

File
H. L. L. H.
23-62-109
September 10th, 1962.

59-F-115
C.C. Parker & Parson, Brinckerhoff Ltd.,
Consulting Engineers,
795 Main Street West,
Hamilton, Ontario.

Attention: Mr. Moulson

Dear Sir:

Re: Hwy. #403, Cont. #62-109,
Track Protection of C.P.R. at
Church Access and King Street.

The length of sheetpile above abutment footing
will be 5'6".

The distance of the sheetpiles from the ties is
5 feet.

The equivalent surcharge on the railway track is
taken as 10 feet.

Soils conditions are as per Foundation Reports
Job Nos. 60-F-25 and 25A for W.P. #192-60.

Required Sheetpile Penetration: The recommended depth of
penetration is 8'6". This will allow for a safety factor
of 1.5.

Sheetpile Section: This may be calculated for a Bending
Moment of 2.758 foot-pounds per foot-lin. of sheetpiling,
acting at the base of footing elevation.

Yours truly,

RS/hl
c.c. K. Selby, ✓
T.J. Kovich (C),
Files.

L. H. L. H.
R. Schonfeld,
For: T.J. Kovich,
Regional Soils Engineer.

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

October 12, 1960.

D.H.O. FOUNDATION REPORT -

W.J. 59-F-115 -- W.P. 185-60.

Attention: Mr. S. McCosbie.

Re: Chedoke Expressway -- Underpass at
King Street, Hamilton, Ontario, Dist.4.

Attached, we are forwarding to you, the detailed foundation investigation report for the above structure site. The information and recommendations contained in this report pertain only to the design of the high level, multi-span structure proposed.

We believe that the report will prove adequate for your future design work with respect to this proposed structure; however, should any queries arise, please feel free to contact our Office.

AM/Mie?
Attach.

L. G. Soderman,
PRINCIPAL FOUNDATIONS ENGR.

Per:

A. Sternac
(A. Sternac,
FOUNDATIONS OFFICE ENGR.)

cc: Messrs. A. M. Toye (2)
B. A. Tregaskes
D. G. Bussay
I. C. Campbell
D. S. Richardson
T. J. Kovich
A. Watt
C. C. Parker & Assoc. (4)
Foundations Office
Gen. Files.

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FOUNDATION INVESTIGATION

For

-- CHODOKE EXPRESSWAY --

Underpass at King Street,
Hamilton, Ont., District 4.
S.J. 59-F-115 - S.P. 185-60.

1. INTRODUCTION:

Presented in this report are the results of a detailed subsoil investigation carried out at the proposed location of the King Street Underpass, Highway 403, in the City of Hamilton. The information contained in this report and the recommendations submitted pertain only to the design of the high level multi-span structure proposed. Ancillary ramps associated with this underpass are discussed in a separate report, 59-F-125, entitled: "Chedoke Expressway, Hamilton, Ontario. Foundation Conditions at Ramps G, H, J and K, King, Main Interchange".

2. SUMMARY OF RECOMMENDATIONS:

Conditions at the bridge site were found to be such that fills in excess of 16 feet would be unstable. On this basis, it was decided to try and limit fills to a maximum height of 12 feet without berms. As a result of this, King Street must be carried on a structure from at least Chainage 7 + 90 to Chainage 19 + 40. It is recommended that the structure be founded on piles extending to bedrock at all piers and at the East abutment. At the West abutment a spread footing can be used with an allowable bearing pressure of 5 tons per square foot.

3. DESCRIPTION OF SITE AND GEOLOGY:

At present, King Street is carried across the Chedoke Creek Valley on a multi-span steel and concrete structure just to the North of the proposed new structure. This is to be replaced by another multi-span structure, the location of which is shown

3. DESCRIPTION OF SITE AND GEOLOGY: (cont'd.) ...

in Drawing 59-P-115A.

The Chedoke Creek Valley is roughly U-shaped, and at the King Street structure, has a bottom width of nearly 1,000 feet. At some time this area has been used for the disposal of waste from the City of Hamilton and this material was encountered in the investigation.

Geologically, the site investigated is located in the physiographic area known as the Niagara Escarpment. The bedrock structure consists of relatively erosion-resistant limestone which overlies softer shale. This area has experienced several glacial advances and recessions with interglacial lake periods. Because of this, soil types consist generally of reworked glacial clay tills immediately above bedrock with more recent beach deposit and post-glacial lake sediment overlying the clay till stratum.

4. FIELD AND LABORATORY WORK:

The field work was carried out by means of continuous flight augers and skid-mounted core-drilling machine adapted for soil sampling.

To examine conditions below the proposed structure, 16 borings were carried out.

When a skid-mounted core-drilling machine was used, the borings were carried out using conventional wash-boring methods. In cohesive soil, samples were obtained by means of a 2" I.D. thin-walled Shelby tube sampler. Where possible, in non-cohesive soils, sampling was done by means of a 2" O.D. split-barrelled spoon sampler. The dimensions of the spoon sampler and the energy used in driving it, conforms to the requirements of the Standard Penetration Test. As a supplement to the Standard Penetration Test resistance profile, a 2" diameter cone was dynamically driven from existing ground surface to refusal depth to define a cone resistance profile.

cont'd. /3 ...

4. FIELD AND LABORATORY WORK: (cont'd.) ...

The split-spoon samples were visually examined and identified in the field. The Shelby tube samples were carefully sealed and taken to the laboratory. In the laboratory, routine tests for index properties were carried out on selected representative samples.

Laboratory and field test results have been summarized in Table No. 1, included under Appendix I. The locations of the boreholes are shown in Drawing 59-F-115A.

5. SOIL CONDITIONS:

5.1 General:

A soil profile is presented in Drawing 59-F-115A attached to this report. Reference should be made to this in conjunction with the following descriptions.

The soil profile described below is valid for the whole area as far as the bedrock and stiff to very stiff silty clay and clayey silt layers are concerned. Above the latter layer the profile becomes less uniform. In the valley centre the two upper layers are described below. At the East of the valley there is a layer of essentially granular material and on the West side of the valley a material which appears to be derived from a swamp which has existed at some time here. This is an essentially cohesive and organic material. These materials come together between Borings 7 and 8. There are similarities between these materials, namely: their colour; their siltiness; and the fact that while a definite division has been shown in the drawing, each material occurs to a lesser extent within the precincts of the other.

cont'd. /A ...

5. SOIL CONDITIONS: (cont'd.) ...

5.2 Very Variable Mixture of Sand, Gravel, Rubble & Refuse -
Locally Clayey:

The uppermost layer in the valley consists of variable materials all apparently dumped in this location when the area was being used as a disposal ground for sanitary sewage and other refuse from the City of Hamilton. This layer extends from Chainage 8 + 50 to Chainage 18 + 15, approximately. Its lower limit is erratic but between Chainage 10 + 50 and 18 + 15 its average position is at elevation 250.0'. East of Chainage 10 + 50 it rises gradually at first to elevation 267' in Boring K 15 and then more steeply. The layer ends between Borings K 15 and K 16. The materials which constitute this layer are ashes and slag sometimes mixed with a small amount of clay; sand and gravel and building rubble; household garbage in various stages of decomposition; in some places, small amounts of decayed or partially decayed organic matter in the form of roots. In general, this material can be considered free draining although it was found to be mixed with clay in some places. Standard penetration tests carried out in this material indicate that its relative density can be described as loose to medium.

The two materials described immediately below, have an upper boundary which is erratic. Its average position is at elevation 250 feet to Chainage 10 + 50. East of Chainage 10 + 50 it rises gradually at first to elevation 267 ft. in Boring K 15 and then more steeply.

5.3 Grey-Brown Silty Sand or Gravelly Sand with Variable
amounts of Clay:

As has been noted above, this material is variable and no definite properties can be attributed to it. Standard penetration tests carried out during the investigation showed the material to be in a loose or medium condition of relative density. It occurs

cont'd. /9 ...

5. SOIL CONDITIONS: (cont'd.) ...

5.3 Grey-Brown Silty Sand or Gravelly Sand with Variable Amounts of Clay: (cont'd.) ...

as an approximately wedge-shaped layer immediately above the till and varying between about 12 and zero feet in thickness. It extends from Chainage 14+60 approximately, to Chainage 10+20 where it peters out.

5.4 Soft Grey-Brown Silty Clay with Variable Amounts of Organic Matter:

This layer is mainly distinguished from the above by the amount of clayey material and by the amount of organic matter in it. Tests on material recovered during the investigation for this structure were inconclusive but this material was also encountered during the investigations for Raaps 'J' and 'G'. Tests carried out for these raaps gave the following results: Water contents varying between 18 and 27 per cent; liquid limits ranging between 28 and 66 per cent and plastic limits ranging between 18 and 38 per cent. Shear strength determinations carried out gave results which appeared to indicate a shear strength of about 400 lb./sq.ft. could be assumed for design. This material occurs in a layer of approximately 10 to 20 feet in thickness. It extends from about Chainage 14+60 to Chainage 18+00.

5.5 Stiff to Very Stiff Silty Clay & Clay Silt Locally Layered:

Overlying bedrock there is a layer of grey clayey silt and silty clay with random stones scattered through it of a size up to one quarter of an inch. This material is considered to be a till. It has a shear strength ranging between 1040 and 2275 lb./sq.ft. with an average value of 1600 lb./sq.ft. Its average unit weight is 126 lb./cu.ft. It has water contents ranging from 11.6 to 29.9% with an average value of 21.7%. The average limits of this material are: Plastic limit 18.8%; Liquid limit 30.2%. The upper horizon

5. SUBSOIL CONDITIONS: (cont'd.) ...

5.5 Stiff to Very Stiff Silty Clay & Clay Silt Locally Layered: -
(cont'd.)...

varies locally but the trend can be said to be horizontal West of Boring K7 and sloping upwards to the East of this boring. Where it is horizontal, its elevation is approximately 235 ft. to the East of Boring K7, it rises fairly uniformly to elevation 275 ft. near Boring K16. It thus varies between about 40 and about 70 feet in thickness.

5.6 Shale Bedrock:

The whole area under discussion is underlain by red and grey-green Queenston shale. This material appears to be little weathered as several cores were taken from the contact with full recovery in almost every case. The surface of the bedrock slopes fairly uniformly from East to West across the site, falling from elevation 204' at Boring K13 (Chainage 11+00) to elevation 173' at Boring K1 (Chainage 19+30).

Variations from the above soil profile occur at either side of the valley. The changed profile applies East of Chainage 6+50 on the one hand, and West of Chainage 18+50 on the other hand.

Soil Conditions East of Chainage 8+50:

At this side of the valley the soil conditions above the till layer are as follows:

At the surface a layer of stiff brown sandy clay with fine gravel in it. This layer is estimated to be ten feet thick.

Next, a layer of medium dense sandy silt with layers of dense sand in it. This layer is estimated to be ten feet thick.

Immediately above the till, a layer of silty clay and fine sand or silty sand. This material is in a medium dense condition and is about five feet thick.

5. SUBSOIL CONDITIONS: (cont'd.) ...

Soil Conditions East of Chainage 8+50: (cont'd.) ...

Conditions at this section are such that any embankment which is stable on the rubble and refuse fill, will be stable here.

Soil Conditions West of Chainage 18+50:

The top layer at this side of the valley was composed of stiff to hard light brown clay with small stones scattered through it.

The next layer was composed of dense sand and gravel. This material was observed to be locally cemented where it appeared on the face nearby, and it is thought that random cementing has taken place throughout the layer. This layer was found to be 12 1/2 feet thick. Below this there is a layer of medium dense to dense fine sand. In places, this sand was silty. This layer was found to be approximately 23 feet thick.

The layer above the till at the West side of the valley is composed of grey silty clay with irregular layers of dense sand. The silty clay is very stiff to hard and the layer is considered to be incompressible. This layer is estimated to be 17 feet in thickness in Boring K1. In Boring K2 it was found to extend almost to the ground surface.

6. WATER CONDITIONS:

Water levels were observed in Borings K1, 2, 3, 4, 5, 6, 11 and 13, and are plotted in Drawing 59-F-115A. It will be seen that water level was found to be from five to ten feet below ground level in most holes. This means that ground water will be found to be at about elevation 255' on the West side of the valley and five to ten feet higher on the East side of the valley. Water levels in Borings K1 and 2 are probably unreliable because of the low permeability of the grey silty clay with sand layers.

cont'd. /8 ...

7. CONCLUSIONS AND RECOMMENDATIONS:

For the purpose of estimating the height of embankment which could be built at this site, it was assumed that the resistance of all the materials in the valley could be represented by making the assumption the base had a shear strength of 400 lb./sq.ft. On the basis of this decision it was observed that the limiting height of the embankment was 16 feet. It was decided to limit the practical height of the embankment to 12 feet. This means that the King Street structure will have to extend to Chainage 7 + 90 at the East side of the valley and to the top of the slope at the opposite side of the valley. It will be noticed that East of Chainage 7 + 90, the base consists of material which is essentially either stiff or granular and dense and so no problems are anticipated with fills in this area.

The bridge thus must extend from Chainage 7 + 90 to at least Chainage 19 + 30. The foundation conditions in the valley are such that spread footings cannot be used for the bridge piers and it is recommended that the piers be supported on piles driven to bedrock.

It is recommended that pile tests be carried out before the design of the bridge foundation is finalized. The object of these pile tests would be to investigate the competence of the bedrock under the proposed design loads, and to investigate the effects of driving groups of piles into the shale bedrock.

At the location of the West abutment there is a considerable overburden over bedrock: about 140 feet. As this would mean driving very long piles through highly resistant media, it is recommended that a spread footing be used for this abutment. This spread footing must be placed at Station 19 + 40 or farther West and should be established at elevation 304 feet or below. A footing at this elevation can have a gross bearing pressure of 20 tons per square foot. With a factor of safety of four, this gives a net allowable bearing pressure of five tons persquare foot.

7. CONCLUSIONS AND RECOMMENDATIONS: (cont'd.) ...

If work below the water table is necessary there is a possibility that water will enter the excavation and it may be necessary to take steps to control it.

October 1960

REPORT PREPARED BY:

John Brown
.....

John Brown
Project Foundation Engr.

REPORT APPROVED BY:

A. Sternac
.....

A. Sternac,
Foundations Office Engr.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K1	S1	5'-6.5'	Stiff light brown silty clay with small stones.	38	21.2	-	-	-	-	
	S2	10'-10.5'	Coarse sand to fine/med. gravel traces of silty clay.	50-6"	9.1	-	-	-	-	
	S3	15'-16.5'	Grey brown fine/med. gravel with traces of sand.	34	6.7	-	-	-	-	
	S4	20'-21.5'	Fine gravel with fine/med. sand.	33	-	-	-	-	-	
	S5	25'-26.5'	Brown fine sand with light brown silty very fine sand.	54	-	-	-	-	-	
	S6	30'-31.5'	Fine brown red sand.	31	-	-	-	-	-	
	S7	35'-36.5'	Fine red sand.	34	-	-	-	-	-	
	S8	40'-41.5'	Very fine red sand.	14	-	-	-	-	-	
	S9	45'-46.5'	Grey silty clay with fine gravel and fine red sand.	48	-	-	-	-	-	
	S10	50'-51.5'	Silty clayey fine sand with fine gravel.	62	-	-	-	-	-	
	S11	55'-56.5'	Grey silty clay changing to med. red sand.	44	-	-	-	-	-	
	S12	60'-61.5'	Med. red sand changing to silty clay.	48	-	-	-	-	-	
	S13	65'-66.5'	Grey silty clay with small stones and thin layers of sand.	40	-	-	-	-	-	

Cont. P. 2.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 125-60

SOLE 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
K1	T14	70'-71.5'	Grey silty clay with fine sand.	P	-	-	-	-	-	
	VANE	76.5'		-	-	-	-	1520	-	Sens: 1.5
	T15	80'-81.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	86.5'		-	-	-	-	1840	-	Sens: 7.1
	T16	90'-91.5'	Grey silty clay with a layer of fine gravel and pieces of red-green shale.	P	-	-	-	-	-	
	VANE	96.5'		-	-	-	-	> 2000	-	Sens: 1.9
	T17	100-101.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	106.5'		-	-	-	-	1680	-	Sens: 1.3
	T18	110-111.5'	Grey silty clay with sand and fine gravel.	P	-	-	-	-	-	
	VANE	116.5'		-	-	-	-	> 2000	-	Sens: 2.1
	T19	120-121.5'	Grey silty clay.	Pushed 12" 20-6"	-	-	-	-	-	
	VANE	126.5'		-	-	-	-	> 2000	-	
	T20	130-131.5'	Silty soft grey clay with fine sand.	P	-	-	-	-	-	
	VANE	136.5'		-	-	-	-	> 2000	-	
	RC21	136.8-146.8	Hard shales (Bedrock)	-	-	-	-	-	-	100% Recovery

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K2	S1	5'-6.5'	Fine brown sand brown sandy clay.	13	21.6	-	-	-	-	
	VANE	8'		-	-	-	-	1680	-	Sens: 2.6
	T2	10'-11.5'	Brown clayey silt.	P	23.0	14.3	24.4	-	-	
	S3	15'-16.5'	Layers brown fine sand grey-brown clayey silt.	17	17.7	-	-	-	-	
	S4	20'-21.5'	Grey clayey silt with silt layers.	19	19.1	-	-	-	-	
	T5	25'-26.5'	Grey clayey silt.	P	-	-	-	-	-	
	S6	30'-31.5'	Grey clayey silt with layers of fine sand.	17	19.2	-	-	-	-	
	T7	35'-37'	Grey clayey silt.	P	-	-	-	-	-	
	VANE	38.5'		-	-	-	-	1680	-	Sens: 1.5
	S8	40'-41.5'	Grey clayey silt.	13	22.5	-	-	-	-	
	VANE	43'		-	-	-	-	1600	-	Sens: 2.9
	S9	45'-46.5'	Grey silty clay.	17	-	-	-	-	-	
	VANE	48'		-	-	-	-	1760	-	Sens: 1.6
	T10	50'-52'	Grey silty clay.	P	-	-	-	-	-	
	T11	55'-57'	Grey silty clay.	P	-	-	-	-	-	
	VANE	58.5'		-	-	-	-	> 2000	-	Sens > 2.8

Cont. P. 4.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K2	S12	60'-61.5'	Grey silty clay.	12	-	-	-	-	-	
	VANE	63'		-	-	-	-	1600	-	Sens: 2.0
	T13	65'-66.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	68'		-	-	-	-	1840	-	Sens: 1.8
	S14	70'-71.5'	Grey silty clay.	27	-	-	-	-	-	
	VANE	73'		-	-	-	-	2000	-	Sens: 1.8
	T15	75'-77'	Grey silty clay.	P	-	-	-	-	-	
	S16	85'-86.5'	Grey clayey silt.	28	-	-	-	-	-	
	S17	96'-97'	Green and red weathered shale.	250+	-	-	-	-	-	
K3	S1	10'-11.5'	Brown silty clay with ashes and refuse.	2	83.8	-	-	-	-	
	S2	15'-16.5'	Brown silty clay with ashes and refuse.	5	31.7	-	-	-	-	
	VANE	18'		-	-	-	-	800	-	Sens: 2.5
	S3	20'-21.5'	Grey-brown silty clay with sand.	11	23.1	-	-	-	-	
	S4	25'-26.5'	Grey-brown silty clay with sand.	7	27.2	-	-	-	-	
	S5	30'-31.5'	Grey silty clay.	8	22.2	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 50-F-115

W.P. 185-60

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
K4	S1	5'-6.5'	Fine brown clayey sand.	7	15.2	-	-	-	-	
	S2	10'-11.5'	Ashes, gravel and brick rubble.	3	-	-	-	-	-	
	S3	15'-16.5'	Brown silt with decayed vegetation.	8	42.3	-	-	-	-	
	VANE	18'		-	-	-	-	1440	-	Sens: 3.6
	VANE	21.5'		-	-	-	-	1600	-	Sens: 1.0
	S4	20'-21.5'	Brown clayey silt with decayed vegetation and rubble.	P	-	-	-	-	-	
	S5	25'-26.5'	Brown silty fine sand.	4	34.4	-	-	-	-	
	S6	30'-31.5'	Grey clayey silt.	13	-	-	-	-	-	
	T7	33'-35'	Grey clayey silt.	P	-	-	-	-	-	
	VANE	36.5'		-	-	-	-	1760	-	Sens: 1.6
	T8	40'-41.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	43.0'		-	-	-	-	>2000	-	Sens:>1.8
	S9	50'-51.5'	Grey silty clay.	23	18.6	-	-	-	137.3	
	S10	60'-61.5'	Grey silty clay.	16	24.8	-	-	-	-	
	T11	62'-64'	Grey silty clay.	P	-	-	-	-	-	
	VANE	65.5'		-	-	-	-	1520	-	Sens: 2.1

Cont. P. 6.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K4	S12	70'-71.5'	Grey silty clay with fragments of shale.	68	-	-	-	-	-	
	S13	80'-81.5'	Weathered shale.	160	-	-	-	-	-	
K5										
K6	S1	10'-11.5'	Gravel, sand, ashes and refuse.	2	-	-	-	-	-	Lost sample.
	S2	15'-16.5'	Brown sandy silt with decayed refuse.	6	23.8	-	-	-	-	
	S3	20'-21.5'	Grey silty clay.	7	-	-	-	-	-	
	S4	25'-26.5'	Grey silty clay with decayed vegetation.	5	25.0	-	-	-	-	
	S5	30'-31.5'	Sand and gravel.	7	-	-	-	-	-	
	S6	35'-36.5'	Grey silty clay.	10	46.3	-	-	-	-	
	S7	40'-41.5'	Grey silty clay.	11	-	-	-	-	-	
K7	S1	5'-6.5'	Brown silty clay with ashes and sand.	17	-	-	-	-	-	
	S2	10'-11.5'	Black/brown silty clay with ashes.	2	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. k85-60

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
K7	S3	15'-16.5'	Silty clay with ashes.	4	-	-	-	-	-	Sample lost.
	S4	20'-21.5'	Silty clay with ashes.	6	-	-	-	-	-	
	S5	25'-26.5'	Grey-brown silty sand with organic matter.	2	29.9	-	-	-	-	
	S6	30'-31.5'	Grey-brown silty sand with ashes, organic matter.	6	-	-	-	-	-	Sample lost.
	S7	35'-36.5'	Grey gravelly sand.	21	19.9	-	-	-	-	
	S8	40'-41.5'	Grey sandy silt with gravel.	9	22.2	-	-	-	-	
	S9	45'-47'	Grey sandy clay.	P	-	-	-	-	-	Sample lost.
	VANE	50'		-	-	-	-	1520	-	Sens: 1.5
	T10	55'-57'	Stiff grey clayey silt.	P	25.2	20.1	29.8	2275	126.1	
	VANE	60'		-	-	-	-	2000	-	Sens: 2.1
	T11	65'-66.5'	Stiff grey clayey silt.	-	26.3	20.8	35.8	1655	121.2	Hammered.
	RC12	75'-80'	Shale.	-	-	-	-	-	-	
	RC13	80'-85'	Shale.	-	-	-	-	-	-	
K8	S1	3'-4.5'	Clay, ashes, and some small stones.	13	-	-	-	-	-	
	S2	10'-11.5'	Ashes, clay and decayed matter.	31	-	-	-	-	-	

TABLE NO. 1.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K8	S3	15'-16.5'	Light brown sandy clay.	5	25.3	-	-	-	-	
	S4	20'-21.5'	Soft brown sandy clay.	6	-	-	-	-	-	
	S5	25'-26.5'	Grey sandy gravel.	12	15.3	-	-	-	-	
	S6	30'-32.5'	Loose fine silty sand.	5	-	-	-	-	-	
	VANE	36.5'		-	-	-	-	1920	-	Sens: 4.0
	T7	40'-41.5'	Grey clayey silt.	-	-	-	-	-	-	Hammered.
	VANE	46'		-	-	-	-	1040	-	Sens: 1.4
	T8	50'-51.5'	Grey clayey silt.	P	23.1	18.3	30.0	1350	126.4	
	VANE	55.5'		-	-	-	-	960	-	Sens: 1.7
	T9	60'-61.5'	Grey clayey silt.	-	15.4	15.1	23.6	-	-	Hammered.
	T10	70'-71.5'	Grey clayey silt.	-	-	-	-	-	-	Hammered.
	RC11	73'-78'	Shale.	-	-	-	-	-	-	80% Recovery.
	RC12	78'-83'	Shale.	-	-	-	-	-	-	100% Recovery.
K9	S1	5'-6.5'	Brown silty clay with ashes.	15	16.8	-	-	-	-	
	S2	10'-11.5'	Brown silty clay with sand, ashes, coal, etc.	16	16.8	-	-	-	-	
	S3	20'-21.5'	Brown silty clay.	16	25.3	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115
W.P. 185-60

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
K9	T4	25'-26.5'	Brown silty clay.	-	-	-	-	-	-	Hammered - lost
	T5	30'-31.5'	Stiff grey clayey silt.	P	23.6	17.7	29.8	1560	128.3	
	VANE	35'		-	-	-	-	>2000	-	Sens: -
	T6	40'-41.5'	Grey clayey silt.	P	24.3	19.3	23.4	1730	127.0	
	VANE	45'		-	-	-	-	1600	-	Sens: 2.0
	T7	50'-51.5'	Grey clayey silt.	P	27.1	19.1	33.5	1435	124.9	
	VANE	55'		-	-	-	-	1360	-	Sens: 2.1
	T8	60'-61.5'	Grey clayey silt.	P	-	20.1	36.0	-	-	
	RC9	70.2-75.2'	Shale.	-	-	-	-	-	-	
	RC10	75.2-80.5'	Shale.	-	-	-	-	-	-	
K10	S1	5'-6.5'	Gravel, sand and rubble.	11	-	-	-	-	-	
	S2	10'-11.5'	Gravel, sand, ashes and decayed refuse.	4	-	-	-	-	-	
	S3	15'-16.5'	Gravel, sand and ashes.	2	-	-	-	-	-	
	S4	20'-21.5'	Grey-brown silty clay with decayed refuse.	46	21.9	-	-	-	129.6	Organic content 0.18%
	S5	25'-26.5'	Brown silty clay with a trace of sand.	30	22.4	-	-	-	132.6	
	VANE	31.5		-	-	-	-	1680	-	Sens: 2.3 Cont. P.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K10	S6	31.5-33'	Grey silty clay.	15	-	-	-	-	-	Sens: 1.7 No recovery.
	T7	35'-36.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	38'		-	-	-	-	1600	-	
	T8	45'-47'	Grey silty clay.	P	-	-	-	-	-	
	S9	50'-51.5'	Grey silty clay with fragments of shale.	41	-	-	-	-	-	
	T10	55'-55.5'		P	-	-	-	-	-	Sens: >1.8
	VANE	57'		-	-	-	-	> 2000	-	
	S11	57'-58.5'	Grey silty clay with fragments of shale.	28	-	-	-	-	-	
	T12	60-61.5'	Grey silty clay with fragments of shale.	P	-	-	-	-	-	
	S13	70-71.5'	Weathered shale.	38	-	-	-	-	-	
K11	S1	5'-6.5'	Gravel, sand and decayed refuse.	P	-	-	-	-	-	
	S2	10'-11.5'	Ashes, gravel and decayed refuse.	P	-	-	-	-	-	
	S3	15'-16.5'	Sand and ashes.	6	-	-	-	-	-	
	S4	20'-21.5'	Clayey sand with decayed refuse.	10	-	-	-	-	-	

Cont. P. 11.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115
W.P. 185-60

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
K11	S5	25'-26.5'	Grey-brown clayey silt with traces of fine sand.	40	-	-	-	-	-	Sens: 1.7 No recovery.
	S6	30'-31.5'	Grey-brown silty clay.	15	-	-	-	-	-	
	VANE	33'		-	-	-	-	>2000	-	
	T7	35'-36.5'	Grey silty clay.	P	-	-	-	-	-	
	T8	37'-38.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	40'		-	-	-	-	1440	-	
	VANE	44.5'		-	-	-	-	1760	-	
	T9	48'-49.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	51.0'		-	-	-	-	1360	-	
	S10	53'-54.5'	Stiff grey silty clay with intermediate layers of stiff red clay.	48	-	-	-	-	-	
K12	S1	5'-6.5'	Brown sand mixed with ashes and decayed refuse.	7	-	-	-	-	-	
	S2	10'-11.5'	Brown clayed sand with ashes and decayed refuse.	9	-	-	-	-	-	
	S3	15'-16.5'	Brown clayey sand, ashes, rubble and decayed refuse.	4	43.0	-	-	-	-	
	S4	20'-21.5'	Hard brown silty clay.	60	18.6	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K12	S5	25'-26.5'	Brown silty clay with gravel.	27	24.8	-	-	-	-	
	S6	30'-31.5'	Grey silty clay with traces of sand.	17	11.6	-	-	-	-	
	S7	35'-36.5'	Grey silty clay.	24	22.9	-	-	-	-	
K13	S1	5'-6.5'	Ashes, sand gravel and decayed refuse.	4	-	-	-	-	-	
	S2	10'-11.5'	Ashes, broken brick, gravel.	6	-	-	-	-	-	
	S3	15'-16.5'	Ashes, broken brick, gravel.	7	-	-	-	-	-	
	S4	20'-21.5'	Sand, ashes and refuse.	15	-	-	-	-	-	
	S5	25'-26.5'	Sand, gravel and ashes.	7	27.8	-	-	-	-	
	S6	30'-31.5'	Grey clayey silt with fine gravel.	47	12.8	-	-	-	136.6	
	T7	35'-36.5'	Grey silty clay.	P	-	-	-	-	-	
	S8	40'-41.5'	Grey silty clay.	13	-	-	-	-	-	
	T9	44'-45.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	47'		-	-	-	-	1440	-	Sens: 1.5
	T10	50'-51.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	53'		-	-	-	-	880	-	Sens: 2.2
	T11	55'-56.5'	Grey silty clay.	P	-	-	-	-	-	Cont. P. 13.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-P-115

W.P. 185-60

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
K13	VANE	58'		-	-	-	-	1120	-	Sens: 3.1
	T12	60'-61.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	63'		-	-	-	-	1600	-	Sens: 2.7
	T13	65'-66.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	68'		-	-	-	-	1600	-	Sens: 2.9
	VANE	71.5'		-	-	-	-	>2000	-	Sens: >2.1
	S14	74.5-74.8	Red weathered shale.	50-3"	-	-	-	-	-	
K14	S1	5'-6.5'	Brown sandy clay with gravel and ashes.	6	17.1	-	-	-	-	
	S2	10'-11.5'	Brown silty clay with ashes and decayed vegetation.	7	13.8	-	-	-	-	
	S3	15'-16.5'	Gravel, sand, ashes and refuse.	8	-	-	-	-	-	
	S4	25'-26.5'	Grey-brown silty clay with fragments of organic matter.	15	-	-	-	-	-	
	S5	30'-31.5'	Grey-brown silty clay with gravel.	18	16.1	-	-	-	-	
K15	S1	5'-6.5'	Bricks, ashes and rubble.	9	-	-	-	-	-	
	S2	10'-11.5'	Bricks, ashes and rubble.	9	-	-	-	-	-	

Cont. P. 14.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-6C

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
K15	S3	15'-16.5'	Bricks, ashes and rubble.	7	-	-	-	-	-	
	S4	20'-21.5	Clayey mixture of bricks, ashes and rubble.	15	-	-	-	-	-	
	S5	25'-26.5'	Grey silty clay with fine gravel.	16	18.3	-	-	-	-	
K16	S1	10'-11.5'	Brown sandy clay with fine gravel.	9	12.0	-	-	-	-	
	S2	15'-16.5'	Loose brown sandy silt changing to fine to med. sand.	20	2.7	-	-	-	-	
	S3	20'-21.5'	Brown silty clay with layers of fine brown sand.	26	21.9	-	-	-	-	
	S4	25'-26.5'	Grey silty clay with sand and gravel.	43	14.6	-	-	-	-	
			S denotes split spoon sa. T denotes shelby tube sa. RC denotes rock core sa.							

NOTE: change of scale.

LEGEND

1/2 UNCONFINED COMPRESSION (Qu)	---	O
VANE TEST (C) AND SENSITIVITY (S)	---	+S
NATURAL MOISTURE AND		
LIQUIDITY INDEX	-----	LI
LIQUID LIMIT	-----	X
PLASTIC LIMIT	-----	

CONSISTENCY			SAMPLE	NATURAL UNIT W
MOIST. CONTENT- % DRY WT.				P.C.F.
10	20	30		
			S1	-
			S2	-
			S3	-
			S4	-
			S5	-
			S6	-
			S7	-
			S8	-
			S9	-
			S10	-
			S11	-
			S12	-
			S13	-
			T14	-
			T15	-
			T16	-
			T17	-
			T18	-
			T19	-
			T20	-
			RC21	-

DEPARTMENT OF HIGHWAYS - ONTARIO

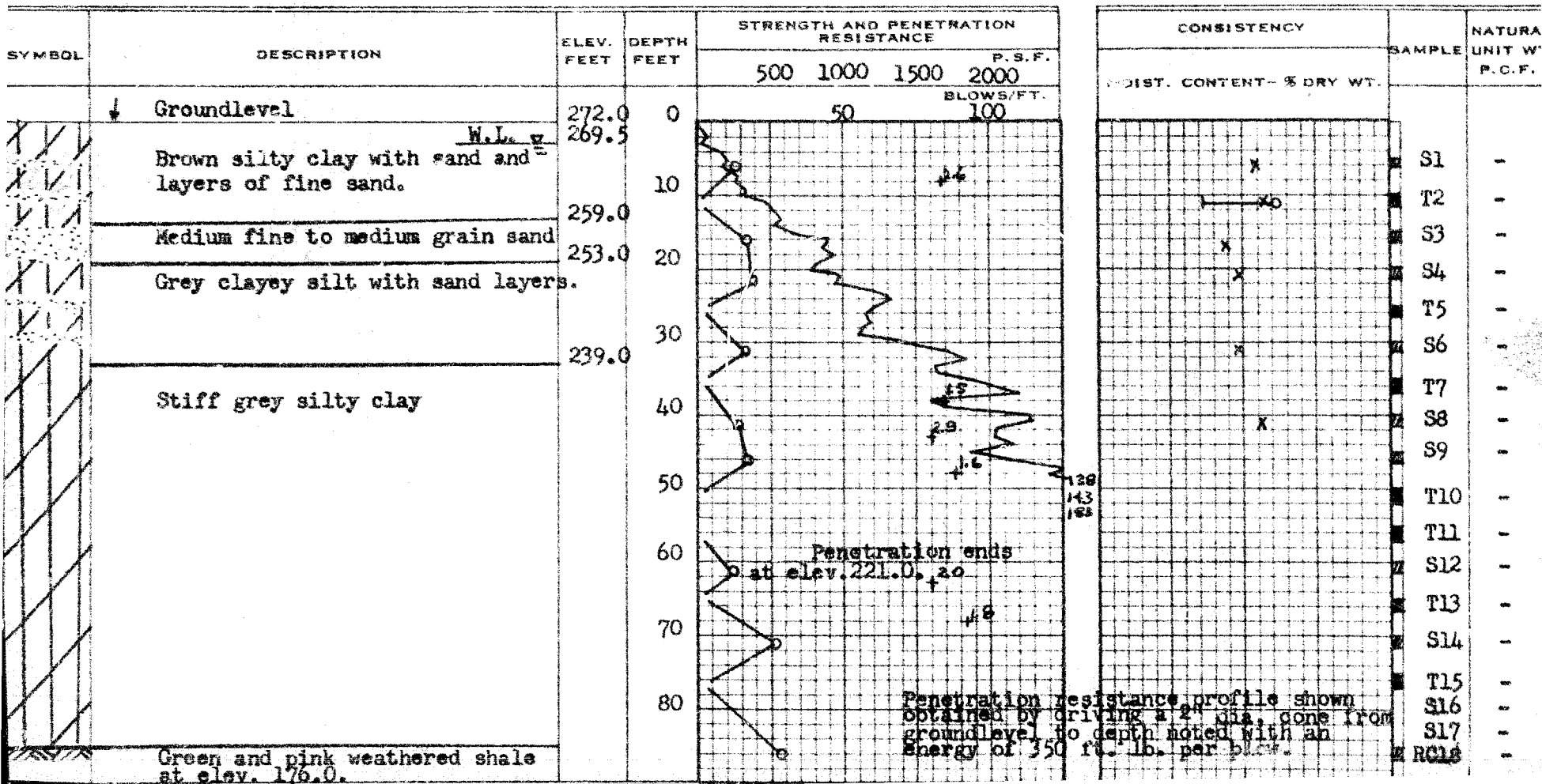
MATERIALS AND RESEARCH SECTION

W.P. 185-60 BORE HOLE NO. K2
 JOB 59-F-115 STATION 18+50 CL. King St.
 DATUM G.S.C. COMPILED BY B.K.
 BORING DATE Jan. 20/60. CHECKED BY J.B.

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

LEGEND

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



DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

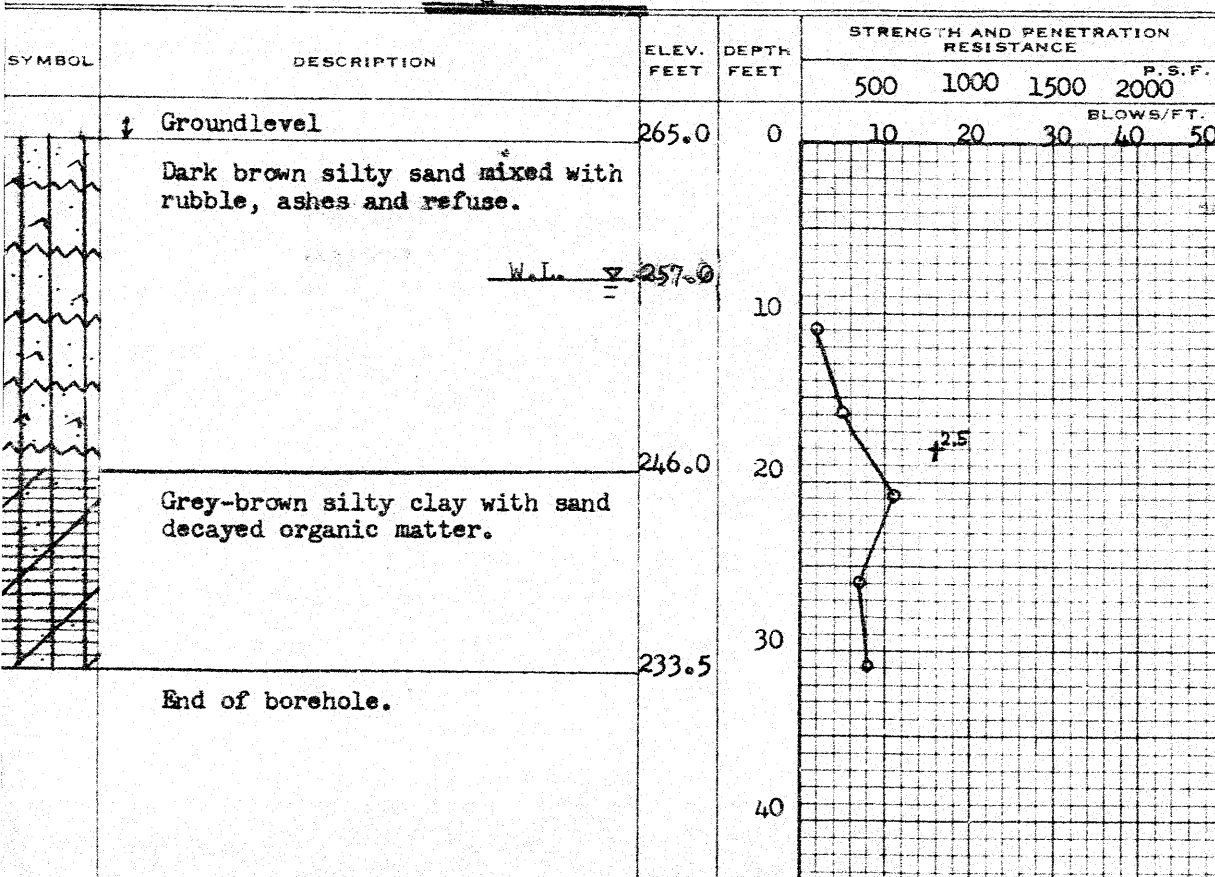
W.P. 185-60 BORE HOLE NO. K3
 JOB 59-P-115 STATION 17+70 CL Kings St.
 DATUM G.S.C. COMPILED BY B.K.
 BORING DATE Jan. 4/60 CHECKED BY J.B.

Note: Change of Scale.

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



CONSISTENCY			SAMPLE	NATURAL UNIT WT P.C.F.
MOIST. CONTENT- % DRY WT.				
10	20	30		
			S1	-
		X	S2	-
	X		S3	-
		X	S4	-
		X	S5	-

DEPARTMENT OF HIGHWAYS - ONTARIO

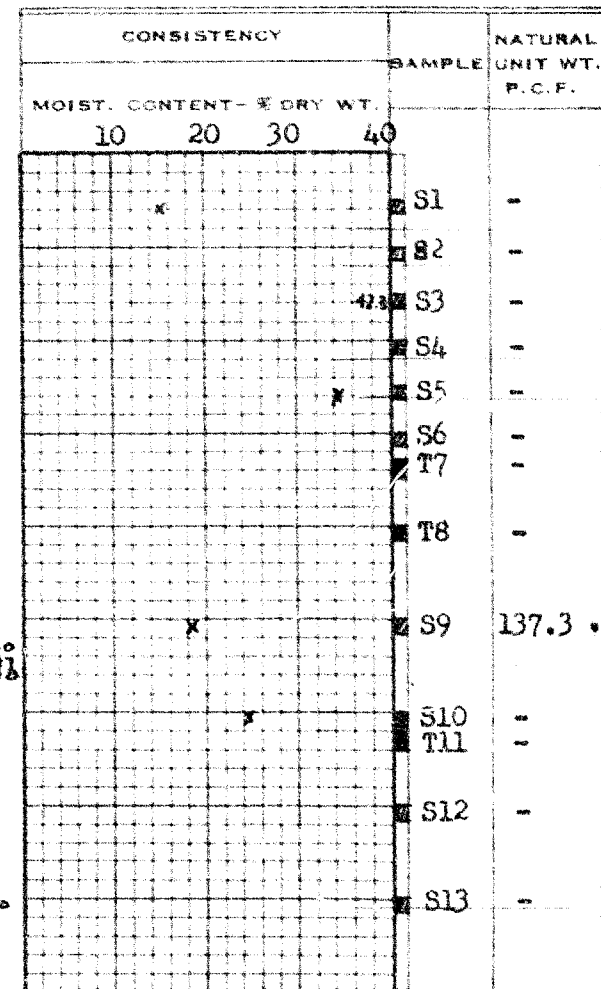
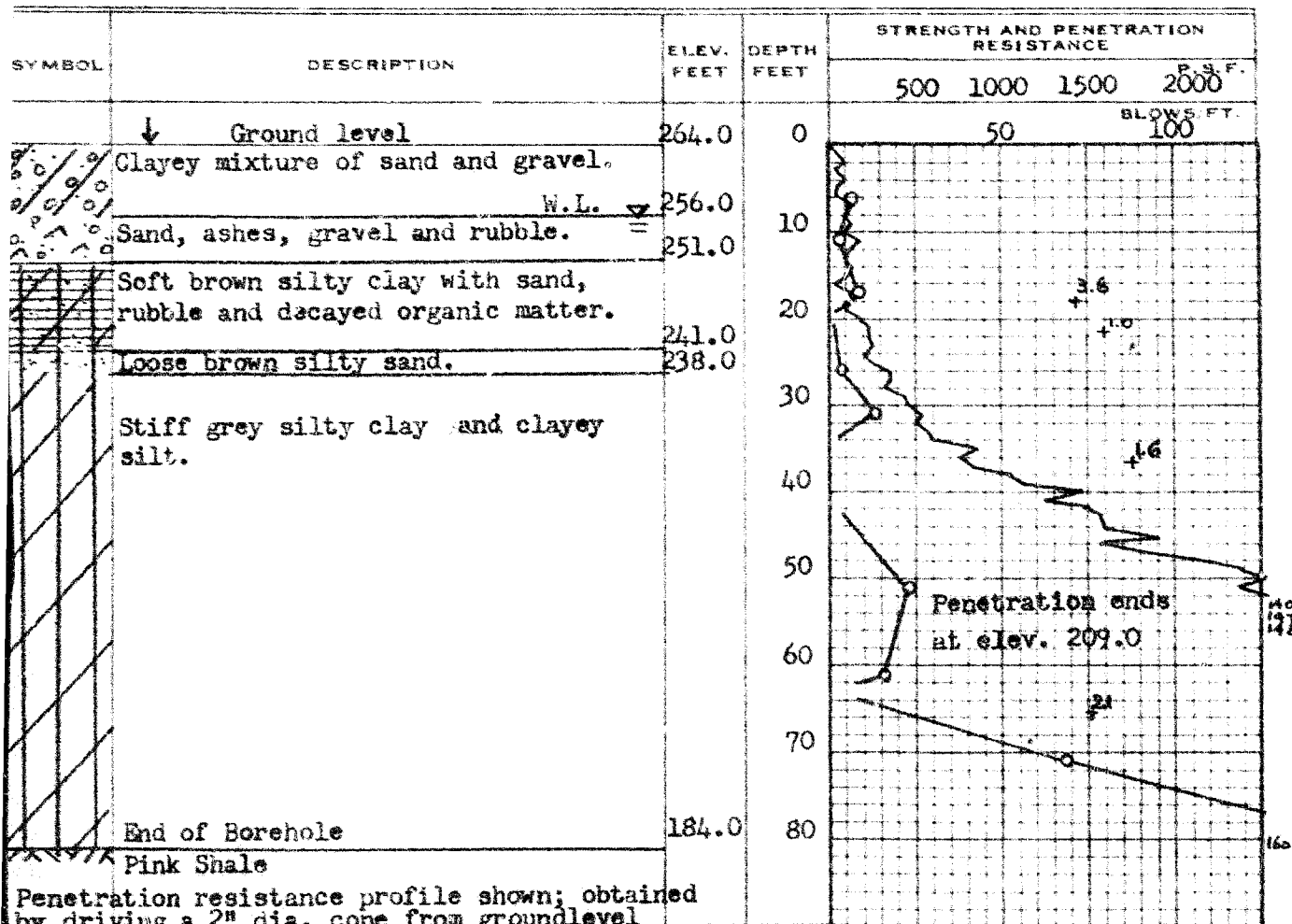
MATERIALS AND RESEARCH SECTION

W.P. 185-60 ----- BORE HOLE NO. K4 -----
 JOB 59-F-115 ----- STATION 17+50 CL King St. -----
 DATUM G.S.C. ----- COMPILED BY B.K. -----
 BORING DATE Jan. 13/60 ----- CHECKED BY J.B. -----

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

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) ----- O
 VANE TEST (C) AND SENSITIVITY (S) ----- +
 NATURAL MOISTURE AND LIQUIDITY INDEX ----- LI
 LIQUID LIMIT ----- X
 PLASTIC LIMIT -----



MATERIALS AND RESEARCH SECTION

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

1/2 UNCONFINED COMPRESSION (Qu)	—	0
VANE TEST (C) AND SENSITIVITY (S)	—	+s
NATURAL MOISTURE AND		LI
LIQUIDITY INDEX	—	X
LIQUID LIMIT	—	0
PLASTIC LIMIT	—	1

CONSISTENCY		SAMPLE	NATURAL UNIT WT.
MOIST. CONTENT - % DRY WT.			P.C.F.

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 185-60 ----- BORE HOLE NO. K6 -----

JOB 59-F-115 ----- STATION 16+00 CL. King St.

DATUM G.S.C. ----- COMPILED BY B.K.

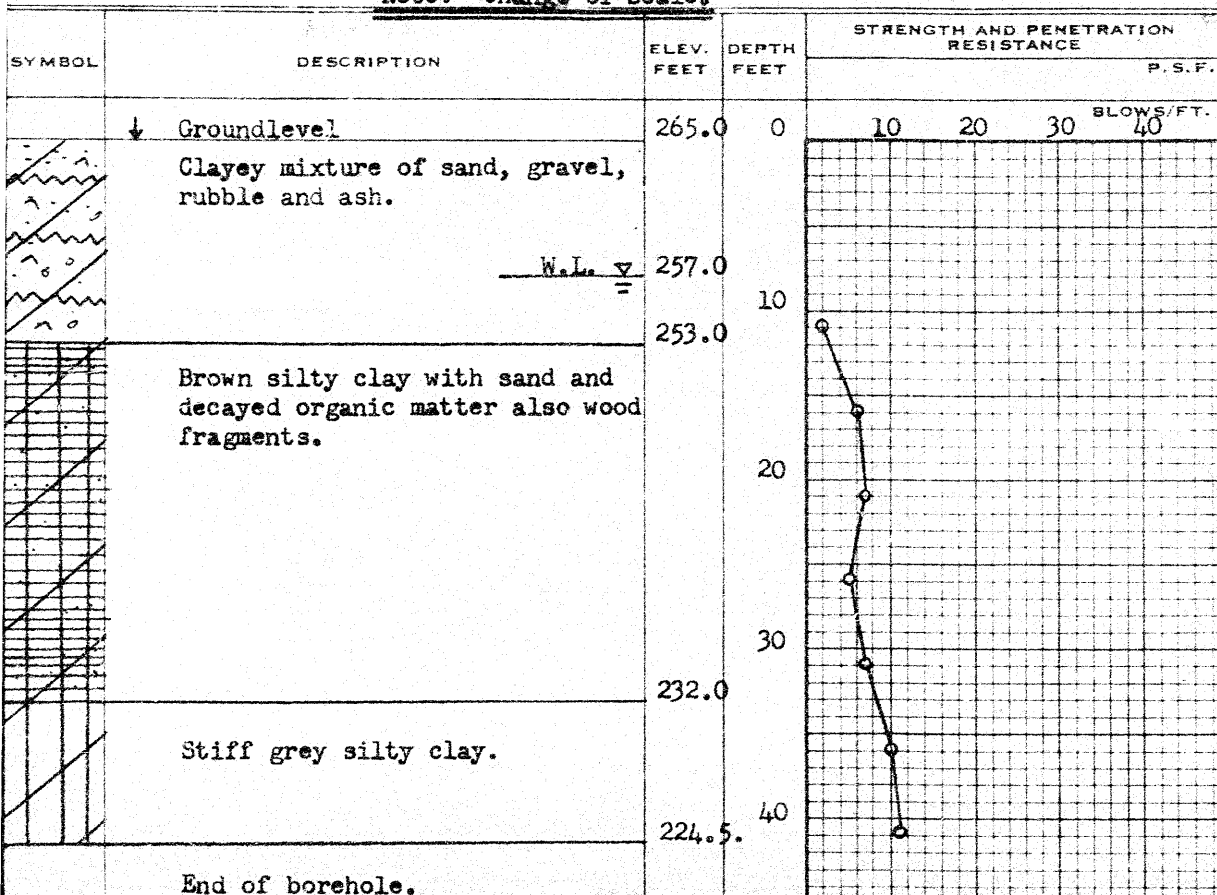
BORING DATE Jan. 2/60 ----- CHECKED BY J.B.

Note: Change of Scale.

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 -----



CONSISTENCY			SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.				
10	20	30		
			S1	-
		x	S2	-
			S3	-
		x	S4	-
			S5	-
			S6	-
			S7	-

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

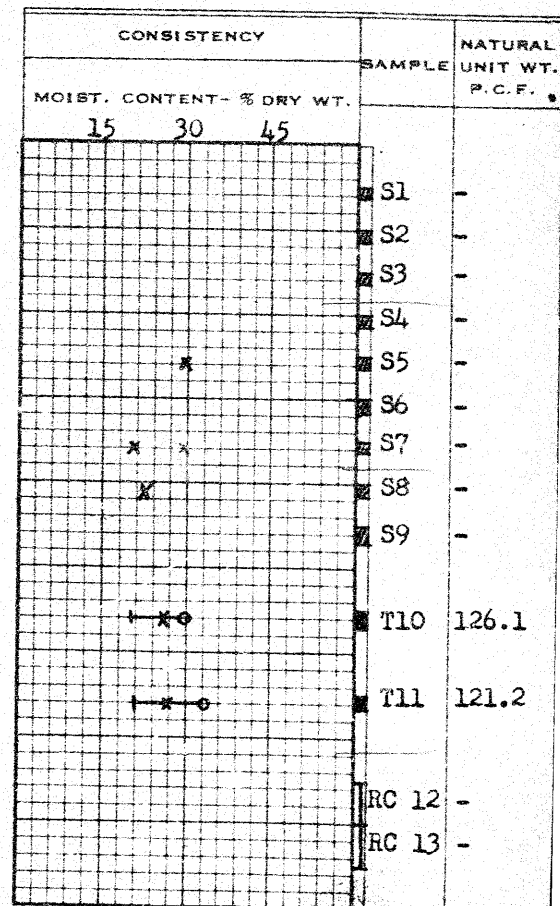
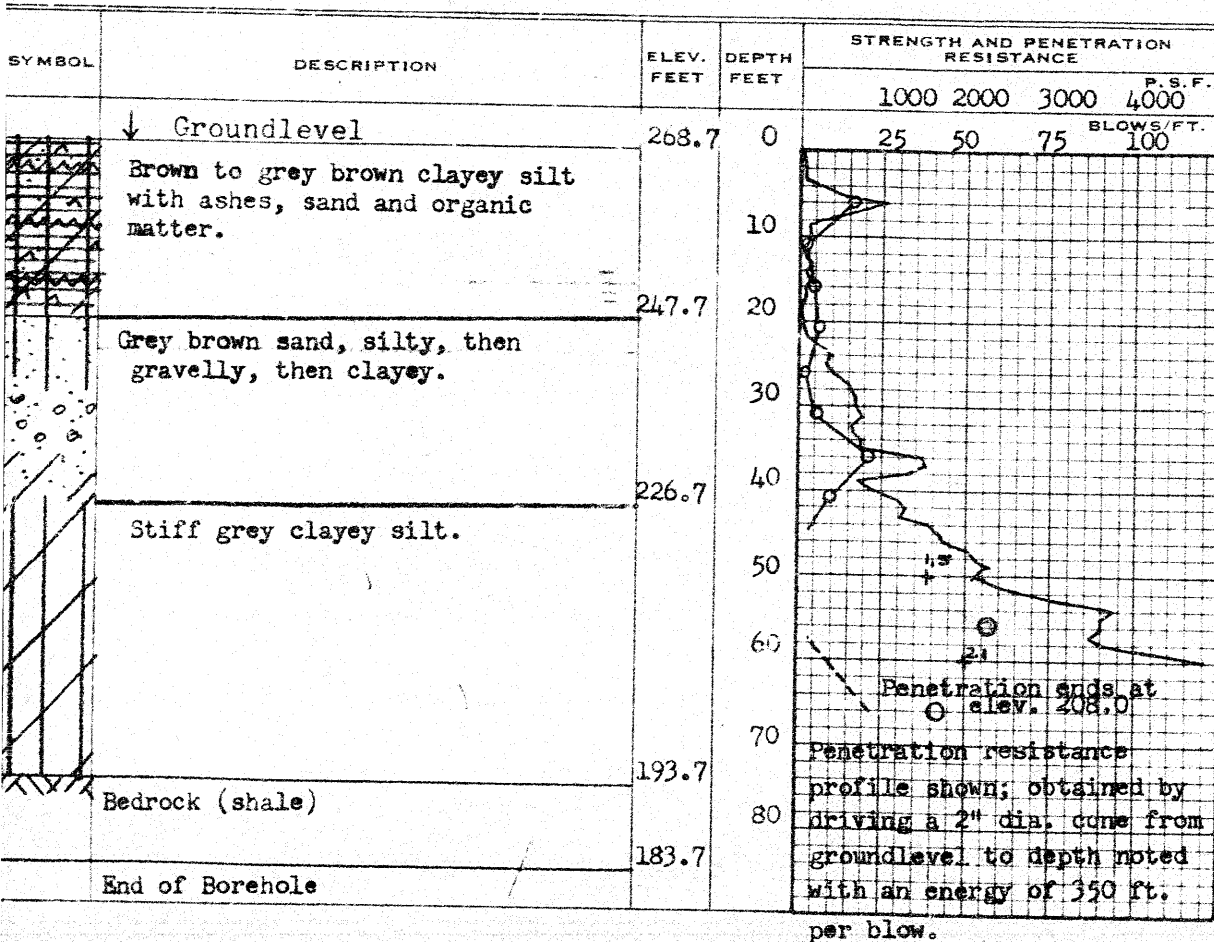
W.P. 185-60
 JOB F-59-115
 DATUM G. S. C.
 BORING DATE Nov. 19/59

BORE HOLE NO. K 7
 435+47.68, Rt
 STATION H.O.S.T. Chedoke
 COMPILED BY B. K.
 CHECKED BY J. B.

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

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) — O
 VANE TEST (C) AND SENSITIVITY (S) — +
 NATURAL MOISTURE AND LIQUIDITY INDEX — LI
 LIQUID LIMIT — X
 PLASTIC LIMIT —



DEPARTMENT OF HIGHWAYS - ONTARIO

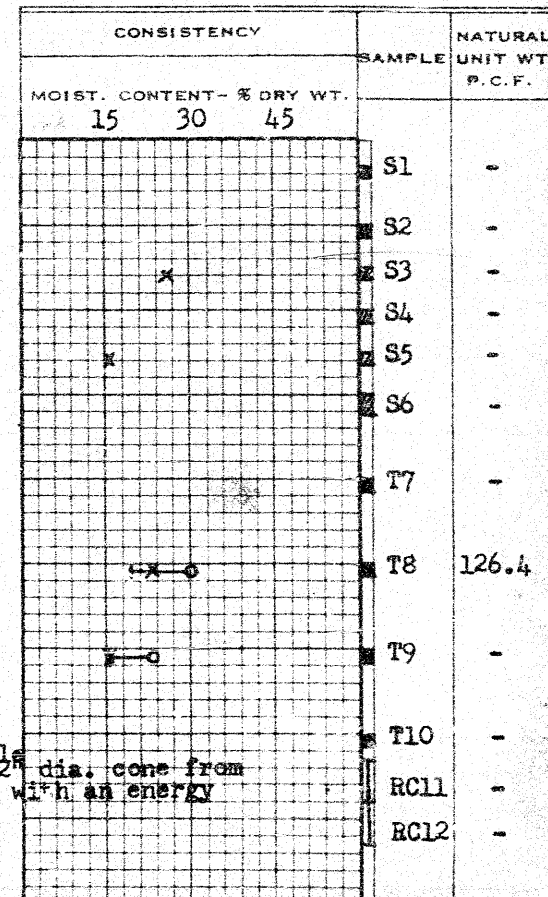
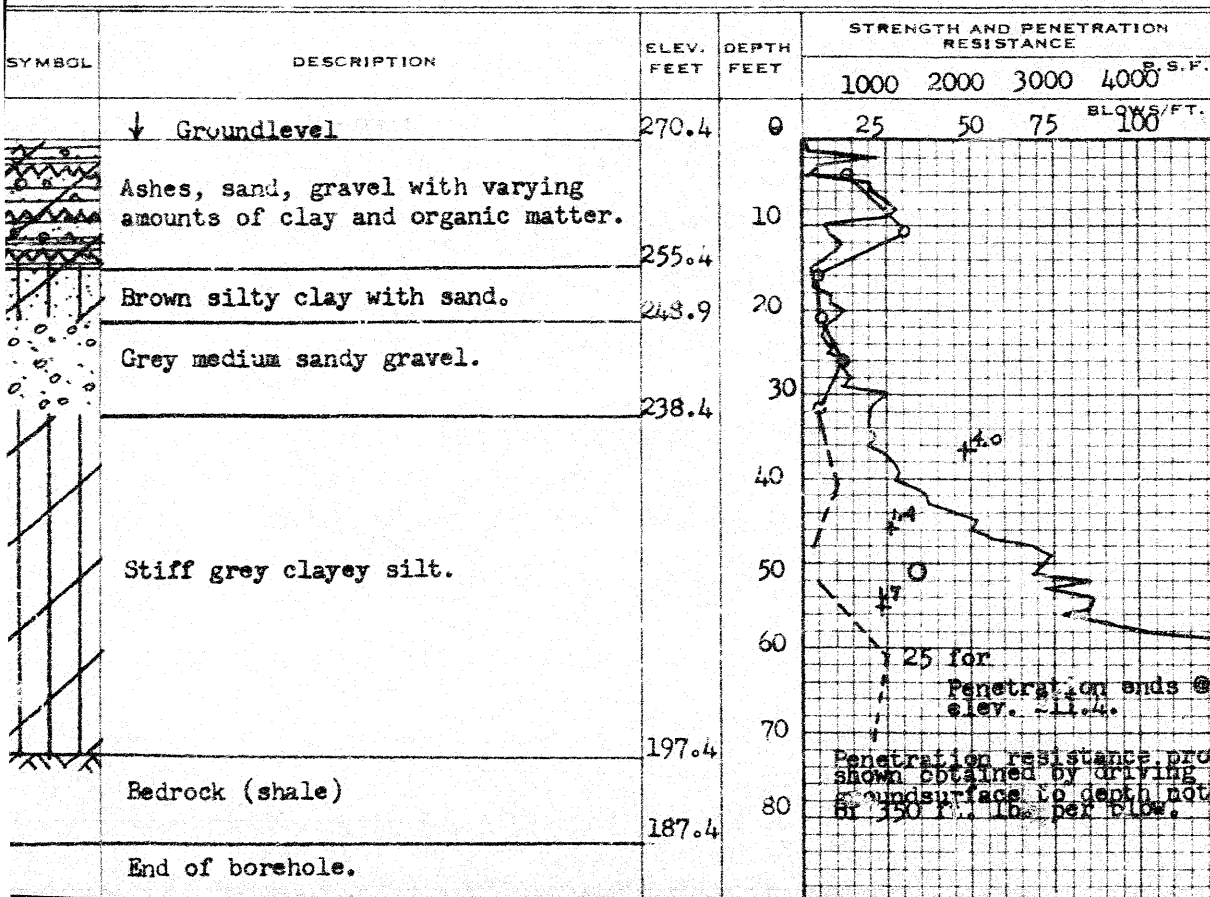
MATERIALS AND RESEARCH SECTION

W.P. 185-60 BORE HOLE NO. K8
 435/75 9' Rt.
 JOB F59-115 STATION H.O.S.T. Chedoke CL.
 DATUM G.S.C. COMPILED BY B.K.
 BORING DATE Nov. 24/59 CHECKED BY J.B.

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

LEGEND

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



DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

V.P. 185-60

JOB F59-113

DATUM G. S. C.

BORING DATE Nov. 27/59 CHECKED BY J. B.

BORE HOLE NO. K 9

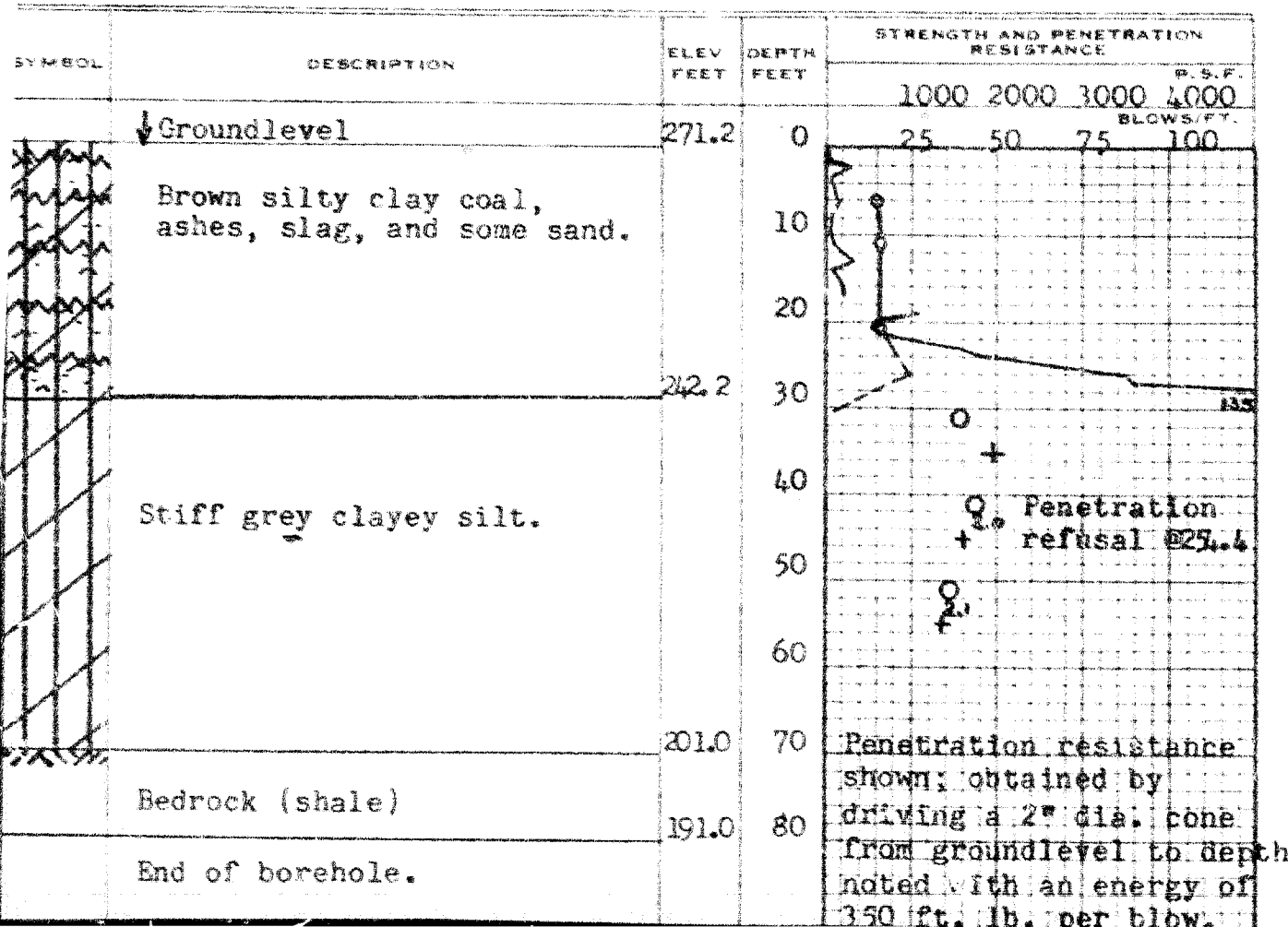
434+92 70' Lt.
STATION H.O.S.T. Ched. E

COMPILED BY B. K.

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

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) — O
VANE TEST (C) AND SENSITIVITY (S) — +
NATURAL MOISTURE AND LIQUIDITY INDEX — LI
LIQUID LIMIT — X
PLASTIC LIMIT —



CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.			
15 30 45			
		S1	-
		S2	-
		S3	-
		T4	-
		T5	128.3
		T6	127.0
		T7	124.9
		T8	-
		RC 9	-
		RC 10	-

DEPARTMENT OF HIGHWAYS - ONTARIO

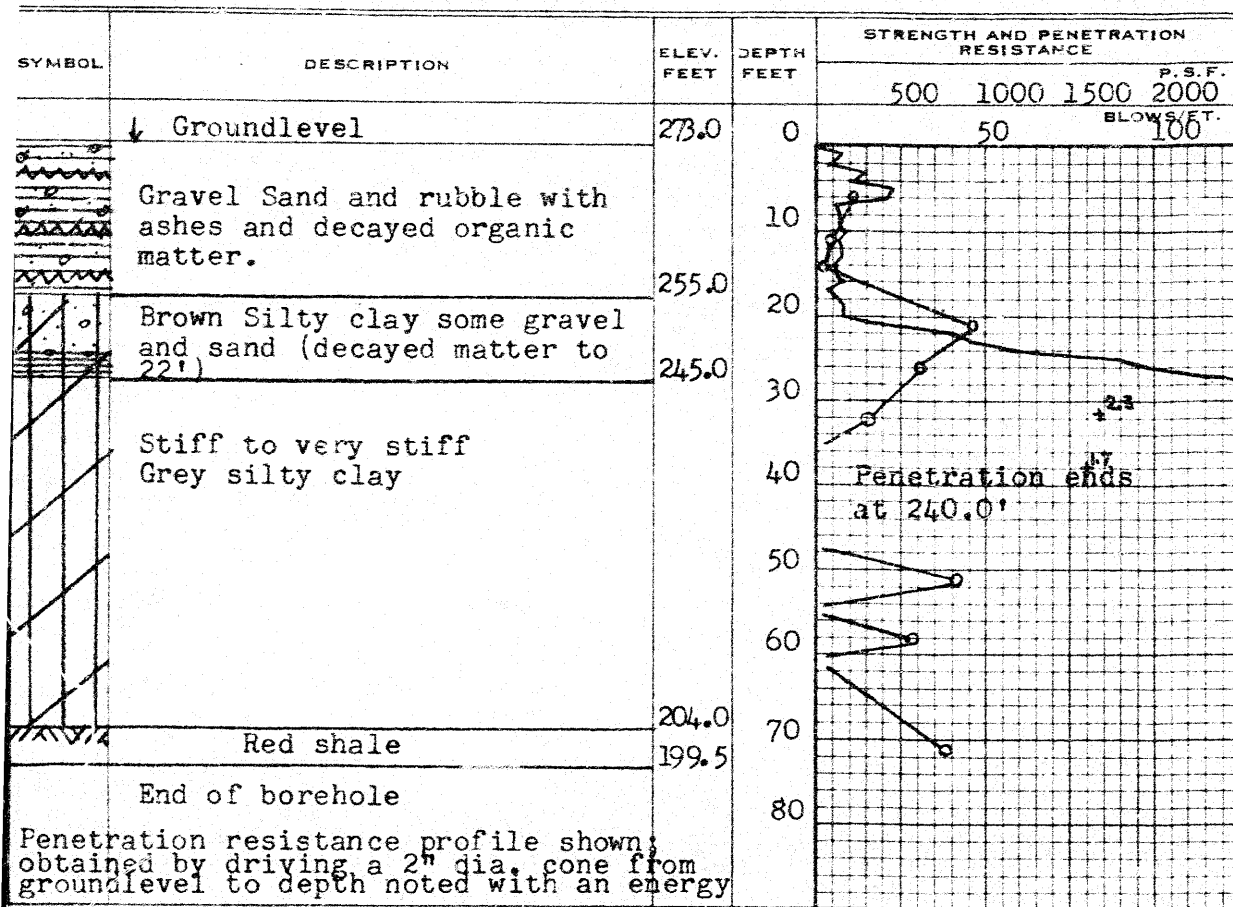
MATERIALS AND RESEARCH SECTION

W.P. 185-60 BORE HOLE NO. K 10
 JOB 59-F-115 STATION 12+50 E King St.
 DATUM G. S. C. COMPILED BY B. K.
 BORING DATE Jan. 13/60 CHECKED BY J. B.

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

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) O
 VANE TEST (C) AND SENSITIVITY (S) +
 NATURAL MOISTURE AND LIQUIDITY INDEX LI
 LIQUID LIMIT X
 PLASTIC LIMIT



CONSISTENCY			SAMPLE	NATURAL UNIT WT P.C.F.
MOIST. CONTENT - % DRY WT.				
10	20	30		
			S1	-
			S2	-
			S3	-
			S4	129.6
			S5	132.6
			S6	-
			T7	-
			T8	-
			S9	-
			T10	-
			S11	-
			T12	-
			S13	-

DEPARTMENT OF HIGHWAYS - ONTARIO

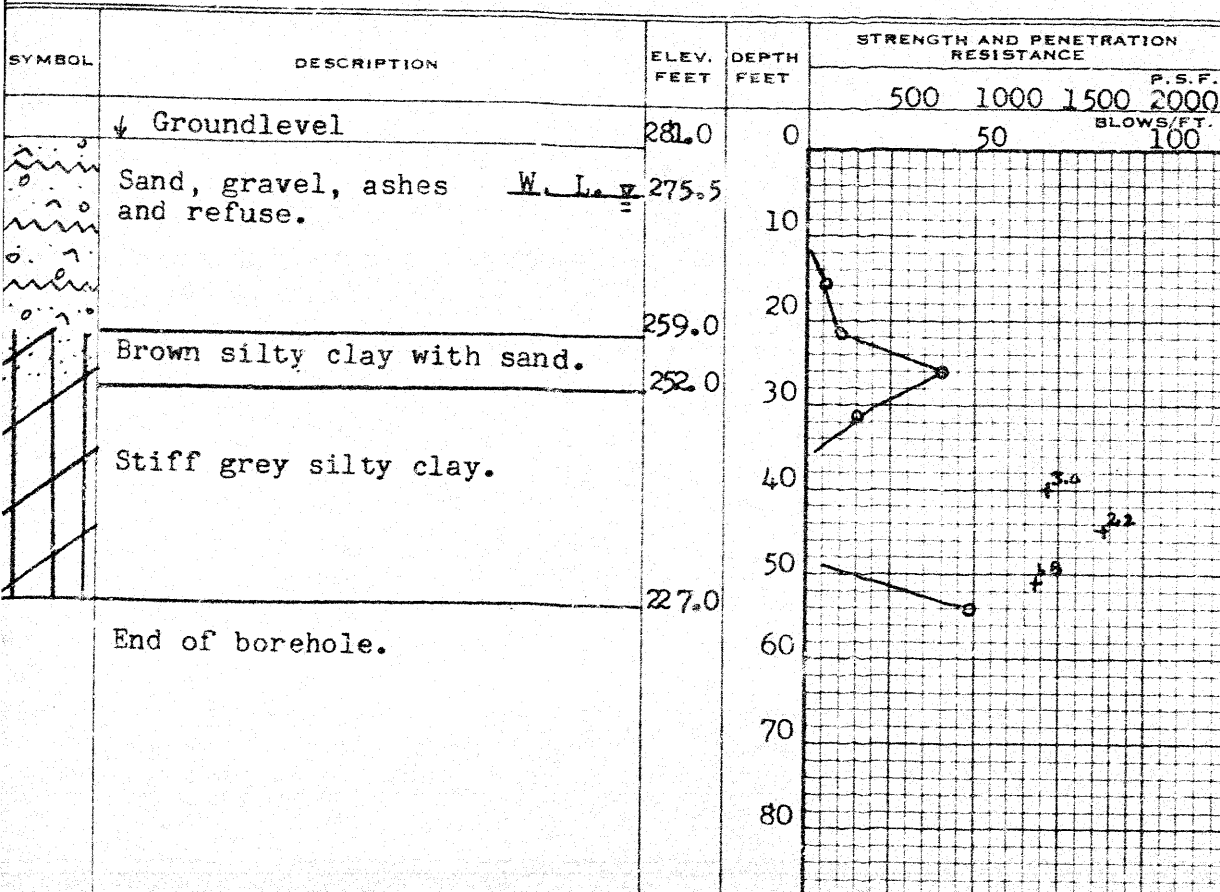
MATERIALS AND RESEARCH SECTION

W.P. 185-60 BORE HOLE NO. K 11
 JOB 59-F-115 STATION 11+80 E
 DATUM G. S. C. COMPILED BY B. K.
 BORING DATE Jan. 15/60 CHECKED BY J. B.

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

LEGEND

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



CONSISTENCY	SAMPLE	NATURAL UNIT WT P.C.F.
MOIST. CONTENT - % DRY WT.		
	S1	
	S2	
	S3	
	S4	
	S5	
	S6	
	T7	
	T8	
	T9	
	S10	

DEPARTMENT OF HIGHWAYS - ONTARIO

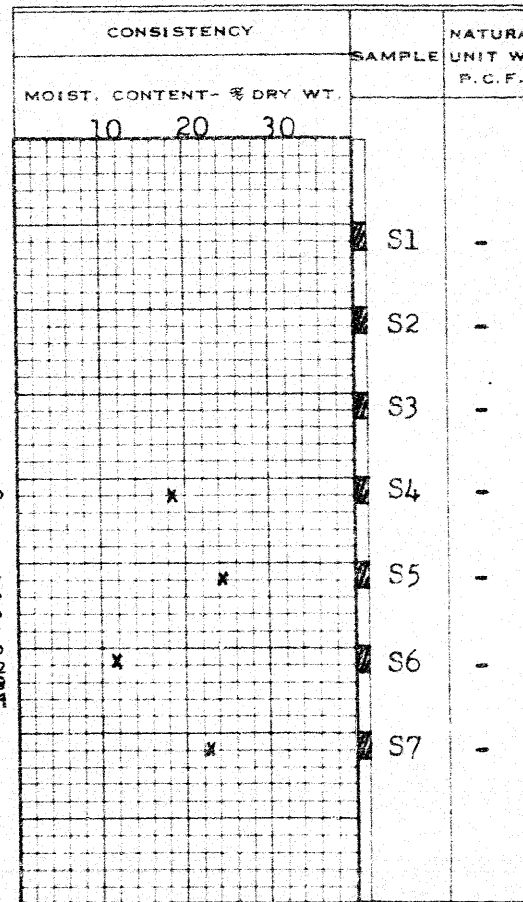
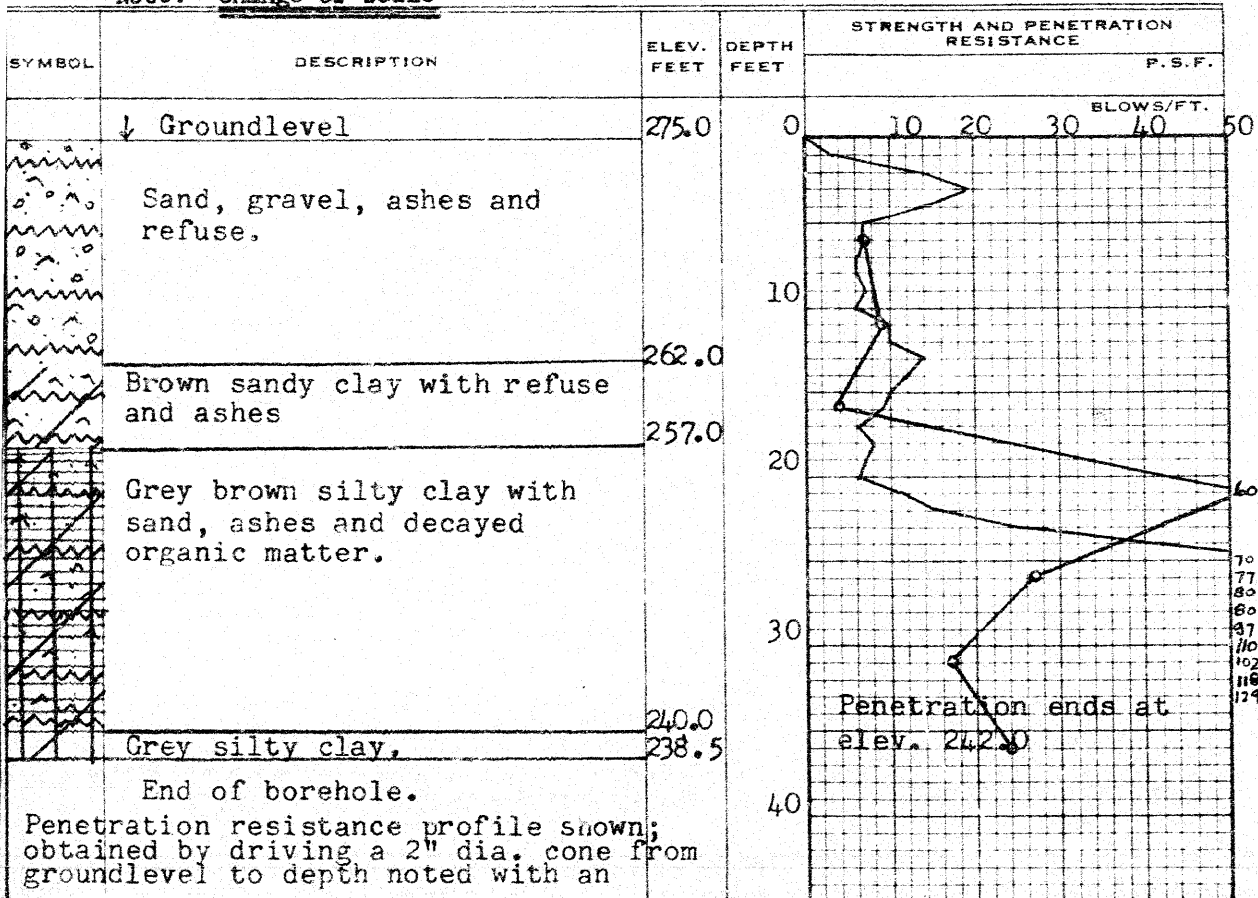
MATERIALS AND RESEARCH SECTION

W.P. 185-60 BORE HOLE NO. K 12
 JOB 59-F-115 STATION 11+80 15' Rt
 DATUM G. S. C. COMPILED BY B. K.
 BORING DATE Jan. 4/60 CHECKED BY J. B.

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) — O
 VANE TEST (C) AND SENSITIVITY (S) — +
 NATURAL MOISTURE AND LIQUIDITY INDEX — LI
 LIQUID LIMIT — L
 PLASTIC LIMIT — P

Note: Change of scale



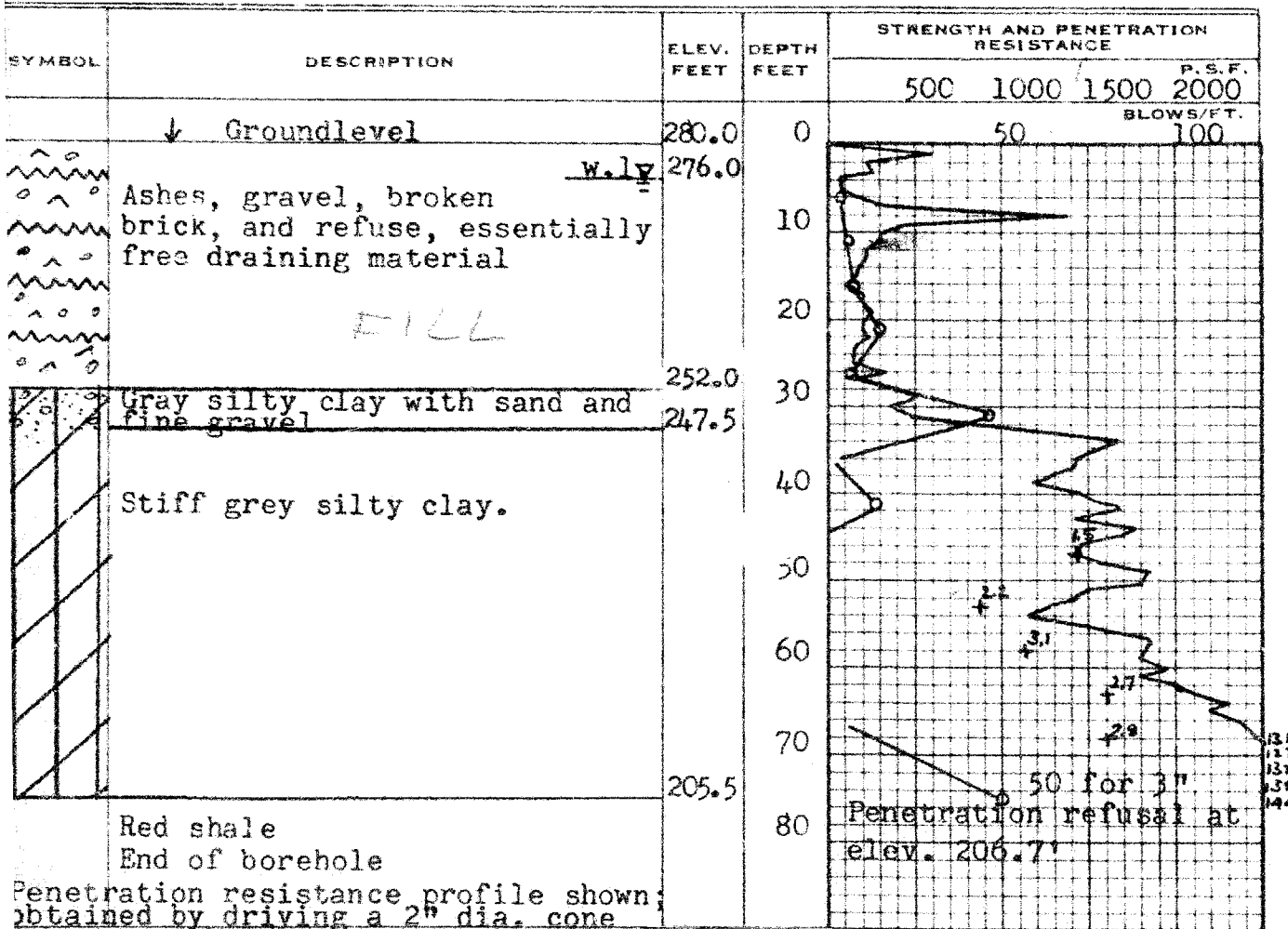
DEPARTMENT OF HIGHWAYS - ONTARIO

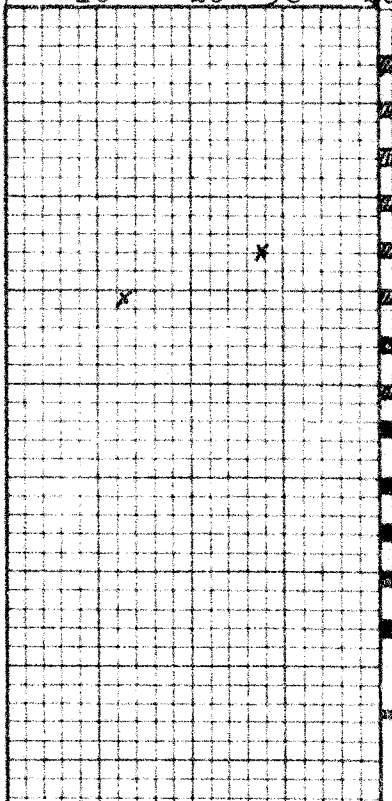
MATERIALS AND RESEARCH SECTION

W.P. 185-60 BORE HOLE NO. K 13
 JOB 59-F-115 STATION 11+00 @ King St.
 DATUM G. S. C. COMPILED BY B. K.
 BORING DATE Jan. 11/60 CHECKED BY G. C.

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) — O
 VANE TEST (C) AND SENSITIVITY (S) — +
 NATURAL MOISTURE AND LIQUIDITY INDEX — X
 LIQUID LIMIT —
 PLASTIC LIMIT —



CONSISTENCY				SAMPLE	NATURAL UNIT WT P.C.F.
MOIST. CONTENT - % DRY WT.					
10	20	30	40		
				S1	-
				S2	-
				S3	-
				S4	-
				S5	-
				S6	136.6
				T7	-
				S8	-
				T9	-
				T10	-
				T11	-
				T12	-
				T13	-
				S14	-

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

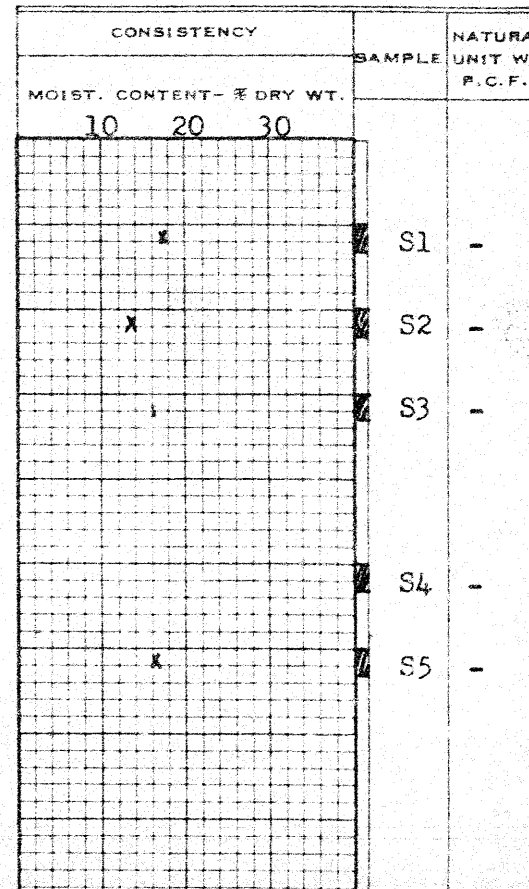
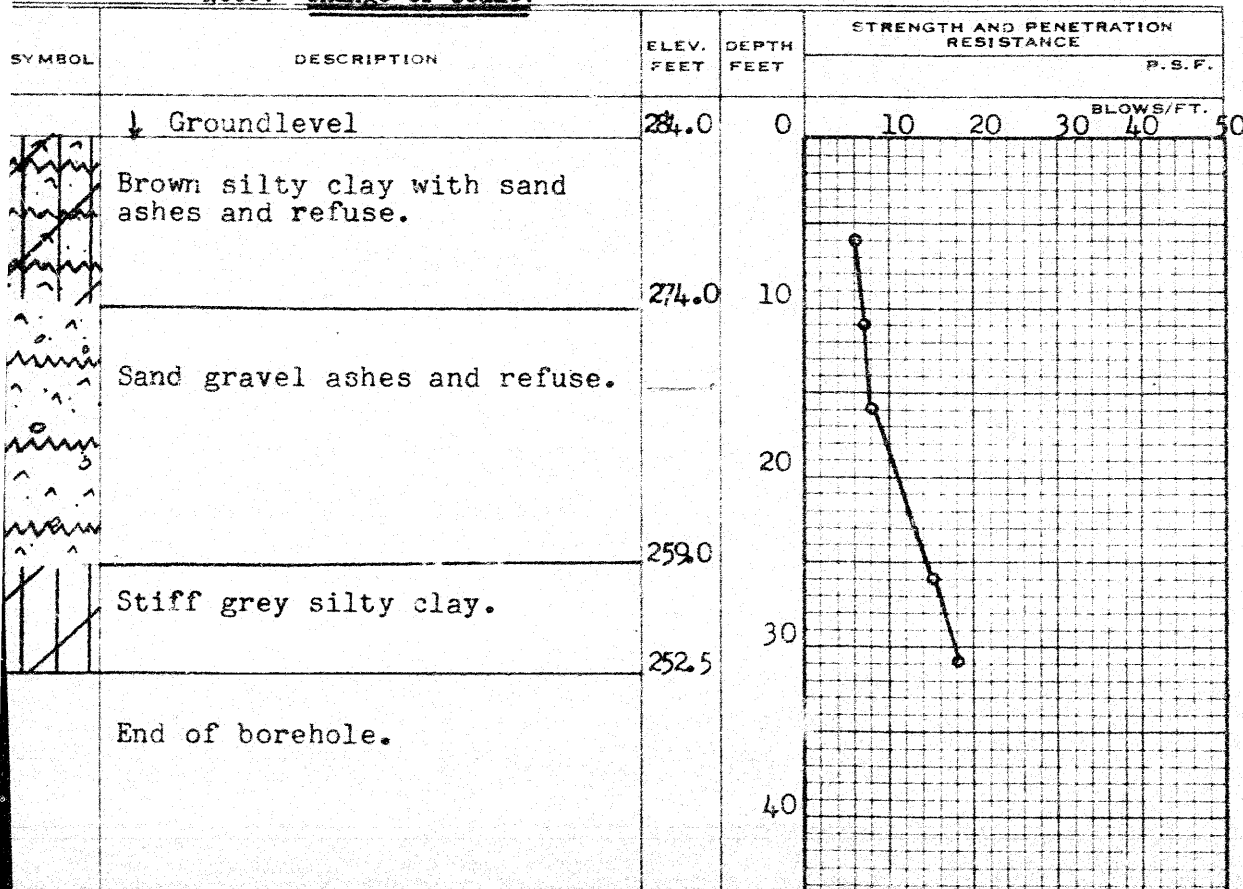
W.P. 185-60 BORE HOLE NO. K 14
 JOB 59-F-115 STATION 10+00 E
 DATUM G. S. C. COMPILED BY B. K.
 BORING DATE Dec. 1/60 CHECKED BY J. B.

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

LEGEND

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

Note: Change of scale.





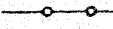



DEPARTMENT OF HIGHWAYS - ONTARIO






MATERIALS AND RESEARCH SECTION



W.P. 185-60 ----- BORE HOLE NO. K 15 -----
 JOB 59-F-115 ----- STATION 9+00 E King St. -----
 DATUM G. S. C. ----- COMPILED BY B. K. -----
 BORING DATE Dec. 31/60 CHECKED BY J. B. -----

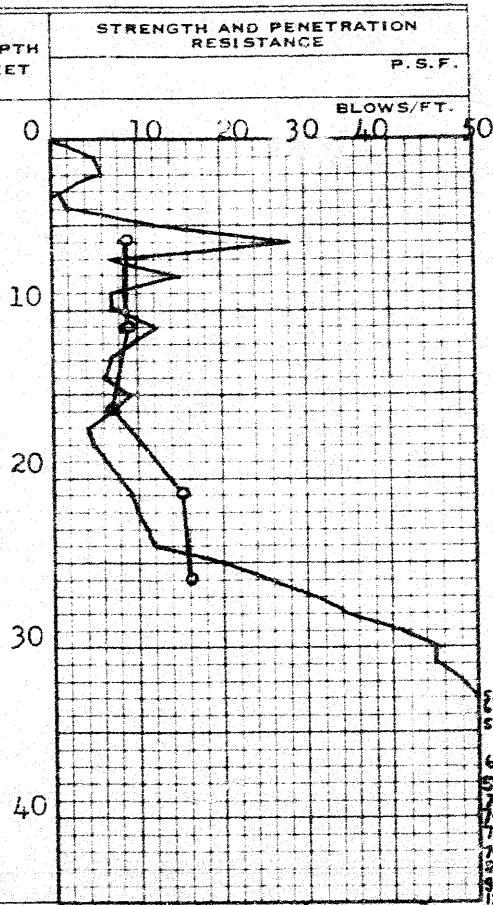
Note: change of scale

LEGEND

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

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
	↓ Groundlevel	290.0	0
	Locally clayey mixture of sand, gravel, ashes, and rubble.		
	Stiff grey silty clay.	268.0	
	End of Borehole.	263.5	



CONSISTENCY	SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.		
	S1	-
	S2	-
	S3	-
	S4	-
	S5	-

MATERIALS AND RESEARCH SECTION

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) _____	O
VANE TEST (C) AND SENSITIVITY (S) _____	+*
NATURAL MOISTURE AND	
LIQUIDITY INDEX _____	LI
LIQUID LIMIT _____	X
PLASTIC LIMIT _____	

Note: Change of scale

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE		CONSISTENCY		SAMPLE	NATURAL UNIT WT P.C.F.
				P. S. F.		MOIST. CONTENT - % DRY WT.			
	↓ Groundlevel	298.0	0	BLOWS/FT.		10 20 30			
	Stiff brown sandy clay with fine gravel.								
		286.0	10					S1	-
	Med. dense Brown sandy silt.							S2	-
	Seams of silty clay and med dense fine brown sand.	278.0	20					S3	-
	Stiff grey silty clay.	275.0							
		271.5						S4	-
	End of Borehole		30	Penetration ends at elev. 269.8"					
	Penetration resistance profile shown; obtained by driving a 2" dia. cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow.		40						

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

October 12, 1960.

D.H.O. FOUNDATION REPORT -

W.J. 59-F-115 -- W.P. 185-60.

Attention: Mr. E. McCombie.

Cont. 62-109

Re: Chedoke Expressway -- Underpass at
King Street, Hamilton, Ontario, Dist. 4.

Attached, we are forwarding to you, the detailed foundation investigation report for the above structure site. The information and recommendations contained in this report pertain only to the design of the high level, multi-span structure proposed.

We believe that the report will prove adequate for your future design work with respect to this proposed structure; however, should any queries arise, please feel free to contact our Office.

AS/MdeF
Attach.

cc: Messrs. A. M. Toye (2)
E. A. Tregaskes
D. G. Ramsay
I. C. Campbell
R. E. Richardson
T. J. Kovich
A. Watt
C. C. Parker & Assoc. (4)
Foundations Office
Gen. Files.

L. G. Soderman,
PRINCIPAL FOUNDATIONS ENGR.

Per:

A. Sternac
(A. Sternac,
FOUNDATIONS OFFICE ENGR.)

*1/4
1/10/61*

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2. SUMMARY OF RECOMMENDATIONS.
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 - 5.3 Grey-Brown Silty Sand or Gravelly Sand with Variable Amounts of Clay.
 - 5.4 Soft Grey-Brown Silty Clay With Variable Amounts of Organic Matter.
 - 5.5 Stiff to Very Stiff Silty Clay & Clay Silt - Locally Layered.
 - 5.6 Shale Bedrock.
6. WATER CONDITIONS.
7. CONCLUSIONS AND RECOMMENDATIONS.

FOUNDATION INVESTIGATION

For

-- CHEDOKE EXPRESSWAY --

Underpass at King Street,
Hamilton, Ont., District 4.
W.J. 59-F-115 - W.P. 185-60.

1. INTRODUCTION:

Presented in this report are the results of a detailed subsoil investigation carried out at the proposed location of the King Street Underpass, Highway 403, in the City of Hamilton. The information contained in this report and the recommendations submitted pertain only to the design of the high level multi-span structure proposed. Ancillary ramps associated with this underpass are discussed in a separate report, 59-F-125, entitled: "Chedoke Expressway, Hamilton, Ontario. Foundation Conditions at Ramps G, H, J and K, King, Main Interchange".

2. SUMMARY OF RECOMMENDATIONS:

Conditions at the bridge site were found to be such that fills in excess of 16 feet would be unstable. On this basis, it was decided to try and limit fills to a maximum height of 12 feet without berms. As a result of this, King Street must be carried on a structure from at least Chainage 7 + 30 to Chainage 19 + 40. It is recommended that the structure be founded on piles extending to bedrock at all piers and at the East abutment. At the West abutment a spread footing can be used with an allowable bearing pressure of 5 tons per square foot.

3. DESCRIPTION OF SITE AND GEOLOGY:

At present, King Street is carried across the Chedoke Creek Valley on a multi-span steel and concrete structure just to the North of the proposed new structure. This is to be replaced by another multi-span structure, the location of which is shown

3. DESCRIPTION OF SITE AND GEOLOGY: (cont'd.) ...

in Drawing 59-F-115A.

The Chedoke Creek Valley is roughly U-shaped, and at the King Street structure, has a bottom width of nearly 1,000 feet. At some time this area has been used for the disposal of waste from the City of Hamilton and this material was encountered in the investigation.

Geologically, the site investigated is located in the physiographic area known as the Niagara Escarpment. The bedrock structure consists of relatively erosion-resistant limestone which overlies softer shale. This area has experienced several glacial advances and recessions with interglacial lake periods. Because of this, soil types consist generally of reworked glacial clay tills immediately above bedrock with more recent beach deposit and post-glacial lake sediment overlying the clay till stratum.

4. FIELD AND LABORATORY WORK:

The field work was carried out by means of continuous flight augers and skid-mounted core-drilling machine adapted for soil sampling.

To examine conditions below the proposed structure, 16 borings were carried out.

When a skid-mounted core-drilling machine was used, the borings were carried out using conventional wash-boring methods. In cohesive soil, samples were obtained by means of a 2" I.D. thin-walled Shelby tube sampler. Where possible, in non-cohesive soils, sampling was done by means of a 2" O.D. split-barrelled spoon sampler. The dimensions of the spoon sampler and the energy used in driving it, conform to the requirements of the Standard Penetration Test. As a supplement to the Standard Penetration Test resistance profile, a 2" diameter cone was dynamically driven from existing ground surface to refusal depth to define a cone resistance profile.

cont'd. /3 ...

4. FIELD AND LABORATORY WORK: (cont'd.) ...

The split-spoon samples were visually examined and identified in the field. The Shelby tube samples were carefully sealed and taken to the laboratory. In the laboratory, routine tests for index properties were carried out on selected representative samples.

Laboratory and field test results have been summarized in Table No. 1, included under Appendix I. The locations of the boreholes are shown in Drawing 59-F-115A.

5. SOIL CONDITIONS:

5.1 General:

A soil profile is presented in Drawing 59-F-115A attached to this report. Reference should be made to this in conjunction with the following descriptions.

The soil profile described below is valid for the whole area as far as the bedrock and stiff to very stiff silty clay and clayey silt layers are concerned. Above the latter layer the profile becomes less uniform. In the valley centre the two upper layers are described below. At the East of the valley there is a layer of essentially granular material and on the West side of the valley a material which appears to be derived from a swamp which has existed at some time here. This is an essentially cohesive and organic material. These materials came together between Borings 7 and 8. There are similarities between these materials, namely:- their colour; their siltyness; and the fact that while a definite division has been shown in the drawing, each material occurs to a lesser extent within the precincts of the other.

cont'd. /4 ...

5. SOIL CONDITIONS: (cont'd.) ...

5.2 Very Variable Mixture of Sand, Gravel, Rubble & Refuse -
Locally Clayey:

The uppermost layer in the valley consists of variable materials all apparently dumped in this location when the area was being used as a disposal ground for sanitary sewage and other refuse from the City of Hamilton. This layer extends from Chainage 8 + 50 to Chainage 18 + 15, approximately. Its lower limit is erratic but between Chainage 10 + 50 and 13 + 15 its average position is at elevation 250.0'. East of Chainage 10 + 50 it rises gradually at first to elevation 267' in Boring K 15 and then more steeply. The layer ends between Borings K 15 and K 16. The materials which constitute this layer are ashes and slag sometimes mixed with a small amount of clay; sand and gravel and building rubble; household garbage in various stages of decomposition; in some places, small amounts of decayed or partially decayed organic matter in the form of roots. In general, this material can be considered free draining although it was found to be mixed with clay in some places. Standard penetration tests carried out in this material indicate that its relative density can be described as loose to medium.

The two materials described immediately below, have an upper boundary which is erratic. Its average position is at elevation 250 feet to Chainage 10 + 50. East of Chainage 10 + 50 it rises gradually at first to elevation 267 ft. in Boring K 15 and then more steeply.

5.3 Grey-Brown Silty Sand or Gravelly Sand with Variable
amounts of Clay:

As has been noted above, this material is variable and no definite properties can be attributed to it. Standard penetration tests carried out during the investigation showed the material to be in a loose or medium condition of relative density. It occurs

cont'd. /5 ...

5. SOIL CONDITIONS: (cont'd.) ...

5.3 Grey-Brown Silty Sand or Gravelly Sand with Variable Amounts of Clay: (cont'd.) ...

as an approximately wedge-shaped layer immediately above the till and varying between about 12 and zero feet in thickness. It extends from Chainage 14+60 approximately, to Chainage 10+20 where it tapers out.

5.4 Soft Grey-Brown Silty Clay with Variable Amounts of Organic Matter:

This layer is mainly distinguished from the above by the amount of clayey material and by the amount of organic matter in it. Tests on material recovered during the investigation for this structure were inconclusive but this material was also encountered during the investigations for Ramps 'J' and 'G'. Tests carried out for these ramps gave the following results: Water contents varying between 18 and 97 per cent; liquid limits ranging between 28 and 66 per cent and plastic limits ranging between 18 and 38 per cent. Shear strength determinations carried out gave results which appeared to indicate a shear strength of about 400 lb/sq.ft. could be assumed for design. This material occurs in a layer of approximately 10 to 20 feet in thickness. It extends from about Chainage 14+60 to Chainage 18+00.

5.5 Stiff to Very Stiff Silty Clay & Clay Silt Locally Layered:

Overlying bedrock there is a layer of grey clayey silt and silty clay with random stones scattered through it of a size up to one quarter of an inch. This material is considered to be a till. It has a shear strength ranging between 1040 and 2275 lb./sq.ft. with an average value of 1600 lb./sq.ft. Its average unit weight is 126 lb./cu.ft. It has water contents ranging from 11.6 to 29.9% with an average value of 21.7%. The average limits of this material are: Plastic limit 18.8%; Liquid limit 30.2%. The upper horizon

cont'd. /6 ...

5. SUBSOIL CONDITIONS: (cont'd.) ...

5.5 Stiff to Very Stiff Silty Clay & Clay Silt Locally Layered: -
(cont'd.)...

varies locally but the trend can be said to be horizontal West of Boring K7 and sloping upwards to the East of this boring. Where it is horizontal, its elevation is approximately 235 ft. to the East of Boring K7, it rises fairly uniformly to elevation 275 ft. near Boring K16. It thus varies between about 40 and about 70 feet in thickness.

5.6 Shale Bedrock:

The whole area under discussion is underlain by red and grey-green Queenston shale. This material appears to be little weathered as several cores were taken from the contact with full recovery in almost every case. The surface of the bedrock stops fairly uniformly from East to West across the site, falling from elevation 204' at Boring K13 (Chainage 11+00) to elevation 173' at Boring K1 (Chainage 19+30).

Variations from the above soil profile occur at either side of the valley. The changed profile applies East of Chainage 8+50 on the one hand, and West of Chainage 18+50 on the other hand.

Soil Conditions East of Chainage 8+50:

At this side of the valley the soil conditions above the till layer are as follows:

At the surface a layer of stiff brown sandy clay with fine gravel in it. This layer is estimated to be ten feet thick.

Next, a layer of medium dense sandy silt with layers of dense sand in it. This layer is estimated to be ten feet thick.

Immediately above the till, a layer of silty clay and fine sand or silty sand. This material is in a medium dense condition and is about five feet thick.

cont'd. /7 ...

5. SUBSOIL CONDITIONS: (cont'd.) ...

Soil Conditions East of Chainage 8+50: (cont'd.) ...

Conditions at this section are such that any embankment which is stable on the rubble and refuse fill, will be stable here.

Soil Conditions West of Chainage 18+50:

The top layer at this side of the valley was composed of stiff to hard light brown clay with small stones scattered through it.

The next layer was composed of dense sand and gravel. This material was observed to be locally cemented where it appeared on the face nearby, and it is thought that random cementing has taken place throughout the layer. This layer was found to be 12 1/2 feet thick. Below this there is a layer of medium dense to dense fine sand. In places, this sand was silty. This layer was found to be approximately 23 feet thick.

The layer above the till at the West side of the valley is composed of grey silty clay with irregular layers of dense sand. The silty clay is very stiff to hard and the layer is considered to be incompressible. This layer is estimated to be 17 feet in thickness in Boring K1. In Boring K2 it was found to extend almost to the ground surface.

6. WATER CONDITIONS:

Water levels were observed in Borings K1, 2, 3, 4, 5, 6, 11 and 13, and are plotted in Drawing 59-F-115A. It will be seen that water level was found to be from five to ten feet below ground level in most holes. This means that ground water will be found to be at about elevation 255' on the West side of the valley and five to ten feet higher on the East side of the valley. Water levels in Borings K1 and 2 are probably unreliable because of the low permeability of the grey silty clay with sand layers.

cont'd. /3 ...

7. CONCLUSIONS AND RECOMMENDATIONS:

For the purpose of estimating the height of embankment which could be built at this site, it was assumed that the resistance of all the materials in the valley could be represented by making the assumption the base had a shear strength of 400 lb./sq.ft. On the basis of this decision it was observed that the limiting height of the embankment was 16 feet. It was decided to limit the practical height of the embankment to 12 feet. This means that the King Street structure will have to extend to Chainage 7 + 90 at the East side of the valley and to the top of the slope at the opposite side of the valley. It will be noticed that East of Chainage 7 + 90, the base consists of material which is essentially either stiff or granular and dense and so no problems are anticipated with fills in this area.

The bridge thus must extend from Chainage 7 + 90 to at least Chainage 19 + 30. The foundation conditions in the valley are such that spread footings cannot be used for the bridge piers and it is recommended that the piers be supported on piles driven to bedrock.

It is recommended that pile tests be carried out before the design of the bridge foundation is finalized. The object of these pile tests would be to investigate the competence of the bedrock under the proposed design loads, and to investigate the effects of driving groups of piles into the shale bedrock.

At the location of the West abutment there is a considerable overburden over bedrock: about 140 feet. As this would mean driving very long piles through highly resistant media, it is recommended that a spread footing be used for this abutment. This spread footing must be placed at Station 19 + 40 or farther West and should be established at elevation 304 feet or below. A footing at this elevation can have a gross bearing pressure of 20 tons per square foot. With a factor of safety of four, this gives a net allowable bearing pressure of five tons per square foot.

7. CONCLUSIONS AND RECOMMENDATIONS: (cont'd.) ...

If work below the water table is necessary there is a possibility that water will enter the excavation and it may be necessary to take steps to control it.

October 1960

REPORT PREPARED BY:

John Brown
.....

John Brown
Project Foundation Engr.

REPORT APPROVED BY:

A. Sternac
.....

A. Sternac,
Foundations Office Engr.

APPENDIX I.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K1	S1	5'-6.5'	Stiff light brown silty clay with small stones.	38	21.2	-	-	-	-	
	S2	10'-10.5'	Coarse sand to fine/med. gravel traces of silty clay.	50-60	9.1	-	-	-	-	
	S3	15'-16.5'	Grey brown fine/med. gravel with traces of sand.	34	6.7	-	-	-	-	
	S4	20'-21.5'	Fine gravel with fine/med. sand.	33	-	-	-	-	-	
	S5	25'-26.5'	Brown fine sand with light brown silty very fine sand.	54	-	-	-	-	-	
	S6	30'-31.5'	Fine brown red sand.	31	-	-	-	-	-	
	S7	35'-36.5'	Fine red sand.	34	-	-	-	-	-	
	S8	40'-41.5'	Very fine red sand.	14	-	-	-	-	-	
	S9	45'-46.5'	Grey silty clay with fine gravel and fine red sand.	48	-	-	-	-	-	
	S10	50'-51.5'	Silty clayey fine sand with fine gravel.	62	-	-	-	-	-	
	S11	55'-56.5'	Grey silty clay changing to med. red sand.	44	-	-	-	-	-	
	S12	60'-61.5'	Med. red sand changing to silty clay.	48	-	-	-	-	-	
	S13	65'-66.5'	Grey silty clay with small stones and thin layers of sand.	40	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 135-60

W. 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
K1	T14	70'-71.5'	Grey silty clay with fine sand.	P	-	-	-	-	-	
	VANB	76.5'		-	-	-	-	1520	-	Sens: 1.5
	T15	80'-81.5'	Grey silty clay.	P	-	-	-	-	-	
	VANB	86.5'		-	-	-	-	1840	-	Sens: 7.1
	T16	90'-91.5'	Grey silty clay with a layer of fine gravel and pieces of red-green shale.	P	-	-	-	-	-	
	VANB	96.5'		-	-	-	-	> 2000	-	Sens: 1.9
	T17	100-101.5'	Grey silty clay.	P	-	-	-	-	-	
	VANB	106.5'		-	-	-	-	1680	-	Sens: 1.3
	T18	110-111.5'	Grey silty clay with sand and fine gravel.	P	-	-	-	-	-	
	VANB	116.5'		-	-	-	-	> 2000	-	Sens: 2.1
	T19	120-121.5'	Grey silty clay.	Pushed 12" 20-6"	-	-	-	-	-	
	VANB	126.5'		-	-	-	-	> 2000	-	
	T20	130-131.5'	Silty soft grey clay with fine sand.	P	-	-	-	-	-	
	VANB	136.5'		-	-	-	-	> 2000	-	
	RC21	136.8-146.8	Hard shales (Bedrock)	-	-	-	-	-	-	100% Recovery

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K2	S1	5'-6.5'	Fine brown sand brown sandy clay.	13	21.6	-	-	-	-	
	VANE	8'		-	-	-	-	1680	-	Sens: 2.6
	T2	10'-11.5'	Brown clayey silt.	P	23.0	14.3	24.4	-	-	
	S3	15'-16.5'	Layers brown fine sand grey-brown clayey silt.	17	17.7	-	-	-	-	
	S4	20'-21.5'	Grey clayey silt with silt layers.	19	19.1	-	-	-	-	
	T5	25'-26.5'	Grey clayey silt.	P	-	-	-	-	-	
	S6	30'-31.5'	Grey clayey silt with layers of fine sand.	17	19.2	-	-	-	-	
	T7	35'-37'	Grey clayey silt.	P	-	-	-	-	-	
	VANE	38.5'		-	-	-	-	1680	-	Sens: 1.5
	S8	40'-41.5'	Grey clayey silt.	13	22.5	-	-	-	-	
	VANE	43'		-	-	-	-	1600	-	Sens: 2.9
	S9	45'-46.5'	Grey silty clay.	17	-	-	-	-	-	
	VANE	48'		-	-	-	-	1760	-	Sens: 1.6
	T10	50'-52'	Grey silty clay.	P	-	-	-	-	-	
	T11	55'-57'	Grey silty clay.	P	-	-	-	-	-	
	VANE	58.5'		-	-	-	-	> 2000	-	Sens > 2.8

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K2	S12	60'-61.5'	Grey silty clay.	12	-	-	-	-	-	Sens: 2.0 Sens: 1.8 Sens: 1.8
	VANE	63'		-	-	-	-	1600	-	
	T13	65'-66.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	68'		-	-	-	-	1840	-	
	S14	70'-71.5'	Grey silty clay.	27	-	-	-	-	-	
	VANE	73'		-	-	-	-	> 2000	-	
	T15	75'-77'	Grey silty clay.	P	-	-	-	-	-	
	S16	85'-86.5'	Grey clayey silt.	28	-	-	-	-	-	
	S17	96'-97'	Green and red weathered shale.	250+	-	-	-	-	-	
K3	S1	10'-11.5'	Brown silty clay with ashes and refuse.	2	83.8	-	-	-	-	Sens: 2.5
	S2	15'-16.5'	Brown silty clay with ashes and refuse.	5	31.7	-	-	-	-	
	VANE	18'		-	-	-	-	800	-	
	S3	20'-21.5'	Grey-brown silty clay with sand.	11	23.1	-	-	-	-	
	S4	25'-26.5'	Grey-brown silty clay with sand.	7	27.2	-	-	-	-	
	S5	30'-31.5'	Grey silty clay.	8	22.2	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 50-F-115

W.P. 185-60

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
K4	S1	5'-6.5'	Fine brown clayey sand.	7	15.2	-	-	-	-	
	S2	10'-11.5'	Ashes, gravel and brick rubble.	3	-	-	-	-	-	
	S3	15'-16.5'	Brown silt with decayed vegetation..	8	42.3	-	-	-	-	
	VANE	18'		-	-	-	-	1440	-	Sens: 3.6
	VANE	21.5'		-	-	-	-	1600	-	Sens: 1.0
	S4	20'-21.5'	Brown clayey silt with decayed vegetation and rubble.	P	-	-	-	-	-	
	S5	25'-26.5'	Brown silty fine sand.	4	34.4	-	-	-	-	
	S6	30'-31.5'	Grey clayey silt.	13	-	-	-	-	-	
	T7	33'-35'	Grey clayey silt.	P	-	-	-	-	-	
	VANE	36.5'		-	-	-	-	1760	-	Sens: 1.6
	T8	40'-41.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	43.0'		-	-	-	-	>2000	-	Sens:>1.8
	S9	50'-51.5'	Grey silty clay.	23	18.6	-	-	-	137.3	
	S10	60'-61.5'	Grey silty clay.	16	24.8	-	-	-	-	
	T11	62'-64'	Grey silty clay.	P	-	-	-	-	-	
	VANE	65.5'		-	-	-	-	1520	-	Sens: 2.1

Cont. P. 6.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

HOLE NO	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH psf.	UNIT WEIGHT pcf.	REMARKS
K4	S12	70'-71.5'	Grey silty clay with fragments of shale.	68	-	-	-	-	-	
	S13	80'-81.5'	Weathered shale.	160	-	-	-	-	-	
K5										
K6	S1	10'-11.5'	Gravel, sand, ashes and refuse.	2	-	-	-	-	-	
	S2	15'-16.5'	Brown sandy silt with decayed refuse.	6	23.8	-	-	-	-	
	S3	20'-21.5'	Grey silty clay.	7	-	-	-	-	-	Lost sample.
	S4	25'-26.5'	Grey silty clay with decayed vegetation.	5	25.0	-	-	-	-	
	S5	30'-31.5'	Sand and gravel.	7	-	-	-	-	-	
	S6	35'-36.5'	Grey silty clay.	10	46.3	-	-	-	-	
	S7	40'-41.5'	Grey silty clay.	11	-	-	-	-	-	
K7	S1	5'-6.5'	Brown silty clay with ashes and sand.	17	-	-	-	-	-	
	S2	10'-11.5'	Black/brown silty clay with ashes.	2	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. k85-60

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
K7	S3	15'-16.5'	Silty clay with ashes.	4	-	-	-	-	-	
	S4	20'-21.5'	Silty clay with ashes.	6	-	-	-	-	-	Sample lost.
	S5	25'-26.5'	Grey-brown silty sand with organic matter.	2	29.9	-	-	-	-	
	S6	30'-31.5'	Grey-brown silty sand with ashes, organic matter.	6	-	-	-	-	-	Sample lost.
	S7	35'-36.5'	Grey gravelly sand.	21	19.9	-	-	-	-	
	S8	40'-41.5'	Grey sandy silt with gravel.	9	22.2	-	-	-	-	
	S9	45'-47'	Grey sandy clay.	P	-	-	-	-	-	Sample lost.
	VANE	50'		-	-	-	-	1520	-	Sens: 1.5
	T10	55'-57'	Stiff grey clayey silt.	P	25.2	20.1	29.8	2275	126.1	
	VANE	60'		-	-	-	-	2000	-	Sens: 2.1
	T11	65'-66.5'	Stiff grey clayey silt.	-	26.3	20.8	35.8	1655	121.2	Hammered.
	RC12	75'-80'	Shale.	-	-	-	-	-	-	
	RC13	80'-85'	Shale.	-	-	-	-	-	-	
K8	S1	3'-4.5'	Clay, ashes, and some small stones.	13	-	-	-	-	-	
	S2	10'-11.5'	Ashes, clay and decayed matter.	31	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K8	S3	15'-16.5'	Light brown sandy clay.	5	25.3	-	-	-	-	
	S4	20'-21.5'	Soft brown sandy clay.	6	-	-	-	-	-	
	S5	25'-26.5'	Grey sandy gravel.	12	15.3	-	-	-	-	
	S6	30'-32.5'	Loose fine silty sand.	5	-	-	-	-	-	
	VANE	36.5'		-	-	-	-	1920	-	Sens: 4.0
	T7	40'-41.5'	Grey clayey silt.	-	-	-	-	-	-	Hammered.
	VANE	46'		-	-	-	-	1040	-	Sens: 1.4
	T8	50'-51.5'	Grey clayey silt.	P	23.1	18.3	30.0	1350	126.4	
	VANE	55.5'		-	-	-	-	960	-	Sens: 1.7
	T9	60'-61.5'	Grey clayey silt.	-	15.4	15.1	23.6	-	-	Hammered.
	T10	70'-71.5'	Grey clayey silt.	-	-	-	-	-	-	Hammered.
	RC11	73'-78'	Shale.	-	-	-	-	-	-	80% Recovery.
	RC12	78'-83'	Shale.	-	-	-	-	-	-	100% Recovery.
K9	S1	5'-6.5'	Brown silty clay with ashes.	15	16.8	-	-	-	-	
	S2	10'-11.5'	Brown silty clay with sand, ashes, coal, etc.	16	16.8	-	-	-	-	
	S3	20'-21.5'	Brown silty clay.	16	25.3	-	-	-	-	

TABLE NO. 1.

Page 9

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K9	T4	25'-26.5'	Brown silty clay.	-	-	-	-	-	-	Hammered - lost
	T5	30'-31.5'	Stiff grey clayey silt.	P	23.6	17.7	29.8	1560	128.3	
	VANE	35'		-	-	-	-	>2000	-	Sens: -
	T6	40'-41.5'	Grey clayey silt.	P	24.3	19.3	23.4	1730	127.0	
	VANE	45'		-	-	-	-	1600	-	Sens: 2.0
	T7	50'-51.5'	Grey clayey silt.	P	27.1	19.1	33.5	1435	124.9	
	VANE	55'		-	-	-	-	1360	-	Sens: 2.1
	T8	60'-61.5'	Grey clayey silt.	P	-	20.1	36.0	-	-	
	RC9	70.2-75.2'	Shale.	-	-	-	-	-	-	
	RC10	75.2-80.5'	Shale.	-	-	-	-	-	-	
K10	S1	5'-6.5'	Gravel, sand and rubble.	11	-	-	-	-	-	
	S2	10'-11.5'	Gravel, sand, ashes and decayed refuse.	4	-	-	-	-	-	
	S3	15'-16.5'	Gravel, sand and ashes.	2	-	-	-	-	-	
	S4	20'-21.5'	Grey-brown silty clay with decayed refuse.	46	21.9	-	-	-	129.6	Organic content 0.18%
	S5	25'-26.5'	Brown silty clay with a trace of sand.	30	22.4	-	-	-	132.6	
	VANE	31.5		-	-	-	-	1680	-	Sens: 2.3 Cont. P.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K10	S6	31.5-33'	Grey silty clay.	15	-	-	-	-	-	Sens: 1.7 No recovery.
	T7	35'-36.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	38'		-	-	-	-	1600	-	
	T8	45'-47'	Grey silty clay.	P	-	-	-	-	-	
	S9	50'-51.5'	Grey silty clay with fragments of shale.	41	-	-	-	-	-	
	T10	55'-55.5'		P	-	-	-	-	-	
	VANE	57'		-	-	-	-	> 2000	-	
	S11	57'-58.5'	Grey silty clay with fragments of shale.	28	-	-	-	-	-	
	T12	60-61.5'	Grey silty clay with fragments of shale.	P	-	-	-	-	-	
	S13	70-71.5'	Weathered shale.	38	-	-	-	-	-	
K11	S1	5'-6.5'	Gravel, sand and decayed refuse.	P	-	-	-	-	-	
	S2	10'-11.5'	Ashes, gravel and decayed refuse.	P	-	-	-	-	-	
	S3	15'-16.5'	Sand and ashes.	6	-	-	-	-	-	
	S4	20'-21.5'	Clayey sand with decayed refuse.	10	-	-	-	-	-	

Cont. P. 11.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115
W.P. 185-60

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
K11	S5	25'-26.5'	Grey-brown clayey silt with traces of fine sand.	40	-	-	-	-	-	
	S6	30'-31.5'	Grey-brown silty clay.	15	-	-	-	-	-	
	VANE	33'		-	-	-	-	>2000	-	Sens: 1.7
	T7	35'-36.5'	Grey silty clay.	P	-	-	-	-	-	No recovery.
	T8	37'-38.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	40'		-	-	-	-	1440	-	Sens: 3.0
	VANE	44.5'		-	-	-	-	1760	-	Sens: 2.2
	T9	48'-49.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	51.0'		-	-	-	-	1360	-	Sens: 1.8
	S10	53'-54.5'	Stiff grey silty clay with intermediate layers of stiff red clay.	48	-	-	-	-	-	
K12	S1	5'-6.5'	Brown sand mixed with ashes and decayed refuse.	7	-	-	-	-	-	
	S2	10'-11.5'	Brown clayed sand with ashes and decayed refuse.	9	-	-	-	-	-	
	S3	15'-16.5'	Brown clayey sand, ashes, rubble and decayed refuse.	4	43.0	-	-	-	-	
	S4	20'-21.5'	Hard brown silty clay.	60	18.6	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K12	S5	25'-26.5'	Brown silty clay with gravel.	27	24.8	-	-	-	-	
	S6	30'-31.5'	Grey silty clay with traces of sand.	17	11.6	-	-	-	-	
	S7	35'-36.5'	Grey silty clay.	24	22.9	-	-	-	-	
K13	S1	5'-6.5'	Ashes, sand gravel and decayed refuse.	4	-	-	-	-	-	
	S2	10'-11.5'	Ashes, broken brick, gravel.	6	-	-	-	-	-	
	S3	15'-16.5'	Ashes, broken brick, gravel.	7	-	-	-	-	-	
	S4	20'-21.5'	Sand, ashes and refuse.	15	-	-	-	-	-	
	S5	25'-26.5'	Sand, gravel and ashes.	7	27.8	-	-	-	-	
	S6	30'-31.5'	Grey clayey silt with fine gravel.	47	12.8	-	-	-	136.6	
	T7	35'-36.5'	Grey silty clay.	P	-	-	-	-	-	
	S8	40'-41.5'	Grey silty clay.	13	-	-	-	-	-	
	T9	44'-45.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	47'		-	-	-	-	1440	-	Sens: 1.5
	T10	50'-51.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	53'		-	-	-	-	880	-	Sens: 2.2
	T11	55'-56.5'	Grey silty clay.	P	-	-	-	-	-	Cont. P. 13.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 59-F-115

W.P. 185-60

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
K13	VANE	58'		-	-	-	-	1120	-	Sens: 3.1
	T12	60'-61.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	63'		-	-	-	-	1600	-	Sens: 2.7
	T13	65'-66.5'	Grey silty clay.	P	-	-	-	-	-	
	VANE	68'		-	-	-	-	1600	-	Sens: 2.9
	VANE	71.5'		-	-	-	-	>2000	-	Sens: >2.1
	S14	74.5-74.8	Red weathered shale.	50-3"	-	-	-	-	-	
K14	S1	5'-6.5'	Brown sandy clay with gravel and ashes.	6	17.1	-	-	-	-	
	S2	10'-11.5'	Brown silty clay with ashes and decayed vegetation.	7	13.8					
	S3	15'-16.5'	Gravel, sand, ashes and refuse.	8	-	-	-	-	-	
	S4	25'-26.5'	Grey-brown silty clay with fragments of organic matter.	15	-	-	-	-	-	
	S5	30'-31.5'	Grey-brown silty clay with gravel.	18	16.1	-	-	-	-	
K15	S1	5'-6.5'	Bricks, ashes and rubble.	9	-	-	-	-	-	
	S2	10'-11.5'	Bricks, ashes and rubble.	9	-	-	-	-	-	Cont. P. 14.

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
K15	S3	15'-16.5'	Bricks, ashes and rubble.	7	-	-	-	-	-	
	S4	20'-21.5	Clayey mixture of bricks, ashes and rubble.	15	-	-	-	-	-	
	S5	25'-26.5'	Grey silty clay with fine gravel.	16	18.3	-	-	-	-	
K16	S1	10'-11.5'	Brown sandy clay with fine gravel.	9	12.0	-	-	-	-	
	S2	15'-16.5'	Loose brown sandy silt changing to fine to med. sand.	20	2.7	-	-	-	-	
	S3	20'-21.5'	Brown silty clay with layers of fine brown sand.	26	21.9	-	-	-	-	
	S4	25'-26.5'	Grey silty clay with sand and gravel.	43	14.6	-	-	-	-	
			S denotes split spoon sa. T denotes shelby tube sa. RC denotes rock core sa.							

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

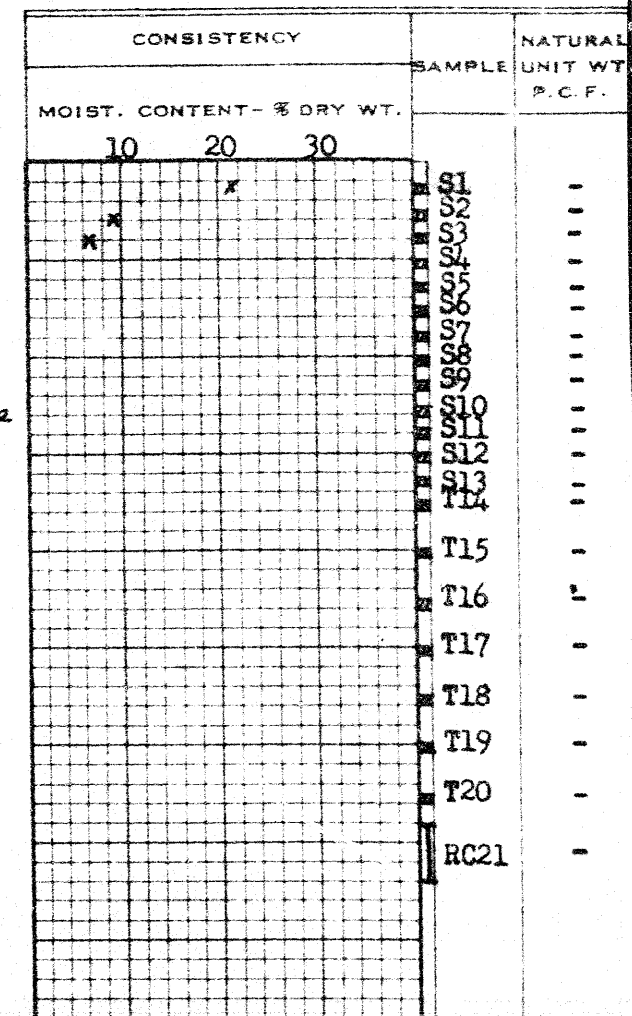
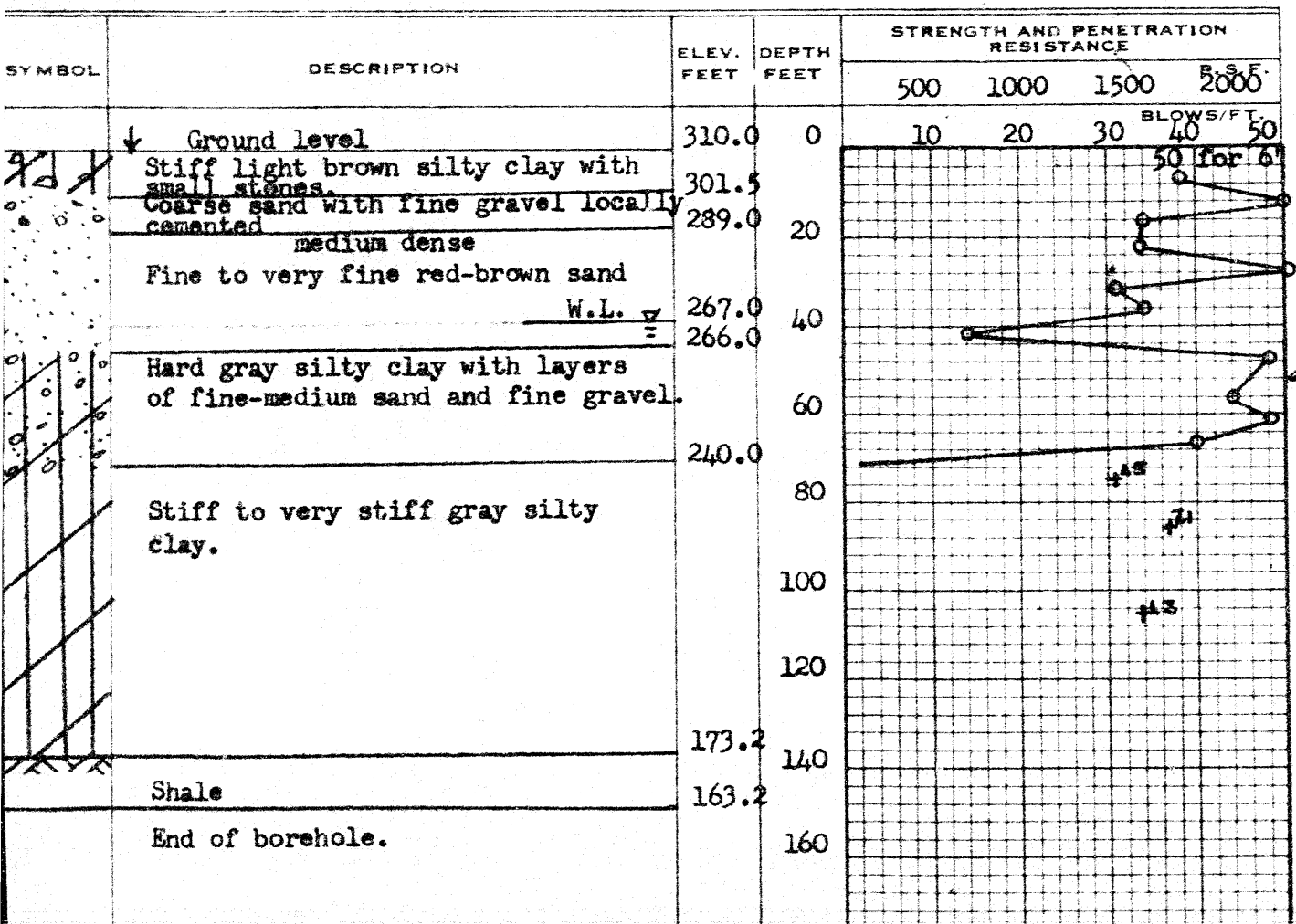
NOTE: change of scale.

W.P. 185-60 ----- BORE HOLE NO. K1 -----
 JOB 59-F-115 ----- STATION 19+30 25' Lt. King St. -----
 DATUM G.S.C. ----- COMPILED BY B.K. -----
 BORING DATE Feb. 1/60 ----- CHECKED BY J.B. -----

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

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) ----- O
 VANE TEST (C) AND SENSITIVITY (S) ----- +
 NATURAL MOISTURE AND LIQUIDITY INDEX ----- LI
 LIQUID LIMIT ----- X
 PLASTIC LIMIT -----



DEPARTMENT OF HIGHWAYS - ONTARIO

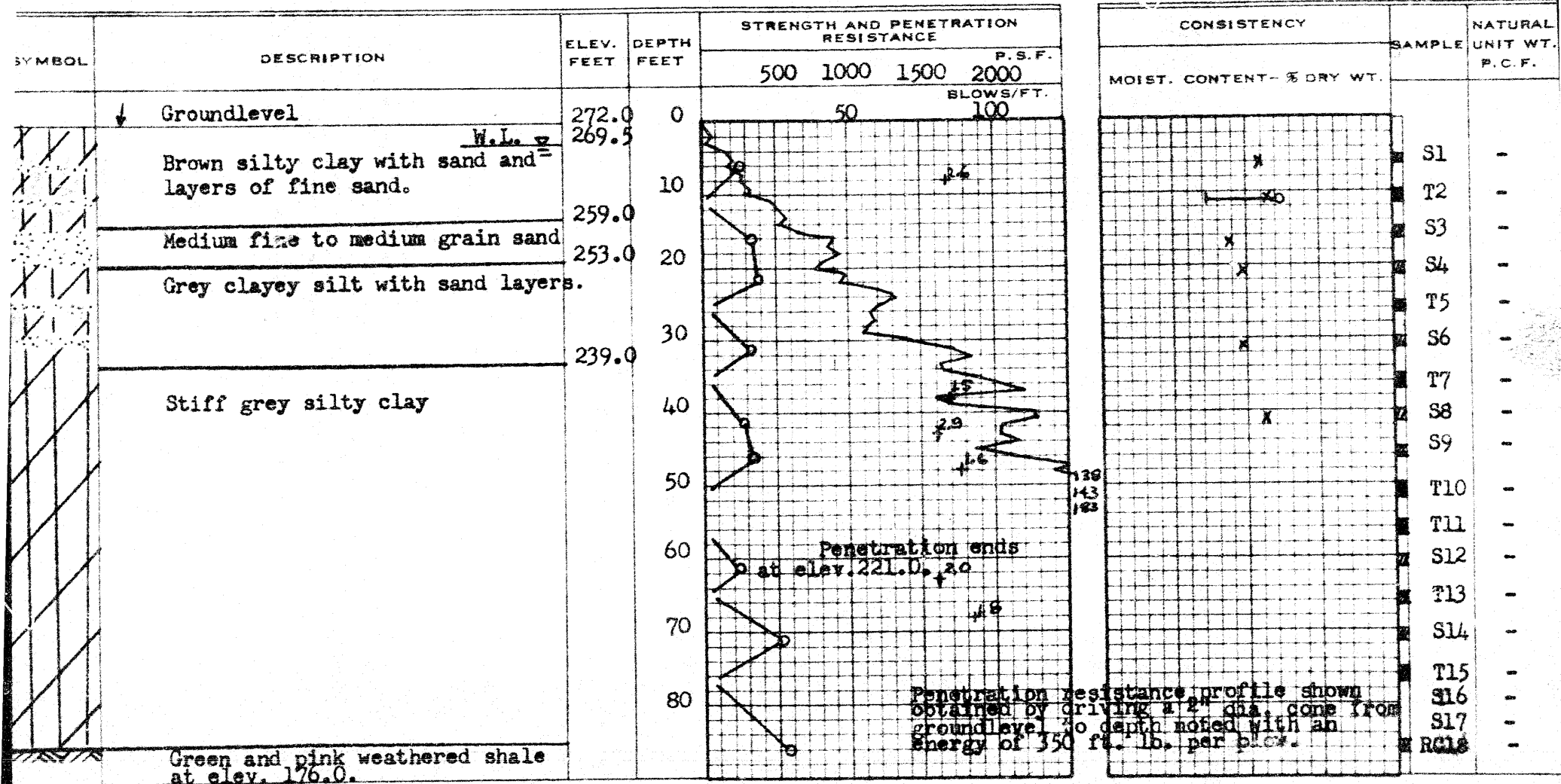
MATERIALS AND RESEARCH SECTION

I.P. 185-60 BORE HOLE NO. K2
 JOB 59-F-115 STATION 18+50 CL. King St.
 DATUM G.S.C. COMPILED BY B.K.
 BORING DATE Jan. 20/60. CHECKED BY J.B.

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



End of borehole - EL 175.0

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

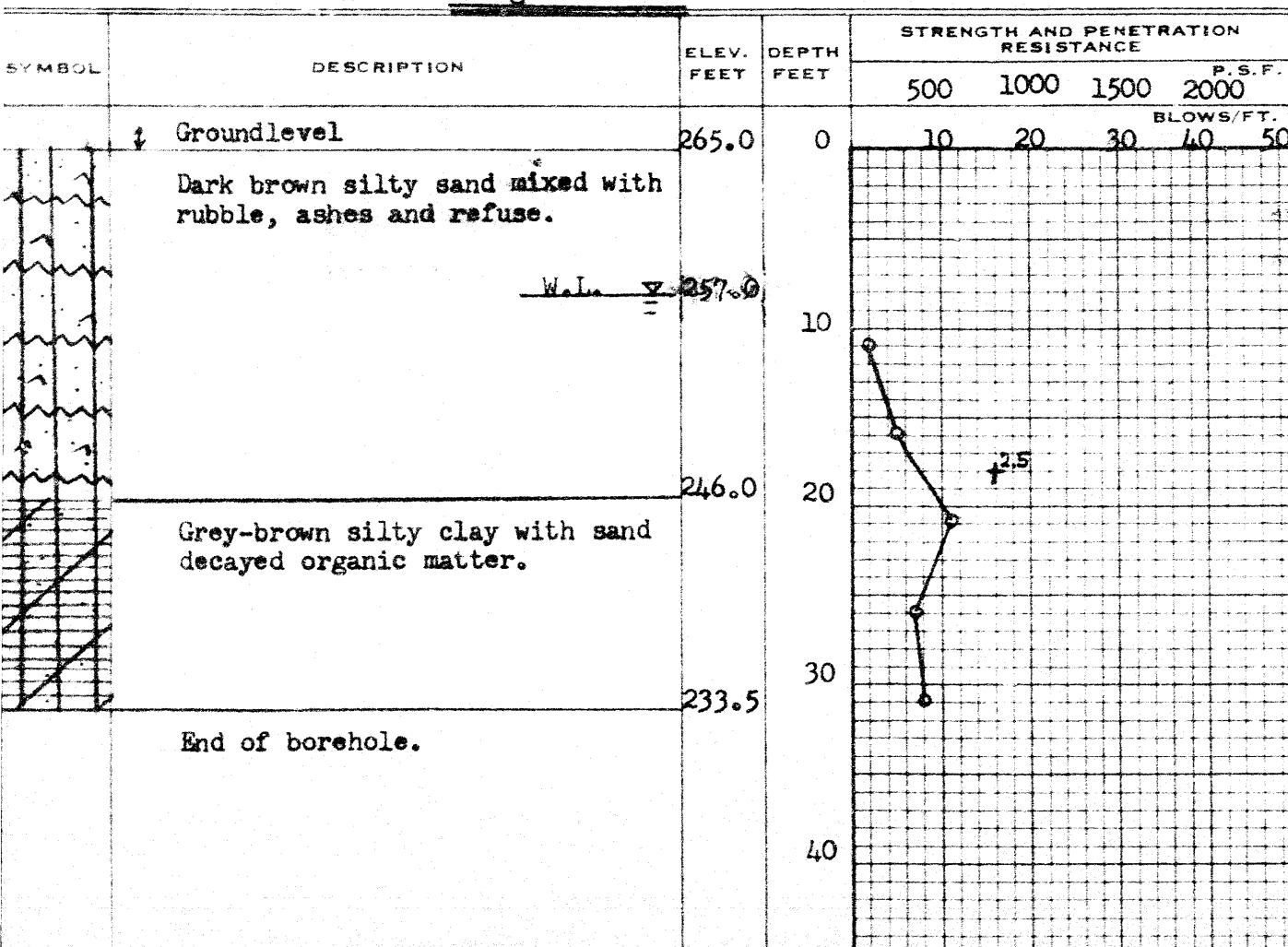
W.P. 185-60 BORE HOLE NO. K3
 JOB 59-F-115 STATION 17+70 CL Kings St.
 DATUM G.S.C. COMPILED BY B.K.
 BORING DATE Jan. 4/60 CHECKED BY J.B.

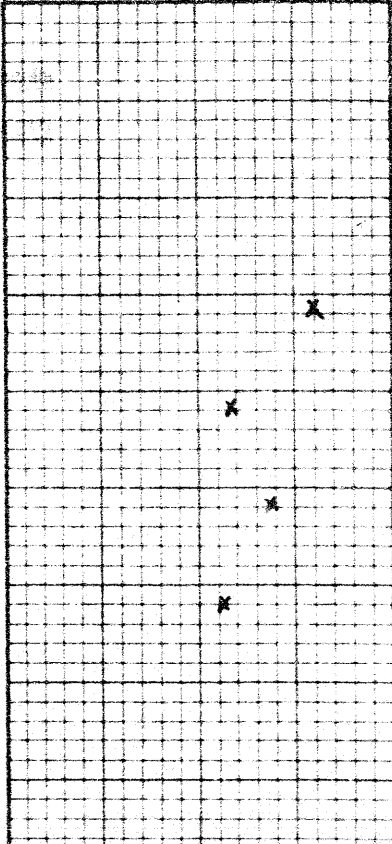
Note: Change of Scale.

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



CONSISTENCY			SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT- % DRY WT.				
10	20	30		
 <p>The flowchart grid contains the following data points marked by asterisks (*):</p> <ul style="list-style-type: none">At 20% Moist. Content, 100% Consistency: 1 pointAt 25% Moist. Content, 50% Consistency: 1 pointAt 25% Moist. Content, 25% Consistency: 1 pointAt 30% Moist. Content, 75% Consistency: 1 pointAt 30% Moist. Content, 50% Consistency: 1 point			S1	-
			S2	-
			S3	-
			S4	-
			S5	-

DEPARTMENT OF HIGHWAYS - ONTARIO

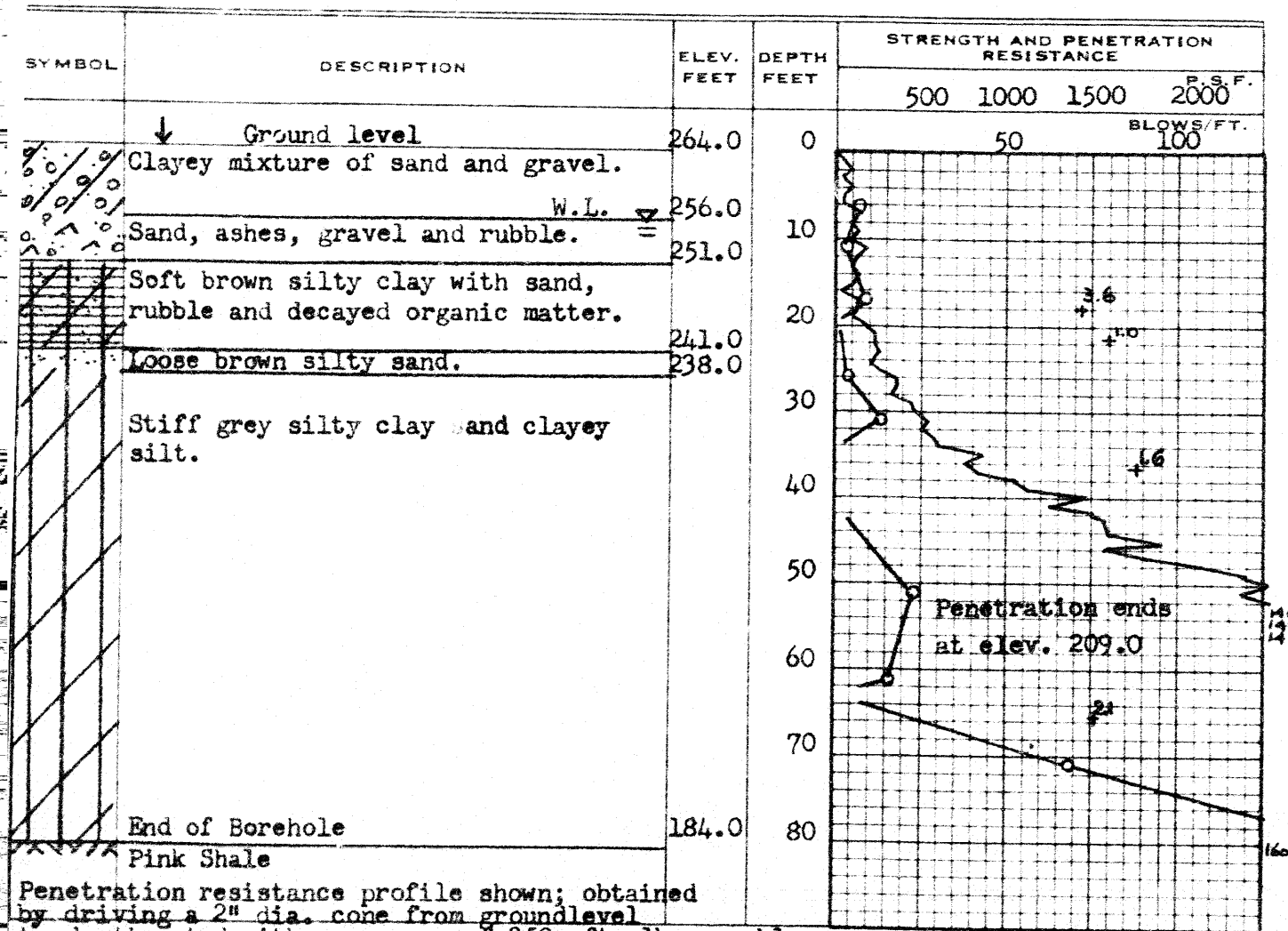
MATERIALS AND RESEARCH SECTION

W.P. 185-60 ----- BORE HOLE NO. K4 -----
 JOB 59-F-115 ----- STATION 17+50 Cl. King St. -----
 DATUM G.S.C. ----- COMPILED BY B.K. -----
 BORING DATE Jan. 13/60 ----- CHECKED BY J.B. -----

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 -----



CONSISTENCY				SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.					
10	20	30	40		
	*			S1	-
				S2	-
				S3	-
				S4	-
			*	S5	-
				S6	-
				T7	-
				T8	-
	*			S9	137.3
		*		S10	-
				T11	-
				S12	-
				S13	-

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 185-60 BORE HOLE NO. K5

JOB - 59-F-115 STATION - 17400 50' Lt. King

DATUM G.S.C. COMPILED BY B.K.

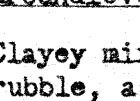

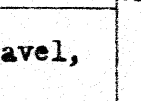

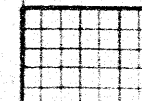
BORING DATE Jan. 4/60 CHECKED BY J.B.

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

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) --- 0
VANE TEST (C) AND SENSITIVITY (S) --- + S
NATURAL MOISTURE AND LIQUIDITY INDEX --- X
LIQUID LIMIT ---
PLASTIC LIMIT ---

Note: Change of scale.

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P.S.F.	
	↓ Groundlevel	264.0	0	BLOWS/FT.	
	Clayey mixture of sand, gravel, rubble, ash and refuse.	W.L.  256.0	10		
	Limit uncertain.	244.0	20		
	Grey-brown silty clay with decayed organic matter.	234.0	30		
	Grey silty clay.	224.0	40		
	End of borehole.				

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

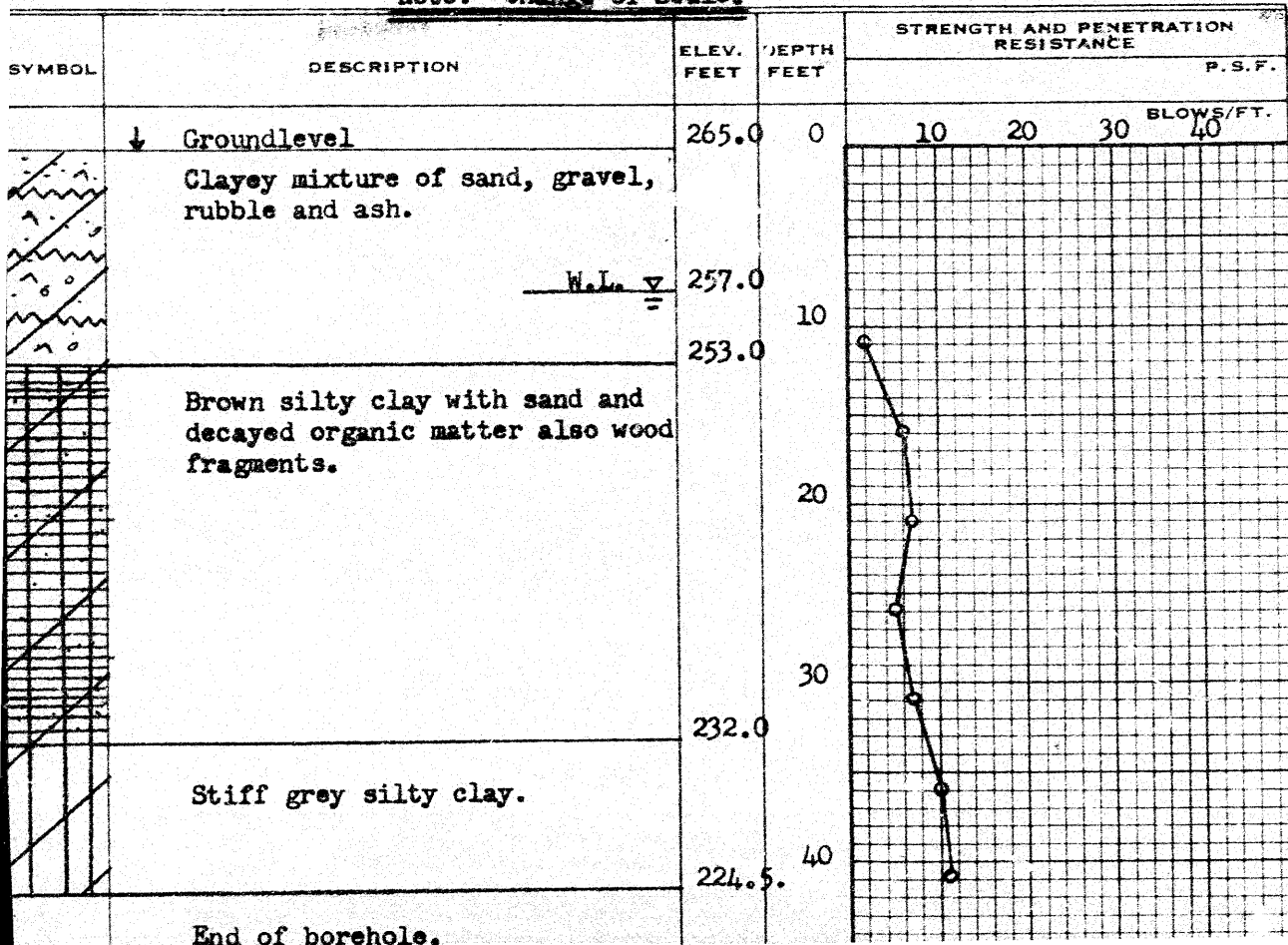
W.P. 185-60 BORE HOLE NO. K6
 JOB 59-F-115 STATION 16+00 CL King St.
 DATUM G.S.C. COMPILED BY B.K.
 BORING DATE Jan. 2/60 CHECKED BY J.B.

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

LEGEND

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

Note: Change of Scale.



CONSISTENCY			SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.				
10	20	30		
			S1	-
			S2	-
			S3	-
			S4	-
			S5	-
			S6	-
			S7	-

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

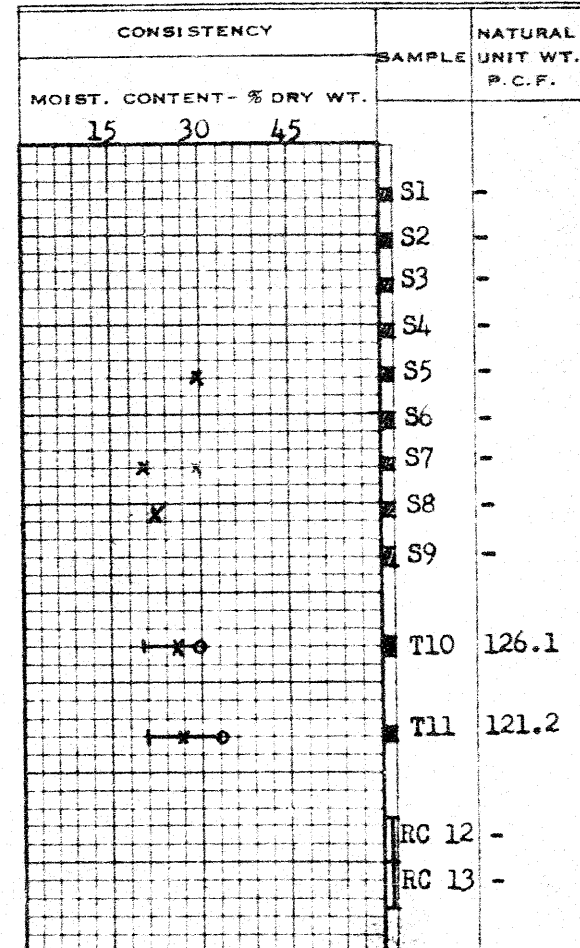
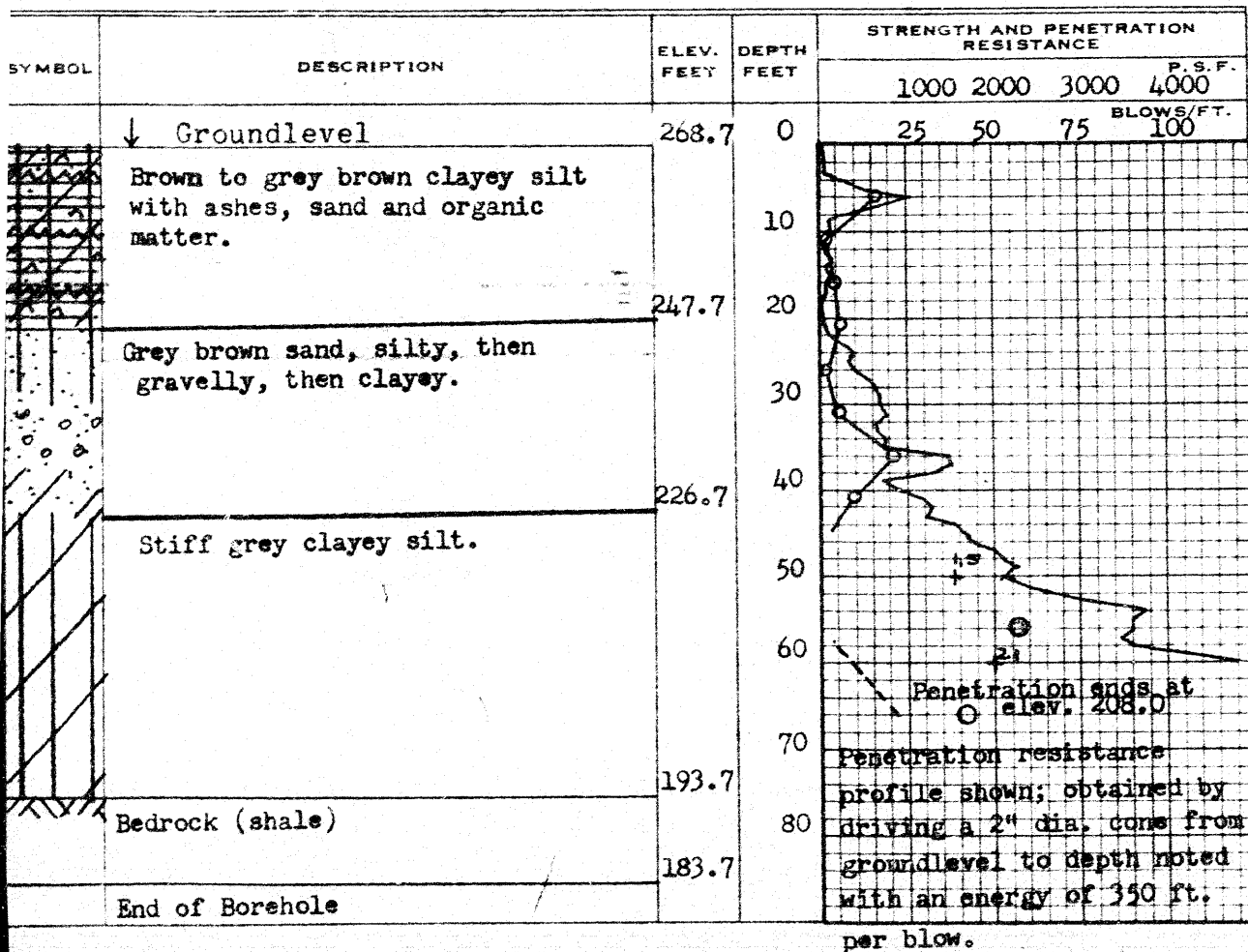
N.P. 185-60
 JOB F-59-115
 DATUM G. S. C.
 BORING DATE Nov. 19/59

BORE HOLE NO. K 7
 435+47.68' Rt
 STATION H.O.S.T., Chedoke
 COMPILED BY B. K.
 CHECKED BY J. B.

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

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) — O
 VANE TEST (C) AND SENSITIVITY (S) — +
 NATURAL MOISTURE AND LIQUIDITY INDEX — X
 LIQUID LIMIT — —
 PLASTIC LIMIT — —



DEPARTMENT OF HIGHWAYS - ONTARIO

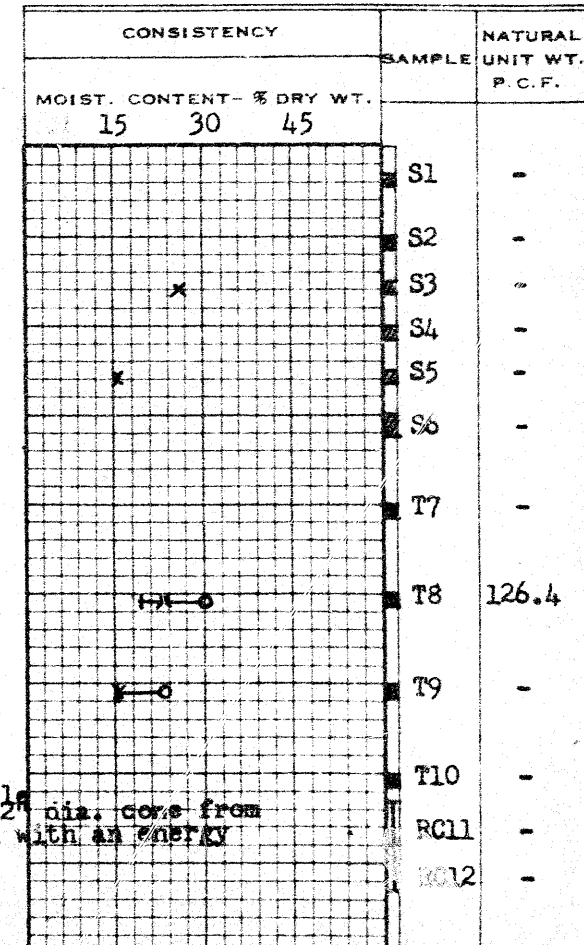
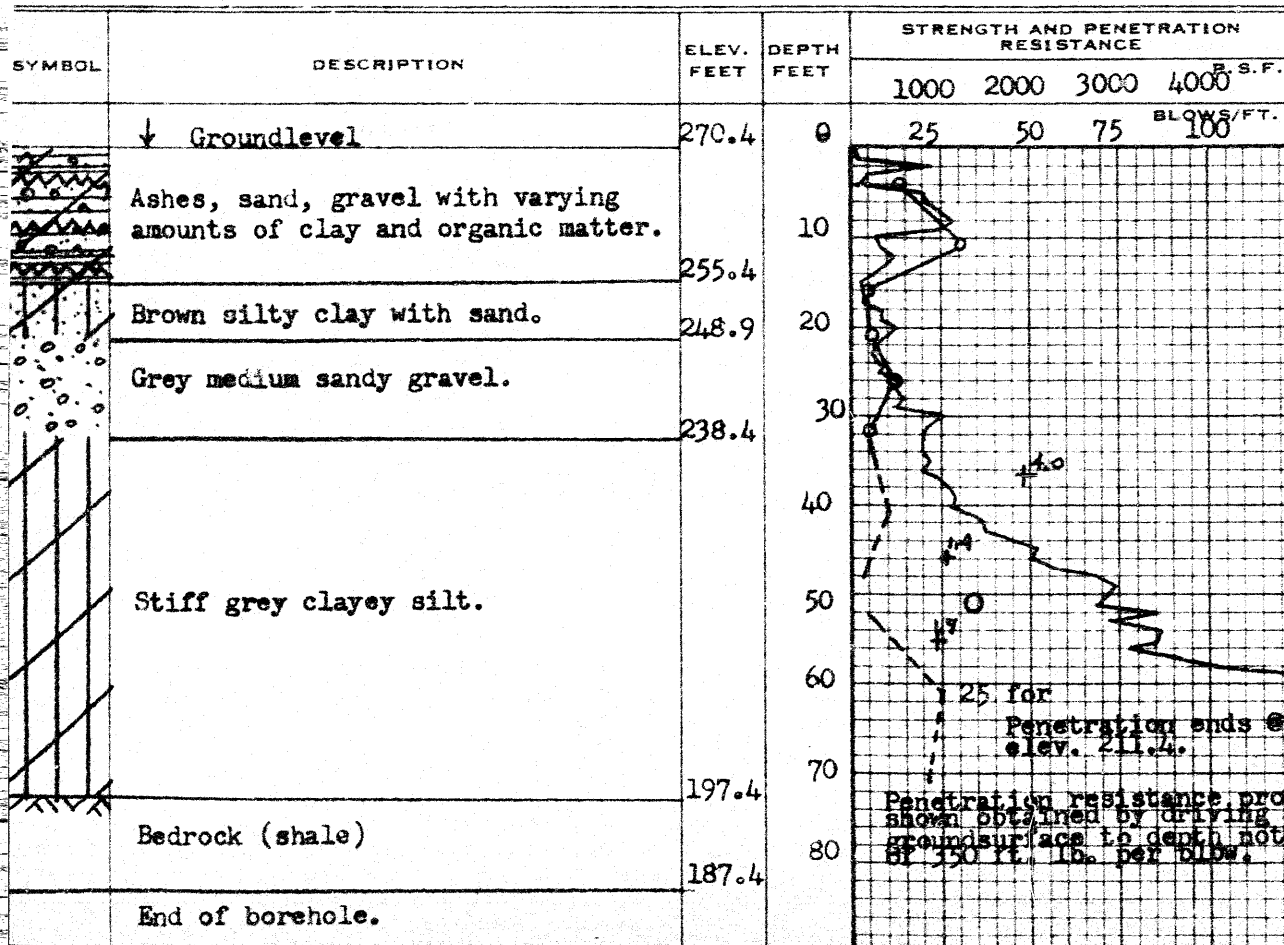
MATERIALS AND RESEARCH SECTION

W.P. 185-60 BORE HOLE NO. K8
 435+75 9th Rt.
 JOB F59-115 STATION H.O.S.T. Chedoke CL.
 DATUM G.S.C. COMPILED BY B.K.
 BORING DATE Nov. 24/59 CHECKED BY J.B.

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

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) O
 VANE TEST (C) AND SENSITIVITY (S) +s
 NATURAL MOISTURE AND LIQUIDITY INDEX LI
 LIQUID LIMIT X
 PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO

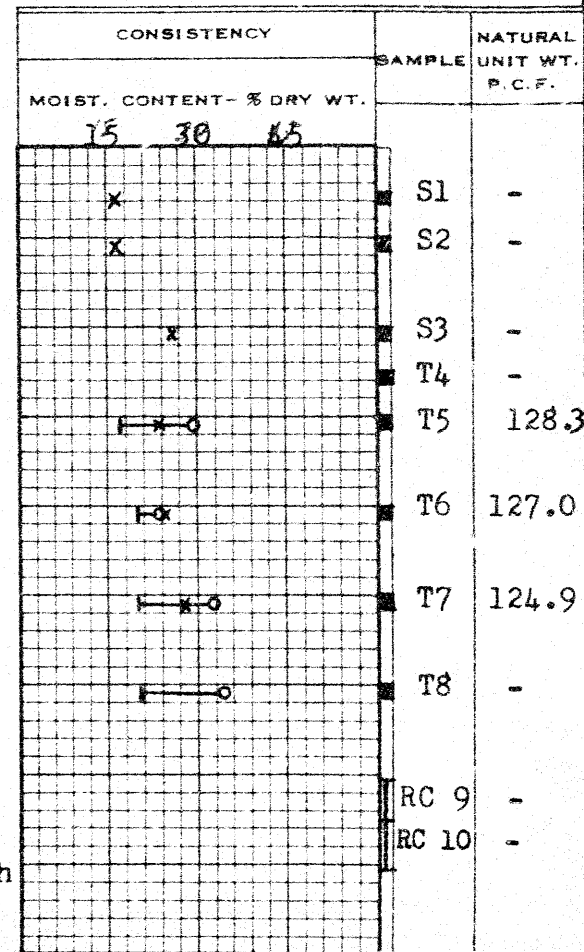
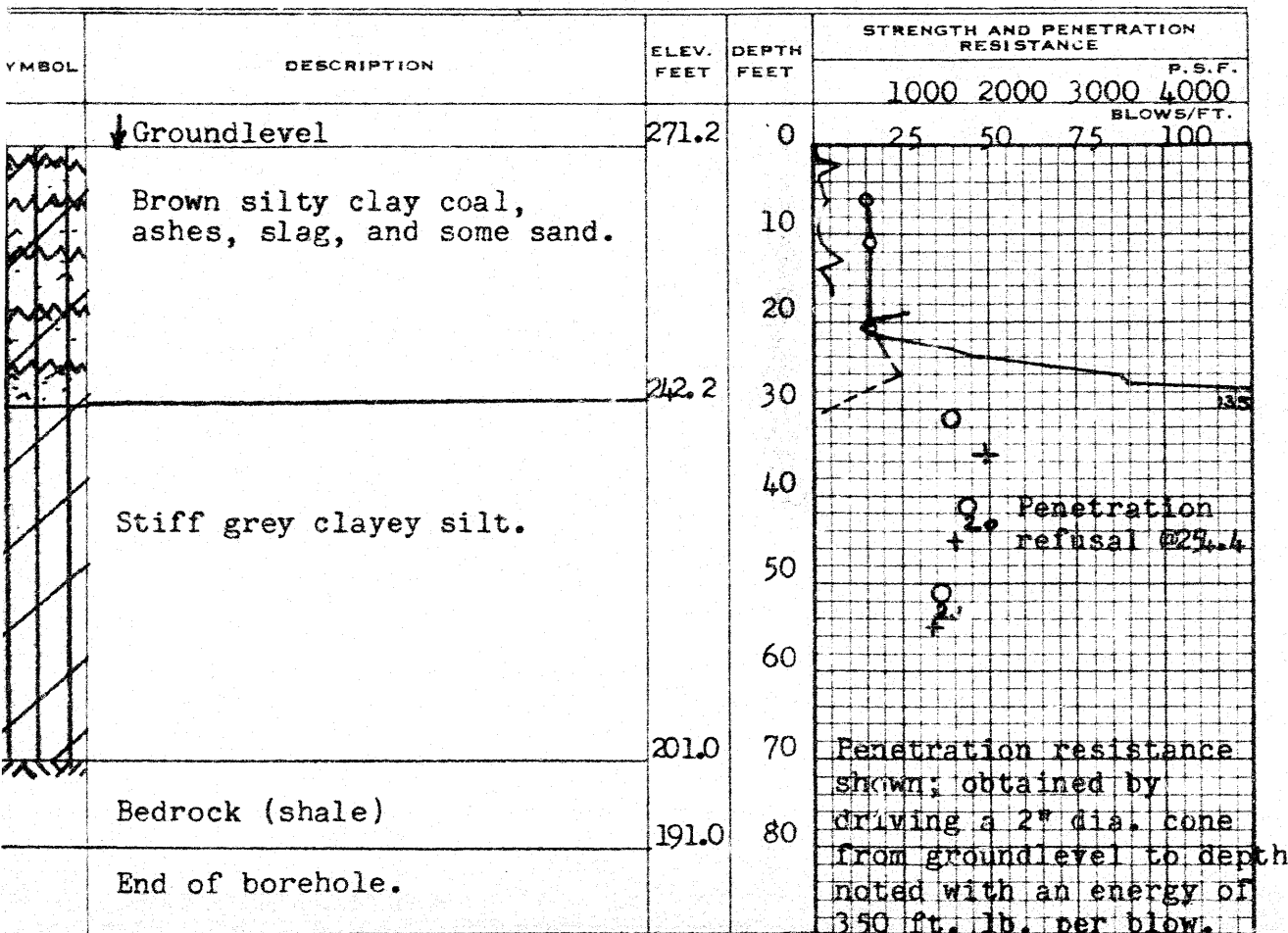
MATERIALS AND RESEARCH SECTION

I.P. 185-60
 BORE HOLE NO. K 9
 434+92 70' Lt
 OB F59-115 STATION H.O.S.T. Ched. 4
 ATUM G. S. C. COMPILED BY B. K.
 DRING DATE Nov. 27/59 CHECKED BY J. B.

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

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) O
 VANE TEST (C) AND SENSITIVITY (S) +
 NATURAL MOISTURE AND LIQUIDITY INDEX LI
 LIQUID LIMIT X
 PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO

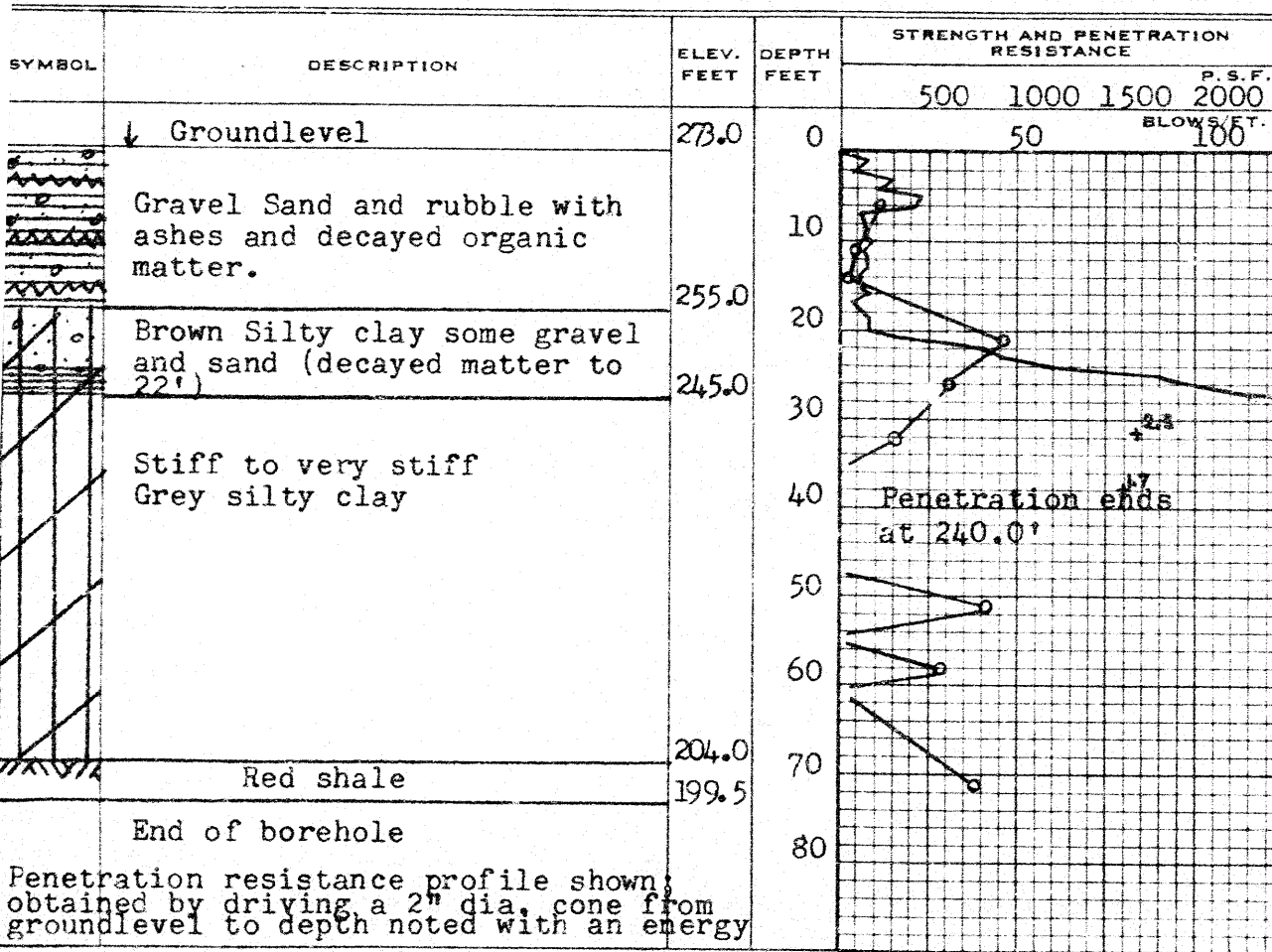
MATERIALS AND RESEARCH SECTION

N.P. 185-60 BORE HOLE NO. K 10
 JOB 59-F-115 STATION 12+50 E King St.
 DATUM G. S. C. COMPILED BY B. K.
 BORING DATE Jan. 13/60 CHECKED BY J. B.

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) — O
 VANE TEST (C) AND SENSITIVITY (S) — +
 NATURAL MOISTURE AND LIQUIDITY INDEX — LI
 LIQUID LIMIT — X
 PLASTIC LIMIT —

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



CONSISTENCY			SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.				
10	20	30		
			S1	-
			S2	-
			S3	-
			S4	129.6
			S5	132.6
			S6	-
			T7	-
			T8	-
			S9	-
			T10	-
			S11	-
			T12	-
			S13	-

DEPARTMENT OF HIGHWAYS - ONTARIO

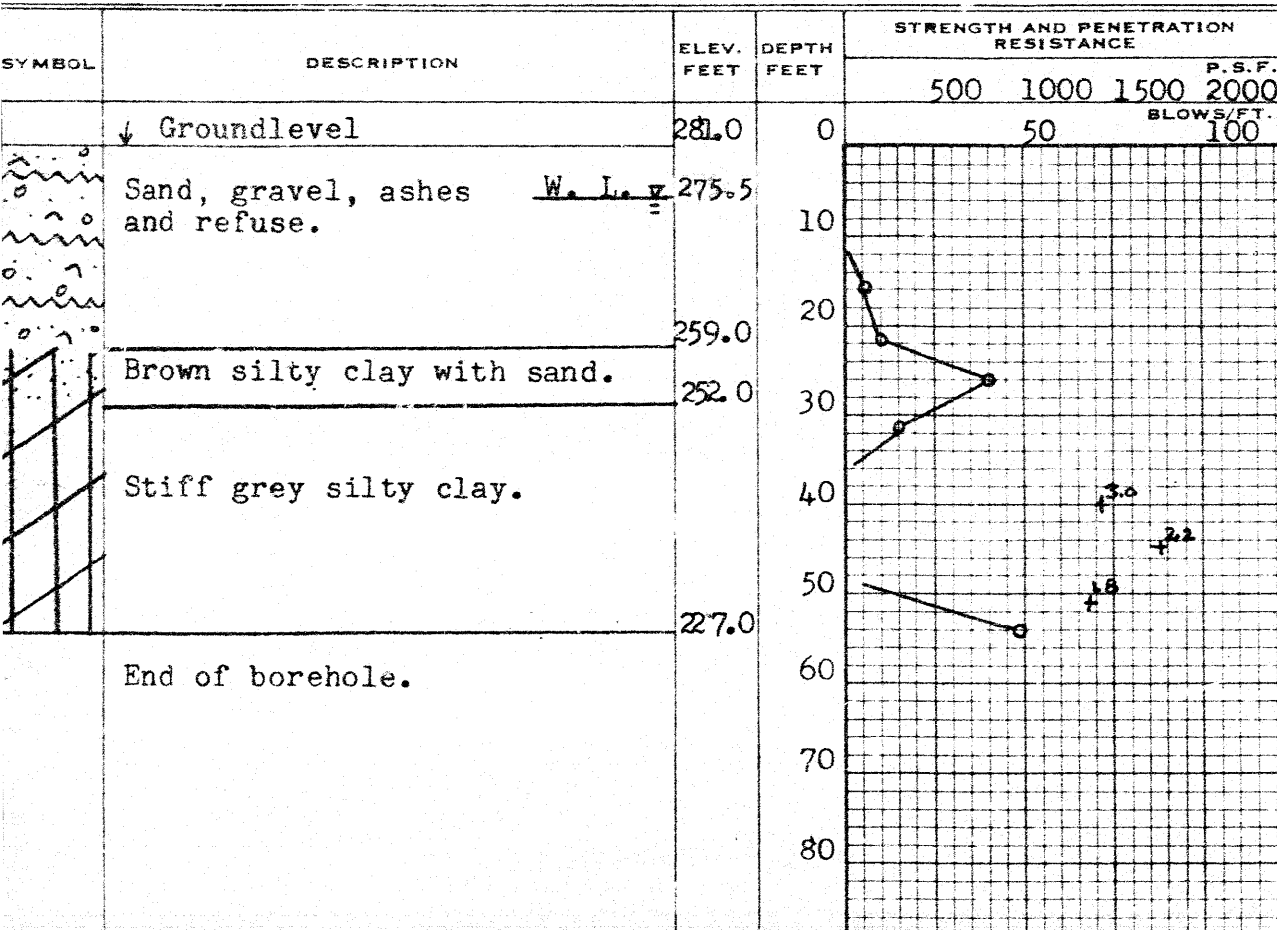
MATERIALS AND RESEARCH SECTION

W.P. 185-60 ----- BORE HOLE NO. K 11
11+80 E
 JOB 59-F-115 ----- STATION King St.
 DATUM G. S. C. ----- COMPILED BY B. K.
 BORING DATE Jan. 15/60 CHECKED BY J. B.

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 ----- ☐



CONSISTENCY	SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT- % DRY WT.		
	S1	
	S2	
	S3	
	S4	
	S5	
	S6	
	T7	
	T8	
	T9	
	S10	

DEPARTMENT OF HIGHWAYS - ONTARIO

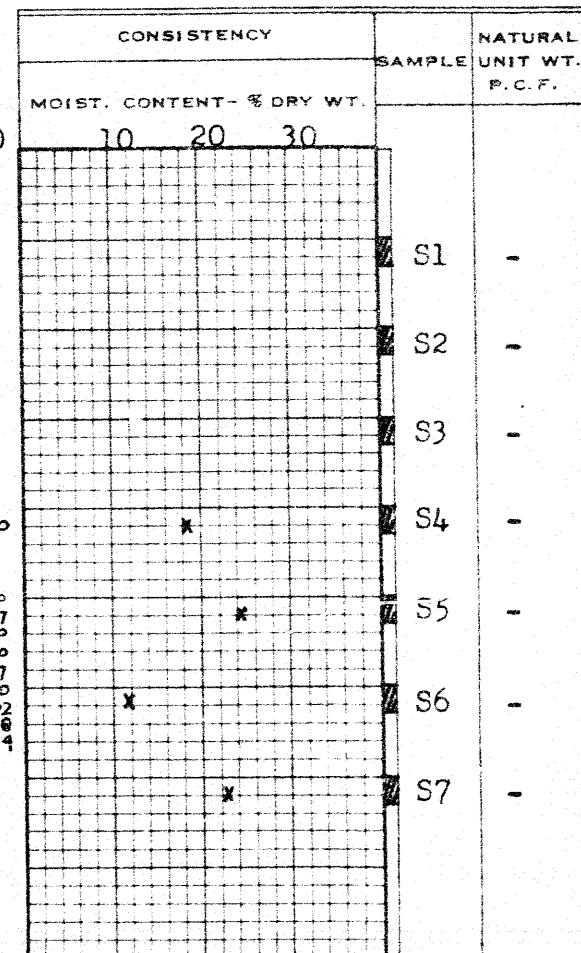
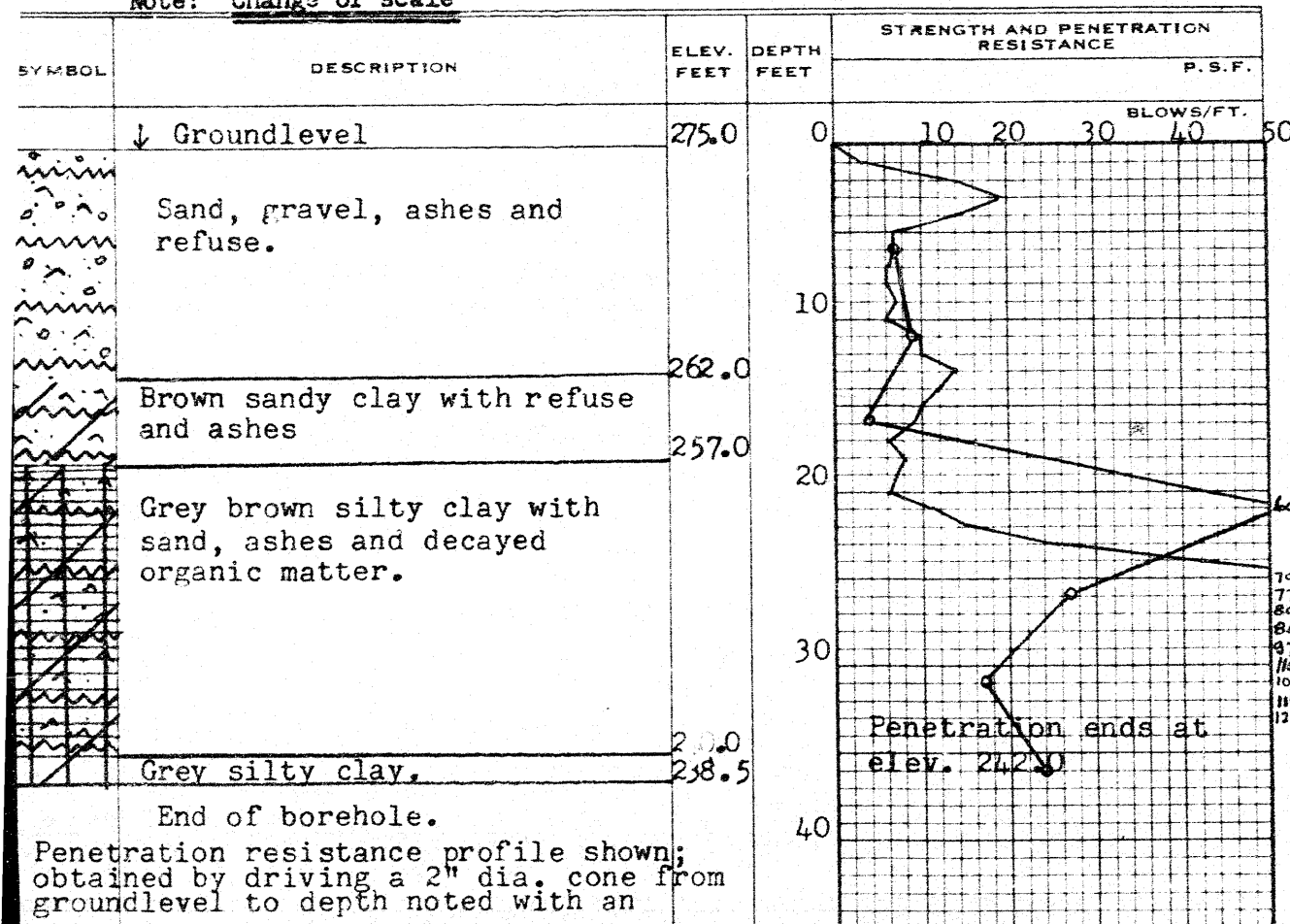
MATERIALS AND RESEARCH SECTION

W.P. 185-60 ----- BORE HOLE NO. K 12
 JOB 59-F-115 ----- STATION 11+80 15' Rt King St.
 DATUM G. S. C. ----- COMPILED BY B. K.
 BORING DATE Jan. 4/60 ----- CHECKED BY J. B.

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) --- O
 VANE TEST (C) AND SENSITIVITY (S) --- +
 NATURAL MOISTURE AND LIQUIDITY INDEX --- X
 LIQUID LIMIT --- o
 PLASTIC LIMIT --- |

Note: Change of scale



DEPARTMENT OF HIGHWAYS - ONTARIO

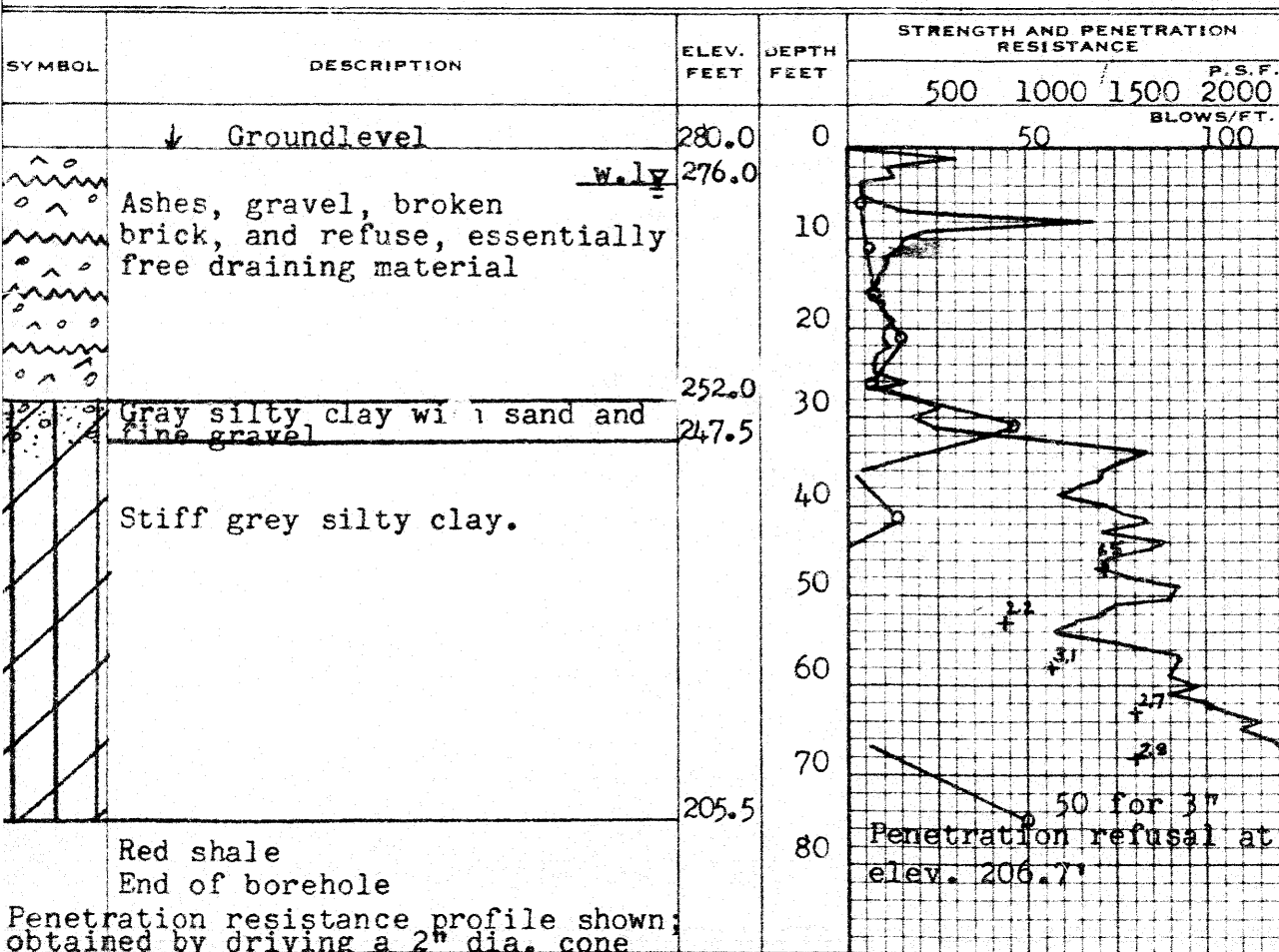
MATERIALS AND RESEARCH SECTION

W.P. 185-60 BORE HOLE NO. K 13
 JOB 59-F-115 STATION 11+00 E King St.
 DATUM G. S. C. COMPILED BY B. K.
 BORING DATE Jan. 11/60 CHECKED BY G. C.

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

LEGEND

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



CONSISTENCY				SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT- % DRY WT.					
10	20	30	40		

Penetration resistance profile shown; obtained by driving a 2" dia. cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow.

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION


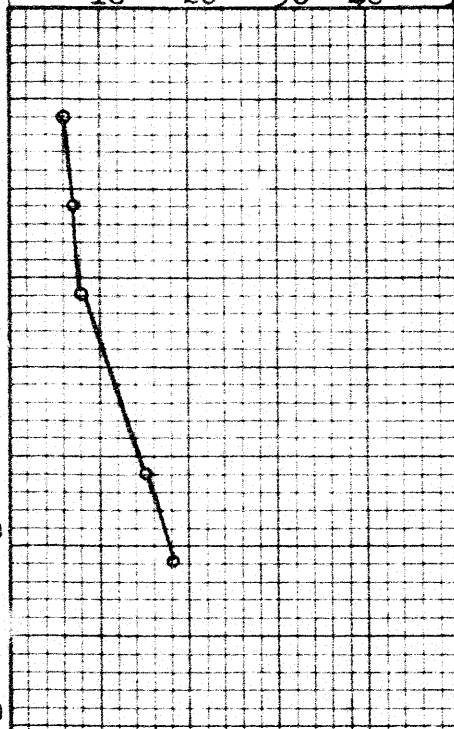
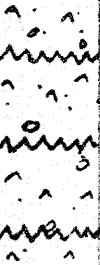
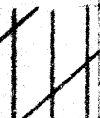
W.P. 185-60 _____ BORE HOLE NO. K 14 _____
 JOB 59-F-115 _____ STATION King St. _____
 DATUM G. S. C. _____ COMPILED BY B. K. _____
 BORING DATE Dec. 1/60 _____ CHECKED BY J. B. _____

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

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) _____ O
VANE TEST (C) AND SENSITIVITY (S) _____ + S
NATURAL MOISTURE AND _____
LIQUIDITY INDEX _____ X
LIQUID LIMIT _____
PLASTIC LIMIT _____

Note: Change of scale.

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P.S.F.	
	↓ Groundlevel	284.0	0	BLOWS/FT. 10 20 30 40 50	
	Brown silty clay with sand ashes and refuse.	274.0	10		
	Sand gravel ashes and refuse.	259.0	20		
	Stiff grey silty clay.	252.5	30		
	End of borehole.		40		

CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.			
10	20	30	
	x		S1 -
	x		S2 -
	x		S3 -
			S4 -
	x		S5 -

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

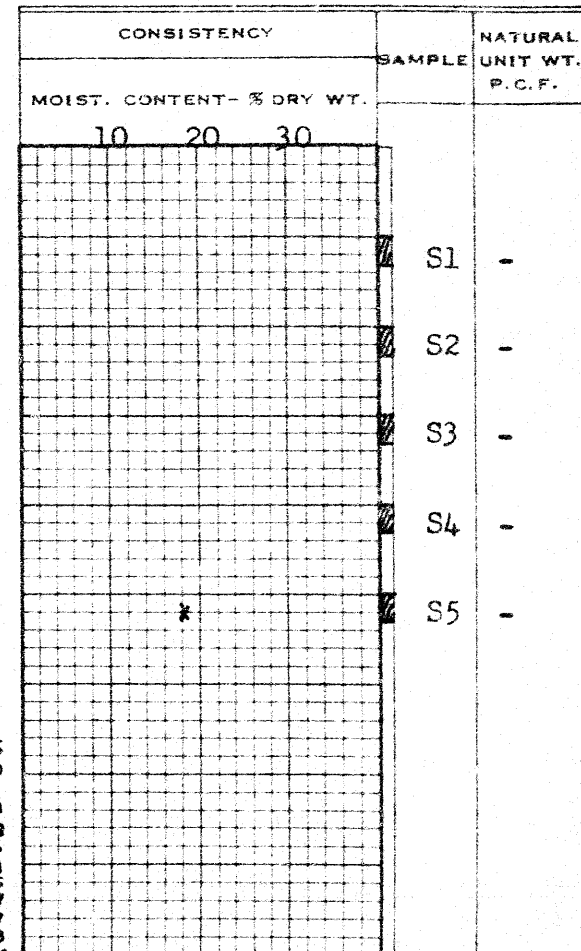
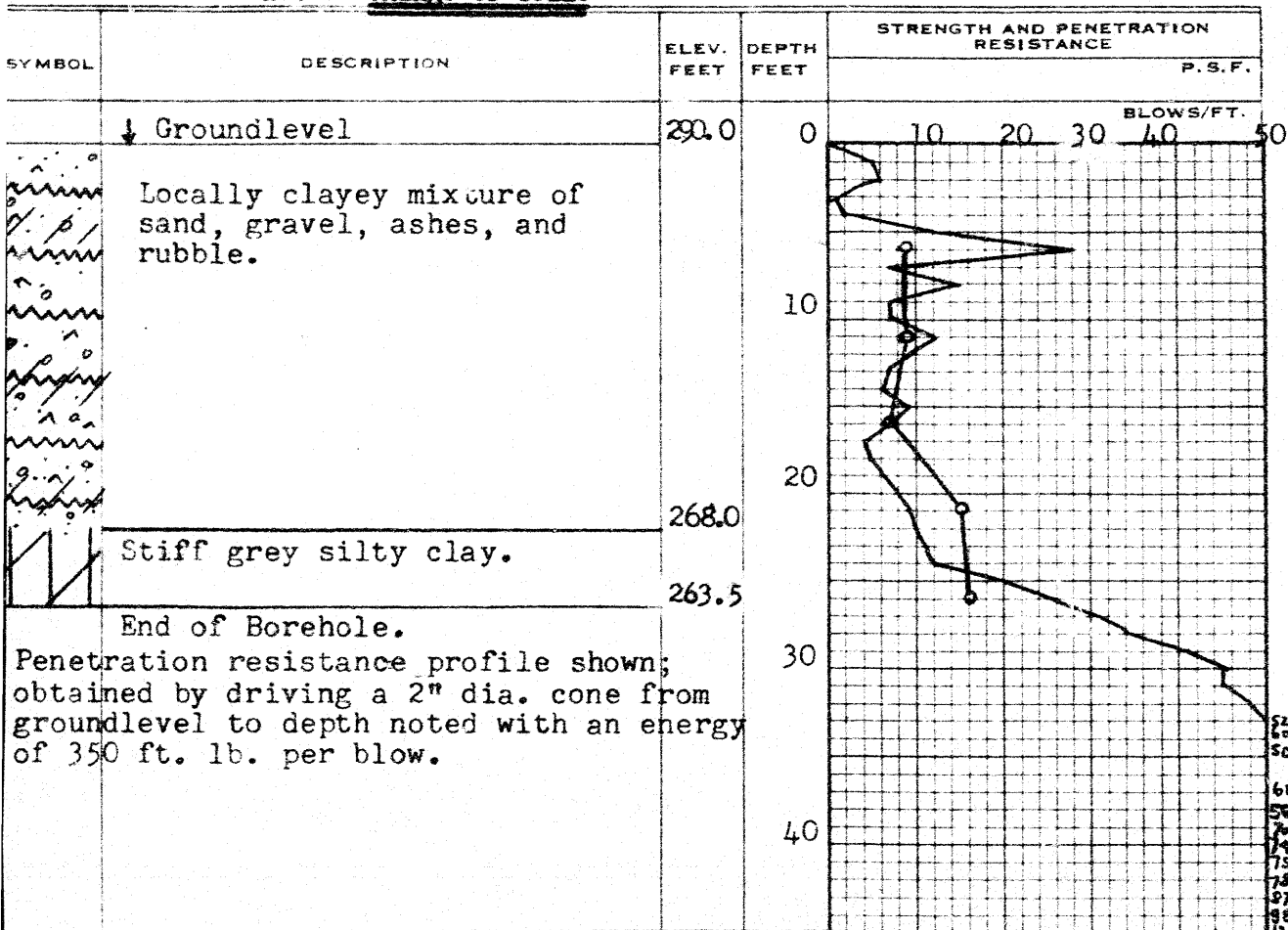
W.P. 185-60 ----- BORE HOLE NO. K 15 -----
 JOB 52-F-115 ----- STATION 9+00 King St. -----
 DATUM G. S. C. ----- COMPILED BY B. K. -----
 BORING DATE Dec. 31/60 CHECKED BY J. B. -----

Note: change of scale

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 -----



Penetration ends at elev.
245.0

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 185-60
BORE HOLE NO. K 16
JOB 59-F-115
STATION King St.
DATUM G. S. C.
COMPILED BY B. K.
BORING DATE Jan. 5/60
CHECKED BY J. B.

Note: Change of scale

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

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) _____ O
VANE TEST (C) AND SENSITIVITY (S) _____ + S
NATURAL MOISTURE AND _____ LI
LIQUIDITY INDEX _____ X
LIQUID LIMIT _____
PLASTIC LIMIT _____

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P.S.F.	
	↓ Groundlevel	298.0	0	BLOWS/FT.	
	Stiff brown sandy clay with fine gravel.				
	Med. dense	286.0	10		
	Brown sandy silt.				
	Seams of silty clay and med dense fine brown sand.	278.0	20		
	Stiff grey silty clay.	275.0			
		271.5			
	End of Borehole		30	Penetration ends at elev. 269.8'	
	Penetration resistance profile shown; obtained by driving a 2" dia. cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow.		40		

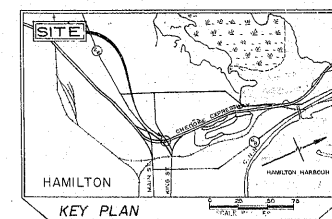
CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.			
10	20	30	
S1			-
S2			-
S3			-
S4			-

#59-F-115

W.P. #185-60

HWY. #403 &

KING STREET



KEY PLAN

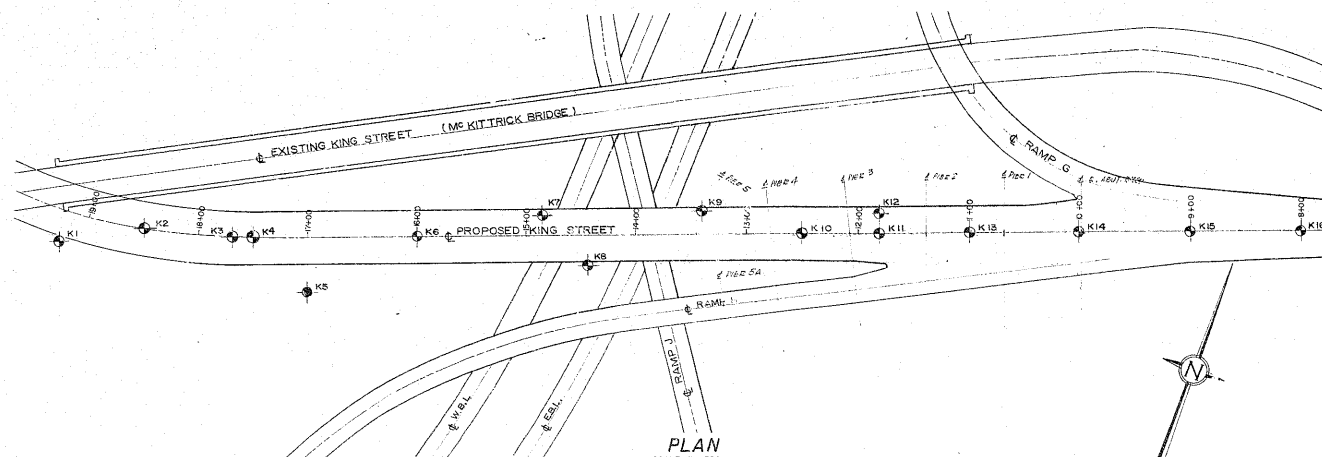
LEGEND			
	BORE HOLE		
	BORE AND PENETRATION HOLE		
	VERY VARIABLE MIXTURE OF SAND, GRAVEL, RUBBLE AND REFUSE LOCALLY CLAYEY		
	SOFT GREY BROWN SILTY CLAY WITH VARIABLE AMOUNTS OF ORGANIC MATTER		
	GREY BROWN SILTY SAND OR GRAVELLY SAND WITH VARIABLE AMOUNTS OF CLAY		
	STIFF TO VERY STIFF GREY SILTY CLAY AND CLAYEY SILT LOCALLY LAYERED		
HOLE	ELEVATION	STATION	DISTANCE FROM
1	310.0	19 + 50	25' LT.
2	272.0	18 + 50	5
3	265.0	17 + 70	5
4	264.0	17 + 50	5
5	264.0	17 + 00	50' LT.
6	265.0	16 + 00	5
7	268.7	14 + 85	16' RT.
8	270.4	14 + 43	27' LT.
9	271.2	13 + 40	20' RT.
10	273.0	12 + 50	5
11	281.0	11 + 80	5
12	275.0	11 + 80	5
13	280.0	11 + 00	5
14	284.0	10 + 00	5
15	290.0	9 + 00	5
16	298.0	8 + 00	5

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

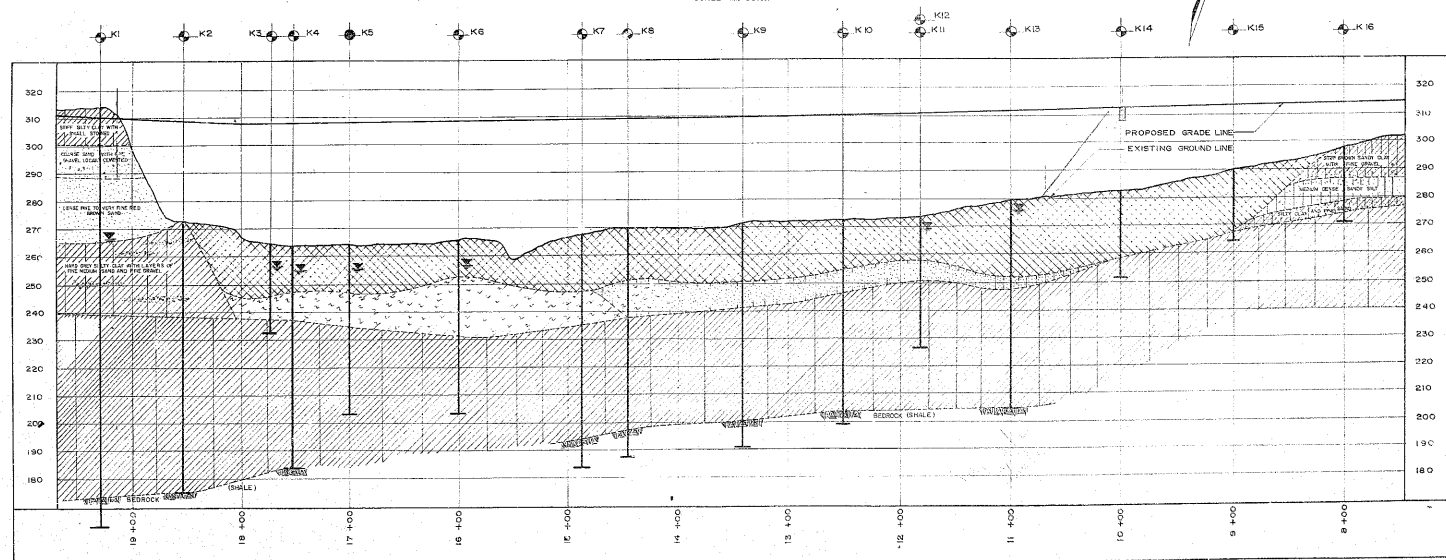
DEPARTMENT OF HIGHWAY - COTAC
MATERIALS & RESEARCH SECTION

KING STREET PROPOSED CROSSING

DESIGNED BY: J. BROWN	DISTRICT NO.: 4	DATE OF FORMER INFO:
CHECKED BY: J. BROWN	W.P. NO. 115-80	DATE OF INFO:
APPROVED BY: J. BROWN	SCALE: AS SHOWN	DESIGNED BY: 58F115A



PLAN
SCALE 1" = 50' feet



PROFILE SCALE HORIZ. 1" = 50'
VERT. 1" = 20'