

#58-F-207C

LAMBTON

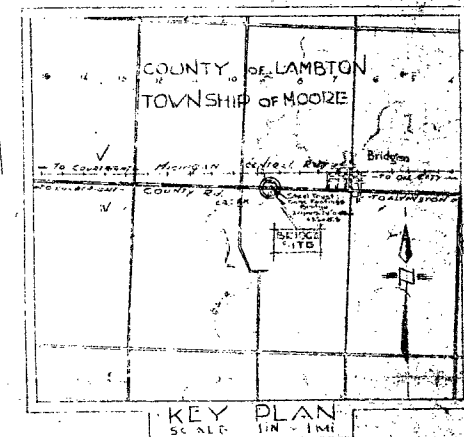
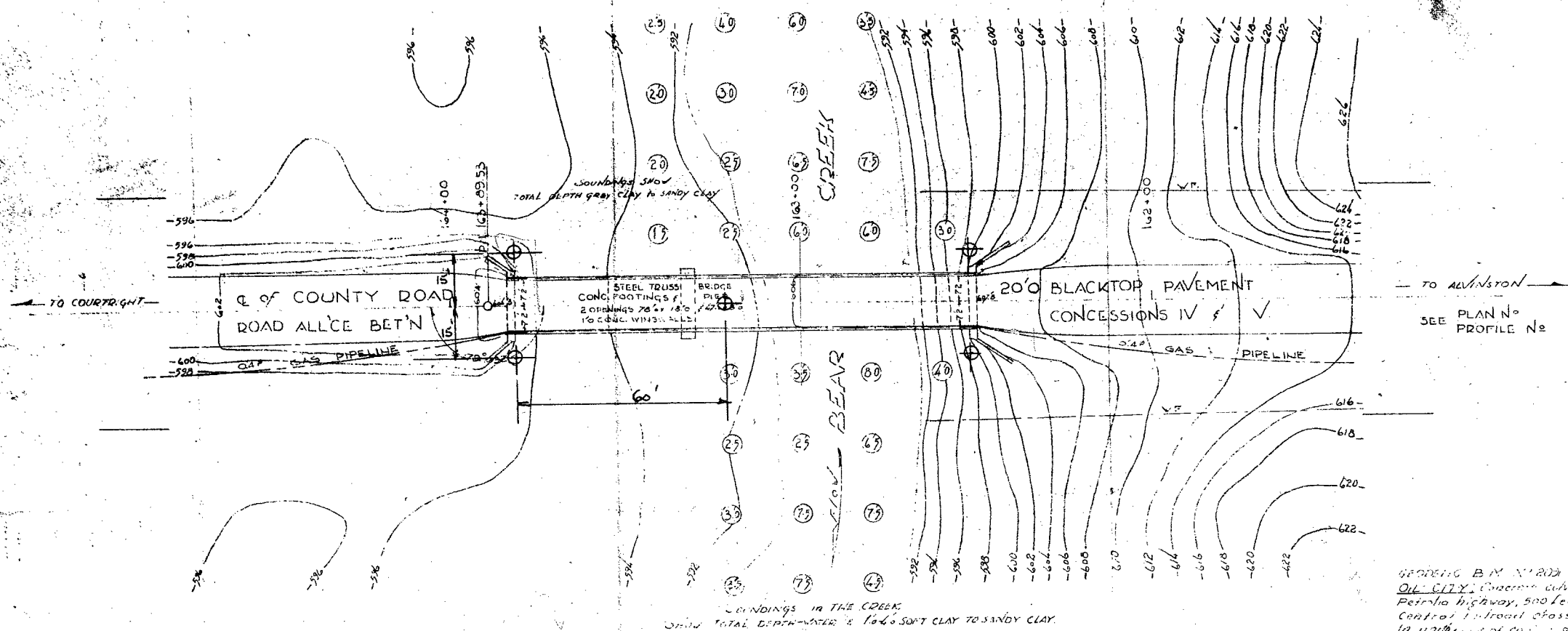
COUNTY RD.

BEAR CREEK

BRIDGE

BRIDGEN

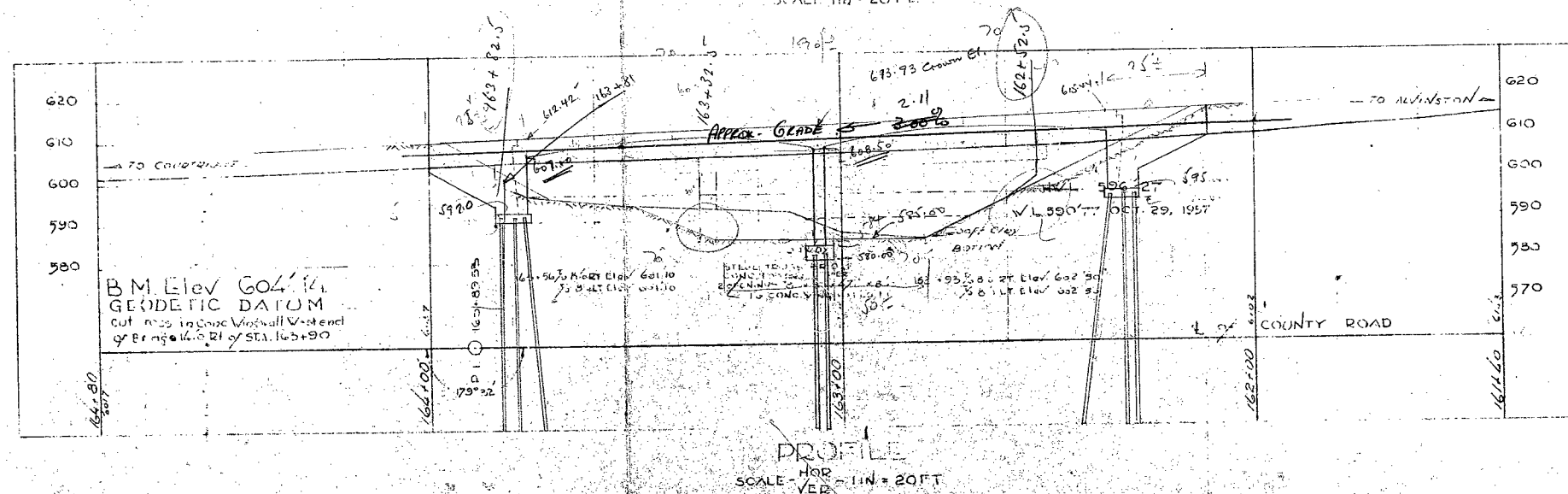
COUNTY OF LAMBTON
TOWNSHIP OF MOORE
CON. V LOT 9

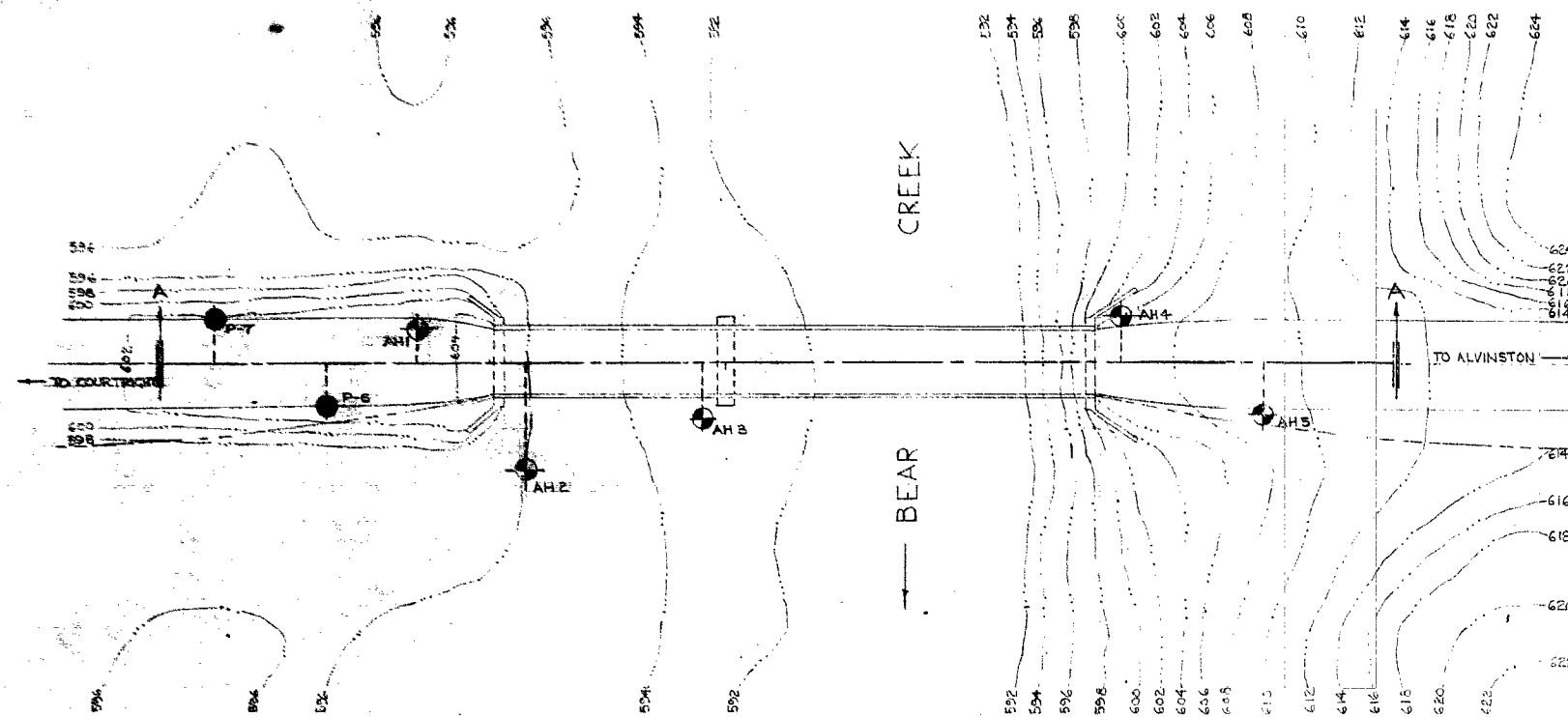


GEODETIC B.M. NO. 1004
OIL CITY, Ontario, adjacent to the
Petrolia Highway, 500 feet north of the
Central Railroad Cross 29 in Village, Petrolia
in north side of County of Lambton.

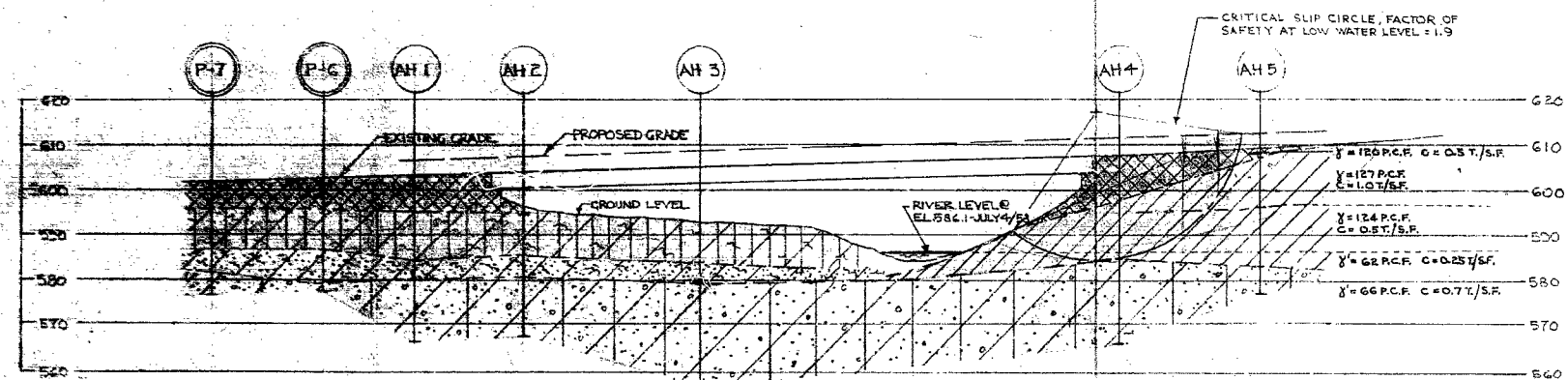
WP 103 B-58

As sent to Geocan
for sale. 24 June 58

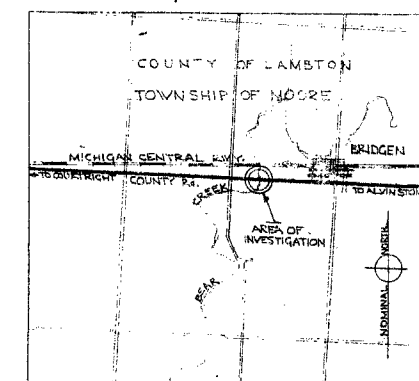
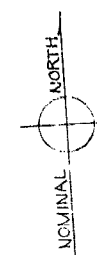




PLAN
SCALE 1"=20'-0"



SECTION A-A
SCALE 1"=20'-0"



KEY PLAN
SCALE 1"=1 MILE

LEGEND

- AUGER HOLE IN PLAN
- AUGER HOLE IN ELEVATION
- PROBING IN PLAN
- PROBING IN ELEVATION

STRATIGRAPHY

- FIRM BROWN CLAY FILL
- FIRM TO STIFF BROWN AND GREY LAMINATED CLAY, SOME PEBBLES
- SOFT TO STIFF YELLOWISH BROWN ORGANIC CLAYEY SILT
- STRATIFIED GREY AND BROWN LOOSE COARSE SAND, SOFT TO FIRM CLAY AND LEAVES
- FIRM TO STIFF GREY SILTY CLAY TILL

SPECIAL NOTE: DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT BOREHOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.

REVISIONS		REFERENCE		REFERENCE	
NO.	DATE	DESCRIPTION	DWG. NO.	DESCRIPTION	DWG. NO.
			5365-1	DEPARTMENT OF HIGHWAYS, ONTARIO - PROPOSED CROSSING AT BEAR CREEK AND COUNTY ROAD, ALVINSTON TO COURTRIGHT, TOWNSHIP OF MOORE - COUNTY OF LAMBTON, ONTARIO	

DEPARTMENT OF HIGHWAYS, ONTARIO

PROPOSED BEAR CREEK BRIDGE

COUNTY ROAD, ALVINSTON TO COURTRIGHT, TOWNSHIP OF MOORE - COUNTY OF LAMBTON, ONTARIO

BORING PLAN AND SOIL STRATIGRAPHY

GEOCON LTD

DATE JULY 22, 1958 SCALE AS SHOWN

MADE	CHECKED	APPROVED
M.W.	R.M.	J.H.

No. S 6800-1

GEOCON LTD

HEAD OFFICE

180 VALLÉE ST., MONTREAL 18, QUEBEC

TELEPHONE UN. 6-7632

Rexdale, Ontario,
August 18th, 1958.

BA 776

DISTRICT OFFICES

14 HAAS ROAD
REXDALE, TORONTO, ONT.
TEL. CH. 4-8641

3355 WEST BROADWAY AVE.
VANCOUVER 8, B.C.
TEL. CH. 5810

Department of Highways, Ontario,
Parliament Buildings,
Toronto 2, Ontario.

Attention: Mr. A. M. Towe, P. Eng.,
Bridge Engineer.

58F207C

Re: Soil Investigation,
Proposed Bear Creek Bridge,
Bridgen, Ontario.

Dear Sirs:

This letter accompanies our detailed report on the above investigation.

We find that the site is covered by up to 15 feet of flood plain deposits underlain by clay till. The east side of the site is covered by partially desiccated clays underlain by clay till. Artesian conditions were encountered in stratified sand seams overlying the clay till on the west side of the river.

Based on detailed foundation analysis, it is recommended that the proposed bridge be founded on non-displacement type friction piles driven about 35 feet into the clay till stratum. Expected settlement and stability of the pile group and bridge abutments are discussed in the report.

We consider that this report gives all the information required for safe and economical foundation design. If we can be of any further service, please do not hesitate to call us.

Yours very truly,

GEOCON LTD

V. Milligan

V. Milligan, P. Eng.,
District Engineer.

VH/dw
36800



ST. JOHN'S

HALIFAX

QUEBEC

MONTREAL

TORONTO

LONDON

VANCOUVER



S6800
REPORT
TO
DEPARTMENT OF HIGHWAYS, ONTARIO
ON
SOIL CONDITIONS AND FOUNDATIONS
PROPOSED BEAR CREEK BRIDGE
BRIDGEN ONTARIO

Distribution:

- 4 copies - Department of Highways, Ontario,
Toronto, Ontario.**
- 3 copies - Geocan Ltd,
Toronto, Ontario.**

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INTRODUCTION

Gescocon Ltd has been retained by the Department of Highways, Ontario (proposal dated July 4th, 1958 and accepted July 11th, 1958) to investigate and report on the soil conditions at the site of the proposed Bear Creek bridge at Bridgen, Ontario.

The object of the investigation was to determine and interpret the soil conditions as they affect the design of foundations for the proposed bridge.

SUMMARIZED SOIL CONDITIONS

The uppermost stratum at the site consists of firm clay fill forming the approaches to the existing bridge. At the east end of the bridge, the fill is underlain by a stratum of soft to firm clay, the upper portion of which has been desiccated to a stiff consistency. Over the western portion of the site, the clay stratum has been removed by erosion and replaced by recent flood plain deposits consisting chiefly of organic silts with sand and clay layers. Underlying the clay stratum and the flood plain deposits, at an average elevation of about 581, is a stratum of firm to stiff grey clay till extending to the depth explored in all holes.

DISCUSSION

It is understood that the proposed bridge will be either a one or two span structure constructed about 4 feet higher in elevation than the existing bridge. The total length of the bridge will be of the order of 140 feet. Design details for the proposed bridge are not yet available.

The borings and probings carried out in this investigation indicate that the upper 20 to 30 feet of the site is covered by fill, laminated clay and deposits of flood plain origin generally of soft to firm consistency or loose relative density. These deposits have a low bearing capacity and a medium to high compressibility.

The use of a spread footing or deep pier foundation for the proposed bridge have been considered. Due to the low bearing capacity and high compressi-

bility of the upper deposits, spread footings or piers would have to be carried down a depth of about 25 feet to the till stratum. Footing excavations would have to be adequately braced and dewatered and construction difficulty may be encountered at the base of excavations due to artesian head in the sand seams directly overlying the till stratum. It is therefore considered that the use of a spread footing or pier foundation would be uneconomical.

It is recommended, therefore, that the proposed bridge be founded on friction piles driven about 35 feet into the till stratum. To prevent excessive soil heave which might affect the stability of the east bank, it is further recommended that a non-displacement type of pile be adopted.

Calculations were carried out for a single 12 inch "H" pile, 50 feet in length, and bearing in the till stratum at elevation 532 and 547 at the east and west abutments respectively. Ultimate load capacities of 89 and 76 tons for a single pile were computed at the east and west abutments, respectively, using the following values of effective skin friction for the various soil strata:

<u>Soil Strata</u>	<u>Effective Skin Friction</u> <u>(pounds per square foot)</u>
Organic Silt	500
Desiccated Laminated Clay	700
Laminated Clay	700
Clay Till	800

The values of effective skin friction used above are smaller than the average measured shear strengths, as experience has shown that in firm to stiff clay soils, transverse vibration of the pile during driving forms a partial gap at pile/ soil interface and therefore the available shear strength of the soil is not fully mobilized.

Based on the computed ultimate values and allowing for a factor of safety of approximately 3 against ultimate failure, it is recommended that an allowable load of 30 tons per pile be used for design.

Settlement computations carried out assuming a four pile cluster, at a pile spacing of 4 feet, under a load of 30 tons per pile, indicate that a maximum total settlement of about 3 inches will take place. From the results of the consolidation tests, it is computed that 90 percent of this settlement will occur within 15 to 20 years.

Stability analyses were carried out for the east bank of the river assuming the approach embankment at elevation 612 at the probable abutment location. A minimum factor of safety of 1.9 was obtained for low water level conditions for the most critical slip circle shown on the section on Drawing S6800-1. This factor of safety is adequate for the overall stability of the bank under the final conditions.

Settlement computations indicate that settlement under the west approach embankment, as proposed, will be small.

If organic silt and clay fill are used as backfill material for the proposed abutments, possible periodic swelling pressures may be induced on the abutments. It is therefore recommended that only clean coarse granular fill be used as backfill. It is further recommended that the backfill be placed and compacted without the use of water and that jetting of the backfill be avoided. The granular material should be placed to extend horizontally at road surface a distance equal to the height of the abutment and sloped to the base of the abutment.

CONCLUSIONS AND RECOMMENDATIONS

1. The west side of the site is covered by up to 15 feet of flood plain deposits underlain by clay till. The east side of the site is covered by partially desiccated clays underlain by clay till. Fill forms the approaches to the bridge.

2. Groundwater level was approximately at river level elevation at the time of the investigation. Artesian conditions exist in the sand seams above the clay till as discussed in the report.

3. It is recommended that the proposed bridge be founded on non-displacement type friction piles driven about 35 feet into the clay till stratum. Allowable bearing values and theoretical settlement predictions are discussed in the report.

4. Stability analyses on the east bank give an adequate factor of safety against sliding provided non-displacement type piles are used.

5. It is recommended that granular backfill be placed behind the abutments to eliminate possible swelling pressures, as discussed in the report.

PERSONNEL

The field work was carried out under the supervision of Mr. R.M. Quigley. The report was written by Mr. Quigley, checked by Mr. J.L. Seychuk and reviewed by Mr. V. Milligan.

R. M. Quigley

RMQ/dw
96800

R. M. Quigley, P. Eng.

APPENDIX I

Procedure

Site and Geology

Soil Conditions

Water Conditions --

Office Reports on Soil Exploration

The principal soil strata encountered by the borings are as follows:

Fill

A layer of asphalt, about seven inches in thickness, forms the paved surface of the road.

East Approach: A layer of mottled grey and brown pebbly clay fill, varying from 2 to 10 feet in thickness, was encountered at ground surface in auger holes 4 and 5 put down behind the east abutment of the existing bridge. The fill is very crumbly and contains many voids.

One standard penetration resistance or "N" value of 8 blows per foot obtained in the fill and one unconfined compressive strength of 1.3 tons per square foot obtained on an undisturbed sample of the fill indicate that the consistency is firm to stiff. A wet unit weight determination gave a value of 118 pounds per cubic foot at a natural moisture content of about 20 percent.

West Approach: A maximum thickness of about 7 feet of brown crumbly clay fill forms the long approach embankment at the west end of the existing bridge. This fill is similar in composition to the underlying stratum of organic silt. It was probably derived from this stratum by excavation of the deep ditches along both sides of the approach road. The consistency of the fill is estimated to be firm.

Organic Silt

A stratum of yellowish brown sandy to clayey organic silt, of flooded plain origin, varying in thickness from about 8 to 11 feet, was encountered at ground surface in auger holes 2 and 3 and beneath the fill in auger hole 1. The stratum shows indistinct irregular laminations of sandy silt and clay with finely disseminated organic matter. The sandy layers contain tiny white shells. The entire stratum is crumbly due to oxidation and seasonal desiccation and resembles a topsoil.

Organic Silt (continued)

Standard penetration resistance or "N" values ranging from 2 to 10 blows per foot with an average value of about 6 blows per foot were obtained for the stratum. Two unconfined compression tests performed on samples obtained from the stratum gave compressive strengths of 0.9 and 1.7 tons per square foot indicating that the consistency is firm to stiff. A typical stress-strain curve is given on Figure 1 of Appendix II. Two wet unit weight determinations gave values of 122 and 125 pounds per cubic foot at corresponding natural moisture contents of about 26 and 22 percent.

A consolidation test was performed on an undisturbed sample of the silt and the resulting void ratio versus pressure curve is shown on Figure 3 of Appendix II. A compression index, C_c , of 0.26 was obtained. The curve shows that the organic silt has been preconsolidated, probably by desiccation, to a maximum preconsolidation pressure of approximately 2 tons per square foot as determined by the Schmertmann method. Liquid and plastic limits of about 41 and 22 and a natural moisture content of 25 percent were also obtained for the sample.

Stratified Sand, Clay and Leaves

A four to five foot thick stratum of interbedded coarse sand, clay and leaves was encountered beneath the organic silt stratum in auger holes 1, 2, and 3. In auger holes 1 and 2, the colour of the stratum was grey, while in auger hole 3, it was brown. The individual layers averaged about one half an inch in thickness. Water under a slight artesian head was encountered in the sand seams. It is assumed that this head was equivalent to river water level elevation.

Standard penetration resistance or "N" values of 3, 3 and 5 blows per foot were obtained for the stratum. These values are probably low due to artesian uplift forces. It is considered that the sand is loose in relative density and the consistency of the clay is soft to firm.

Laminated Clay

A stratum of brown laminated pebbly clay, becoming grey with depth, was encountered beneath the fill in auger holes 4 and 5. The thickness of the stratum was found to be 13 and 24 feet in auger holes 4 and 5 respectively. In auger hole 5, the upper 11 feet has been desiccated and oxidized to a brown colour. In auger hole 4, only 4 feet of the brown desiccated portion remains, the rest having been removed by erosion.

Standard penetration resistance or "N" values ranging from 6 to 12 blows per foot with an average value of about 9 blows per foot were obtained in the stratum. Unconfined compression tests performed on samples obtained from the stratum gave compressive strengths ranging from a maximum of about 2.5 tons per square foot in the upper desiccated portion to a minimum of about 0.5 tons per square foot in the lower portion. The consistency of the clay, therefore, varies from very stiff to soft with depth. Two typical stress-strain curves are given on Figure 1 of Appendix II. A plot of unconfined compressive strength versus elevation for the clay stratum and the underlying till stratum is shown on Figure 2 of Appendix II.

Clay Till

A stratum of grey clay till of undetermined thickness was encountered beneath the laminated clay in auger holes 4 and 5 and beneath the stratified sand, leaves and clay stratum in auger holes 1, 2, and 3. The maximum depth penetrated in the stratum was 24 feet in auger hole 3. Subangular to subrounded fine to medium gravel of shale and limestone composition was encountered throughout the till stratum. The gravel tended to be concentrated in the upper 10 feet of the stratum.

Standard penetration resistance or "N" values ranging from 9 to 16 blows per foot with an average value of about 11 blows per foot were obtained in the stratum. A plot of "N" values versus elevation for the till stratum is given on Figure 2 of Appendix II. Unconfined compressive

Clay Till (continued)

strengths ranging from 0.8 to 1.6 tons per square foot were obtained for the till. A typical stress-strain curve is shown on Figure 1 of Appendix II. A plot of strength versus elevation for this stratum is given on Figure 2 in Appendix II. It is recommended that an average unconfined compressive strength of 1.0 tons per square foot be used for design purposes.

An average wet unit weight of 128 pounds per cubic foot and an average natural moisture content of 24 percent were obtained for the stratum. A plot of moisture content versus depth for the stratum is given on Figure 2 of Appendix II.

Two liquid limits of about 29 and 34 and two plastic limits of about 18 and 21 were obtained for the till at natural moisture contents of about 19 and 24 percent respectively. A consolidation test was carried out on a sample of the till and the resulting void ratio versus log pressure curve is shown on Figure 4 of Appendix II. From this curve, a compression index of 0.12 and a preconsolidation pressure of about 2 tons per square foot, using the Schmertmann method, were obtained. It is considered that the numerous gravel sizes present in the consolidation sample may have tended to lower the compression index value. Based on the correlation of liquid limit and compression index for similar clays, a compression index of 0.2 is obtained. It is therefore recommended that a compression index of 0.2 be used for design purposes.

WATER CONDITIONS

In auger holes 1, 2, and 3, the groundwater level was approximately at river elevation, 586, at the time of the investigation. Due to the low permeability of the clay and the short duration of the field work, it was not possible to accurately establish the groundwater levels in auger holes 4 and 5.

The presence of the flood plain deposits at the site indicates seasonal flooding of the creek. It is understood from farmers in the area, the spring floods occasionally rise above the west approach embankment.

EXPLANATION OF THE FORM "OFFICE REPORT ON SOIL EXPLORATION"

The object of this form is to enable a comprehensive study of the soil to be made by combining on one sheet all of the information obtained from the boring. An explanation of the various columns of the report follows.

ELEVATION AND DEPTH

This column gives the elevation and depth of boundaries between the various soil strata. The elevation is referred to the datum shown in the general heading.

WATER CONDITIONS

In this column the water level in the casing at the time of boring or the water table in the ground, determined by a series of observations in a piezometer or standpipe, is indicated to scale by a horizontal line with the symbol W.L. or W.T. above the line. A notation of any complicated groundwater conditions will be made in this column.

DESCRIPTION

A description of the soil, using standard terminology, is contained in this column. The consistency of cohesive soils and the relative density of non-cohesive soils are described by the following terms:

Consistency	U-Strength Tons/sq. ft.	Relative Density	Standard Penetration Resistance. Blows/ft.
Very soft	0.03 to 0.25	Very loose	0 to 4
Soft	0.25 to 0.5	Loose	4 to 10
Firm	0.5 to 1.0	Compact	10 to 30
Stiff	1.0 to 2.0	Dense	30 to 50
Very stiff	2.0 to 4.0	Very dense	over 50
Hard	over 4.0		

STRATIGRAPHIC PLOT

The stratigraphic plot follows the standard symbols of the National Research Council, Canada.

ELEVATION SCALE

The information in all columns is plotted to a true elevation scale which is shown in this column.

GRAPHS

The main body of the report forms a graph which is used to plot to correct elevation the important soil properties which are obtained through field and laboratory tests. The scales and symbols for the plotting are shown at the head of the column.

OTHER TESTS

In this column are shown, by symbol, the other field or laboratory tests which have been performed on the soil and for which the results have not been plotted on the above graph.

SAMPLES

The first three columns describe the condition, type and number of each sample obtained from the boring. The location and extent of each sample is plotted to scale.

In the last column is shown the penetration resistance in blows of 4200 inch-pounds required to drive one foot of the sampler into the ground. When a 2 inch Drive Sampler is used the result obtained is termed the "Standard Penetration Resistance".

GEOCON

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 56800 AUGERHOLE 1 DATUM GEODETIC CASING
 BORING DATE JULY 3, 1958 REPORT DATE JULY 21, 1958 COMPILED BY M.W. CHECKED BY RMQ
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION



A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V - IN SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 Qc - TRIAXIAL CONSOLIDATED QUICK
 Q - TRIAXIAL QUICK
 S - TRIAXIAL SLOW
 γ - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL

SOIL PROFILE

ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLT	ELEVATION SCALE
603.4		GROUND LEVEL		
0.7		ASPHALT		
595.4		FIRM BROWN CRUMBLY CLAY FILL		600
8.0		FIRM TO STIFF YELLOWISH BROWN		590
584.4		ORGANIC CLAYEY SILT		
19.0		STRATIFIED GREY LOOSE COARSE SAND FIRM CLAY AND LEAFES		580
580.4		FIRM TO STIFF GREY SILTY CLAY		
23.0		TILL		570
566.4	APPROX. G.W.L. JULY 4, 1958	END OF HOLE		560
37.0				

COMPRESSION STRENGTH TONS/50 FT. • UNWEIGHTED



DYNAMIC PENETRATION TEST BLOWS PER FOOT

OTHER TESTS

SAMPLES

CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
AS	1	-	
2" DO	2	6	
3 1/2" SO	3	7	
2" SO	4	5	
3 1/2" SO	5	11	
50	6	11	

BLOWS ON 3 1/2" SAMPLER HAVE BEEN
 CONVERTED TO STANDARD PENETRATION
 RESISTANCES OR "N" VALUES

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 5-102 AUGER HOLE 2 DATUM GEODETIC CASING -
 BORING DATE JULY 4, 1958 REPORT DATE JULY 21, 1958 COMPILED BY M.W. CHECKED BY R.M.Q.
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION



A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 QC - TRIAXIAL CONSOLIDATED QUICK
 Q - TRIAXIAL QUICK
 S - TRIAXIAL SLOW
 γ - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL

SOIL PROFILE

ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT	ELEVATION SCALE
594.5 0.0		GROUND LEVEL		
		FIRM TO STIFF		
		YELLOWISH BROWN		
		ORGANIC CLAYEY		
585.5 9.0		SILT		
		STRATIFIED GREY		
		LOOSE COARSE		
580.5 14.0		CAND. FIRM CLAY		
		AND LEAVES		
		FIRM TO STIFF		
		GREY CLAY TILL		
567.5 27.0		END OF HOLE		

COMPRESSION STRENGTH TONS/IN.² • UNCONFINED

0.5	1.0	1.5	2.0	2.5
WATER CONTENT W% 10 20 30 40 50				
DYNAMIC PENETRATION TEST BLOWS PER FOOT				

OTHER TESTS

SAMPLES

CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
AS	1	-	
2" SO	2	10	
DO	3	3	
DO	4	12	
DO	5	11	
DO	6	12	

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 56800 AUGERHOLE 5 DATUM GEODETIC CASING -
 BORING DATE JULY 24, 1958 REPORT DATE JULY 21, 1958 COMPILED BY MMV CHECKED BY RMQ
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION



A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

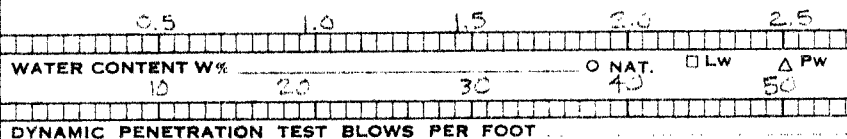
ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 QC - TRIAXIAL CONSOLIDATED QUICK
 Q - TRIAXIAL QUICK
 S - TRIAXIAL SLOW
 γ - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL

SOIL PROFILE

ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT	ELEVATION SCALE
592.8 0.0		GROUND LEVEL		
583.8 9.0		SOFT TO FIRM YELLOWISH BROWN ORGANIC CLAYEY SILT		590
579.8 13.0		STRATIFIED BROWN LOOSE COARSE SAND SOFT CLAY AND LEAVES		580
	APPROX. G.W.L. JULY 4, 1958	FIRM TO STIFF		570
		GREY CLAY TILL		560
556.0 36.8		END OF HOLE		550

COMPRESSIVE STRENGTH TONS/SQ. FT. • UNCONFINED



OTHER TESTS

SAMPLES

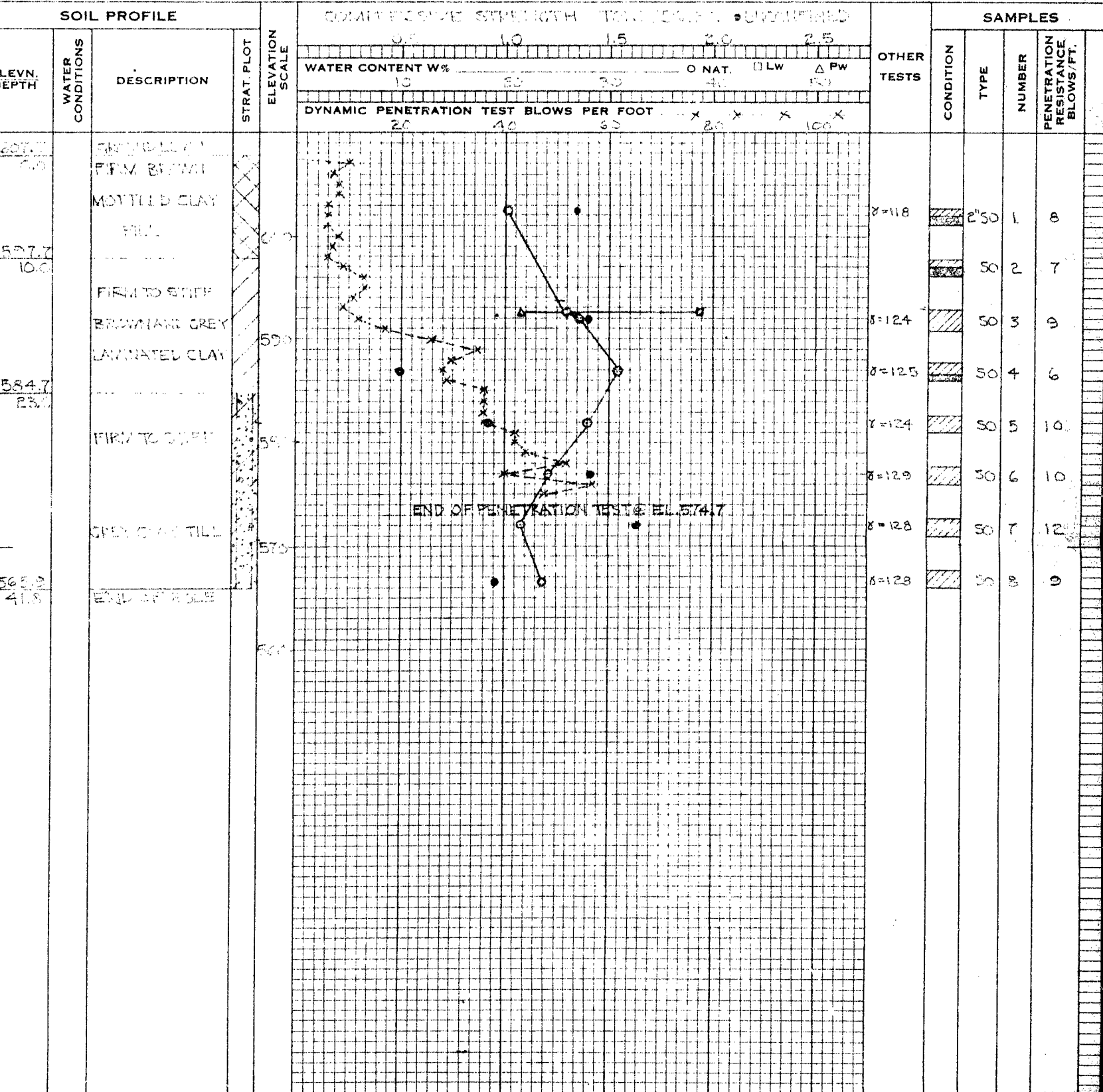
CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
	2" SO	1	2
	SO	2	3
	SO	3	11
	SO	4	13
	SO	5	10
	AS	6	-
	2" SO	7	10

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 6-28 AUGER/BLD 4 DATUM ICEQUETIC CASING -
 BORING DATE JULY 21, 1958 REPORT DATE JULY 21, 1958 COMPILED BY MAW CHECKED BY R.M.Q.
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION 	SAMPLE TYPES A.S. - AUGER SAMPLE S.T. - SLOTTED TUBE W.S. - WASHED SAMPLE D.O. - DRIVE-OPEN D.F. - DRIVE-FOOT VALVE C.S. - CHUNK SAMPLE F.S. - FOIL SAMPLE S.O. - SLEEVE-OPEN S.F. - SLEEVE-FOOT VALVE T.O. - THIN WALLED OPEN R.C. - ROCK CORE	ABBREVIATIONS V - IN-SITU VANE TEST M - MECHANICAL ANALYSIS U - UNCONFINED COMPRESSION Qc - TRIAXIAL CONSOLIDATED QUICK Q - TRIAXIAL QUICK S - TRIAXIAL SLOW γ - WET UNIT WEIGHT K - PERMEABILITY C - CONSOLIDATION WL - WATER LEVEL IN CASING WT - WATER TABLE IN SOIL
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GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 06800 AUGER HOLE 5 DATUM 1221.5 CASING
 BORING DATE JULY 2, 1958 REPORT DATE JULY 22, 1958 COMPILED BY MMV CHECKED BY R.M.G.
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. - LBS. ENERGY)

SAMPLE CONDITION



A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

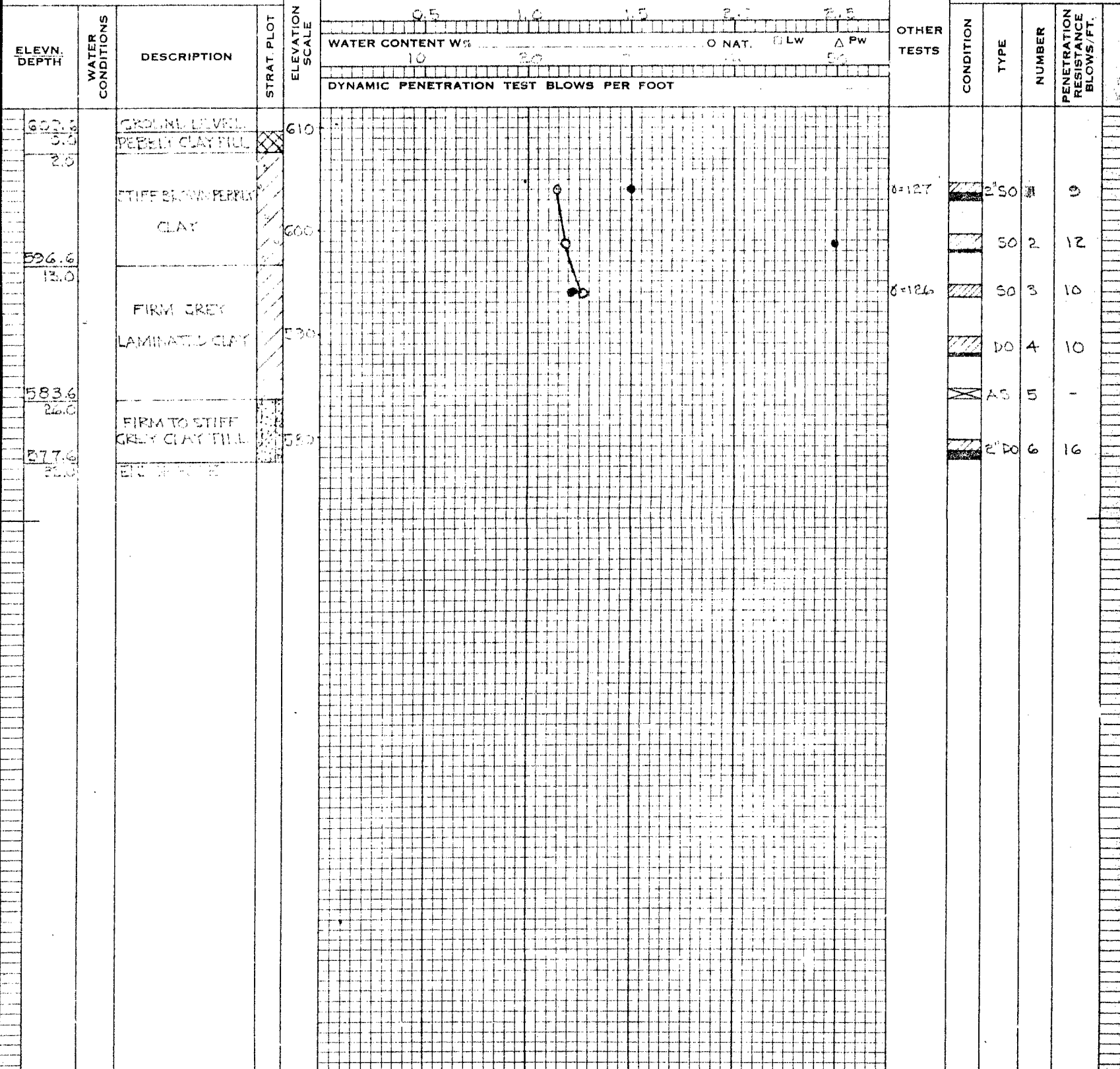
ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 QC - TRIAXIAL CONSOLIDATED QUICK
 Q - TRIAXIAL QUICK
 S - TRIAXIAL SLOW
 γ - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL

SOIL PROFILE

COMPRESSION STRENGTH 1000/50 FT. • UNCONFINED

SAMPLES



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 56500 BORING # 6-17 DATUM GEODETIC CASING ---
 BORING DATE JULY 14, 1953 REPORT DATE JULY 22, 1953 COMPILED BY MMV CHECKED BY RMG
 SAMPLER HAMMER WT. --- LBS. DROP --- INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION



A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
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 Qc - TRIAXIAL CONSOLIDATED QUICK
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 γ - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL

SOIL PROFILE

SAMPLES

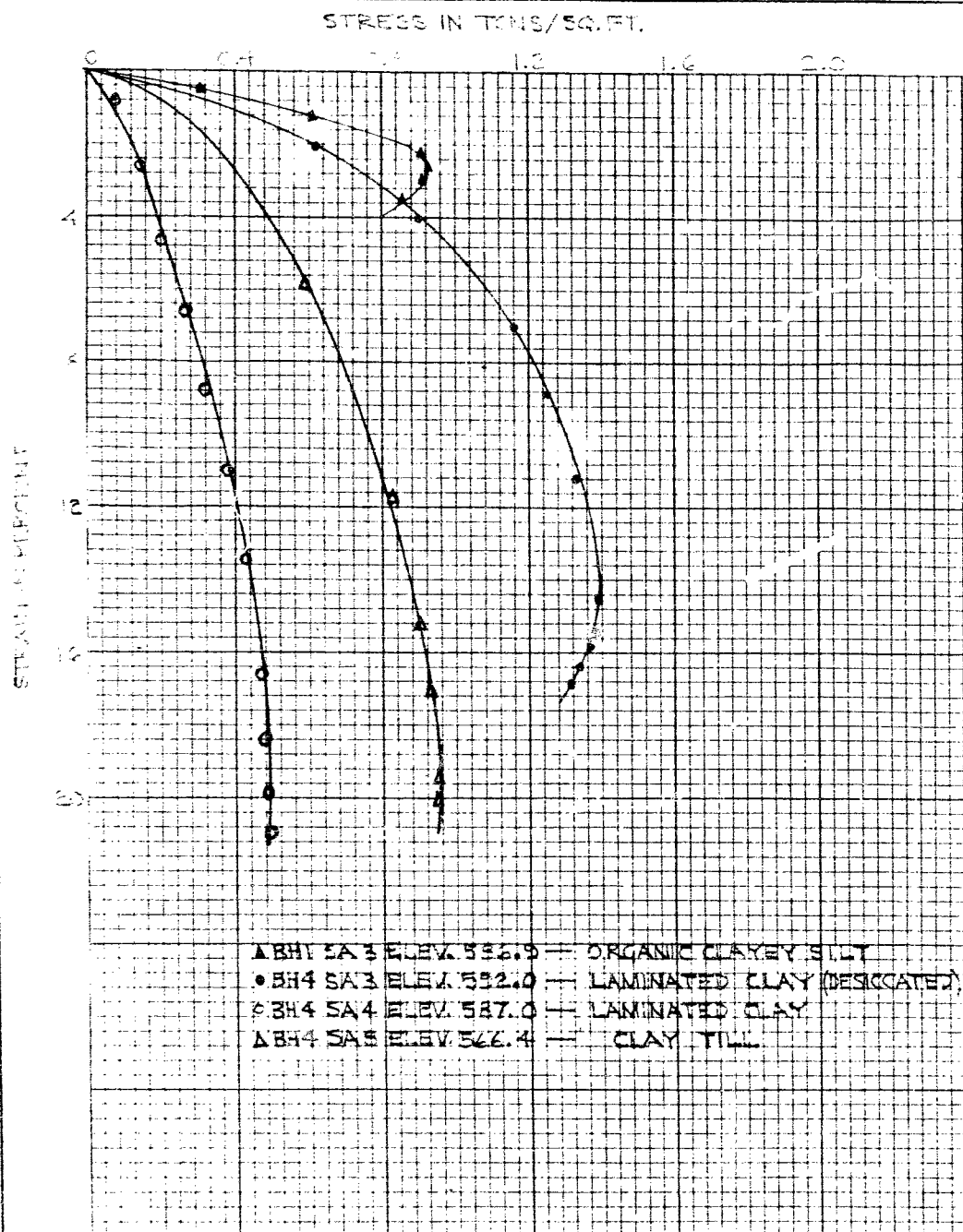
SOIL PROFILE										OTHER TESTS	SAMPLES			
ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT	ELEVATION SCALE	WATER CONTENT W% ○ NAT. □ LW △ PW					OTHER TESTS	CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
					DYNAMIC PENETRATION TEST BLOWS PER FOOT									
602.0 0.0		GROUND LEVEL		600	(6)									
		BROWN CRUMBLY CLAY FILL												
595.0 -6.0														
		YELLOWISH BROWN SANDY ORGANIC SILT												
586.0 -16.0		STRATIFIED SAND, LEAVES AND CLAY		590										
579.0 -23.0		GREY CLAY TILL												
		END OF PROBE												
25.0														
602.0 0.0		GROUND LEVEL		600	(7)									
		BROWN CRUMBLY CLAY FILL												
596.0 -6.0														
		YELLOWISH BROWN ORGANIC SILT UNDERLAIN BY STRATIFIED SAND, LEAVES, AND CLAY												
582.0 -20.0		GREY CLAY TILL		590										
577.0 -25.0		END OF PROBE												
				570										

APPENDIX II

FIGURES - LABORATORY TESTING

UNCONFINED COMPRESSION TESTS TYPICAL STRESS STRAIN CURVES

APPENDIX II
FIGURE I
PROJECT S6800



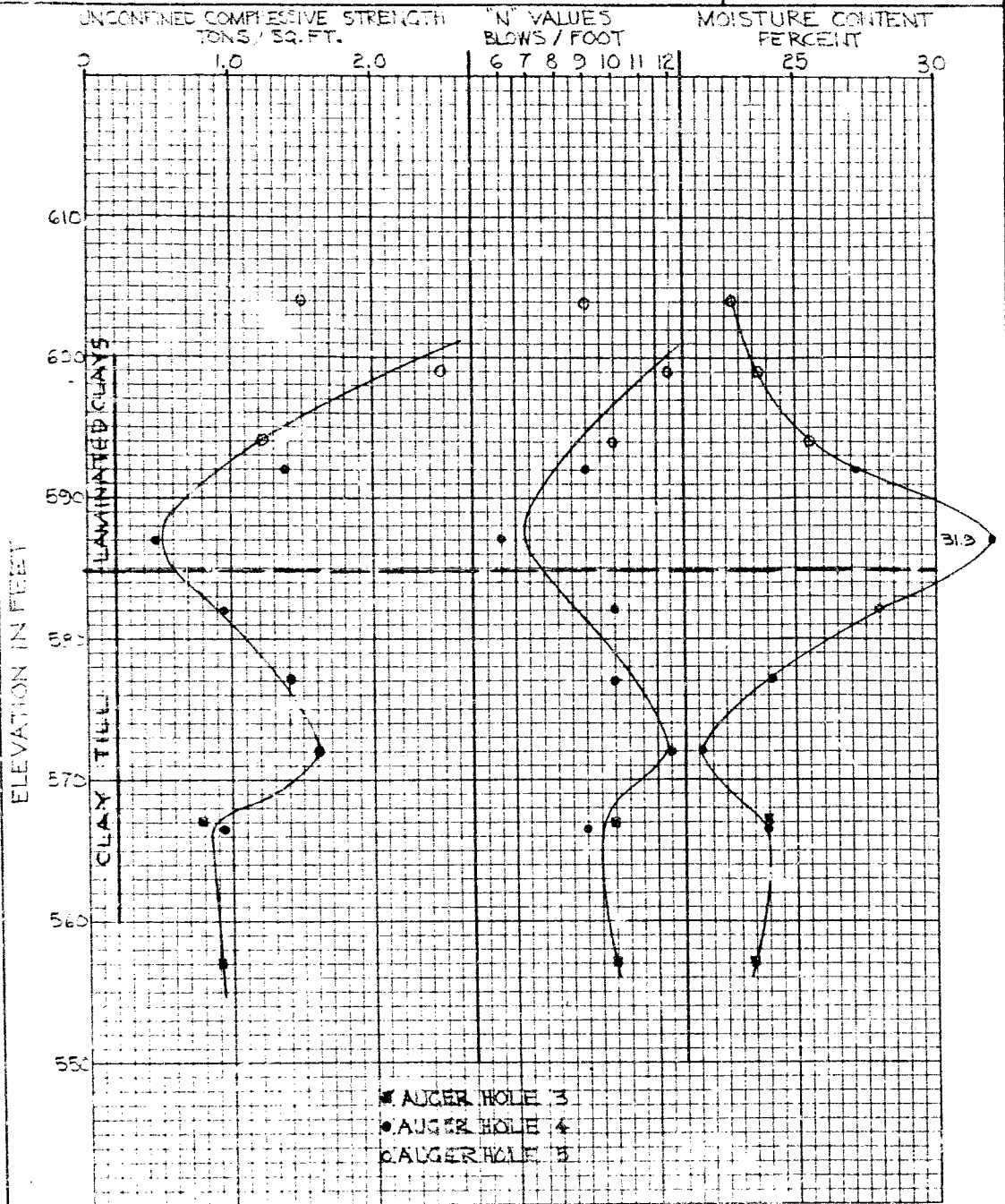
SOIL PROPERTIES VS ELEVATION

(VICINITY PROPOSED EAST ABUTMENT)

APPENDIX II

FIGURE 2

PROJECT 56800



Toronto 5,
Aug. 19, 19

MEMORANDUM TO:

Mr. A. Rutka,
Acting Materials & Research Eng.,
Downsview, Ontario.

RE: BA-770 Queensway & Pinetrest Rd.
Ottawa Queensway Dist. #9
BA-770 Bear Cr. Br.
Development Rd. 471 Dist. 1

Attached please find copies of above soil reports
for your file.

JCN:aw

J. C. McAllister,
for E. McCombie,
Bridge Planning Engineer.