUINTAL, M.A.SC., M.E.I.C., P.ENG.
A. ERIC RANKINE, B.SC., A.M.I.C.E., M.E.I.C., P.ENG.
J. B. CHALLIES, D.ENG., LL.D., M.E.I.C., P.ENG.

MONTREAL: 4123 SHERBROOKE STREET WEST. FITZROY 5261
TORONTO: 33 BLOOR STREET EAST. WALNUT 2-9071

Affiliations:
THE E. B. ALLEN INSPECTION COMPANY
ISOTOPE PRODUCTS LIMITED, RADIOGRAPHERS
IRVING P. KRICK, PH.D., METEOROLOGIST
JACQUES POULIN, QUEBEC LAND SURVEYOR
THE VIBRATION ENGINEERING COMPANY

REPORT NO. S-500-501/55/T-129 AND FINAL

310 Odeon Building,
20 Carlton Street,
Toronto, Ontario.

July 30th, 1955.

55-F-227C

Ontario Department of Highways,
c/o Lazarides, Lount and Partners,
79 Scollard Street,
TORONTO, Ontario.

RE: SOILS INVESTIGATION FOR PROPOSED BRIDGE CROSSING THE MOON RIVER WNW OF BALA, MUSKOKA (TRANS-CANADA HIGHWAY)

Dear Sirs:

We have completed the required nine (9) soundings at the above mentioned site and now wish to report as follows:

LOCATION OF THE SITE AND OF THE TEST HOLES (See Enclosure)

The site for the proposed bridge is located WNW of Bala, Muskoka, where the new Trans-Canada Highway will cross the Moon River.

Nine (9) soundings were carried out at the location shown on client's sketch plan. Three of the required soundings were located in the river. Marking off and levelling was done by our engineer in the field.

THE FIELD WORK

The field work for the nine soundings was begun on July 7th and completed on July 9th, 1955.

THE FIELD WORK Cont'd

The work was carried out with a pressure pump and AXT rods. The open rod was pushed into the ground to refusal on bedrock at all the nine spots. The diamond drill brought to the site was therefore not put into operation. The soundings in the river were carried out by aid of two boats, carrying the equipment and serving as a float.

THE RESULTS

The soundings served to supplement the results obtained by the Department of Highways prior to this investigation. The work we carried out was performed on the southern embankment and 40' off shore in the river.

The depth to rock at the nine (9) locations was determined as follows (for the location of the test hole numbers see the accompanying enclosure).

Test Hole Number	Elevation of Ground Level or Water Level in River (Referring to El. of Station 358+00, this being obtained from contour lines by client)	Depth to Rock from Ground or Water Surface	Elevation of Rock Surface
1	665.1	41.5	623.6
2	666.5	43.8	622.7
3	666.9	43.3	623.6
4	670.3	38.5	631.8
5	668.7	41.0	627.7
6	669.5	42.0	627.5
7	665.0	43.6	621.4
8	665.0	37.2	627.8
9	665.0	36.5	628.5
Sta. 358+00	670.5	-	-

REPORT NO. S-500-501/55/T-129-1 & FINAL Cont'd

THE RESULTS Cont'd

There is a possibility that the ground elevation at Station 358+00 at the time the field work was carried out was actually about 1' lower than given by the contour lines due to prior grading.

The overburden was found to be very soft when the rods were pushed down. For Testhole No. 3 there was a 3.3' layer of coarse gravel found to be extending from 40 feet to bedrock at 43.3 foot depth. Another layer of gravel, apparently much thinner was noticed to be overlying bedrock in testhole No. 2. No gravel was met in the other holes.

Bedrock may be assumed to be of the same type as encountered on the surface at many places where excavating for the highway is being done by blasting in very solid paragneiss.

We trust that this information is satisfactory and remain,

Yours very truly,

RACEY, MacCALLUM AND ASSOCIATES LTD.

J. K. Tubbesing, P. Eng.

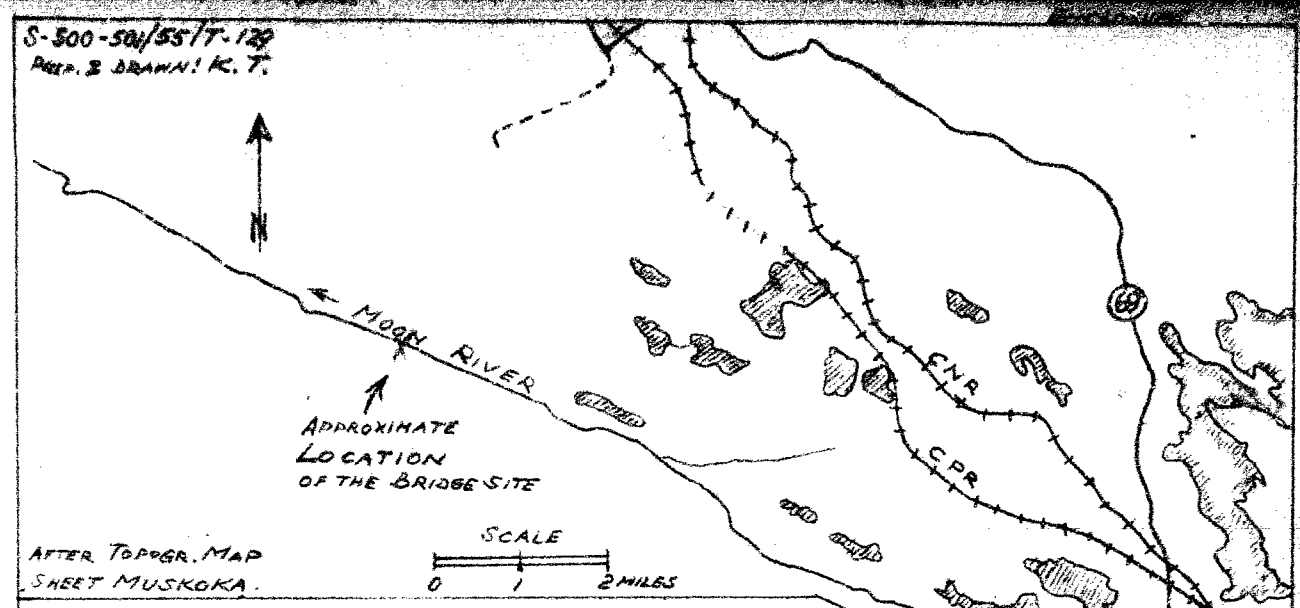
KT/PW

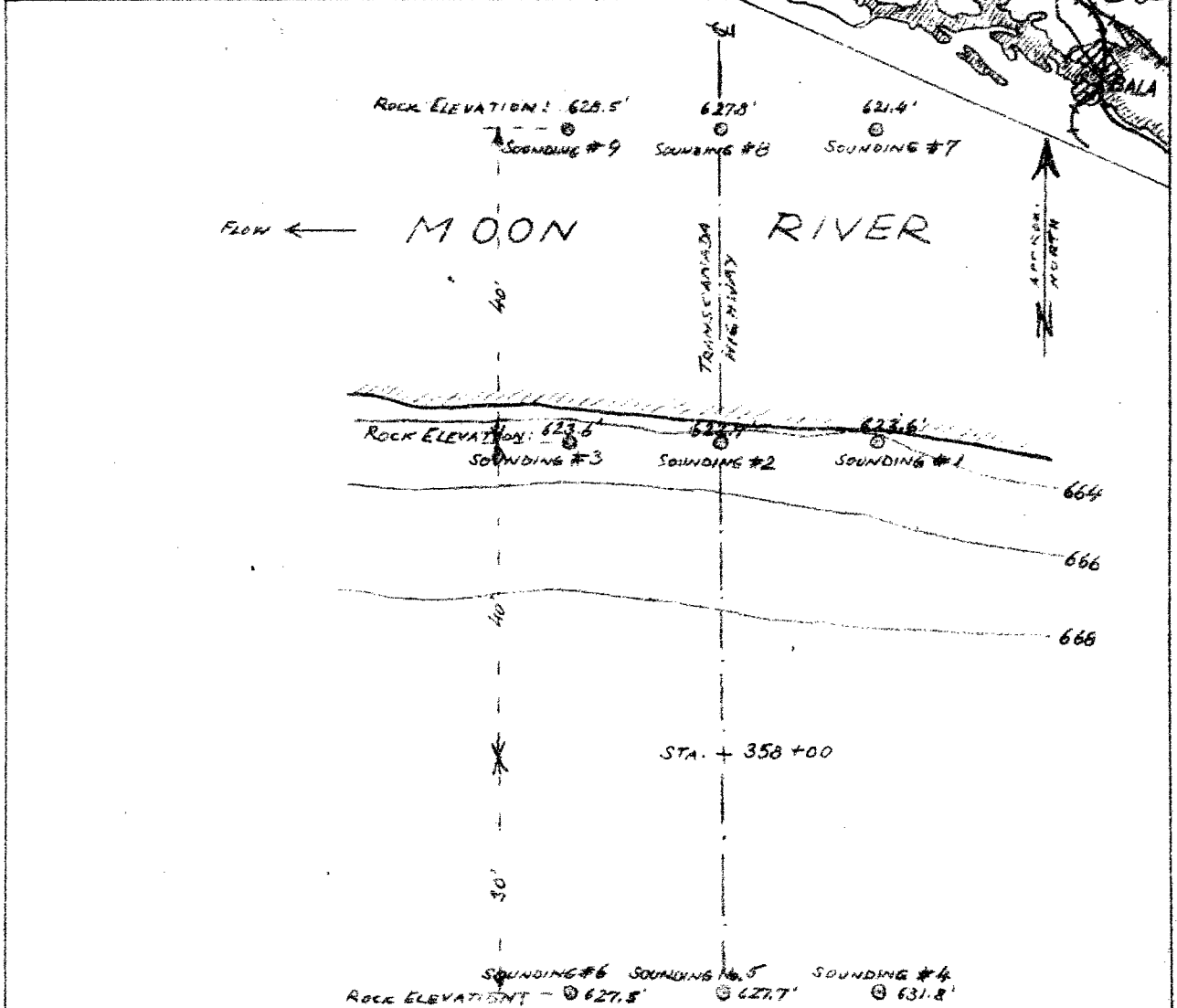
Original and two copies - Ontario Department of Highways, c/o Lazarides, Lount and Partners, Toronto, Ontario.

c.c.'s: 2 - Racey, MacCallum and Associates Limited, Montreal, P. Q.

1 - Soils Engineer

S-500-501/55/T-129
PREP. & DRAWN: K. T.





TRANSCANADA HIGHWAY
PROPOSED MOON RIVER BRIDGE
SKETCH SHOWING LOCATION OF SOUNDINGS TO ROCK.

RAGSY, MACCALLUM & ASSOCIATES

RACEY, MacCALLUM AND ASSOCIATES
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THE VIBRATION ENGINEERING COMPANY

REPORT NO. S-500-501/55/T-129-1

310 Odeon Building,
20 Carlton Street,
Toronto, Ontario.

August 11th, 1955.

Department of Highways for Ontario,
c/o Lasarides, Lount and Partners,
79 Scollard Street,
TORONTO, Ontario.

RE: SOILS INVESTIGATION FOR PROPOSED BRIDGE CROSSING THE MOON RIVER WNW OF BALA, MUSKOKA (TRANS-CANADA HIGHWAY)

Dear Sirs:

We have completed the required nine (9) soundings at the above mentioned site and now wish to report as follows:

LOCATION OF THE SITE AND OF THE TEST HOLES (See Enclosure)

The site for the proposed bridge is located WNW of Bala, Muskoka, where the new Trans-Canada Highway will cross the Moon River.

Nine (9) soundings were carried out at the location shown on client's sketch plan. Three of the required soundings were located in the river. Marking off and levelling was done by our engineer in the field.

THE FIELD WORK

The field work for the nine (9) soundings was begun on July 7th and completed on July 9th, 1955.

REPORT NO. S-500-501/55/T-129-1 Cont'd

THE FIELD WORK Cont'd

The soundings were carried out by pushing an open AXT rod in the soil with the help of a water jet supplied by a standard diamond drill pump. The soundings in the river were performed off a float formed by lashing two boats together. As this was considered to be a preliminary investigation, actual undisturbed sampling was not performed.

THE RESULTS

The soundings served to supplement the results obtained by the Department of Highways prior to this investigation. The work we carried out was performed on the southern embankment and 40' off shore in the river.

The depth to rock at the nine (9) locations was determined as follows (for the location of the test hole numbers see the accompanying enclosure).

Test Hole Number	Elevation of Ground Level or Water Level in River (Referring to El. of Station 358+00, this being obtained from contour lines by client)	Depth to Rock from Ground or Water Surface	Elevation of Rock Surface
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9	665.0	36.5	628.5
Sta. 358+00	670.5	-	-

REPORT NO. S-500-501/55/T-129-1 Cont'd

THE RESULTS Cont'd

There is a possibility that the ground elevation at Station 358+00 at the time the field work was carried out was actually about 1' lower than given by the contour lines due to prior grading.

The resistance to the penetration of the rod was found to be very low. For sounding No. 3 there was a 3'-3" layer of slightly higher resistance extending from a depth of 40 feet to a depth of 43.3 feet where absolute refusal was encountered. On the basis of the penetration resistance and the appearance of the wash water it is assumed that this layer consists of gravel and that the absolute refusal at 43.3' is bedrock. Another layer of gravel apparently much thinner was noticed to be overlying bedrock in Borehole No. 2. No gravel was met in the other holes.

The soft formation encountered close to the surface will not, in our estimation, present any unsuperable obstacle in the design of the structure as we understand that this structure will be supported directly on bedrock.

Bedrock may be assumed to be of the same type as encountered on the surface at many places where excavating for the highway is being done by blasting in very solid paragneiss.

We trust that the above information will be sufficient for the present needs. It is felt, however, that if the design of the structure involves a study of the soil properties, a supplementary programme at a more suitable time including undisturbed sampling should be considered.

Yours very truly,

RACEY, MacCALLUM AND ASSOCIATES LTD.

R. H. Quintal

RHQ/PW

Original and two copies - Lazarides, Lount and Partners, Toronto, Ont.
c.c.'s: 2 - Racey, MacCallum and Associates Limited, Montreal, P. Q.

B.A. 446 B

55-F-227C

RACEY, MacCALLUM AND ASSOCIATES
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MONTREAL: 4123 SHERBROOKE STREET WEST, FITZROY 5261
TORONTO: 33 BLOOR STREET EAST, WALNUT 2-9071

REPORT NO. S-500-501/55/T-129-2

310 Odeon Building,
20 Carlton Street,
Toronto, Ontario.

August 11th, 1955.

Department of Highways for Ontario,
c/o Lazarides, Lount and Partners,
79 Scollard Street,
TORONTO, Ontario.

RE: SOIL CONDITIONS AT PROPOSED BRIDGE CROSSING THE MOON RIVER NEAR BALA

Dear Sirs:

At your request we have examined, with Mr. Lount, the conditions at the subject site and we now wish to report as follows.

From the preliminary investigations at the site, it was found that a very soft formation existed in the whole river valley. At some points this formation was barely two feet thick before bedrock was encountered.

In the construction of the approaches to the bridge the road contractor has constructed an embankment of the required height which, upon being imposed on this soft formation, has caused a breakdown of the structure with a resultant base failure and landslide. The material transported amounts, in our estimation, to between 1000 and 2000 cubic yards of rock fill. This material is now spread in an area which would more or less cover the location of the north abutment.

REPORT NO. S-50C-501/55/T-129-2 Cont'd

On the south side the thickness of this formation is substantially greater and the embankment is presently being advanced to its final position. At this point some shear cracks in the superficial material are already apparent and it would appear that a breakthrough through the matting has occurred and some of the fill is penetrating in the soft formation.

It is felt that the soil in question which may be classified as a highly sensitive, thyxotropic, very soft clay, is a dangerous formation and should be investigated on the south side in view of the possibility that the present factor of safety against failure is less than good engineering procedure would recommend.

It should be noted that some of the soil carried over by the slide has been examined and visually appeared to be a silty clay in which shrinkage cracks had developed. The material, however, could be remoulded very easily in the hand and, with a very small effort, it was found possible to squeeze this soil through the fingers. This afforded a certain evaluation of the strength, according to all authorities, clay of the above strength should be classified as very soft and could possibly have a cohesion of one hundred pounds per square foot or less.

It is suggested, if deemed advisable by your engineers, that large diameter samples (three inches) be secured at least three points on the south bank of the river throughout the whole soft profile and that these samples be submitted to quick and quick consolidated triaxial tests. Furthermore, stress conditions within this soil below the fill, taking into consideration the worst possible conditions of drawdown which may be anticipated at the site, should be carried out in order to determine the margin of strength between the actual shear resistance and the shear stress developed. If this value is too low to guarantee that no slide

REPORT NO. S-500-501/55/T-129-2 Cont'd

will occur either at the present time, during construction, or at a subsequent time, it would be suggested that ways and means of forestalling this eventuality should be considered. We would suggest as one distinct possible solution the excavation of a trench with a drag-line across the right-of-way and the use of explosives to trigger the slide at the present time in order to obtain more stable conditions for the embankment.

While at the site the possibilities of this slide occurring were discussed as regards the difficulties which it will cause either to the design or to the construction of the bridge itself. As the bridge is to rest directly on bedrock, it is felt that the worst feature which might be anticipated would be a carry-over of the displaced material at a site which need be excavated at a later date thus requiring a slightly larger amount of excavation than anticipated. It is felt, however, that the prevention of this condition would be substantially more expensive than the actual remedial work.

Yours very truly,

RACEY, MacCALLUM AND ASSOCIATES LIMITED

R. P. QUINTAL

RPQ/FW

Original and two copies - Lazarides, Lount and Partners, Toronto, Ontario

c.c.'s: 2 - Racey, MacCallum and Associates Limited, Montreal, P. Q.

1 - Soils Engineer

BA 446 C

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Affiliations:
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IRVING P. KRICK, PH.D.,
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JACQUES POULIN,
QUEBEC LAND SURVEYOR
•
THE VIBRATION ENGINEERING COMPANY

MONTREAL: 4123 SHERBROOKE STREET WEST. FITZROY 5261
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310 Odeon Building,
20 Carlton Street,
Toronto, Ontario.

REPORT NO. S-500-501/55/T-129-3

22nd August, 1955.

Department of Highways for Ontario,
c/o Lazarides, Lount and Partners,
79 Scollard Street,
TORONTO, Ontario.

RE: FOUNDATION INVESTIGATION - PROPOSED BRIDGE SITE FOR TRANS-CANADA HIGHWAY CROSSING THE MOON RIVER (MUSKOKA)

Dear Sirs:

Following our report of the preliminary investigation on the site and subsequent communication referring to the danger of a slide on the south shore of the river, we have carried out further investigations which we would like to summarise for you as follows:-

It was noted that the soils close to the river edge varied from a fine sand to a very lean clay. From all appearances, the whole natural terrain was saturated. The embankment forming the approach to the bridge being constructed of a heavy rock fill and built with slopes approximating 45°, it was assumed that the slopes were such that the shear forces developed in the natural soil were substantial and possibly of higher magnitude than safety considerations would allow. As a consequence, it was decided to investigate the shear strength of the soil and to establish the tolerance slopes for various heights of fill, as well as to investigate ways and means of supporting the bridge structure itself.

Immediately prior to the commencement of the boring, the south embankment actually suffered a substantial shear failure, so that the investigation had to be made on the side of the embankment, rather than on the toe. Borehole No.1 was located 111 feet upstream of station 356 + 50, Borehole No.2 was located 115 feet downstream of station 357 + 23, and a probe was put down 115 feet more or less downstream from station 358 + 33. No undisturbed samples were secured at Borehole No.1 since the first 8 feet were found to consist

of a fine silty sand with fine gravel and, at a depth of 8 feet, which would correspond to elevation 663 (the surface being at elevation 671) bedrock was encountered. Inasmuch as this information indicated a substantial rise in the rock table, it was decided to repeat the test close to its original position, thereby determining whether the rock core belonged truly to the bedrock or to a boulder. The second borehole confirmed the information found in the first.

The soils sampled at the location of Borehole No. 2 are described on the attached engineering data sheet. It will be seen that the soil is a silty clay containing lenses of fine sand in which a layer of black peat and organic matter was encountered between the depths of 5 to 10 feet. At a depth of approximately 25 feet the texture of the soil becomes granular and at 27 feet the soil can be classified as a fine sand. At 32 feet a gravelly formation was encountered, which seriously impeded the drilling operations. Refusal was met at 35 feet, that is at elevation 631.

Borehole No. 3, which consisted of a simple sounding with open rod, was carried down to elevation 619, at which depth the refusal was found similar to that which is generally met on bedrock.

In view of the necessity of obtaining design information without delay, no consolidation nor triaxial tests were carried out. Unconfined compression strength measurements were carried out on five samples, however, and gave values as follows:-

Hole No. 2

Sample No.	Q (Ultimate)	Cohesion
1 (2' to 3')	.69	.35 tons per sq. ft.
2 (5' to 7')	.63	.32 tons per sq. ft.
3 (9' to 11')	.21	.10 tons per sq. ft.
4 (15' to 17')	.20	.10 tons per sq. ft.
5 (20' to 22')	.25	.12 tons per sq. ft.

It is evident that a base failure has occurred at the site because of the low cohesion value of 0.10 tons per sq. ft. encountered between 9' and 22'. It is also evident that the closeness of the bedrock to the surface as shown by the relative elevations of rock or refusal in the three tests, would be a contributing factor to any slide which may occur on the site.

It is felt that without the complicating factor of the rock table, an embankment 22 feet high, laid with 45° slope and built immediately to full height rather than by intermediate stages, would tax the soil beyond its ultimate capacity. In view of the added difficulty caused by the closeness of the bedrock at some points, an accurate estimate of the critical slope would require considerable

research, which we do not feel would be justified in the present case. It is our belief that the general area does not show any sign of natural land slides and that the natural slopes close to the embankment will correspond closely to a factor of safety of 1.0 against sliding. As a consequence, in order to provide a minimum factor of safety of the order of 2.0 against a repetition of this type of failure, it is suggested that the slope of any embankment of a height of 20 to 25 feet be made no steeper than 1 in 4.

As regards the design of the bridge abutments, it is felt that with slopes of 1 in 4 the only tendency to movement which may occur will be of the base failure type. The slope of the embankment will prevent actual sliding occurring, but the tendency to movement is such that we recommend anchoring all the abutments and piers into the bedrock. Calculation sheets attached to this report indicate the magnitude of the shear forces to be resisted by this anchorage acting as a unit.

On the basis of the above theoretical consideration, it is felt that the bridge structure itself should be supported on drilled-in caissons and it is not felt that any bending moments need be provided for in these elements.

The attached calculation sheets are for your consideration and we will appreciate any comments on the matter.

Yours very truly,

RACEY, MacCALLUM AND ASSOCIATES LIMITED

MHQ/PW

R. H. Quintal (Signed)

Original and two copies - Messrs. Lazarides, Lount and Partners, 79 Scollard Street, Toronto, Ontario.

c.c.'s: 2 - Racey, MacCallum and Associates Limited, Montreal, P. Q.
1 - Soils Engineer

Order No.: 8500-501/T129

MACEY, MacCALLUM AND ASSOCIATES LIMITED

Foundation Engineering Division

Marykuca
Driller

Hole Begun 18/8/55

Hole Ended 19/8/55

Engineering Data Sheet for Borehole: 1

Scott
Helper

Job Name: Proposed Trans-Canada Highw ay Crossing, Moon River

Job Located: Moon River, Bala, Ontario

Hole Located: 111 ft upstream of C/L @ Sta. 356/55

Hole Elevation: 671.3 Datum: DHO

BF
Checked by

22 Day | 8 Month | 55 Year

DEPTH	EL.	THICKNESS	SYMBOL	DESCRIPTION
0	671			Ground Surface
				Fine silty s and with fine Gravel.
8'	663			Bedrock- Paragneiss
18'	653			End of borehole

TABULAR VALUES

10 20 30 Bl/ft

0
2.5 — Split Spoon — SS 1
5.0 — SS 2
7.5 — Drive Pipe

SAMPLING METHOD

Order No.: 501/T129

RACEY, MacCALLUM AND ASSOCIATES LIMITED
Foundation Engineering Division

Maryouka
Driller

Hole Begun 2/8/55

Scott
Helper

Hole Ended 20/8/55

Engineering Data Sheet for Borehole: 2

Job Name: Proposed T/C H'w'y Xing, Moon River

BFW
Checked by

Job Located: Moon River

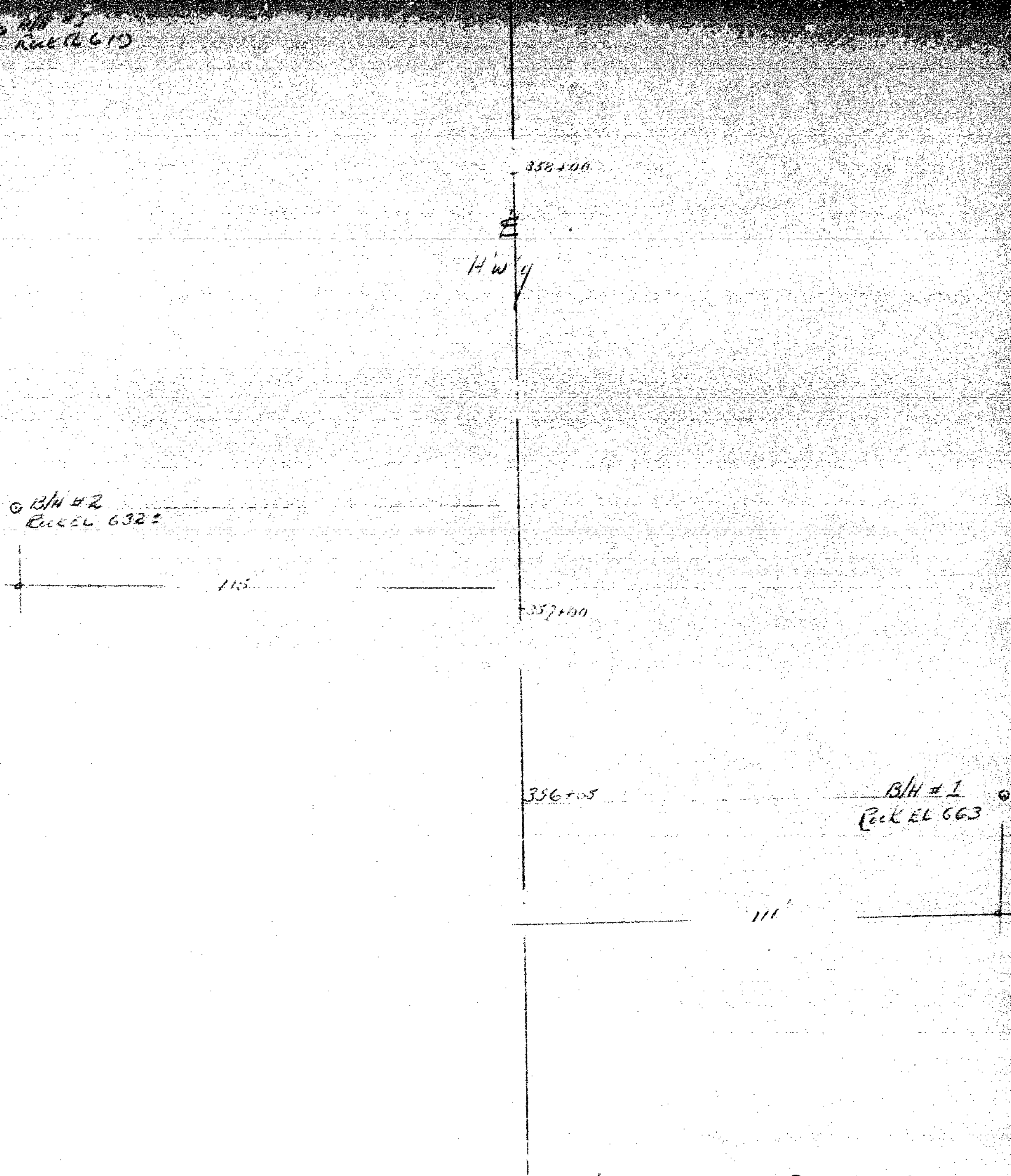
Hole Located: 115 ft downstream of C/L, Sta 357 + 23

Hole Elevation: 667.0 Datum: DHO

Day Month Year

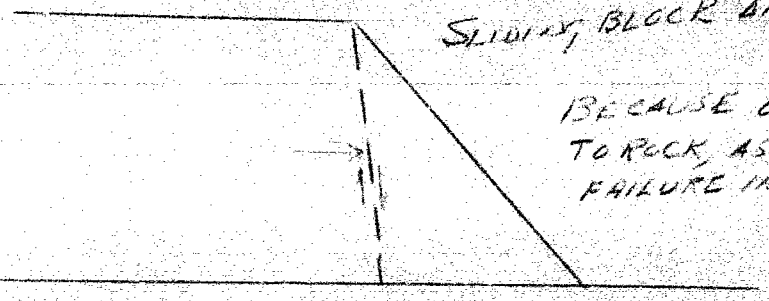
Depth	El.	Thickness	Symbol	Description	Tabular Values	Sampling Method
0	667			Ground Surface.		
				Grey Silty Clay with Lenses of fine sand	2.5	TW1
				Dark peat and organic Silt	5.0	TW 2
					7.5	
				Moist grey silty plastic clay	10.0	TW 3
		27			12.5	
					15.0	
				As above, sand lenses		TW 4
					17.5	
					20.0	
				Moist grey plastic clay, Somewhat silty	22.5	
27.0	640			Dense Sand (140 blows/ft)		
		5				
32	635			Gravel. Drilled to El 632		
	632			Refusal. Apparent bedrock End of Borehole		

Unconfined Compressive Strength, Tons per Sq. Ft.
.2 .4 .6 .8



LOCATION OF BOREHOLES
TRANS-CANADA HIGHWAY
MOON RIVER CROSSING.
SCALE 1" = 30' E.H.

T129
Aug 22/1955



COULOMB-RANKINE PRESSURE

$P_o = \frac{1}{2}\gamma H^2 \tan^2(45° - \frac{\phi}{2}) = \frac{1}{2} \times 120 \times 22^2 \tan^2(45° - \frac{45}{2})$

PER LIN FT OF FILL BASE UNDER SLOPED PORTION:

$P_o = \frac{1}{2}\gamma H \tan^2 \ldots = 1320 \times \tan^2 22°30$

$= 1320 \times .414$

$= 225\ \#/\text{SQ. FT.}$

THE CLAY BEING CAPABLE OF APPROX 200 PSF THE DESIGN IS UNSAFE.

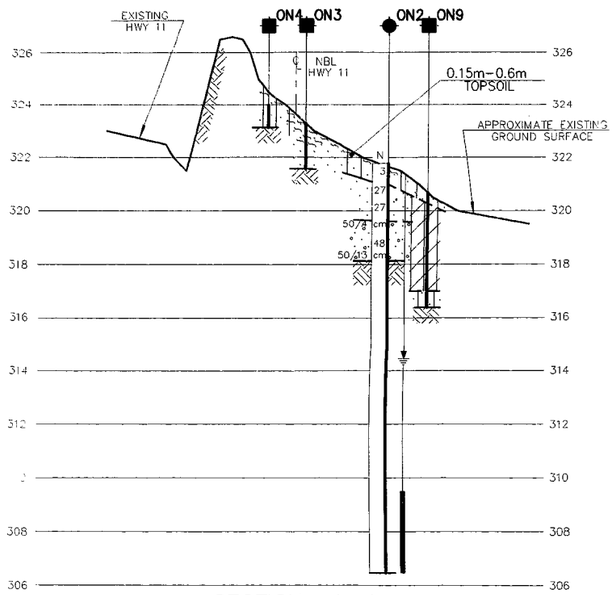
FOR BRIDGE PIERS:

ASSUME SLOPE OF 1:4 —

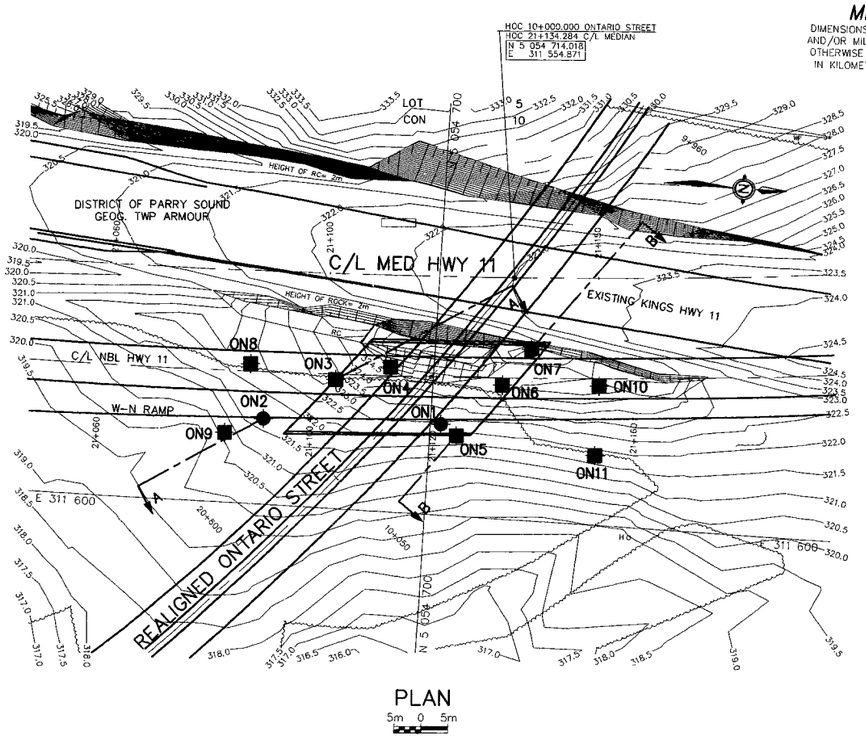
$f_{c\text{-}cy} = \frac{225}{4} = 56\ \#/\text{SQ. FT.}$ SAFE

TOTAL THRUST $P = 5000\ \#/\text{lin ft.}$

ASSUME PIERS OF INFINITE RIGIDITY AS COMPARED TO CLAY, DESIGN FOR $5000\ \#/\text{lin ft.}$ E.G. CAISSONS @ 4' C/C 20 K/CAISSON.



SECTION A–A



PLAN

5m 0 5m

METRIC

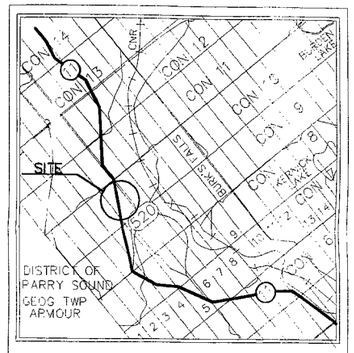
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES – METRES.

CONT. No.
W.P. No. 485–93–01

NBL & REALIGNED ONTARIO STREET CROSSING
BORE HOLE LOCATIONS & SOIL STRATA

SHEET

AGRA Earth & Environmental Ltd.

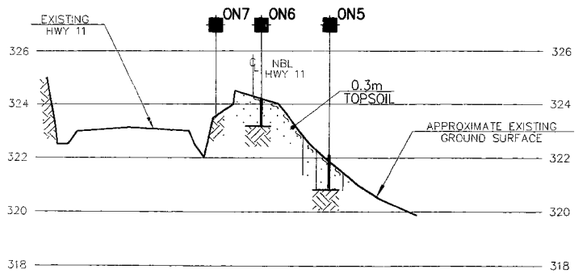


KEY PLAN

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- Testpit
- 'N' Blows/0.3m (Std Per Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- WL at time of investigation– July 9,99
- WL in Piezometer
- Piezometer

No	ELEVATION	CO-ORDINATES NORTH	EAST
ON1	322.5	5 054 702	311 583
ON2	321.8	5 054 669	311 584
ON3	323.1	5 054 682	311 576
ON4	324.0	5 054 692	311 573
ON5	322.2	5 054 705	311 585
ON6	324.4	5 054 713	311 575
ON7	323.6	5 054 716	311 568
ON8	322.2	5 054 666	311 574
ON9	320.7	5 054 662	311 587
ON10	324.5	5 054 731	311 574
ON11	321.8	5 054 731	311 587

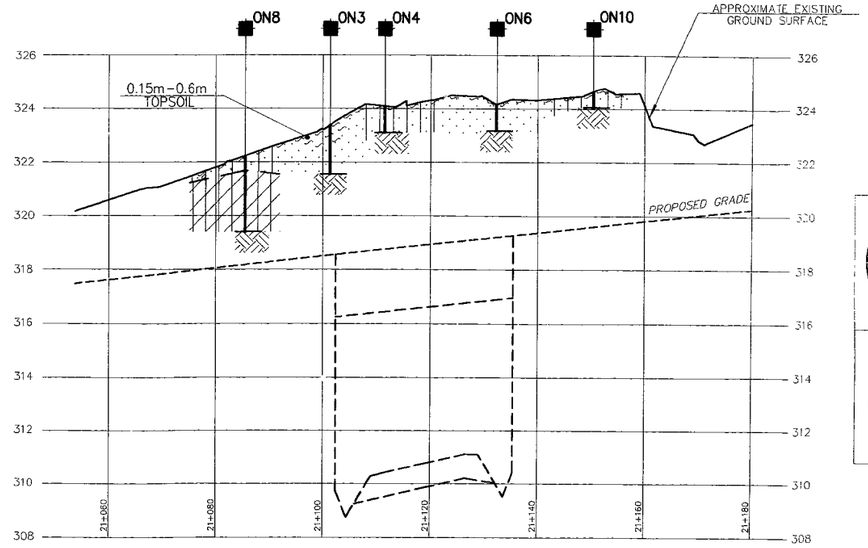


SECTION B–B

5m 0 5m HOR
1m 0 1m VER

SOIL STRATIGRAPHY LEGEND

- SILTY SAND — Very Loose to Compact
- SAND & GRAVEL — Dense to Very Dense
- CLAYEY SILT — Hard
- GNEISS BEDROCK
- SAND — Compact



C /L PROFILE OF HWY 11 NBL

5m 0 5m HOR
1m 0 1m VER

REF. Hwy 11 Bridge Site Plan
Dwg. by MTO; May, 1999

LICENSED PROFESSIONAL ENGINEER — A. D. GUSTAFSON — 02/09/99 — PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER — E. Y. CHUNG — 09/02/00 — PROVINCE OF ONTARIO

–NOTE–

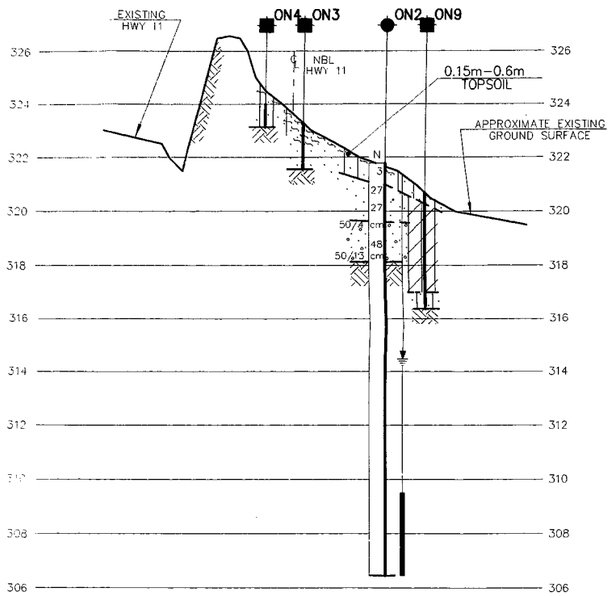
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section GC 2.01 of OPS Gen. Cond.

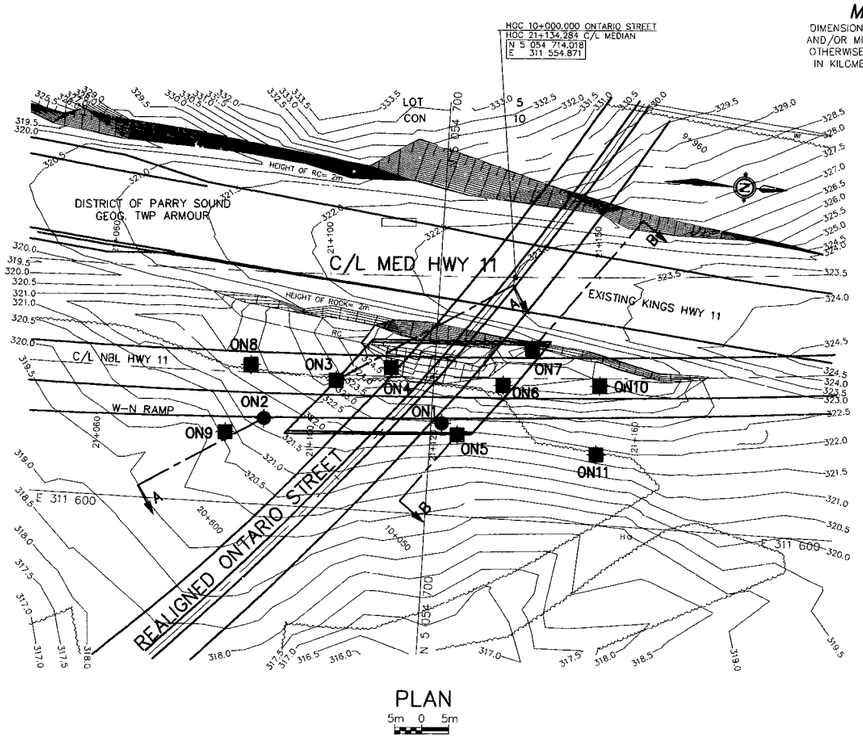
REV	DATE	BY	DESCRIPTION
	Feb.2000	MA	Revision

HWY No. 11			DIST 52–HUNTSVILLE
SUBM'D AD	CHECKED EYC	DATE July,1999	SITE 44–338N
DRAWN MA	CHECKED	APPROVED	DWG 2

FILE: 99520 cont 11&12 TP



SECTION A–A



PLAN

5m 0 5m

METRIC

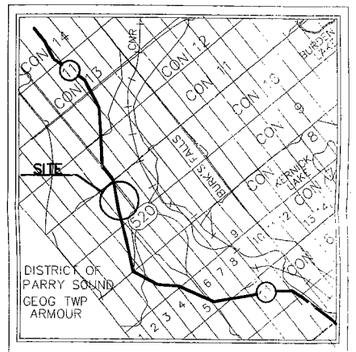
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN; STATIONS IN KILOMETRES – METRES.

CONT. No.
W.P. No. 485–93–01

NBL & REALIGNED ONTARIO STREET CROSSING
BORE HOLE LOCATIONS & SOIL STRATA

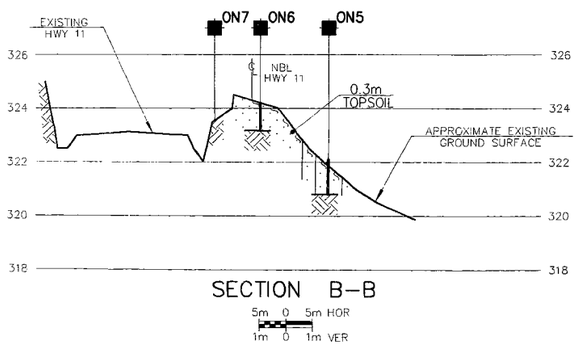
SHEET

AGRA Earth & Environmental Ltd.



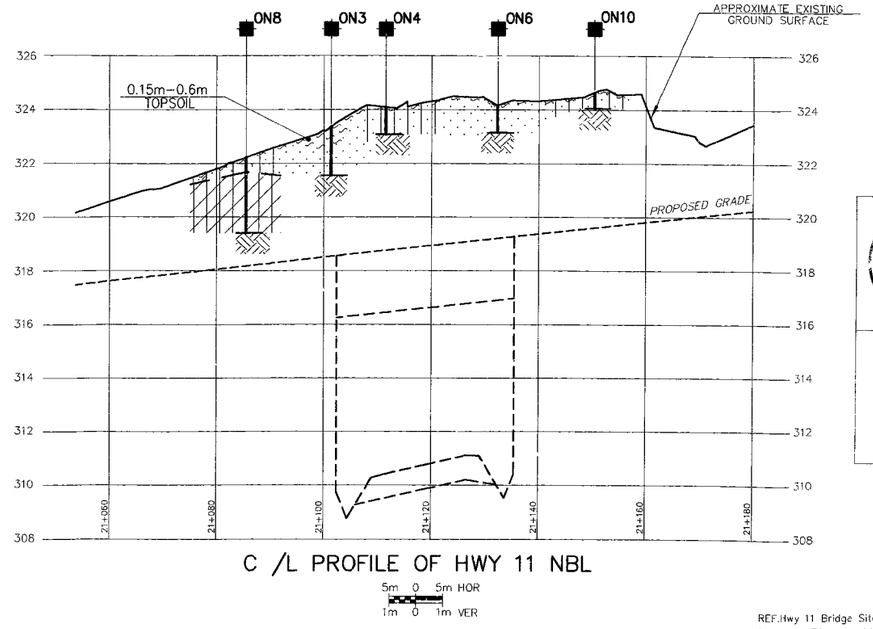
KEY PLAN

1 km 0 1 km 2 km 3 km



SECTION B–B

5m 0 5m HOR
1m 0 1m VER



C /L PROFILE OF HWY 11 NBL

5m 0 5m HOR
1m 0 1m VER

SOIL STRATIGRAPHY LEGEND

- SILTY SAND — Very Loose to Compact
- SAND & GRAVEL — Dense to Very Dense
- CLAYEY SILT — Hard
- GNEISS BEDROCK
- SAND — Compact

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- Testpit
- 'N' Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- WL at time of investigation– July 9.99
- WL in Piezometer
- Piezometer

No	ELEVATION	CO-ORDINATES NORTH	EAST
ON1	322.5	5 054 702	311 583
ON2	321.8	5 054 669	311 584
ON3	323.1	5 054 682	311 576
ON4	324.0	5 054 692	311 573
ON5	322.2	5 054 705	311 585
ON6	324.4	5 054 713	311 575
ON7	323.6	5 054 718	311 568
ON8	322.2	5 054 666	311 574
ON9	320.7	5 054 662	311 587
ON10	324.5	5 054 731	311 574
ON11	321.8	5 054 731	311 567

LICENSED PROFESSIONAL ENGINEER A.D. ROBERTS 02/09/99 PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER E. Y. CHUNG 09/09/99 PROVINCE OF ONTARIO

–NOTE–

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

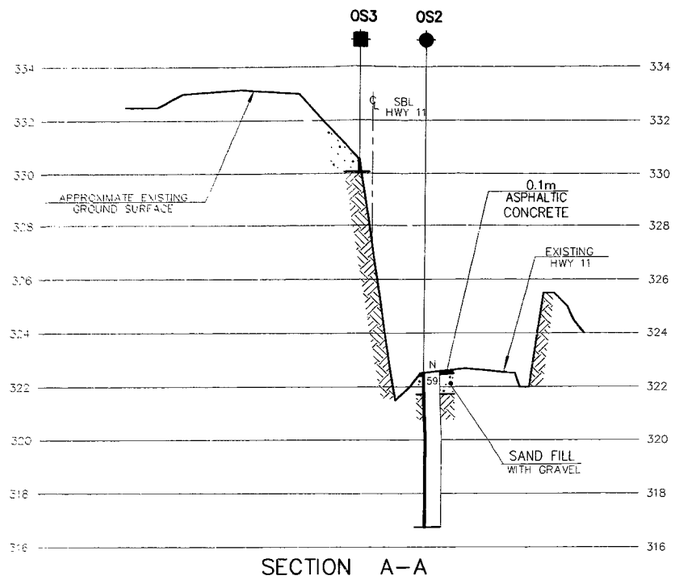
NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section GC 2.01 of OPS Gen.Cond.

REV.	Feb.2000	MA	Revision 1
	DATE	BY	DESCRIPTION

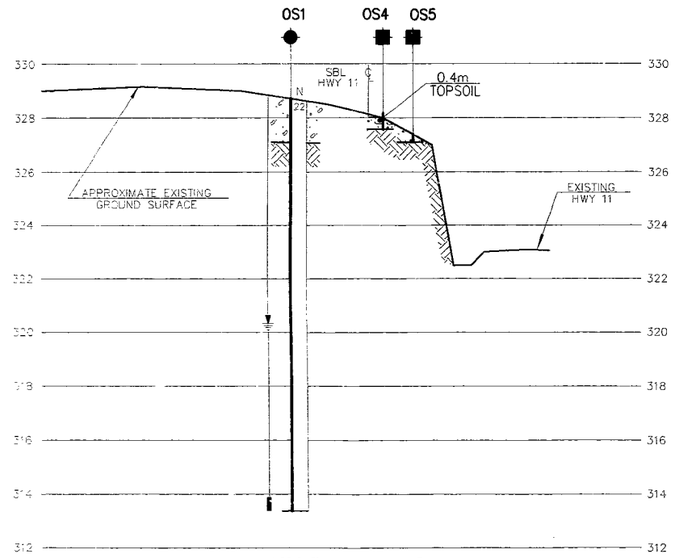
REF.:Hwy 11 Bridge Site Plan
Dwg. by MTO; May.1999

HWY No 11				DIST 52–HUNTSVILLE
SUBM'D AD	CHECKED EYC	DATE July.1999		SITE 44–398N
DRAWN MA	CHECKED	APPROVED		DWG 2

FILE:93520–Dir 18L–TP



SECTION A–A

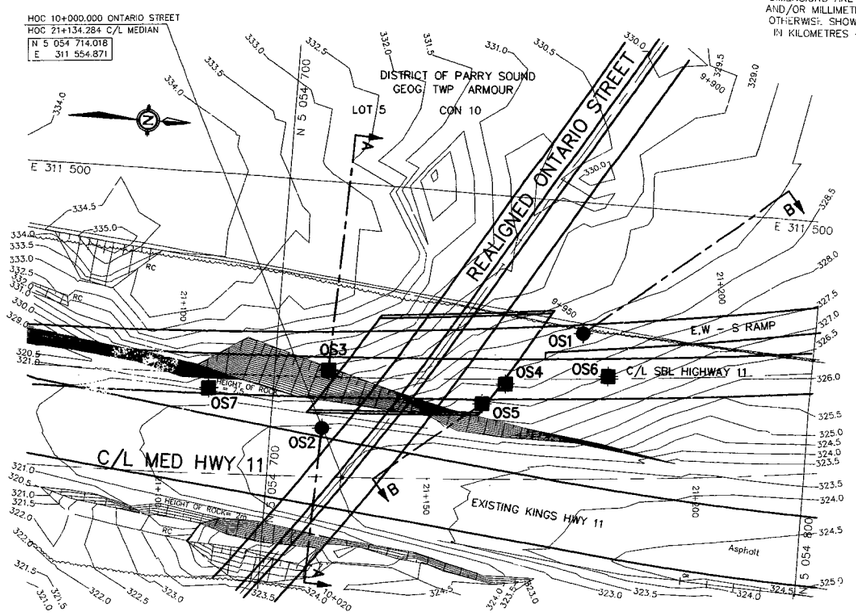


SECTION B–B

5m 0 5m HOR
1m 0 1m VER

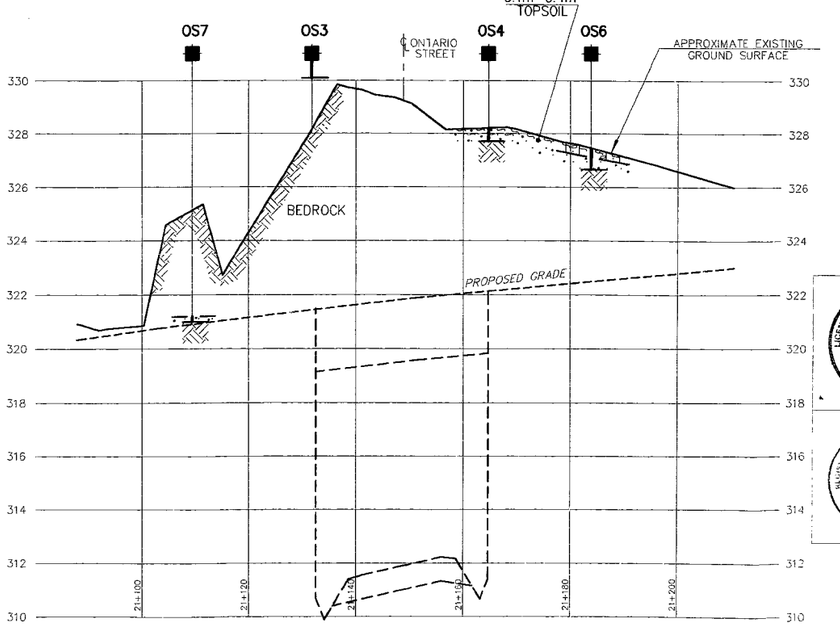
SOIL STRATIGRAPHY LEGEND

- SILTY SAND WITH COBBLES & BOULDERS
- SAND & GRAVEL
- SAND WITH COBBLES & BOULDERS Compact
- GNEISS BEDROCK



PLAN

5m 0 5m



C /L PROFILE OF HWY 11 SBL

5m 0 5m HOR
1m 0 1m VER

REF. Hwy 11 Bridge Site Plan
Dwg. by MTO; May, 1999

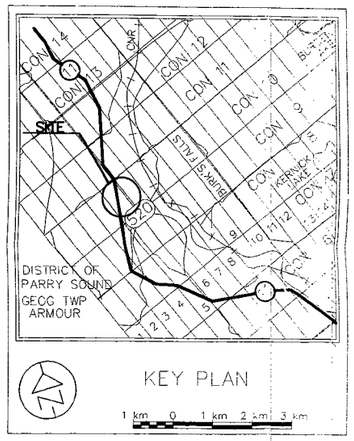
METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES – METRES.

CONT. No.
W.P. No. 486-93-01

SBL & REALIGNED ONTARIO STREET CROSSING
BORE HOLE LOCATIONS & SOIL STRATA

SHEET

AGRA Earth & Environmental Ltd.



KEY PLAN

1 km 0 1 km 2 km 3 km

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- Testpit
- 'N' Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- WL at time of investigation– July 9,99
- WL in Piezometer
- Piezometer

No	ELEVATION	CO-ORDINATES NORTH	CO-ORDINATES EAST
OS1	328.6	5 054 757	311 524
OS2	322.7	5 054 710	311 548
OS3	330.7	5 054 710	311 535
OS4	328.2	5 054 743	311 538
OS5	327.5	5 054 739	311 539
OS6	327.5	5 054 762	311 532
OS7	321.2	5 054 688	311 540

LICENSED PROFESSIONAL ENGINEER A.R. DESPONTS PROVINCE OF ONTARIO 01/01/00

REGISTERED PROFESSIONAL ENGINEER P. Y. CHANG PROVINCE OF ONTARIO 01/01/00

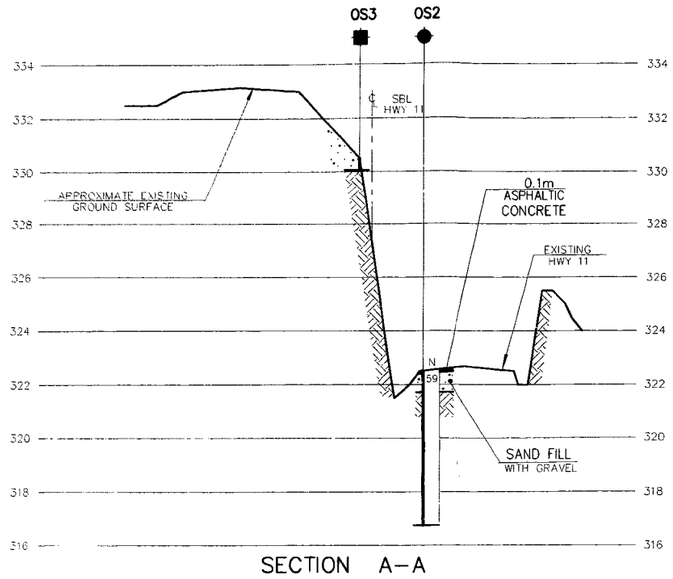
–NOTE–
The boundaries between soil strata have been established only at Bore hole locations. Between Bore holes the boundaries are assumed from geological evidence

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office. Drainage information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 00 310 of OPS Standard

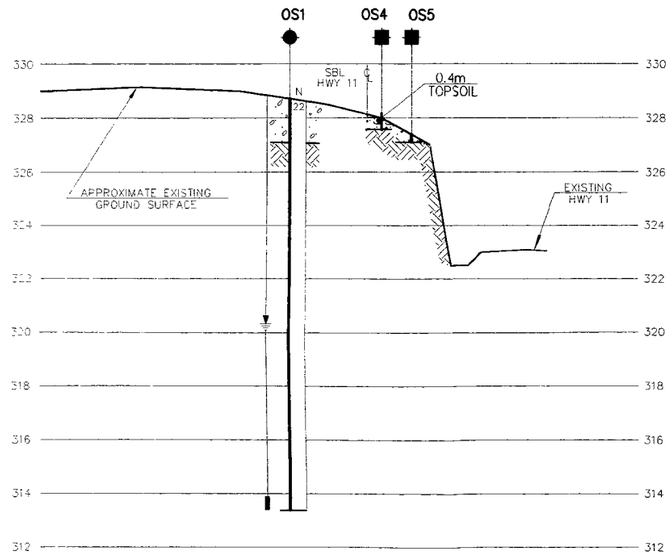
REV	Feb.2000	MA	Revision 1
DATE	BY		DESCRIPTION

HWY. No. 11			DIST. 52-HUNTSVILLE
SUBM'D AD	CHECKED EYC	DATE Sept.1999	SITE 44-398S
DRAWN MA	CHECKED	APPROVED	DWG. 2

FILE:



SECTION A–A

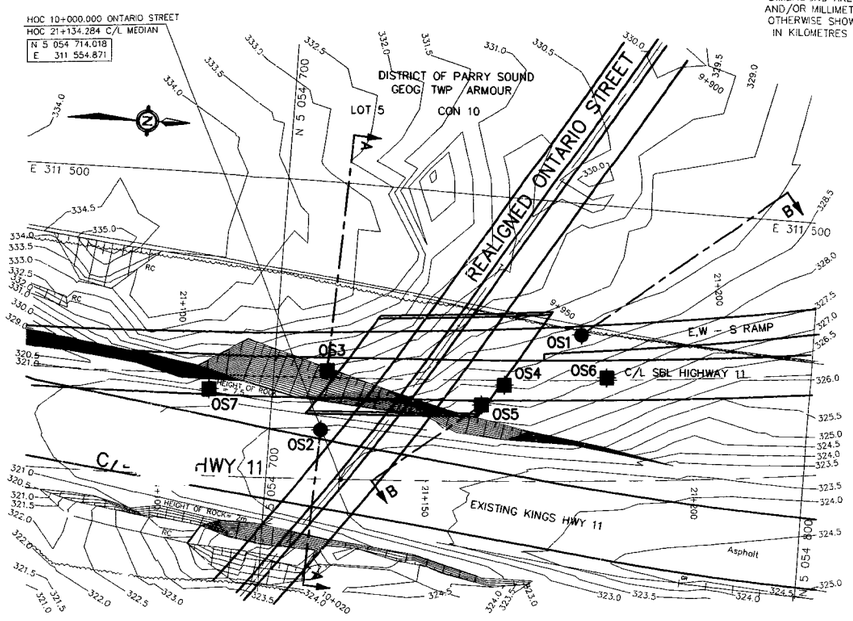


SECTION B–B

5m 0 5m HOR
1m 0 1m VER

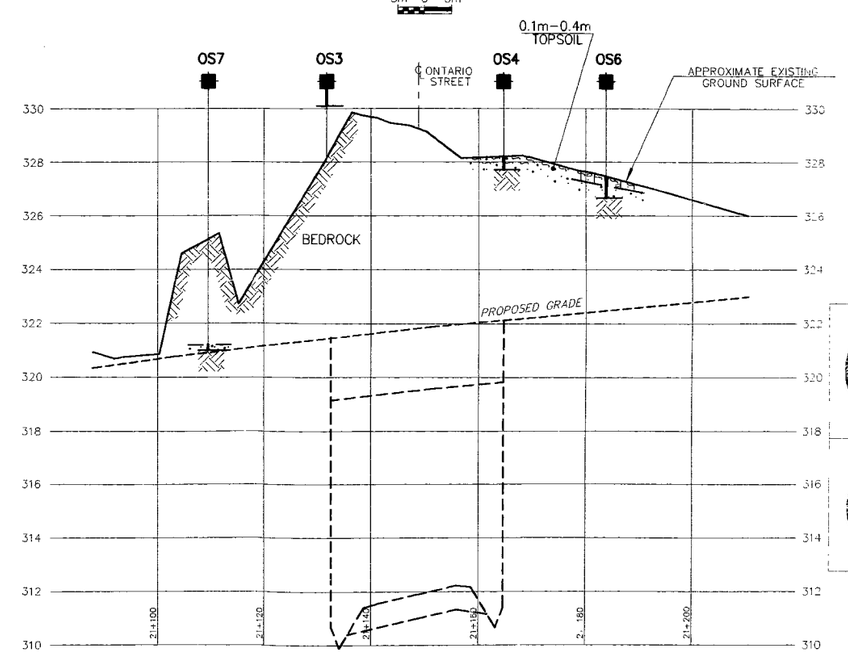
SOIL STRATIGRAPHY LEGEND

- SILTY SAND WITH COBBLES & BOULDERS
- SAND & GRAVEL
- SAND WITH COBBLES & BOULDERS Compact
- GNEISS BEDROCK



PLAN

5m 0 5m



C /L PROFILE OF HWY 11 SBL

5m 0 5m HOR
1m 0 1m VER

REF. Hwy 11 Bridge Site Plan
Dwg. by MTO: May, 1999

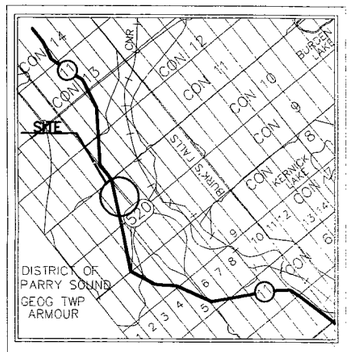
METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES – METRES.

CONT. No.
W.P. No. 486-93-01

SHEET

SBL & REALIGNED ONTARIO STREET CROSSING
BORE HOLE LOCATIONS & SOIL STRATA

AGRA Earth & Environmental Ltd.



KEY PLAN

1 km 0 1 km 2 km 3 km

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- Testpit
- 'N' Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- WL at time of investigation– July 9,99
- WL in Piezometer
- Piezometer

No	ELEVATION	CO-ORDINATES NORTH	EAST
OS1	328.6	5 054 757	311 524
OS2	322.7	5 054 710	311 546
OS3	330.7	5 054 710	311 535
OS4	328.2	5 054 745	311 535
OS5	327.5	5 054 739	311 539
OS6	327.5	5 054 762	311 532
OS7	321.2	5 054 688	311 540

–NOTE–
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

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REV	Feb.2000	M.S.	Revision 1.
	DATE	BY	DESCRIPTION

HWY No. 11				DIST 52-HUNTSVILLE
SUBM'D AD	CHECKED EYC	DATE Sept.1999		SITE 44-398S
DRAWN MA	CHECKED	APPROVED		DWG 2