

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

June 17, 1960.

D.H.O. FOUNDATION INVESTIGATION
W.P. 72-58 -- W.J. 60-F-43.

Attention: Mr. S. McCombie.

Re: Bissett Creek Diversion and Gravel
Road Revision -- District #13.

Attached to this memo, we are forwarding to you, the Foundation Investigation Report for the above mentioned location. The report has been prepared in our Section.

The conclusions and recommendations contained in this report are self-explanatory and we believe, adequate and sufficient for your future design work.

Should there be any other additional questions in connection with this site that you would like to discuss, please feel free to call on our Office.

L. G. Soderman,
PRINCIPAL FOUNDATIONS ENGR.

Per:

AS/MdeF
Attach.

cc: Messrs. A. M. Toye (2)

H. A. Tregaskes
D. G. Ramsay
C. K. Hunter
J. D. Foster
E. R. Saint
A. Watt

Foundations Office
Gen. Files.


(A. Stermac,
FOUNDATIONS OFFICE ENGR.)

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3. FIELD AND LABORATORY WORK
4. SOIL TYPES ENCOUNTERED -
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5. FOUNDATION CONSIDERATIONS
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FOUNDATION INVESTIGATION

For

Bissett Creek Diversion and
Gravel Road Revision.
W.P. 72-58 - Dist. 13 - W.J. 60-F-43.

I. INTRODUCTION:

Bissett Creek, just South of the Highway No. 17 Bridge, should be diverted. This diversion will necessitate the revision of the existing gravel road. The revised gravel road will intersect Bissett Creek South of the existing crossing and at this new site, a structure will have to be built. The new site is on Lot 56, Con. B., Township of Maria (Station 2 + 22.5, Drawing BW-196).

This report deals with the soil investigations carried out on the site of the Bissett's Creek diversion, gravel road revision, and of the new structure to be built at the intersection.

2. DESCRIPTION OF SITE AND GEOLOGY:

Bissett Creek is a tributary of the Ottawa River. The topography of the country is forested hills with seasonal streams in the valleys. Geologically, the area is in the Precambrian Shield, with bedrock mainly granite. The overburden has been formed by glacial drifts and spillways, etc.

3. FIELD AND LABORATORY WORK:

The investigations were carried out by means of a core-drill machine adapted for soil sampling. During the investigation, four boreholes were made, two along the centre line of the creek diversion, and two parallel to the gravel road revision line.

In granular soils, samples were taken 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.

cont'd. /2 ...

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

The split spoon samples were visually examined in the field and representative samples were brought to the laboratory for further tests.

The large boulders and bedrock were drilled by means of an AXT diamond bit, and core barrel samples extracted.

The logs of the boreholes and their location shown on Drawing No. 60-F-43 A, are attached under Appendix I.

4. SOIL TYPES ENCOUNTERED:

4.1 General:

The investigations at the site revealed the following subsoil conditions:-

The top material is made up of brown clayey sand with decayed wood. This top material is underlain by a layer of grey, fine to coarse sand with occasional large boulders. Underlying this grey material, is the bedrock.

4.2 Dark Brown Clayey Sand with Decayed Wood:

This material was intersected at the top 5 ft. in all four boreholes. It is mostly coarse sand mixed with clay and decayed vegetation, which gives it a dark brown colour. It is in a loose state and it is considered to be a recent deposit by creek waters.

4.3 Grey Fine to Coarse Sand with Large Boulders:

Under the dark brown material, a layer of grey fine to coarse sand was encountered. This layer was spotted by frequent large boulders. This necessitated quite a great deal of diamond core drilling. In Borehole No. 1, this layer is about 32 ft. thick. It is mostly comprised of large boulders, and the casing was advanced by drilling. In Borehole No. 2, the layer is about 37 ft. thick. The top 16 ft. was loose and boulder-free.

4. SOIL TYPES ENCOUNTERED: (cont'd.) ...

The lower 21 ft. were dense and thick, with large boulders, and the casing was advanced by drilling. In Borehole No. 3, the thickness of the layer was found to be 27 ft. Only the top 4 ft. were loose sand and free of boulders. The remaining 23 ft. were dense with large boulders, and were penetrated by drilling the casing. In Borehole No. 4, the layer is 44 ft. thick. The top 11 ft. are loose and mixed with pieces of decayed wood. The lower 33 ft. are medium to coarse sand in a dense state and free of boulders.

4.4 Bedrock:

Bedrock was intersected in all four holes under the grey sand layer. Core samples of the bedrock were extracted by means of an AXT diamond bit. From the core samples the bedrock was identified as igneous (gneiss) rock. The elevations of bedrock intersections are shown in the attached log sheets.

During the drilling operations the ground water level was found to be close to the ground surface.

5. FOUNDATION CONSIDERATIONS:

The top layer of dark brown clayey sand with decayed matter, because of its loose and soft state and its heterogeneity, is not a suitable material for the support of a structure, and should therefore be discarded. The lowest elevation at which the presence of this layer was established, is 498.5 ft. Below this layer, there is a thick layer of grey, fine to coarse sand which, with depth, becomes denser and has more boulders. The upper 15 ft. of this layer are in a rather loose state, with an average of $N = 5$. It is therefore recommended that a box type culvert structure be used in which case, the pressure on the ground is relatively small. In such a case, no bearing problem exists and the only question of significance, is the settlement. However, the material being very pervious, the settlements will take place during and immediately after construction and will therefore not present a problem.

cont'd. /4 ...

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

The suggested elevation for the placement of the culvert foundation is 497.5 or lower.

Because of the shear characteristics of the subsoil, no stability problems - neither for the excavation of the new creek bed, nor for the placement of the gravel road fill - are foreseen, provided a minimum slope of 1-1/2:1 is retained.

6. SUMMARY AND RECOMMENDATIONS:

The data and discussions presented under the previous headings, can be summarized as follows:-

1. The stratigraphy of the soil on the site is quite regular. Under the top layer of dark brown clayey sand with decayed matter, there is a layer of grey, medium to coarse sand overlying bedrock. The thickness of this sand layer varies from 27 to 44 ft. depending on the bedrock elevation. With depth, the layer becomes denser and contains more boulders.
2. Because of the rather loose state of the upper portion of the sand layer, a box type culvert is suggested. Elevation 497.5 or lower, is recommended as foundation level.
3. Because of the sandy character of the soil, settlements will develop during and immediately after construction and, therefore, will not present any problem.
4. No stability problems for standard fill and cut slopes are anticipated.
5. Because of the high ground water table, either underwater concreting or dewatering of the excavation will have to be considered. A system of well points could be used in order to lower the water table and complete the excavation and concreting under dry conditions.

June 1960

REPORT PREPARED BY: V. Korlu,
Project Foundations Engr.

REPORT APPROVED BY: *A. Stermac*
A. Stermac,
Foundations Office Engr.

APPENDIX I.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-43

W.P. 72-58

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	RC1	38'-43'	Bedrock	-	-	-	-	-	-	100% recovery
	RC2	43'-47.5'	Bedrock	-	-	-	-	-	-	100% recovery
2	S1	5'-7'	Dark brown sand with decayed matter	5	-	-	-	-	-	100% Recovery
	S2	10'-12'	Grey coarse sand	2	-	-	-	-	-	
	S3	15'-17'	Grey coarse sand	4	-	-	-	-	-	
	S4	21.5'-22'	Very dense sand with boulders	80-5"	-	-	-	-	-	
	RC5	42'-47'	Bedrock or large boulders.	-	-	-	-	-	-	
3	S1	5'-7'	Dark brown clayey sand with decayed matter.	3	-	-	-	-	-	100% Recovery
	RC2	32'-37'	Bedrock	-	-	-	-	-	-	
	RC3	37'-42'	Bedrock	-	-	-	-	-	-	
4	S1	5'-7'	Dark brown clayey sand decayed matter.	2	-	-	-	-	-	100% Recovery
	S2	10'-12'	Grey medium sand (decayed wood)	3	-	-	-	-	-	
	S3	15'-17'	Grey coarse sand	3	-	-	-	-	-	
	S4	25'-27'	Grey coarse sand	18	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-43

W.P. 72-58

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
4	S5	35'-37'	Grey fine to medium sand	-	-	-	-	-	-	
	S6	40'-42'	Grey fine to medium sand	-	-	-	-	-	-	
	RC7	49'-54'	Bedrock	-	-	-	-	-	-	
			S denotes split spoon samples RC denots rock core sample							

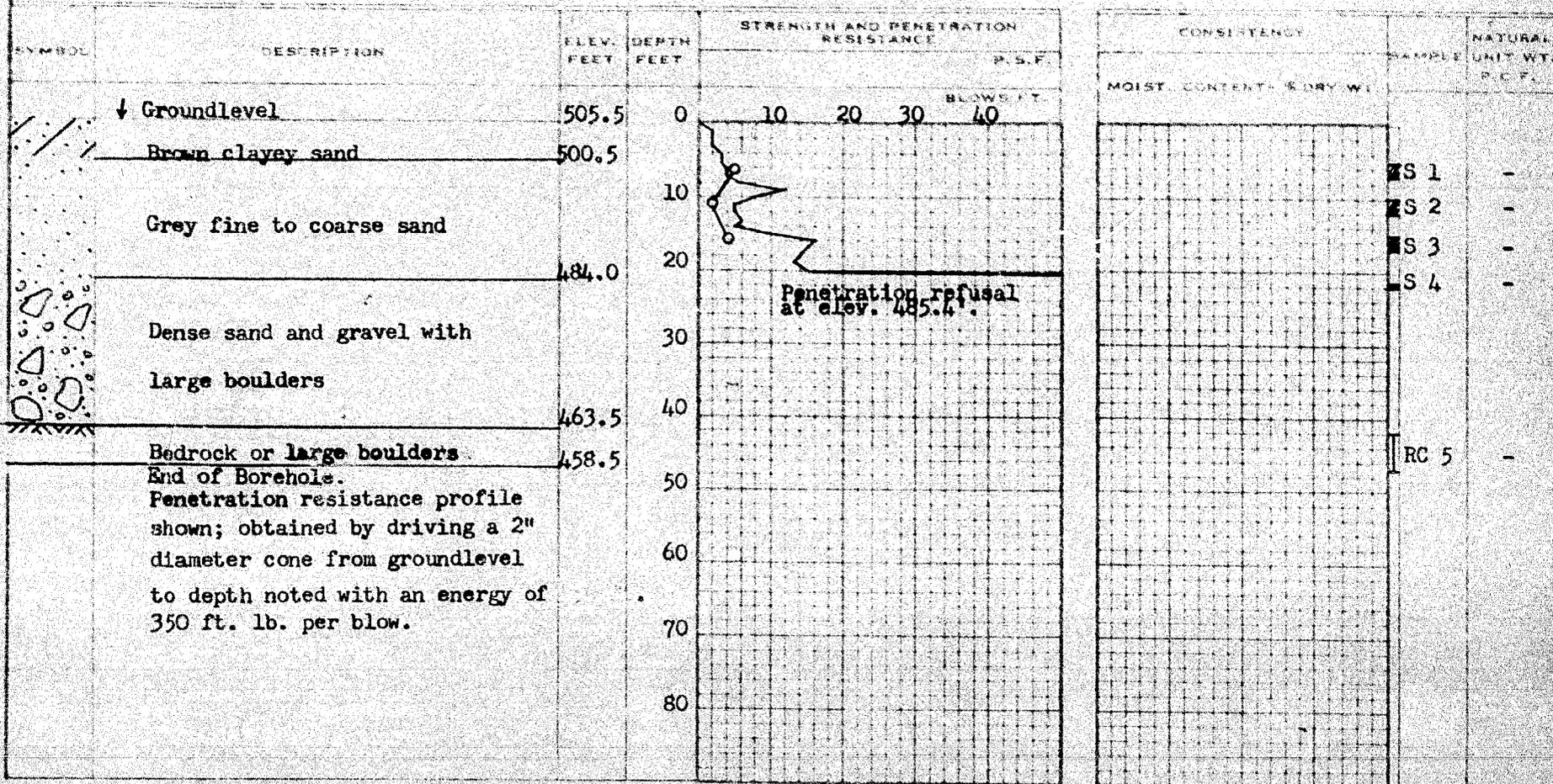
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 72-58 BORE HOLE NO. 2
 JOB 60-F-43 STATION See drawing
 DATUM 505.5' COMPILED BY B.K.
 BORING DATE May 10/60 CHECKED BY V.K.

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

LEGEND

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



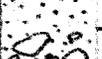
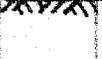
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 72-58 BORE HOLE NO. 3
 JOB 60-P-43 STATION see drawing
 DATUM 503.5' COMPILED BY B.K.
 BORING DATE May 11/60 CHECKED BY V.K.

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

LEGEND

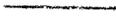
1/2 UNCONFINED COMPRESSION (Qu) 
 VANE TEST (C) AND SENSITIVITY (S) 
 NATURAL MOISTURE AND LIQUIDITY INDEX 
 LIQUID LIMIT 
 PLASTIC LIMIT 

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P. S. F.	
	↓ Groundlevel	503.5	0	10 20 30 40 50 BLOWS/FT	
	(decayed Black brown clayey sand matter)	498.5		Penetration refusal at elev. 493.8'	
	Grey coarse sand	494.5	10		
	Grey sand and gravel with large boulders.		20		
		471.5	30		
	Bedrock	461.5	40		
	End of borehole.		50		
	Penetration resistance profile shown, obtained by driving a 2" diameter cone from ground-level 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.		
	S1	-
	RC2	-
	RC3	-

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

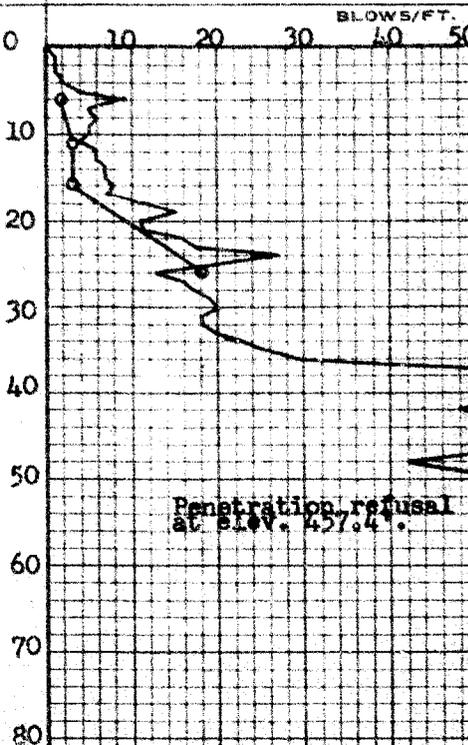
W.P. 72-58 BORE HOLE NO. 4
 JOB 60-F-43 STATION See drawing
 DATUM 506.5' COMPILED BY B.K.
 BORING DATE May 12/60 CHECKED BY V.K.

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

LEGEND

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

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
					P. S. F.
	↓ G.L.	506.5	0		
	Dark brown clayey sand (decayed matter)	501.5	5		
	Grey medium sand (decayed wood)	491.5	10		
	Grey medium to coarse sand	457.5	30		
	Bedrock or large boulders	452.5	50		
	End of borehole.		60		
	Penetration resistance profile shown, obtained by driving a 2" diameter cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow.		80		



SAMPLE	CONSISTENCY		NATURAL UNIT WT. P. C. F.
	MOIST. CONTENT - % DRY WT.		
S1			-
S2			-
S3			-
S4			-
S5			-
S6			-
RC7			-

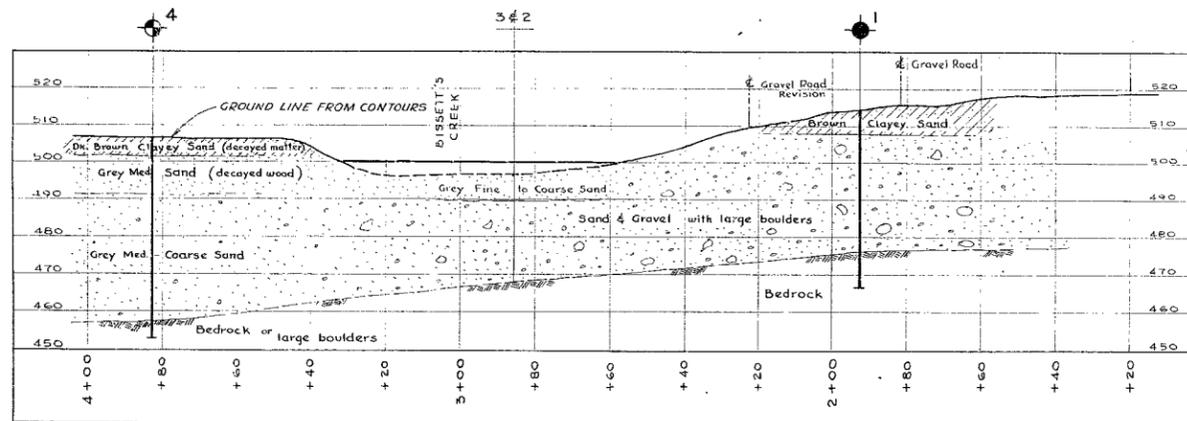
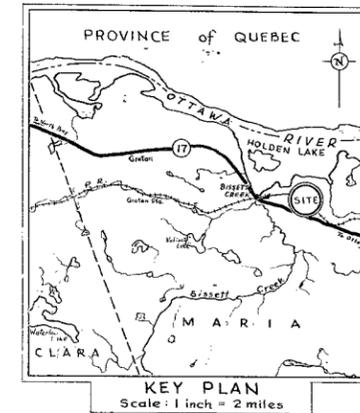
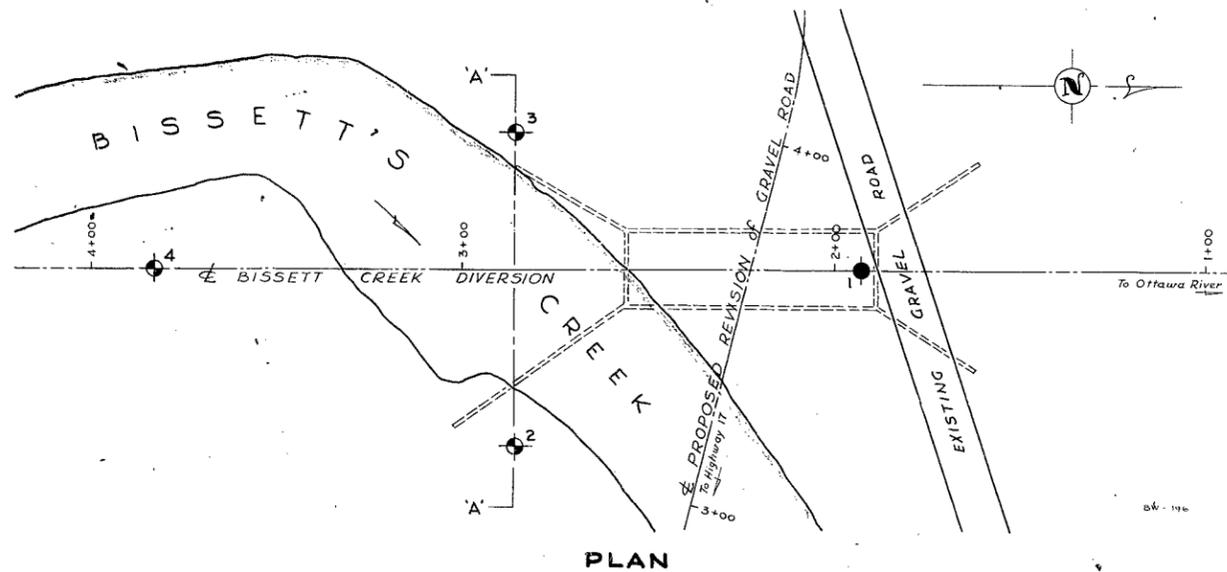
60-F-43

W.P. # 72-58

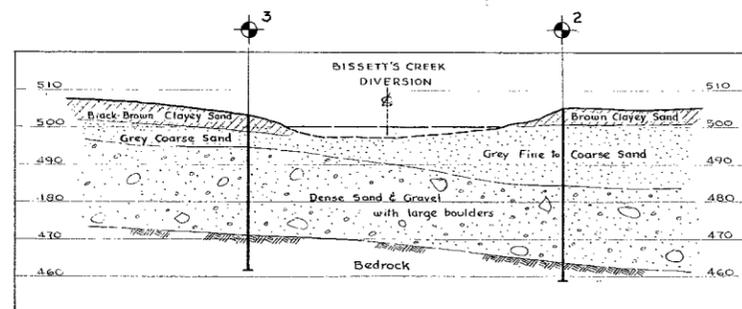
BISSETT CREEK

DIVERSION &

GRAVEL RD. REV.



PROFILE



A - A

LEGEND

BORE HOLE

BORE & PENETRATION HOLE

NO.	ELEVATION	STATION	DISTANCE FROM E
1	514.0	1+93	E
2	505.5	2+86	47' LT
3	503.5	2+86	37' RT
4	506.5	3+83	E

3/11 E
E 726 050
451 22 900
2 17

- 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

BISSETT CREEK DIVERSION

SHOWING POSITIONS & ELEVATIONS OF HOLES

GRAVEL ROAD DISTRICT 15 COUNTY: RENFREW
TOWNSHIP MARIA LOT 56 CON. B5
LOCATION BISSETT CREEK

DRAWN BY: H. D. REED CHECKED BY: W.P. 72-58
DATE 26 MAY 1960 APPROVED BY: DRAWING NO. 60-F-43A
SCALE 1 INCH = 20 FEET