

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 40 P 9 - 22

W.P. No. _____

CONT. No. _____

W. O. No. _____

STR. SITE No. 35-315

HWY. No. _____

LOCATION BR. & APPROACH Roads
ALLANS DAM - SPEED Riv.
GUELPH

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. NONE

REMARKS: _____

COPY

2

BA 1626

4099-22

GEOCRE No.

CITY OF BURLIN
BRIDGE & APPROACH ROAD
ALLIANCE DAM-SPED RIVER
FOUNDATION INVESTIGATION
BY

RACEY, MACCALLUM AND ASSOCIATES LTD.

Feb. 12, 1963



R. K. KILBORN & ASSOCIATES

DIVISION OF KILBORN ENGINEERING LTD.

PROFESSIONAL ENGINEERS

TORONTO

4079-22
GEOCREs No.

RACEY, MacCALLUM AND ASSOCIATES LIMITED

Consulting Engineers

TORONTO

Our Reference: S-536/T-4111

February 12, 1963.

R. K. Kilborn & Associates,
36 Park Lawn Road,
TORONTO 18, Ontario.

4079-22
GEOCREs No.

Attention: Mr. W. A. Scott, P. Eng.

RE: SITE INVESTIGATION,
ALLAN'S DAM BRIDGE,
GUELPH, ONTARIO

Dear Sirs:

We have completed the investigation at the above site in accordance with your letter of authorization dated January 10th, 1963. The purpose of the investigation was to determine the soil and bedrock conditions at the site and to make recommendations regarding the foundation design of the proposed structure.

FIELD WORK

The field work was commenced on January 21st, 1963, and completed on January 30th, 1963. A total of 3 boreholes, each with an adjacent cone penetration test, was put down, through about 2 feet of ice in the Speed River, to depths of up to 30 feet below the river bed, using a standard machine drill rig equipped for soil sampling and bedrock coring. Due to the sub-zero weather conditions, the progress of the field work was considerably slower than expected. Each borehole was put down in BX and AX sizes. Soil samples were recovered by driving a standard split-spoon sampler. The number of blows of a 140-lb. hammer falling 30 inches, required to drive the sampler for a distance of 12 inches into the undisturbed soil, was recorded as the standard penetration resistance. This resistance bears an empirical relationship to the relative density of the subsoil encountered. The cone penetration test was carried out by driving a 60-degree cone into the soil, using the same driving energy as for the split spoon. This procedure provides a continuous picture of density changes of the subsoil with depth. The bedrock was cored in AXT size to depths of up to 11 feet.

Our Reference: S-536/T-4111

February 12, 1963.

FIELD WORK - Continued

The locations of the boreholes and the inferred stratigraphy are shown on Drawing T-4111-1 attached to this report.

The elevations given in the report are referred to the local datum. The bench mark No. 86 at the location shown on your site plan drawing No. 714-PR-1 has a given elevation of 1045.535 feet.

SOIL AND BEDROCK CONDITIONS

The results of the borings are given in detail on the borehole logs and are described below.

1. At the bottom of the Speed River, as encountered in the boreholes, there is a stratum of sand with some gravel. From visual inspection, this stratum is predominantly composed of sand of sizes fine to medium. Gravels, mostly of limestone fragments with sizes of up to 1", were encountered at the lower portion of the stratum. Layers of black organic silt were encountered in borehole 2 between depths of 7 to 12 feet. The thickness of the stratum was found to range from about 4 feet in borehole 1 to about 23 feet in borehole 2.

Standard penetration tests carried out in this stratum gave standard penetration resistances or "N" values ranging from 4 to 31 blows per foot with an average value of 12 blows per foot. However, due to the presence of stone fragments, the "N" values that were obtained in the lower portion of the stratum are considered as erroneously high and not representative. Based on the results of cone penetration tests together with the representative "N" values, the relative density of the stratum is estimated to be generally loose. For design purposes the sand can be taken to have an angle of internal friction of 28° and a submerged unit weight of 50 pounds per cubic foot.

2. Underlying the sand stratum, dolomitic limestone bedrock was encountered in the boreholes. The bedrock was cored in AXT size to a maximum depth of about 11 feet. During bedrock coring in the boreholes it was noted that the upper 2 to 4 feet of the bedrock contained numerous seams of clay. This was confirmed by the low percentage recovery and the badly fissured cores. Good recovery of coring was obtained below the 4-foot depth, however fissures still exist in the bedrock to the depth encountered in the investigation. The colour of the dolomitic limestone was light brown for the upper portion and changes gradually to grey with depth.

Our Reference: S-536/T-4111

February 12, 1963.

WATER CONDITIONS

At the time of the investigation the ice level at the borehole locations in the river was at about elevation 1035 feet and was about 4 feet above the river bed. The highest water level in the river is expected to be at about elevation 1040.0 feet.

DISCUSSION

It is understood that a bridge will be constructed at the site. The bridge will consist of 2 concrete spans of lengths of 55 and 82 feet. The width of the bridge is to be about 60 feet. It is further understood that the present proposal is to place the spans on piers with loadings of up to 16 kips per linear foot.

The investigation has shown that the river bed at the site is underlain by a stratum of loose sand which overlies the dolomite bedrock. The ice level in the river at the time of the investigation was at about elevation 1035 and was about 4 feet above the river bottom.

Because of the loose relative density of the sand stratum together with its susceptibility to scouring, it is considered that the sand is not suitable for foundations. It will therefore be necessary to carry the foundations down to the underlying bedrock. The upper portion of the bedrock at the site was found to be badly fissured with numerous seams of clay. It is therefore recommended that all foundation structures be carried down to below the weathered zone.

The bedrock coring that was carried out in the sound portion gave a high percentage of recovery. However, numerous fissures, mostly in the horizontal direction, were found in the rock cores to the depth encountered. It is therefore recommended that the sound portion of bedrock be considered as "sedimentary rock" and we recommend an allowable bearing value of 15 tons per square foot for design purposes.

The present foundation proposal is to carry the bridge piers to bedrock. Such a scheme would involve an excavation carried out under water to a considerable depth, especially at the centre pier which may be located near borehole No. 2. However, this can be achieved by providing a cofferdam around the construction area to bedrock. The sand and the weathered portion of the bedrock can be excavated before dewatering. It is possible that seepage through the fissures in the bedrock may not present a serious problem. However, should the inflow be such that it cannot be handled by pumping, grouting the bedrock should be considered. Because of the high differential hydrostatic head that will be developed during dewatering and construction, the sheeting should be adequately braced to prevent it from collapsing.

Our Reference: S-536/T-4111

February 12, 1963

DISCUSSION - Continued

The pier structures that are carried down to bedrock should be designed to resist the external forces, such as the wind loads, the water current, the wave action and the ice pressures. For the worst conditions that could be expected, the stability of the foundation structure should be so designed as to have a factor of safety of not less than 1.5 against horizontal slide and against overturning.

It must be noted here that in loose granular deposits, as in the present case, a considerable amount of horizontal deformation will take place before any significant passive resistance can be developed. Such deformation in the horizontal direction would likely be detrimental to the superstructure. It is therefore recommended that in the stability computations any lateral support from the sand should be disregarded.

The possibility of founding the piers on end-bearing piles driven to practical refusal, or on caissons carried down to bedrock, has been considered. However, we would not recommend this method due to the lack of sufficient resistance to horizontal movement provided by the loose granular deposits.

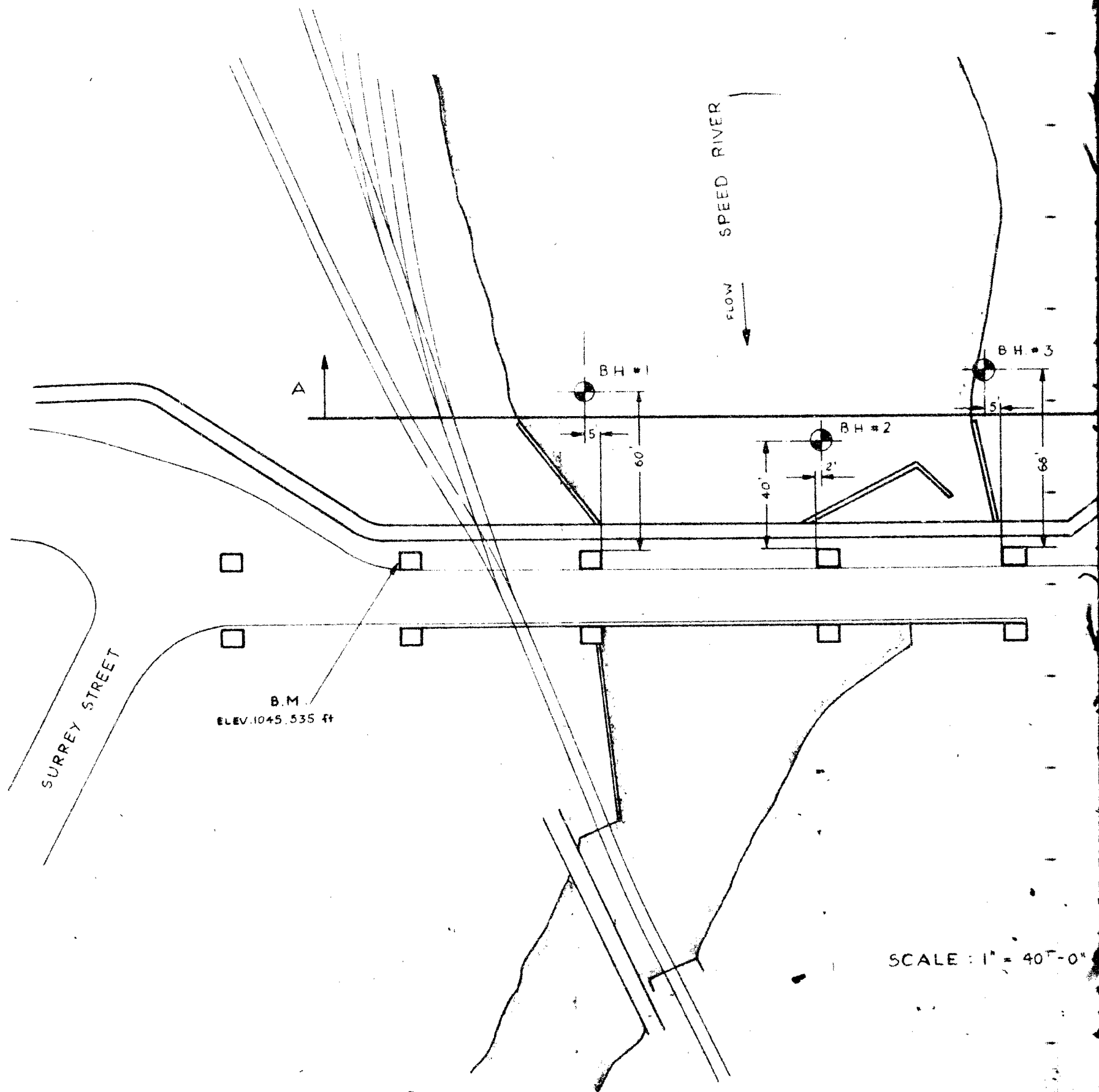
We trust that this report contains all of the information required for the foundation design of the proposed structure. If, however, we can be of any further assistance, please do not hesitate to call on us.

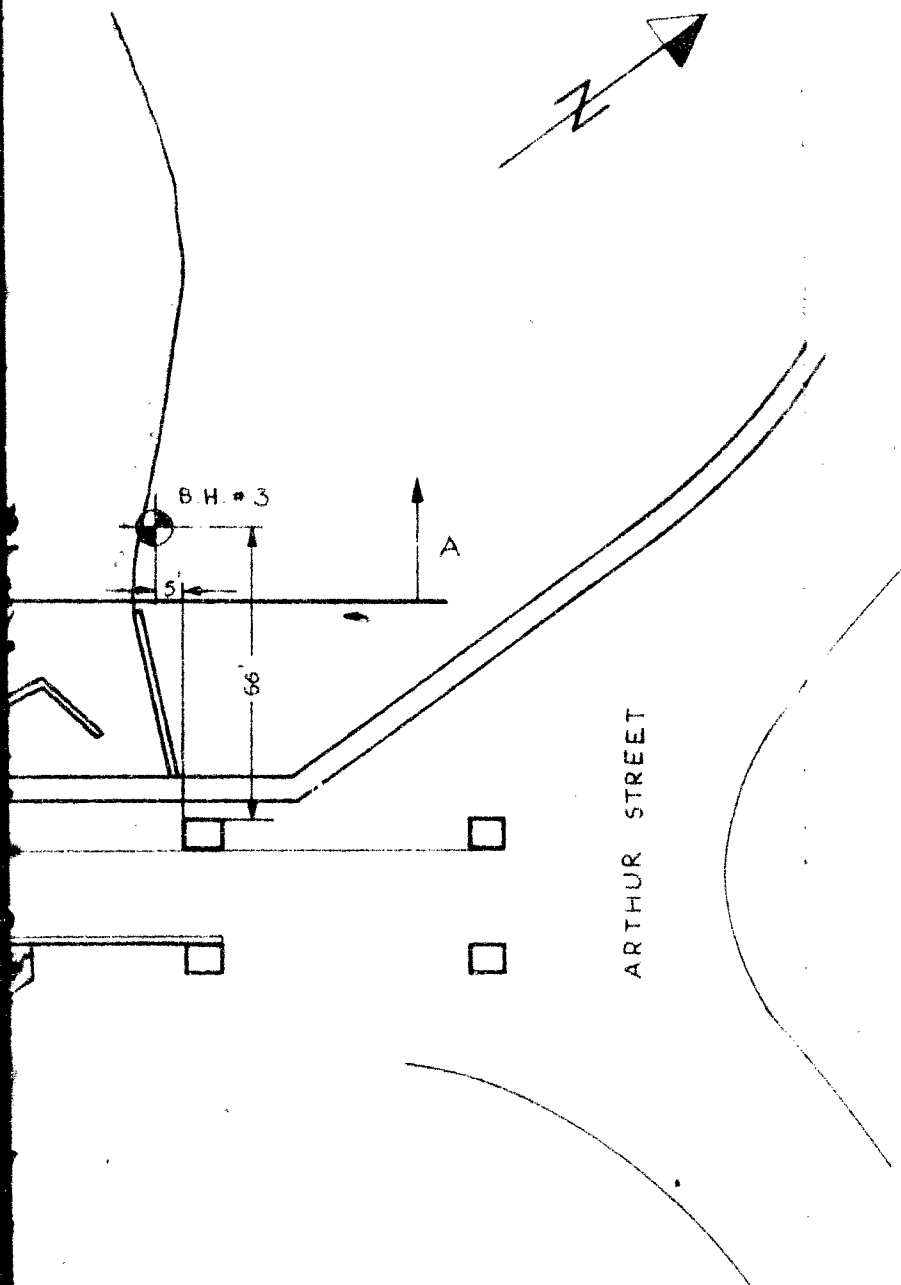
Yours very truly,

RACEY, MacCALLUM, HOUGHTON & ALLEN LTD.

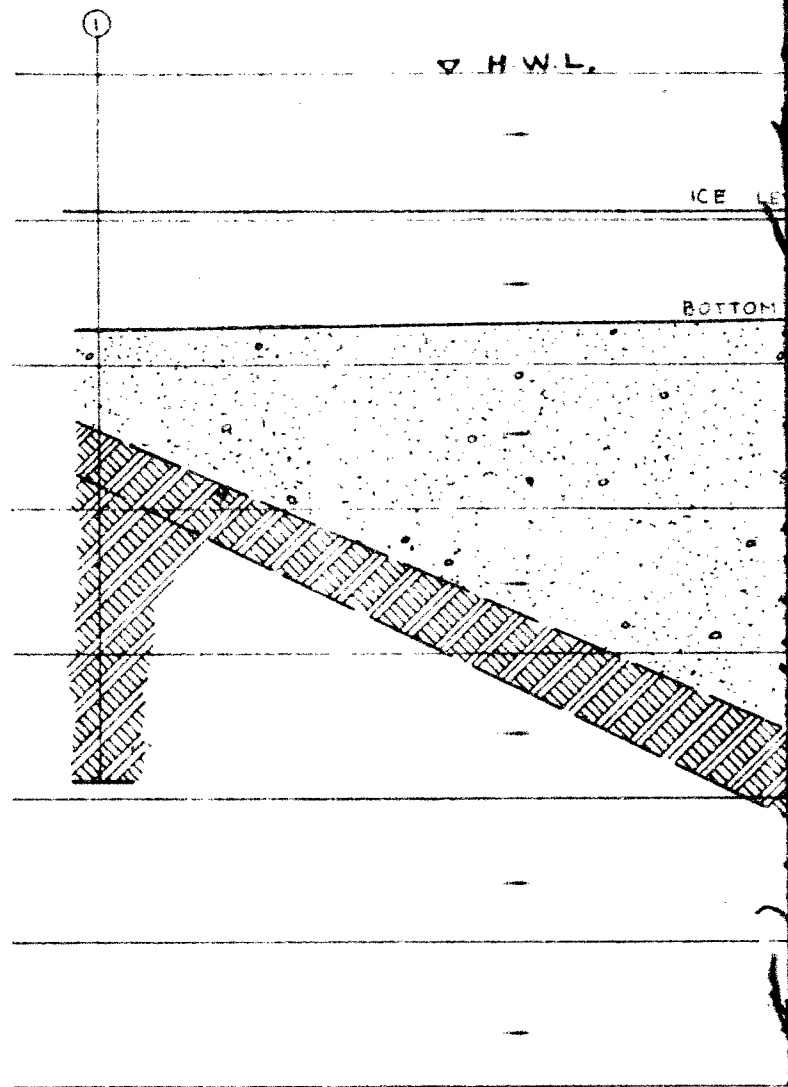
JW/KA

J. Wong, P. Eng.,
Project Engineer.





SCALE: 1" = 40'-0"



LEGEND

STRATIGRAPHY



BOREHOLE IN
LOCATION PLAN



LOOSE TO COMPACT,
BLACK SAND & GRAVEL



NO. OF BOREHOLE

BOREHOLE IN
ELEVATION



BADLY FISSURED DOLOMITE
SOUND, LIGHT BROWN TO
GREY DOLOMITE BEDROCK

END OF
BOREHOLE

HWL

ICE LEVEL

BOTTOM OF RIVER

1040.0

1035.0

1030.0

1025.0

1020.0

1015.0

1010.0

1005.0

BANDS OF BLACK ORGANIC SILT

CROSS-SECTION A-A

SCALE HORIZONTAL 1"=15'-0"
VERTICAL 1"=6'-0"

40P9-22

GEOCRES No.

STRATIGRAPHY

LOOSE TO COMPACT,
BLACK SAND & GRAVEL

BADLY FISSURED DOLOMITE

SOUND, LIGHT BROWN TO
GREY DOLOMITE BEDROCK

ENCLOSURE - No. 1

REVISIONS			BOREHOLE LOCATION PLAN & STRATIGRAPHY			
No.	DATE	BY	ALLAN'S DAM BRIDGE, GUELPH, ONTARIO		DATE OF ISSUE	
			RACEY, MacCALLUM AND ASSOCIATES LIMITED		ORDER NO.	
			CONSULTING ENGINEERS		536/T-4111	
			TORONTO	MONTREAL	OTTAWA	
			DRAWN BY	CHECKED BY	DATE	
			EF	J.W.	5 JAN 65	
			SCALE	DRAWING No.		
			AS SHOWN	1		

RACEY, MacCALLUM AND ASSOCIATES LIMITED
LOG OF BOREHOLE NO. 1

04019 100 6-636 / 7-444

PROJECT PROPOSED: ALLAN'S DAM BRIDGE, GUELPH, ONTARIO

LOCATION SEE BOREHOLE LOCATION PLAN

██████████ 100-441105-3

55 1994

BORING METHOD WASH - BORING BY STANDARD MACHINE DRILLING.
 BOREHOLE WAS IN SIX 1/2 IN. SIZES; SOIL SAMPLES WERE
 RECOVERED BY DRIVING A STANDARD SPLIT-SPoon (S.S.);
 ROCK WAS CORED IN 1 1/2 IN. SIZE (S.S.).

FIELD SUPERVISOR	Mr. G.	1974 JAN. 20, 65
1005 COMPLETED	Mr. J. M.	1974 JAN. 21, 65
1009 COMPLETED	BY	1974

SUBSURFACE PROFILE						SAMPLE NO.	ELEVATION SCALE	PENETRATION RESISTANCE BLOWS/FOOT DONE STANDARD SHEAR STRENGTH L.P.S.F. COMPRESSION TEST VANE TEST	WATER CONTENT % NATURAL LIQUID LIMIT PLASTIC LIMIT	UNIT WEIGHT (P.C.H.)	REMARKS — OTHER TESTS
ELEV. DEPTH	STRATUM	DRAWING SCALE	CORRELATIONS	NORTH ARROW							
035.3 8'-0"	KCE LEVEL										
029.3 4'-0"	BOTTOM OF RIVER LOOSE, BLACK SAND & GRAVEL				1	L.S. 4					
027.9 7'-0"	SADLY FISSURED DOLOMITE				2	R.C. - S.W.					
025.9 9'-5"	SOUND LIGHT BROWN DOLOMITE BEDROCK				5	R.C. - P.B.					
015.5 R'-0"	END OF BOREHOLE				+ 4 C.	- W.D.					

BORING METHOD WASH - BORING BY STANDARD MACHINE DRILLING
 BOREHOLE WAS 4 IN. DIA. AT SIZES; SOIL SAMPLES WERE
 RECOVERED BY DRIVING A STANDARD SPLIT-SPOON (S.S.);
 BEDROCK WAS LOGGED IN ART. SIZE (R.C.)

LOG COMPILED BY J.W. LATE JAN. 21, 1948
 LOG CHECKED BY DATE

SUBSURFACE PROFILE		SAMPLING		PENETRATION RESISTANCE BLOWS/FOOT		WATER CONTENT %		REMARKS
ELEV. DEPTH	STRAT. M.	NO.	DEPTH	STANDARD P.S.	VEE TEST	NATURAL WATER CONTENT X	PLASTIC LIMIT —	
1035.3 0'-0"	ICE LEVEL	1	0'-0"					
1031.3 4'-0"	BOTTOM OF RIVER LOOSE, BLACK SAND & GRAVEL	2	4'-0"					
1027.8 7'-6"	BADLY FISSURED DOLOMITE	3	7'-6"					
1025.9 9'-5"	SOUND LIGHT BROWN DOLOMITE BEDROCK	4	9'-5"					
1015.6 19'-8"	END OF BOREHOLE	5	19'-8"					

ENCLOSURE No. 2

40P9-22
 GEORES No.

RACEY, MacCALLUM AND ASSOCIATES LIMITED

LOG OF BOREHOLE NO. 2

OFFER NO. S-536/T-4111

PROJECT PROPOSED ALLAN'S DAM BRIDGE, GUELPH, ONTARIO

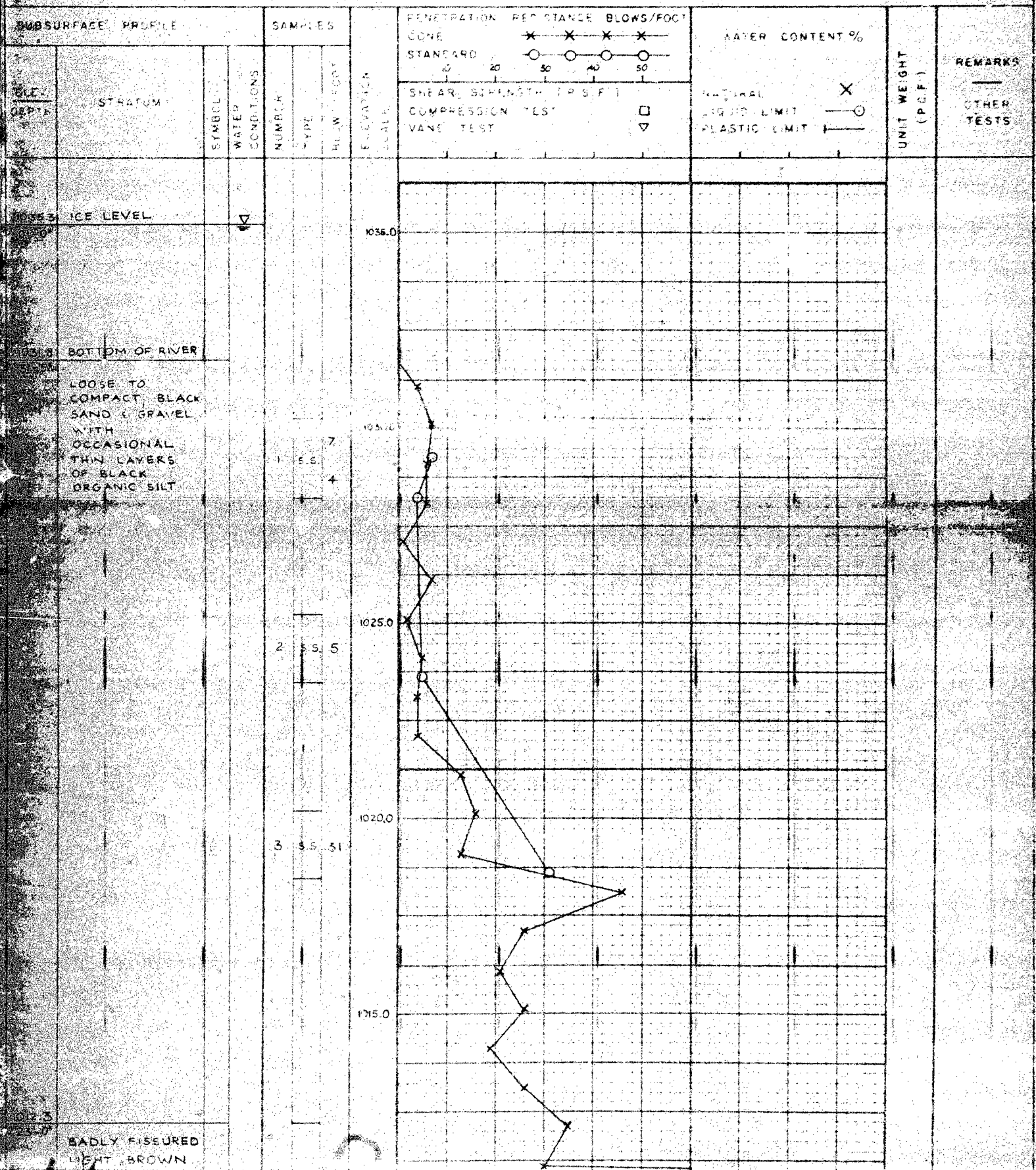
LOCATION SEE BOREHOLE LOCATION PLAN

~~PROPOSED~~ ELEVATION 1035.3

DATE JAN. 23, 65

BORING METHOD WASH-BORING BY STANDARD MACHINE DRILLRIG.
BOREHOLE WAS IN 6X6 AX SIZES. SOIL SAMPLES WERE
RECOVERED BY DRIVING A STANDARD SPLIT-SPOON (S.S.);
BEDROCK WAS CORED IN AX SIZE (R.C.).

FIELD SUPERVISION BY H.G. DATE JAN, 23, 65
LOG COMPILED BY J.W. DATE JAN, 31, 65
LOG CHECKED BY DATE



LOOSE TO
COMPACT, BLACK
SAND & GRAVEL
WITH
OCCASIONAL
THIN LAYERS
OF BLACK
ORGANIC SILT

1 S.S. 4

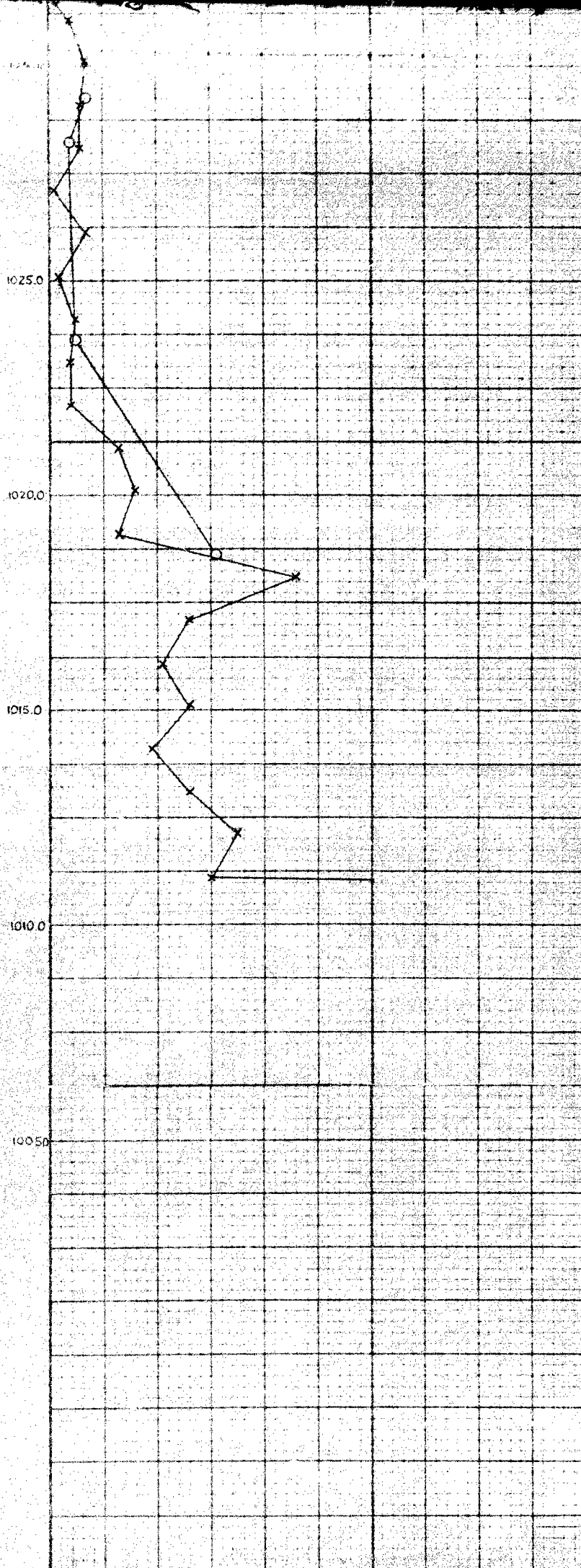
2 S.S. 5

3 S.S. 51

4 R.C. -
R=70%

5 R.C. -
R=80%

6 R.C. -
R=100%



BADLY FISSURED
LIGHT BROWN
DOLOMITE

SOUND GREY
DOLOMITE
BEDROCK

END OF SOREHOLE

40P9-22
GEOCRIS No.

RACEY, MacCALLUM AND ASSOCIATES LIMITED

LOG OF BOREHOLE NO. 3

ORDER NO. S-536/T-4111

PROJECT PROPOSED ALLAN'S DAM BRIDGE, GUELPH, ONTARIO

LOCATION SEE BOREHOLE LOCATION PLAN

GROUND ELEVATION 1035.6

DATUM LOCAL

BORING METHOD WASH-BORING BY STANDARD MACHINE DRILLRIG.
BOREHOLE WAS IN 8" & 4" SIZES. SOIL-SAMPLES WERE
RECOVERED BY DRIVING A STANDARD SPLIT-SPOON (S.S.);
BEDROCK WAS CORED IN 4" SIZE (R.C.).

FIELD SUPERVISION BY H.G. DATE JAN, 22, 65
LOG COMPILED BY J.W. DATE JAN, 31, 65
LOG CHECKED BY DATE

SUBSURFACE PROFILE				SAMPLES		ELEVATION SCALE	PENETRATION RESISTANCE BLOWS/FOOT		WATER CONTENT %		UNIT WEIGHT (P.C.F.)	REMARKS — OTHER TESTS
ELEV. DEPTH	STRATUM	SYMBOL	WATER CONDITIONS	NUMBER	TYPE		CONE STANDARD	10 20 30 40 50	NATURAL	LIQUID LIMIT		
1035.6 0'-0"	ICE LEVEL											
1035.6 2'-0"	BOTTOM OF RIVER											
	LOOSE, BLACK SAND & GRAVEL			1	S.S.	15						
				2	S.S.	22						
1021.4 14'-2"	BADLY FISSURED, LIGHT BROWN DOLOMITE			3	R.C.	—						
1017.9 17'-7"	SOUND, GREY DOLOMITE BEDROCK			4	R.C.	—						
1012.9 22'-7"	END OF BOREHOLE											

ENC

ORDER NO. 5-8587	LOCATION SEE BOREHOLE LOCATION PLAN	GROUND ELEVATION 1035.6	DATUM LOCAL
BORING METHOD WASH-BORING BY STANDARD MACHINE DRILLING. BOREHOLE WAS IN 8" x 8" AX SIZES. SOIL-SAMPLES WERE RECOVERED BY DRIVING A STANDARD SPLIT-SPOON (S.S.); BEDROCK WAS CORED IN AX SIZE (R.C.).		FIELD SUPERVISION BY H.G. DATE JAN, 22, 65 LOG COMPILED BY J.W. DATE JAN, 31, 65 LOG CHECKED BY DATE	

SUBSURFACE PROFILE				SAMPLES		PENETRATION RESISTANCE BLOWS/FOOT		WATER CONTENT %		UNIT WEIGHT (P.C.F.)	REMARKS — OTHER TESTS
ELEV. DEPTH	STRATUM	SYMBOL	WATER CONDITIONS	NUMBER	TYPE	BLOWS/FOOT	ELEVATION SCALE	STANDARD CONE SHEAR STRENGTH (P.S.F.) COMPRESSION TEST VANE TEST	NATURAL LIQUID LIMIT PLASTIC LIMIT		
1035.6 0'-0"	ICE LEVEL										
1035.6 2'-0"	BOTTOM OF RIVER										
	LOOSE, BLACK SAND & GRAVEL			1	S.S.	15					
				2	S.S.	22					
1021.4 14'-2"	BADLY FISSURED, LIGHT BROWN DOLOMITE			3	R.C.	1					
1017.9 17'-7"	SOUND, GREY DOLOMITE BEDROCK			4	R.C.	1					
1012.9 22'-7"	END OF BOREHOLE										

ENCLOSURE No. 4

40P9-22
CIRCLES NO.