

62-5

Mr. A. M. Toye,
Bridge Engineer.
Materials & Research Section.
Attention: Mr. D. McCombie.

October 27, 1959.
FOUNDATION REPORT - D.H.O.
W.P. 67-58 -- W.J. F-59-86.

Re: New Hwy. 62 & Bonnechere River Crossing,
County of Renfrew, Township of Ragarty,
Lots 5 & 6, Cons. XIII - Approximately -
5 Miles Northwest of Killaloe Station.

Enclosed herewith is our foundation report showing the subsoil conditions existing at the above noted site. Reference to the contents of this report shows that the subsoil consists of a layer of loose organic silt overlying a stratum of sand and gravel underlain by granite bedrock.

For your convenience, recommendations pertinent to foundation design, are repeated as follows:-

1. Simple spread footings are not recommended.
2. Steel 'H' piles, driven to refusal, at the contact of granite bedrock, are recommended.
3. Permanent sheet-piling should be provided around the piers and abutments. They should be driven to approx. Elev. 526'.
4. No approach fill stability problems are anticipated. The organic material should be stripped prior to the placing of the approach fill material. Bank slopes on the upstream side should be protected by rip-rap.

If there are any queries in connection with the contents of this report, please contact our office.

AKL/ndef
Encl.

cc: Messrs. A. M. Toye

H. A. Frogaskee

D. C. Ramsay

I. Campbell

C. D. Robertson

J. E. Graspier

A. Watt

Foundation Section

L. G. Soderman,

PRINCIPAL SOILS & FOUNDATIONS ENGR.

per:

AKKL
(A. E. Loh,
Foundation Project Engineer)

-- Gen. Files.

FOUNDATION REPORT

on

New Hwy. 62 & Bonnechere River Crossing,
County of Renfrew, Township of Hagarty,
Lots 5 & 6, Conc. XIII - Approximately -
5 Miles Northwest of Killaloe Station.

Site Plan No: E 3646-1

Distribution:

Mr. A. M. Toye, Bridge Engineer.	(2)
Mr. H. A. Tregaskes, Construction Engineer.	(1)
Mr. D. G. Ramsay, Ed. Design Engineer.	(1)
Mr. I. Campbell, Sr. Project Design Engr.	(1)
Mr. C. B. Robertson, District Engineer, Bancroft, Ontario.	(1)
Mr. J. Gruspier, Regional Soils Engineer.	(1)
Mr. A. Watt, Ontario Water Resources Commission.	(1)
Foundation Section.	(1)
Gen. Files.	(1)

W.P. 67-58.

W.J. F-59-86.

New Hwy. 62 & Bonnechere River Crossing

SITE INVESTIGATION:

A subsoil investigation has been carried out at the above noted site to determine the competence of the subsoil layers for the support of the foundation of the proposed structure. Field work consisted of 5 sampled boreholes with cone test adjacent to each hole, carried out during the period of 19th to 28th of August. The locations of the boreholes and cone tests are shown in the accompanying Drawing No. F-59-86A and their logs under Appendix I.

The boreholes indicate that the subsoil at the site consists of a layer of loose organic silt overlying a stratum of sand and gravel underlain by granite bedrock.

The upper portion of the sand and gravel stratum is in a loose state of packing and contains a considerable amount of silt. The lower portion of the sand and gravel stratum is in a dense state of packing with 'N' values (standard penetration resistance expressed in blows per foot) in excess of 30 registered during the sampling operations. The granite bedrock is sound with no signs of weathering or fracture. Bedrock was proven to be at - Elev. 518' to 512' in Borings 1, 2 & 3, and at Elev. 506' in Boring 4. At the location of Boring 5, bedrock was not proven. No artesian water conditions were encountered during the sampling operations.

FOUNDATION CONSIDERATIONS:

Because of the uncertainties of scouring under the present river bed and the low penetration resistance of the upper portion

FOUNDATION CONSIDERATIONS: (cont'd.) ...

of the sandy subsoil, it would not be advisable to place spread footings above Elev. 526'. Since this will require considerable excavation in the loose sand below the water table, a spread footing foundation does not appear to be economical and feasible and, therefore, is not recommended.

The other alternative to obtain satisfactory foundation support, would be end-bearing piles driven to refusal into the granite bedrock. Steel 'H' piles driven to refusal into the bedrock, will provide adequate footing support for the structure. No total or differential settlements of any consequence, need be anticipated.

In order to protect the subsoil around the piles from stream erosion and scour, permanent sheet-piling should be provided around the piers and abutments. These sheet piles will also serve as cofferdams with respect to excavations in connection with the placing of pile caps during construction. Sheet piles should be driven to approximately Elev. 526'.

Under the proposed grade line, the maximum height of fill is approximately 10 ft. The subsoil can safely support this embankment loading. In the immediate approaches to the structure all the organic material should be stripped prior to the placing of the fill material. Bank slopes on the upstream face should be protected by rip-rap.

cont'd. /3 ...

RECOMMENDATIONS:

- (1) Subsoil conditions are such that simple spread footings cannot be used at this site.
- (2) End-bearing piles driven to refusal at the contact of the granite bedrock, appear to be the obvious means of obtaining satisfactory foundation support. Steel 'H' piles are recommended. No total or differential settlements of any consequence need be anticipated. Bedrock was proven to be at Elev. 518' to 512' at the locations of Borings - 1, 2 & 3. At the location of Borehole No. 4 (South abutment) bedrock was contacted at Elev. 506'. Bedrock was not proven at the location of Borehole No. 5 (i.e. - North abutment location).
- (3) Permanent sheet-piling should be provided around the piers and abutments. They should be driven to approximately Elev. 526'.
- (4) No approach fill stability problems are anticipated. The organic material should be stripped prior to the placing of the approach fill material. Bank slopes on the upstream side should be protected by rip-rap.

AKGL

A. Loh,
Project Foundation Engr.

APPENDIX I.

TABLE NO. I.

SUMMARY OF FIELD & LABORATORY TESTS

JOB F 59-86W.P. 67-58

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
1	S1	10'-12'	Dark grey brownish organic material with silt.	1	36.5	-	-	-	-	
	S2	14.3'-16'	Soft grey clayey silt.	-	55.5	-	-	-	-	
	S3	17'-19'	Loose grey silty medium sand.	-	-	-	-	-	-	
	S4	21.5'-23'	" " " " "	12	17.3	-	-	-	-	
	S5	25'-26.5'	" " " " "	61	15.3	-	-	-	-	
	S6	30'-31.5'	Medium grey coarse sand with silt and fine to medium gravel.	45	11.2	-	-	-	-	
	S7	35'-36'	" " " " " "	106-11'	11.5	-	-	-	-	
	RC	36.2'-40.2'	Bedrock. - Granite	-	-	-	-	-	-	
2	S1	20'-21.5'	Medium grey silty sand; grey sand with gravel.	18	23.6	-	-	-	-	
	S2	25'-26.5'	" " " " "	16	-	-	-	-	-	
	S3	30'-31.5'	Gravel and grey sand.	40	11.7	-	-	-	-	
	S4	35'-36'	" " " " "	94	13.7	-	-	-	-	
	RC	42.6'-45'	Bedrock. - Granite	-	-	-	-	-	-	
3	S1	25'-26.5'	Medium grey sand with fine-medium gravel.	25	18.4	-	-	-	-	
	S2	30'-31'	" " " " "	87	-	-	-	-	-	
	S3	34'-35.5'	Dense grey coarse sand and fine to medium gravel.	65	14.2	-	-	-	-	
	S4	38'-39.5'	" " " " "	97	17.3	-	-	-	-	
	S5	40'-41'	" " " " "	-	12.2	-	-	-	-	
	RC	42.5'-45'	Bedrock. - Granite	-	-	-	-	-	-	

cont'd. /2 ..

SUMMARY OF FIELD & LABORATORY TESTS

JOB F 59-86

W.P. 67-58.

Page - 2 -

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
4	S1	5'-6.5'	Loose dark brown organic material with silt.	1	-	-	-	-	-	
	S2	10'-11.5'	Loose grey silty sand.	2	-	-	-	-	-	
	S3	15'-16.5'	Soft grey clayey silt with sand.	1	68.3	-	-	-	88.9	
	S4	20'-21.5'	" " " " "	1	46.0	-	-	-	-	
	S5	25'-26.5'	Medium grey sand with gravel.	41	12.4	-	-	-	-	
	S6	30'-31.5'	" " " " "	33	13.3	-	-	-	-	
	S7	35'-36.5'	Grey dense coarse sand and fine to medium gravel.	32	7.3	-	-	-	-	
	S8	45'-46.3'	" " " " "	49	11.3	-	-	-	-	
	RC	49.5'-53.5'	Bedrock.- Granite	-	-	-	-	-	-	
5	S1	5'-6.5'	Medium grey silty fine sand with gravel.	17	17.4	-	-	-	-	
	S2	10'-11.5'	" " " " "	20	-	-	-	-	-	
	S3	15'-16.5'	" " " " "	21	22.4	-	-	-	-	
	S4	20'-21.5'	Medium grey coarse sand with gravel.	32	14.9	-	-	-	-	
	S5	25'-25.7'	" " " " "	66	7.7	-	-	-	-	
			S - Denotes Split Spoon Sample. RC- " Rock Core.							

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 67-58 BORE HOLE NO. 1
 JOB F 59-86 STATION 227/05 (5' RT)
 DATUM 555.1 COMPILED BY B.K.
 BORING DATE Aug. 20/59 CHECKED BY M.D.

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 _____

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P. S. F.	BLOWS/FT.
↓	Waterlevel	555.1	0		25 50 75 100
---	Water	551.6			
	dark grey-brownish organic material with silt	541.1	10		
	soft grey clayey silt	538.1	20		
	Loose- grey silty medium sand	528.1	30		
	Medium grey coarse sand with silt & fine to medium gravel.	518.9	40		
	Ext Core-Bedrock Pink Granite-75% recovery.	514.9	40		
	End of borehole		50		
	Penetration resistance profile shown; obtained by driving a 2" dia. cone from ground surface to depth noted with an energy of 350 Ft.lb. per blow.		60		
			70		
			80		

CONSISTENCY			SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.				
20	40	60		
			S 1	-
			S 2	-
			S 3	-
			S 4	-
			S 5	-
			S 6	-
			S 7	-
			RC	-

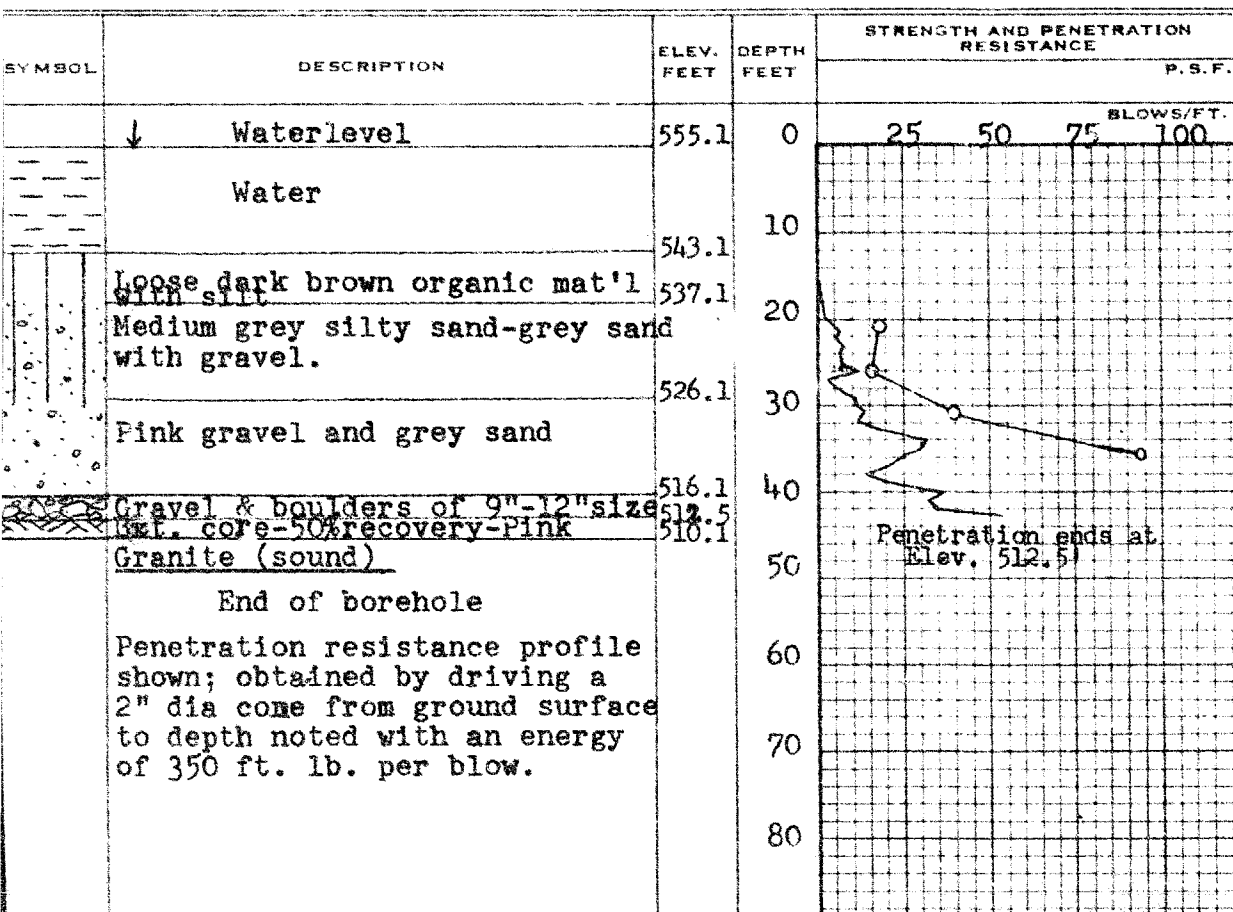
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 67-58 BORE HOLE NO. 2
 JOB F 59-86 STATION 226/10
 DATUM 555.1' COMPILED BY B.K.
 BORING DATE Aug. 22/59 CHECKED BY M.D.

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.			
20 40 60			
		S 1	-
		S 2	-
		S 3	-
		S 4	-
		R.C.	-

DEPARTMENT OF HIGHWAYS - ONTARIO

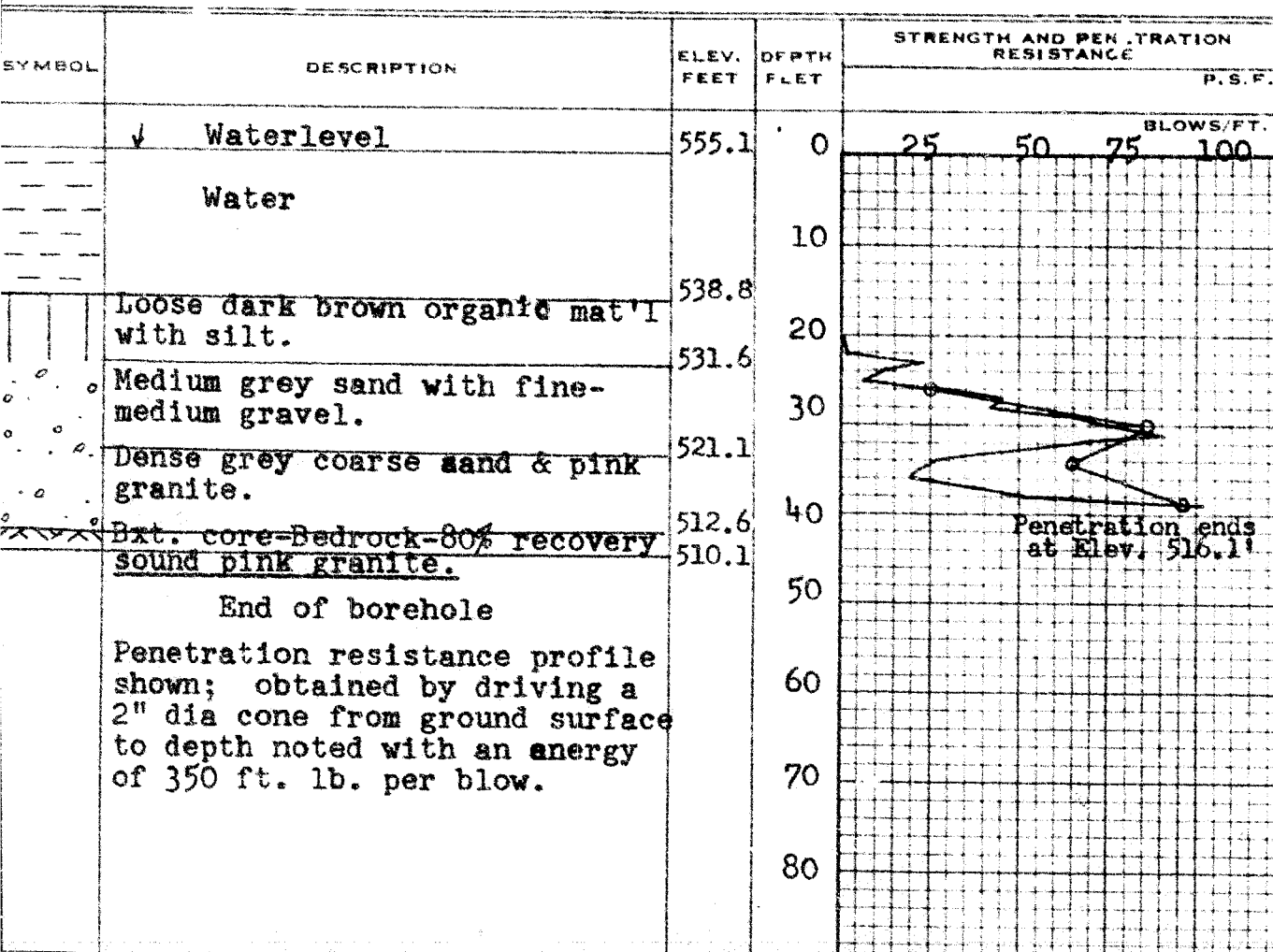
MATERIALS AND RESEARCH SECTION

W.P. 62-58 BORE HOLE NO. 3
 JOB F 59-86 STATION 224+75 (a)
 DATUM 555.1' COMPILED BY B.K.
 BORING DATE Aug. 24/59 CHECKED BY M.D.

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.				
20	40	60		

DEPARTMENT OF HIGHWAYS - ONTARIO

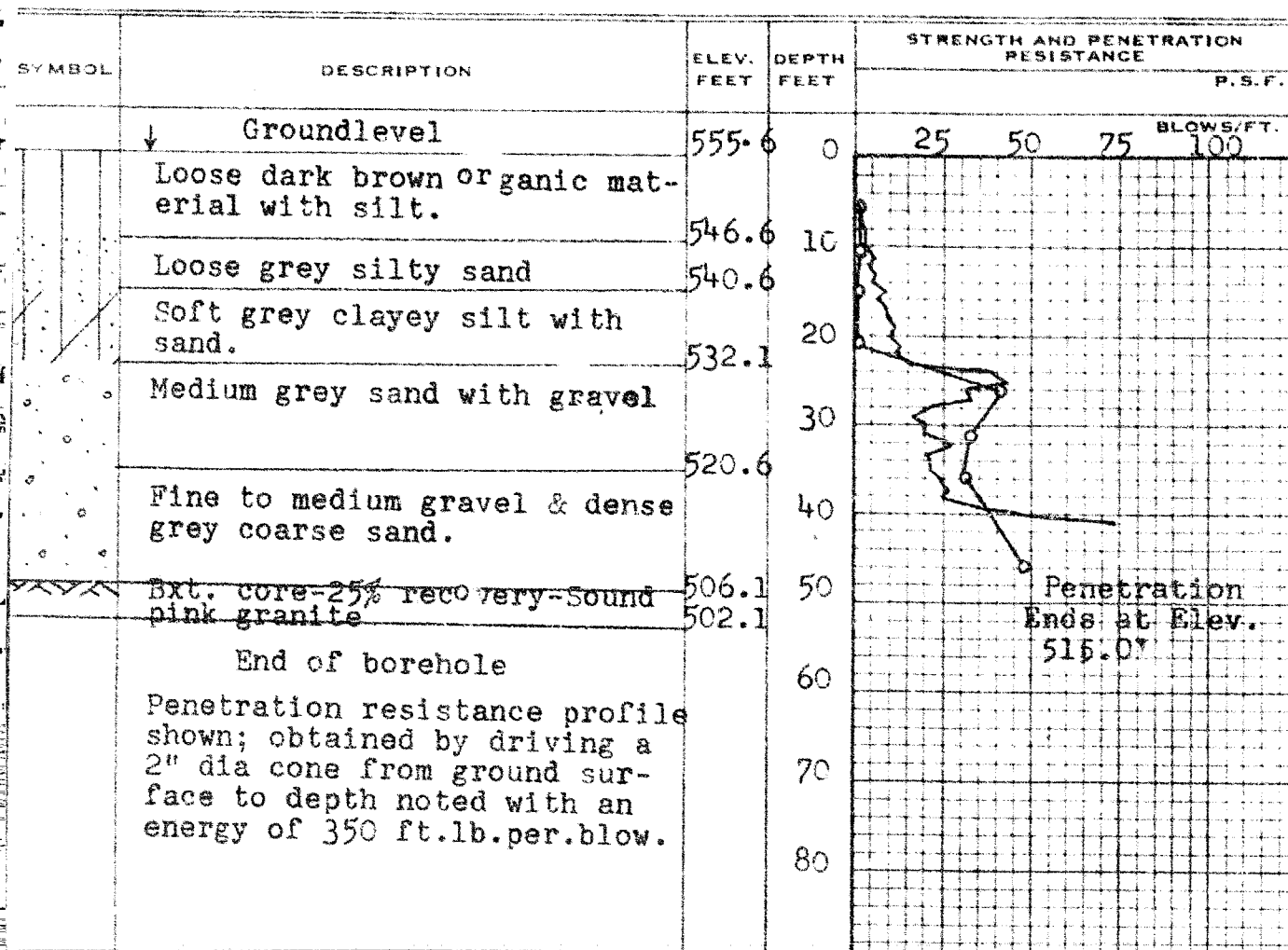
MATERIALS AND RESEARCH SECTION

W.P. 67-58 BORE HOLE NO. 4
 JOB F 59-86 STATION 223+80 (E)
 DATUM 555.6' COMPILED BY B.K.
 BORING DATE Aug. 26/59 CHECKED BY M.D.

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



CONSISTENCY			SAMPLE	NATURAL UNIT WT P.C.F.
MOIST. CONTENT - % DRY WT.				
20	40	60		
			S 1	-
			S 2	-
			S 3	88.9
			S 4	-
			S 5	-
			S 6	--
			S 7	-
			S 8	-
			R.C.	-

OVER

DEPARTMENT OF HIGHWAYS - ONTARIO

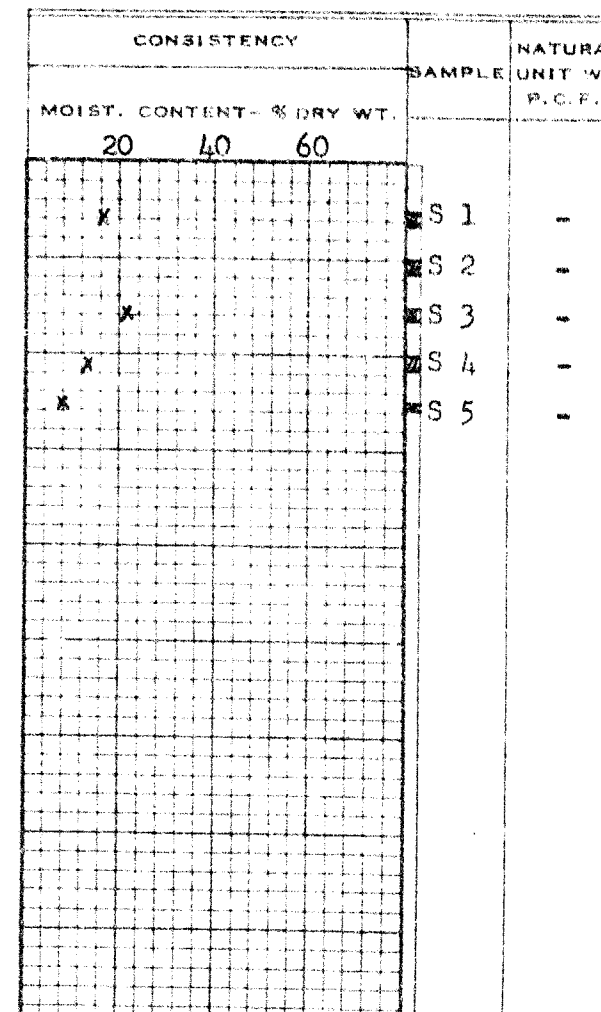
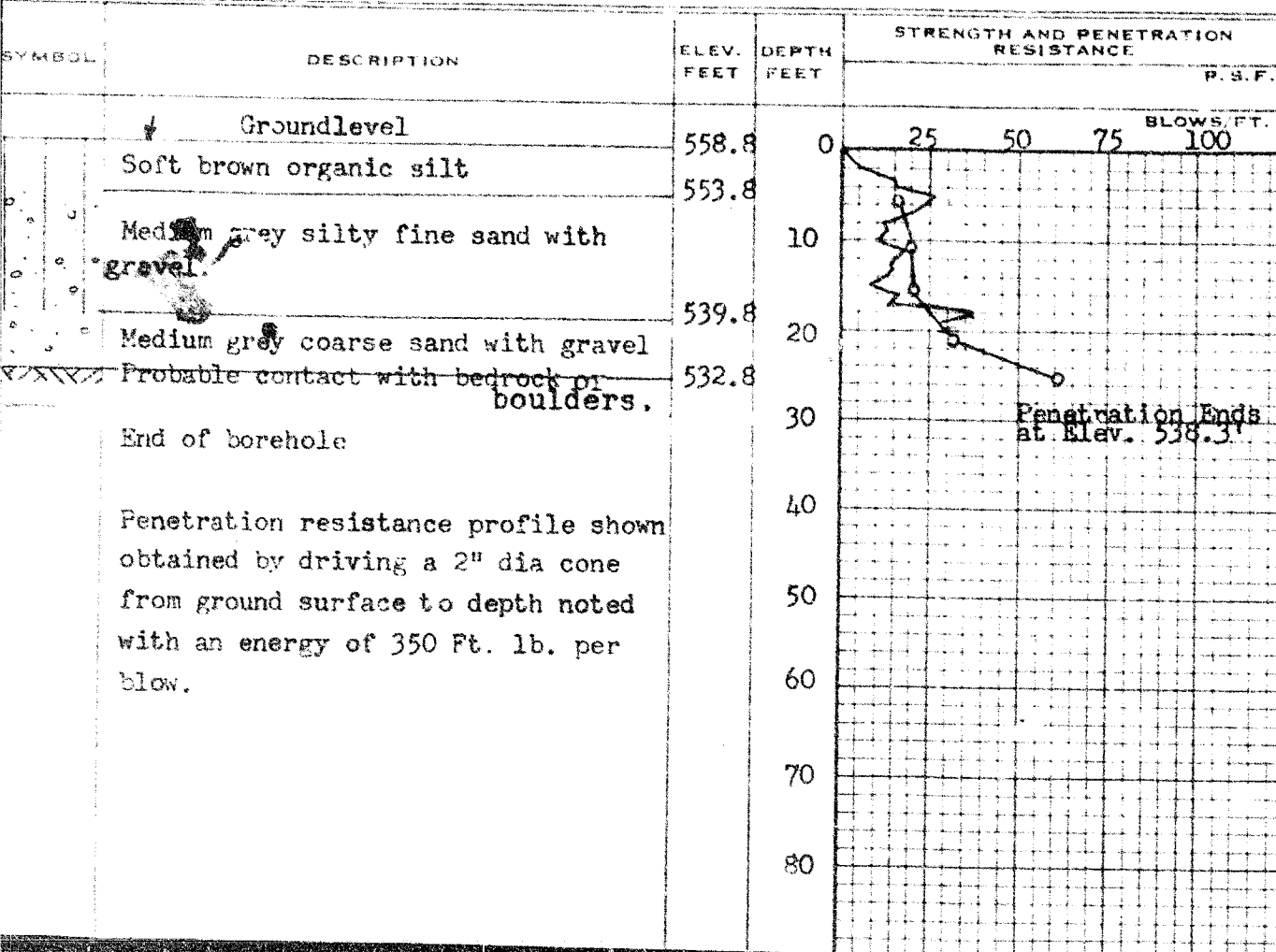
MATERIALS AND RESEARCH SECTION

W.P. 67-58 BORE HOLE NO. 5
 JOB F 59-86 STATION 228/15 (7' RT)
 DATUM 558.8' COMPILED BY B.K.
 BORING DATE Aug. 28/59 CHECKED BY M.D.

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



Holes at
228 + 10

8" of Vegetation
then fine loam sand
with some fibres

227 + 78
Fine loam sand
on bottom with
fibre down to
5 feet

essentially fine loam
sand Not again soil

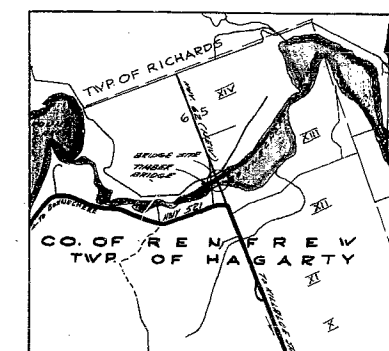
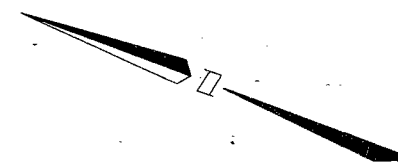
#59-F-86

W.P. 67-58

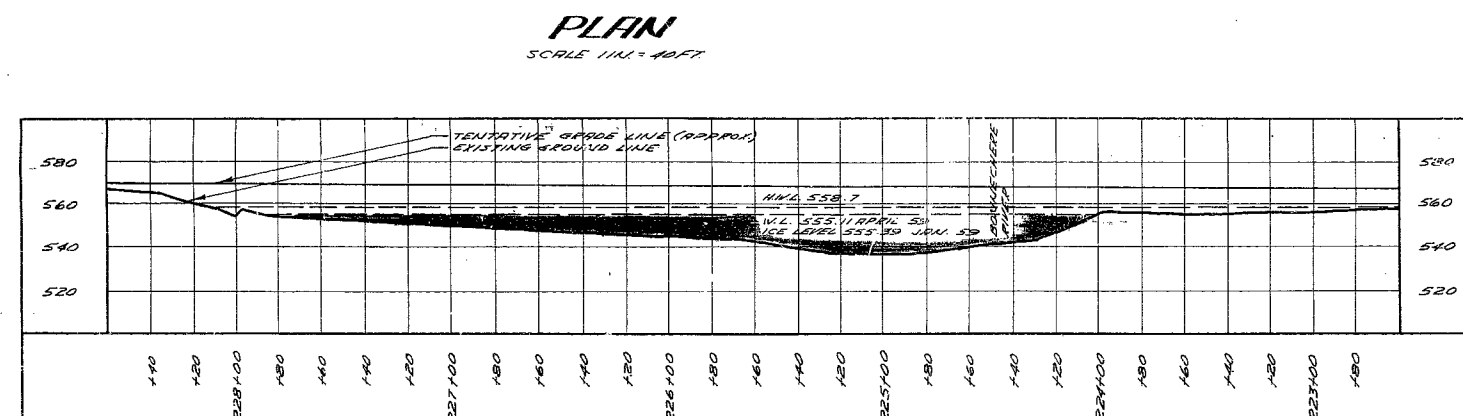
HWY. #62 3

BONNECHERE

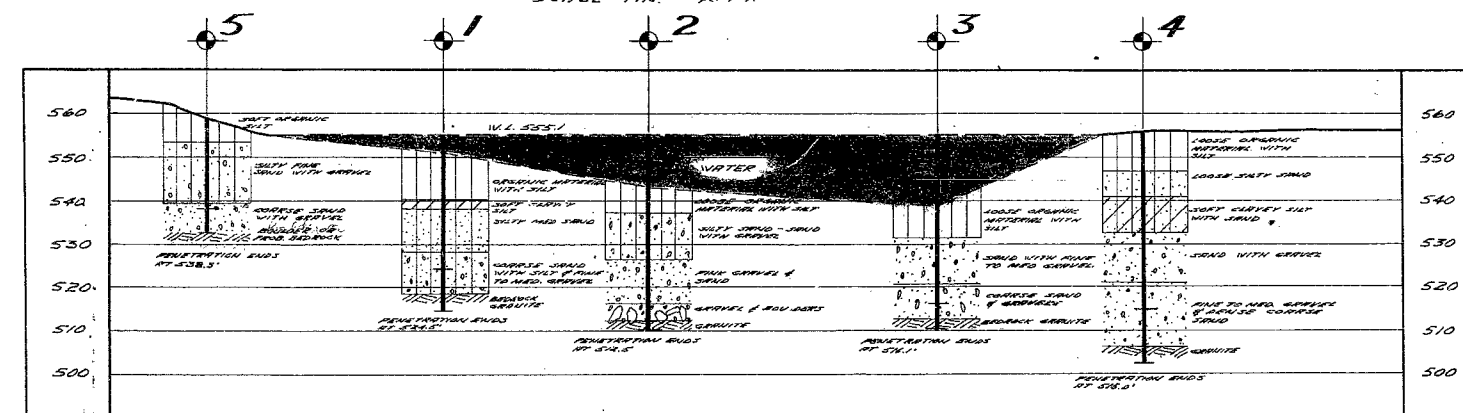
RIVER, DIST. 10



KEY PLAN
SCALE 1 IN. = 0.8 MI.



PROFILE
SCALE 1 IN. = 40 FT.



ELEVATION OF BOREHOLES

LEGEND

BORE HOLE



PENETRATION HOLE



BORE & PENETRATION HOLE



HOLE NO	ELEVATION	STATION	DISTANCE FROM 2
1	555.11	227+05	5.4 FT.
2	555.11	226+10	2
3	555.11	224+75	5.4 FT.
4	555.61	223+80	2
5	558.81	228+15	7.4 FT.

- 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 HIGHWAYS - ONTARIO
MATERIALS & RESEARCH SECTION

**BONNECHERE RIVER
PROPOSED CROSSING**

SHOWING POSITIONS & ELEVATIONS OF HOLES

HWY. 62 (NEW) DISTRICT 10 COUNTY PENFRETH

TOWNSHIP HAGARTY LOT 546 CON. XIII
LOCATION APP. 5 MI. N.W. OF KILLBUCK STATION

LOCATION: Hwy 3 N. W. of Killdeer Station
DRAWN BY: T. MELLORS CHECKED BY: [Signature] W.P. 67-58

DATE	14 OCT. 59	APPROVED BY:		DRAWING NO.	500
------	------------	--------------	---	-------------	-----

SCALE AS SHOWN F59-8