

60-F-33

W.P. # 911-60

Hwy # 17 &

MILE 71 CREEK

CROSSING

Ontario Department of Highways

Letters must not be
removed from file except
by Filing Clerk

Bridge, Culvert and

TO Foundation data

FILE No. 23-60-252-L

Block

Subject

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

June 22, 1960.

U.S.C. FOUNDATION INVESTIGATION
W.P. 911-60 -- 4.J. 60-P-33).

Attention: Mr. S. McCubbin.

Re: Highway 17 & Mile 71 Creek Crossing
Proposed Culvert at approximately
Station 3770+20, approx. 71 Miles
North of Sault Ste. Marie, Dist. 17.

Attached to this memo, we are forwarding to you
the above mentioned foundation report prepared by our
Section.

The conclusions and recommendations that you should
follow in your future design work are summarized in the report
and are self-explanatory.

Should there be any other questions in connection
with the above mentioned location, that you would like to
discuss, please feel free to call on our Office.

cc/ndef
attach.

L. C. Anderson,
PRINCIPAL FOUNDATION ENGINEER.

cc: Messrs. A. M. Teye (2)
D. W. Fregaskes
D. G. Cassey
C. E. Hunter
J. J. Collins
J. J. McInt
J. Watt

cc:

[Handwritten signature]
L. C. Anderson,
PRINCIPAL FOUNDATION ENGINEER.

Foundation Office,
Gen. Office.

**Highway 17 & Mile 71 Creek Crossing
Proposed Culvert at approximately
Station 3770+20, approx. 71 Miles
North of Sault Ste. Marie, Dist. 18.
W.P. 911-60 -- 60-F-33.**

INTRODUCTION:

A subsoil investigation has been carried out at a structure location approximately 71 miles North of Sault Ste. Marie, where existing Hwy. 71 crosses Mile 71 Creek diversion in the County of Algoma. The proposed culvert is located at approximately 40 ft. North of the existing culvert (approx. Station 3770+20, existing Hwy. 17), where a failure has taken place due to undermining of the footings by stream erosion and scour action of the creek. A new culvert structure is necessary to safely carry traffic over the Creek.

This report contains our findings as well as recommendations for the foundations of the structure. The borehole logs, summary of test results and Drawing No. 60-F-33A, showing the locations of the borings and their subsoil profile, are included in this report under Appendix I.

DESCRIPTION OF THE SITE & FIELD WORK:

The site is situated in a valley bounded by steep slopes of bouldery sand & gravel. Mile 71 Creek meanders at the site. It appears that some action should be taken to improve the channelization of the Creek as it is believed that undermining of the footings due to stream erosion and scour was responsible for the failure of the existing culvert.

Field work consisting of 2 sampled boreholes with one accompanying dynamic cone penetration test, was carried out between the period of the 5th and the 8th of April, 1960. Standard diamond drill adapted for soil sampling, was used. Conventional wash boring procedures were followed and samples were recovered at depths of 3' - 5' intervals. Samples were obtained by means of a 2" I.D. split-barrelled spoon sampler. The dimensions of this

DESCRIPTION OF THE SITE & FIELD WORK: (cont'd.) ...

specimen sampler and the energy used in driving it, conform to the requirements of the Standard Penetration Test. Upon recovery, samples were visually examined and identified at the site and placed in containers for transport to our laboratory.

Due to the very dense and granular nature of the material, no laboratory tests have been carried out on the samples.

SUBSOIL CONDITIONS:

Subsoil at the site consists of a thick stratum of dense fine sand with boulders, which, according to available geological information, is underlain by Precambrian bedrock. The fine sand contains numerous boulders and some gravel and exists in a very dense state of packing. 'N' values (Standard Penetration Resistance expressed in no. of blows per foot) in excess of 50, were registered during sampling operations. This stratum of dense fine sand with boulders was explored to a depth of 50 ft. below the existing ground surface (i.e., at Elev. 580) in Boring 1, to confirm its denseness.

Field measurements and operations carried out during the boring programme, indicate that the water level of the Creek was at approximately Elev. 628', which corresponds to 4' - 5' above the existing stream-bed.

FOUNDATION CONSIDERATIONS:

The stratum of dense fine sand with boulders can provide adequate foundation support for the structure. Subsoil conditions are such that spread footing support can be obtained in the dense fine sand with boulders at any elevation below the stream-bed. The elevation of the stream-bed of the proposed Creek diversion channel is believed to be at approximately 624.5'. For footings typically 5' - 7' in width, and founded at an elevation below the stream-bed, an allowable bearing pressure of at least 5 t.s.f. can be used for design. Settlements consequent upon application of this bearing

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

pressure will be of the order of one inch. The footing placement depth will depend on the hydrological conditions. In view of the fact that a failure of the existing culvert has taken place due to undermining of the footings by the scour action of the Creek, consideration should be given to the design of a box culvert rather than other types of structures. In all cases, flare wing walls should be provided at each end of the culvert structure.

Shoring and dewatering operations appear to be necessary during footing excavations.

No approach fill stability problems are anticipated.

CONCLUSIONS & RECOMMENDATIONS:

1. Spread footing support can be obtained in the dense fine sand & boulders at an elevation below the stream-bed (stream-bed elevation of the Creek diversion channel has been assumed to be at approx. 624.5'). For footings typically 5' - 7' in width, an allowable bearing pressure of at least 5 t.s.f. can be used for design. Settlements will be of the order of one inch. The footing placement depths will depend on the hydrological conditions.
2. In view of the fact that a failure of the existing culvert has taken place due to undermining of the footings by the scour action of the Creek, it is our opinion that serious consideration should be given to the design of a box culvert.
3. Flare wing walls should be provided at each end of the culvert.

cont'd. /4 ...

CONCLUSIONS & RECOMMENDATIONS: (cont'd.) ...

4. No approach fill stability problems are anticipated.
5. Shoring and dewatering operations appear to be necessary during footing excavations.

June 1960.

AKGL

REPORT PREPARED BY: A. E. Loh,
PROJECT FOUNDATIONS ENGR.

W. Starnac

REPORT APPROVED BY: W. Starnac,
FOUNDATIONS OFFICE ENGR.

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-33

W.P. 911-60

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST. BLOWS FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH PST	UNIT WEIGHT PCF	REMARKS
1	S1	6'-8'	Dense fine sand & boulders	171						
	S2	10'-12'	" " " "	76						
	S3	13'-15'	" " " "	42						
	S4	16'-17'	" " " "	60						
	S5	23'-25'	" " " "	68						
	S6	30'-32'	" " " "	51						
	S7	35'-36.5'	" " " "	102						

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-P-33

W.P. 911-60

HOLE NO	SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT	MOIST CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH PSI	UNIT WEIGHT PCF	REMARKS
2	S1	10'-12'	Large fine sand & boulders	92						
	S2	12'-14'	" " " "	75						
	S3	14'-16'	" " " "	47						
	S4	20'-22'	" " " "	127						
			S denotes split spoon sample							

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W P 911-60

JOB 60-P-33

DATUM Elev. 628'

BORING DATE Apr. 5/60

BORE HOLE NO. 1

STATION 3770+40 (60' Bt.)

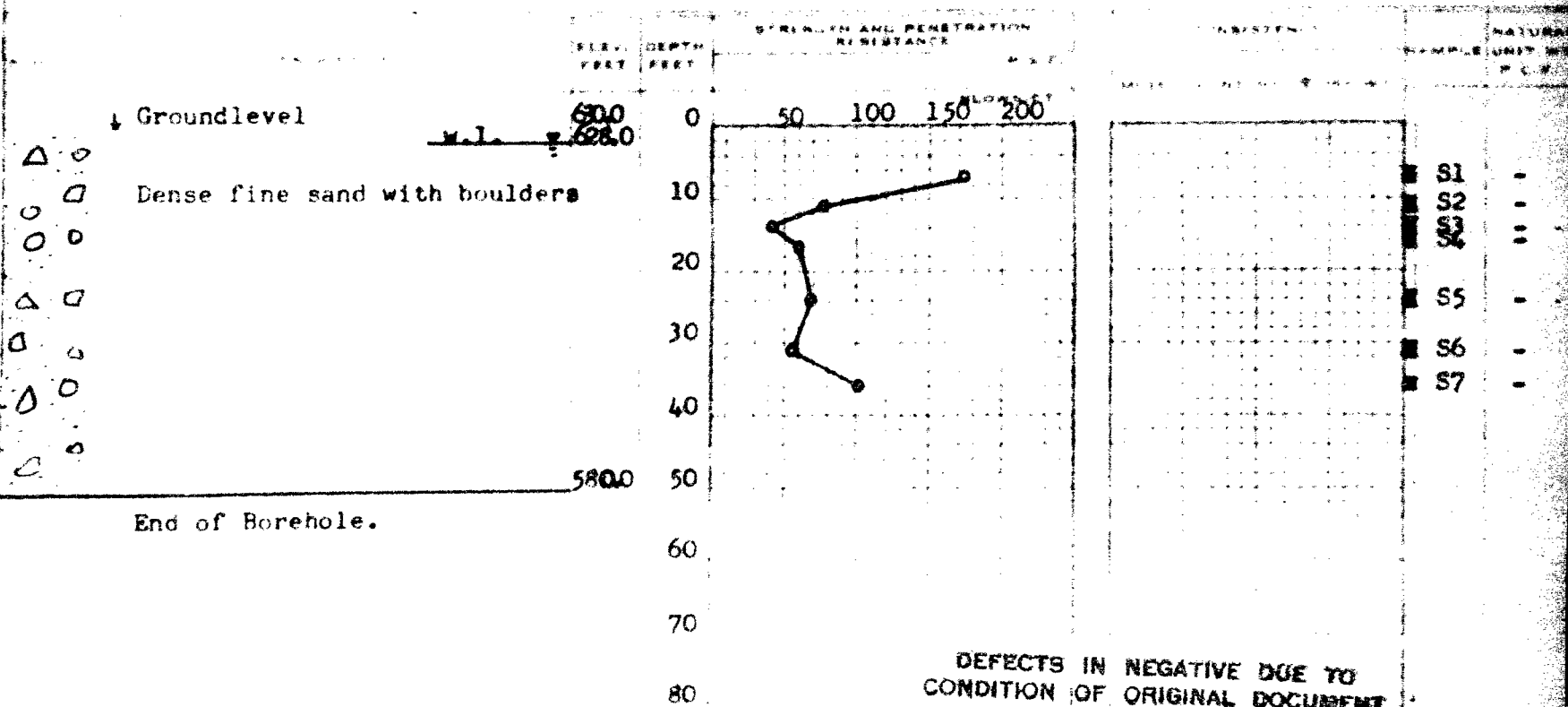
COMPILED BY B. K.

CHECKED BY A. L.

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

LEGEND

1/2 UNCONFINED COMPRESSION (QU) \bigcirc
 VANE TEST (C) AND SENSITIVITY (S) \times
 NATURAL MOISTURE AND LIQUIDITY INDEX Δ
 LIQUID LIMIT \sim
 PLASTIC LIMIT \sim



DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

WP 911-60

BORE HOLE NO. 2

JOB 60-P-33

STATION Sta. 3770+10 (50' Lt.)

DATUM Elev. 628.0'

COMPILED BY B. K.

BORING DATE Apr. 8/60

CHECKED BY A. L.

2" DIA. SPLIT TUBE

2" SHELBY TUBE

2" SPLIT TUBE

2" DIA. CONE

2" SHELBY

CASING

LEGEND

1/2 UNCONFINED COMPRESSION (QU) — O

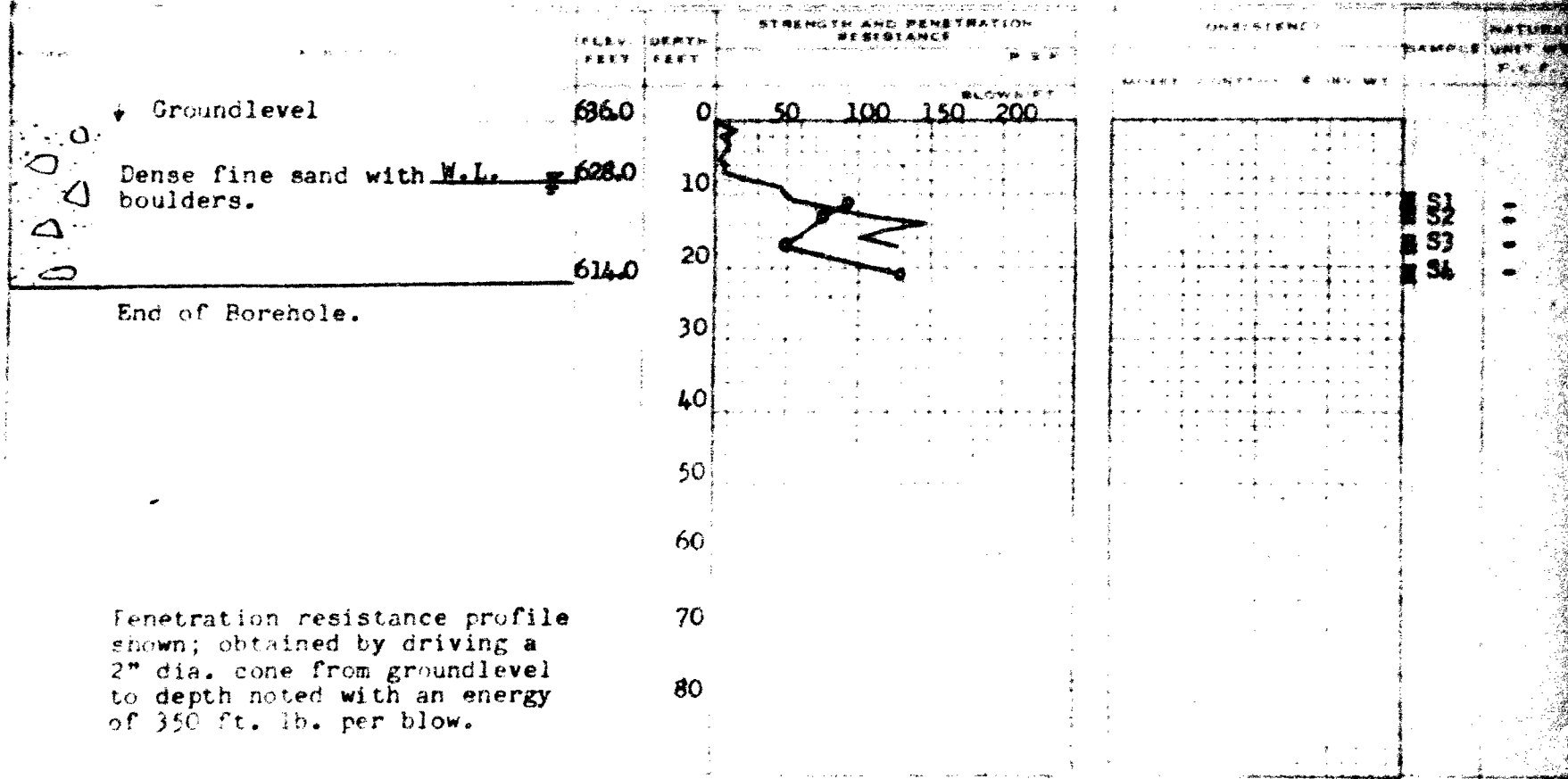
VANE TEST (C) AND SENSITIVITY (S) — AS

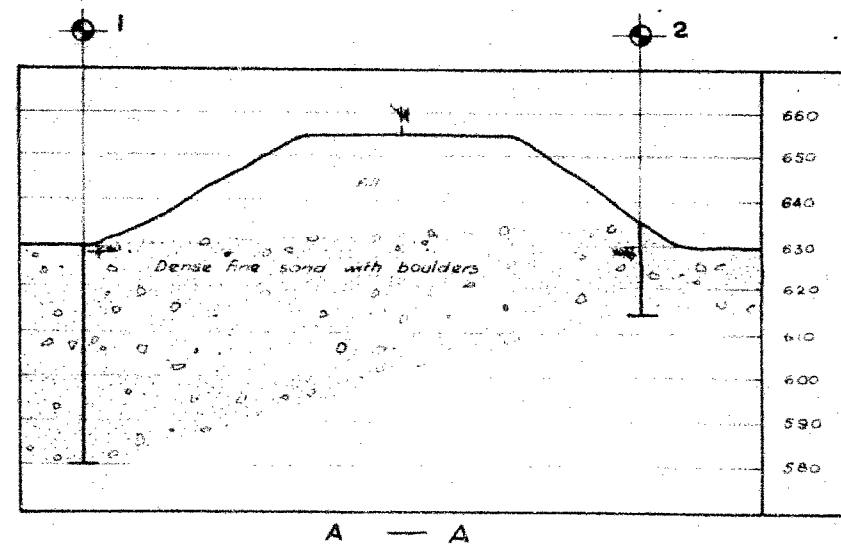
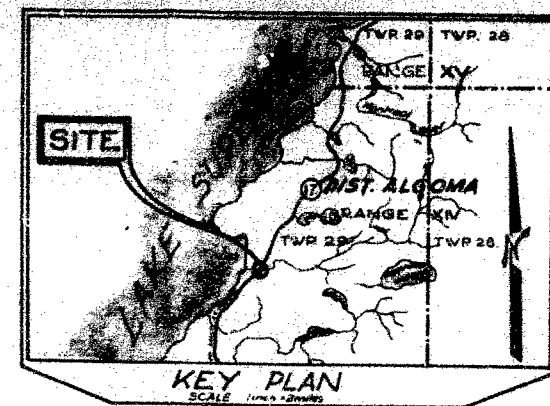
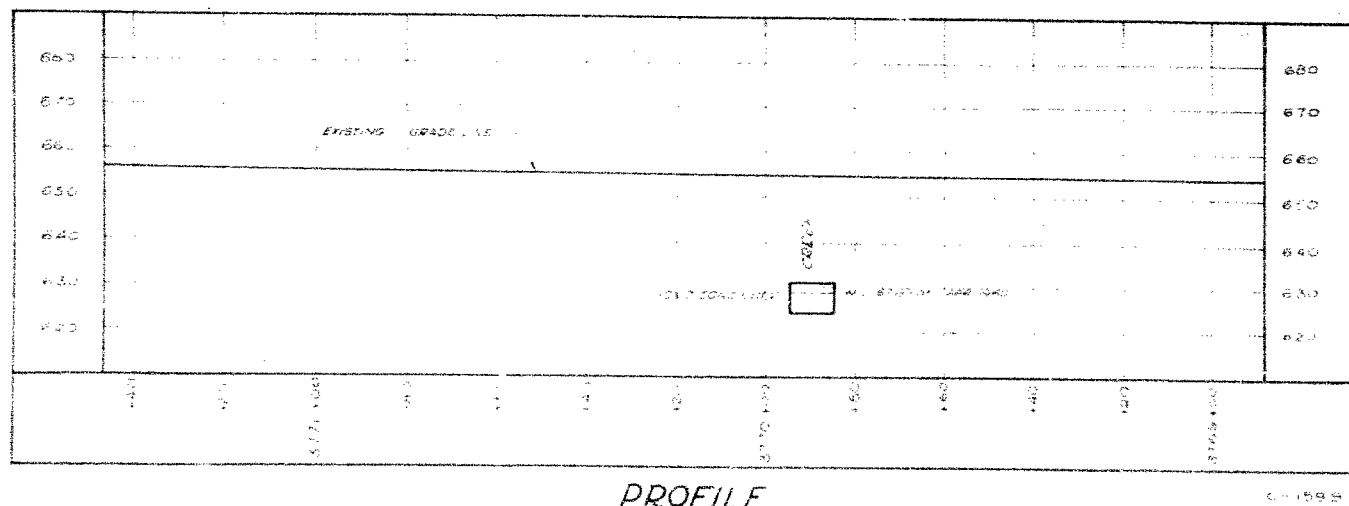
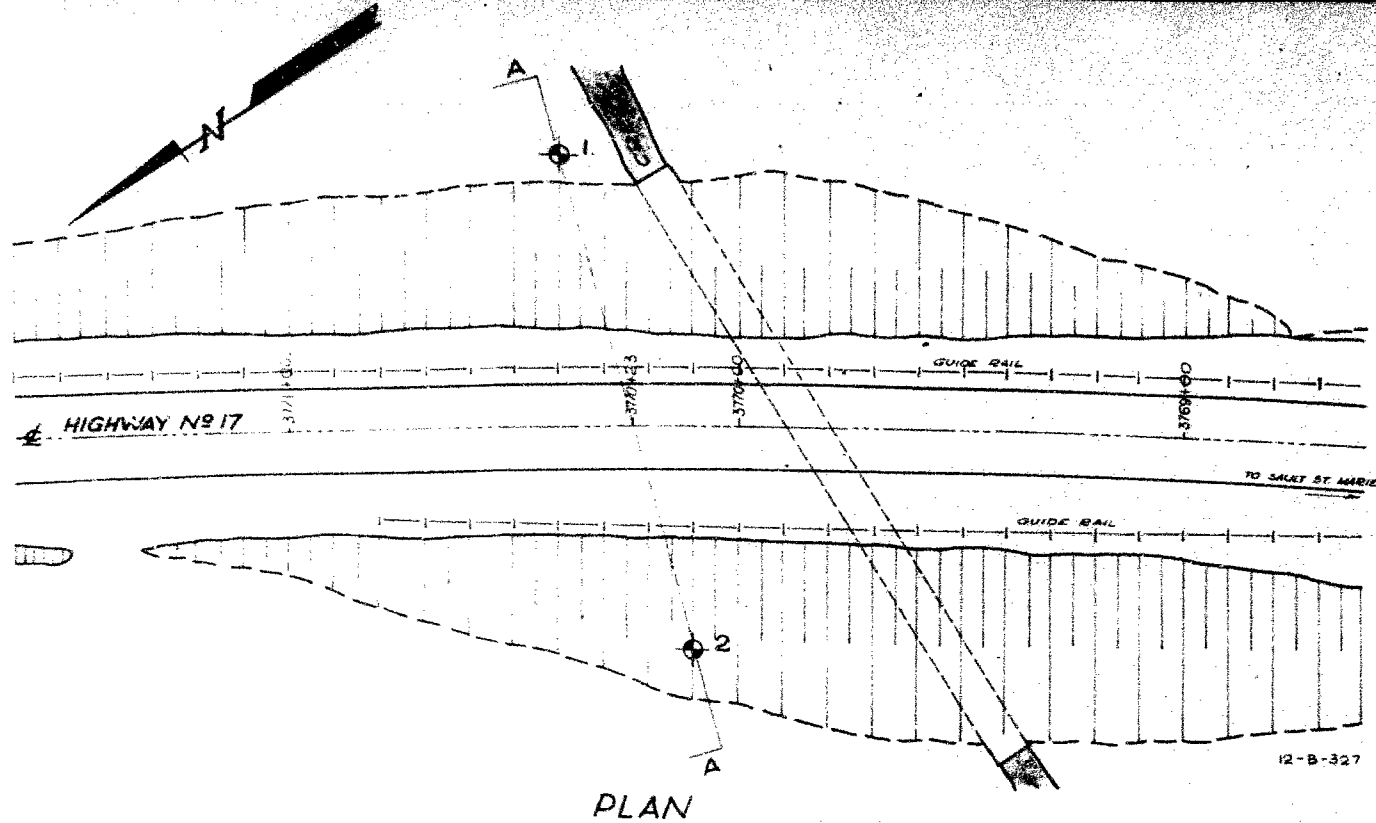
NATURAL MOISTURE AND

LIQUIDITY INDEX — X

LIQUID LIMIT —

PLASTIC LIMIT —





LEGEND			
BORE & PENETRATION HOLE			
HOLE NO.	ELEVATION	STATION	DISTANCE FROM E.
1	630.0	3769+00	60 FT.
2	636.0	3770+40	80 FT.

NOTE

THE BOUNDARIES BETWEEN TOWNSHIP 20, RANGE XV, AND TOWNSHIP 21, RANGE XV, ARE SHOWN FOR INFORMATION ONLY. THE BOUNDARIES ARE NOT TO BE USED FOR ANY PURPOSE OTHER THAN FOR INFORMATION.

DEPARTMENT OF HIGHWAYS - ONTARIO

MILE 71 CREEK

DATE: 10/1/60

BY: J. H. H. H.

60-F-33A