

56-F 212C

HWY. #17

WHITE RIVER

BA 574

56-F-212C

RACEY, MacCALLUM AND ASSOCIATES
LIMITED

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Consulting Engineers
AND ASSOCIATED STAFF

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TORONTO DIVISION
20 CARLTON STREET

Reference: S-500-504/T-443

1 November 1956.

Department of Highways of Ontario,
c/o Sir Alexander Gibb and Partners,
4 Wellington Street East,
TORONTO, Ontario.

Attention: Mr. C.C. Marshall

RE: FOUNDATION INVESTIGATION FOR THE
PROPOSED HIGHWAY NO.17 BRIDGE OVER
THE WHITE RIVER, NEAR BRENNER, ONTARIO.

Dear Sirs:

We have completed our investigation of the proposed Highway No.17 bridge site at the White River, near Brenner, Ontario, and our report on the subject is attached hereto. In general, the foundation conditions are excellent, and no serious engineering problems appear to exist.

We shall be pleased to discuss any matter regarding site conditions, not specifically covered in the report.

Yours very truly,
RACEY, MacCALLUM AND ASSOCIATES LIMITED

97T200

W.A.Trow, P.Eng.,
Divisional Soils Engineer

WAT/MD

In quadruplicate

FOUNDATION INVESTIGATION FOR THE
PROPOSED HIGHWAY NO.17 BRIDGE OVER
THE WHITE RIVER, NEAR BRENNER, ONTARIO.

Reference: S-500-504/T-443

Racey, MacCallum and Associates Limited

1 November 1956.

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1 November 1956.

FOUNDATION INVESTIGATION FOR THE
PROPOSED HIGHWAY NO.17 BRIDGE OVER
THE WHITE RIVER, NEAR BRENNER, ONTARIO.

Thunder Bay

TWP 20

2. 16

E 613000

N. 5391300

This report describes the results of a foundation investigation, consisting of four borings carried to a depth of approximately twenty five feet below the present ground surface, at the above noted bridge site. This work was carried out during the period from 26 September to 9 October 1956, and the location of the borings is shown in enclosure no.1.

DESCRIPTION OF THE SITE AND SUBSOIL CONDITIONS

The site of the proposed highway bridge is in the vicinity of Mile 13 near Brenner, and approximately eleven miles west of White River, Ontario. The highway centre line crosses near a gentle bend in White River, which has built up a boulder pavement of stones up to two feet in diameter along each shore line in this area. The river appears to favour the west bank, which rises on a 1 to 3 slope to a height of about thirteen feet above river level. The east bank is about six feet higher than the river. The predominant soil type in the area, as determined by visual inspection, is a medium sand with occasional large stones in evidence on the west slope. The trees bounding the river showed no indication of serious flood conditions.

The drill was moved to the site and set up on borehole no.1 on Wednesday 26 September. Prior to this date the drill had been shipped by flat car from White River to the railway siding at Brenner, where it was unloaded and winched to the site over a distance of about one quarter of a mile. Access to the east bank and holes 3 and 4 was obtained by means of a log raft, constructed of available timbers in the area.

In all four borings the subsoil was found to consist, for the most part, of a dense mixture of sand, gravel and boulders, which was exceedingly difficult to penetrate. Drilling through obstructing coarse gravel and stones was frequently unsuccessful, because the stones tended to move and wear down the bits. On several occasions the casing could be advanced past the boulders only with the use of dynamite. The dense granular condition was noted at all depths in the borings on the west bank, but it was overlain by approximately eight feet of medium dense brown sand on the east shore.

The density of this granular soil was determined on the basis of the standard penetration measurements, using a two inch diameter split spoon and a two inch O.D. cone. These tests provide an empirical measure of the density and, hence, the bearing capacity of granular soils.

1 November 1956.

DISCUSSION OF THE RESULTS

In view of the uniformity and extremely dense nature of the subsoil at the site, material for a discussion of foundation problems associated with bridge construction would appear to be limited. The competence of the soil to support load is beyond question, at all locations investigated. For footing sizes normally used in construction, it is practically impossible to develop a foundation failure where protection against scour is provided. Hence, the permissible bearing value is usually governed by the settlement that can be tolerated. Empirical methods for determining this safe bearing value are usually based on the results of the standard penetration test, in which the number of blows required to drive a standard two inch O.D. sampling spoon twelve inches into the soil under 350 foot pounds of energy, are related to the estimated subsoil capacity for a limiting settlement of one inch. The factor of safety, using this empirical basis, is assumed to be of the order of three, although there is evidence to show that it may be considerably higher than this value. This is particularly true in view of the fact that coarse granular soils adjust immediately to any load application and, hence, a considerable proportion of any total settlement takes place before final connections to the footings are made. On the basis of the standard penetration measurements made at this site, therefore, the safe bearing value of the soil should be at least equal to four tons per square foot. This value applies for all locations, except in the brown sand comprising the first eight feet of soil on the east bank, which material exists in a somewhat looser condition.

Although the final design proposals are not known, it is assumed that the bridge footings or piers will be carried to sufficient depth for frost and scour protection. For scour protection, current Soil Mechanics literature recommends the establishment of footings below river bed to a depth of four times the greatest known rise of the river level. This is admittedly a conservative rule, to allow for such uncertainties as the effects of the bridge structure on the hydraulics of the river, the possibility of an excessively heavy run off at some future date, and the resistance of the river bed materials to scour after disturbance by construction. At the present time the river appears to have built up some semblance of a boulder pavement, which probably extends under the entire bed; the finer sand and gravel constituents of the soil have undoubtedly been eroded away. A well-graded rip-rap, having a maximum size equal to the stones already in evidence, should therefore provide future protection for any exposed footings. The probable presence of these boulders in the river bed may cause minor excavation difficulties for any pier founded in it. In excavating below the river level on land, a ready flow of ground water should also be anticipated.

1 November 1956.

CONCLUSIONS

On the basis of the foregoing comments, the following conclusions regarding the subsoil at the site, can be drawn.

1. The soil, which consists of a very dense mixture of sand, gravel and boulders, is very competent to support any bridge load and its estimated safe bearing value is of the order of four tons per square foot.

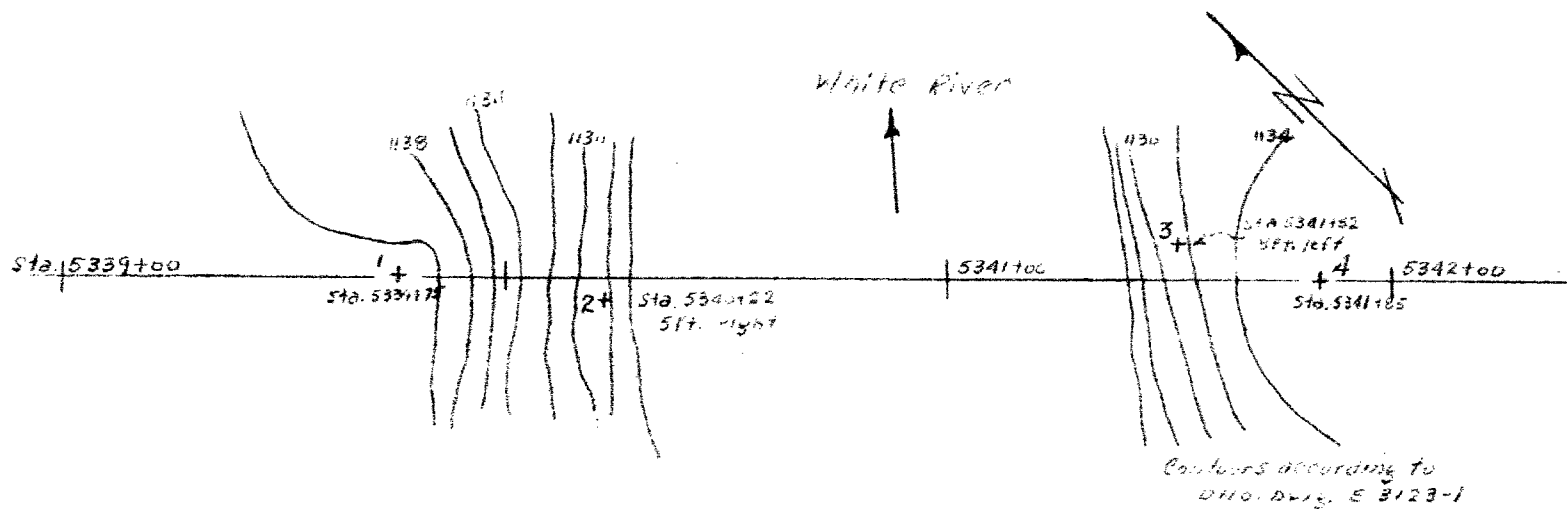
2. It is believed that the finer constituents of the soil are sensitive to scour and, therefore, some protection either in the form of adequate footing depth or well-graded rip-rap protection, is required.

3. Some minor excavation difficulties in the river boulders and from the ground water, should be anticipated.

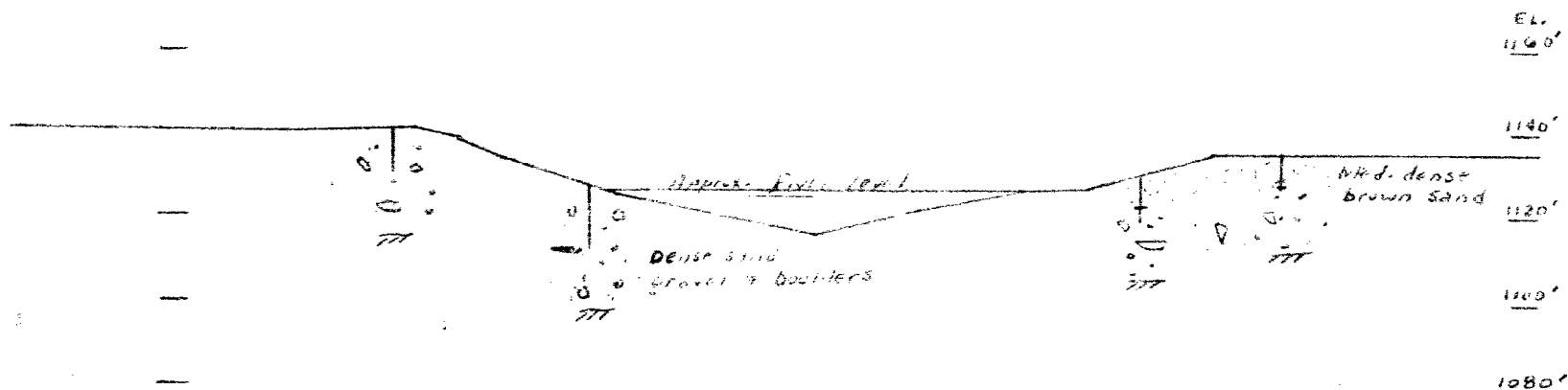
W.A. Trow
W.A. Trow, P. Eng.,
Divisional Soils Engineer.

WAT/MD





Plan and Subsoil Profile Showing Borehole Locations (Scale 40=1" Horiz. & Vert.)



Order No.: 5500-501/442 RACEY, MACCALLUM AND ASSOCIATES

Encl. No. 2

LIMITED

Hole Begun _____

Foundation Engineering Division

Driller _____

Hole Ended _____

Engineering Data Sheet for Borehole: /

Helper _____

Job Name: Bremner Crossing - White R. Hwy 17

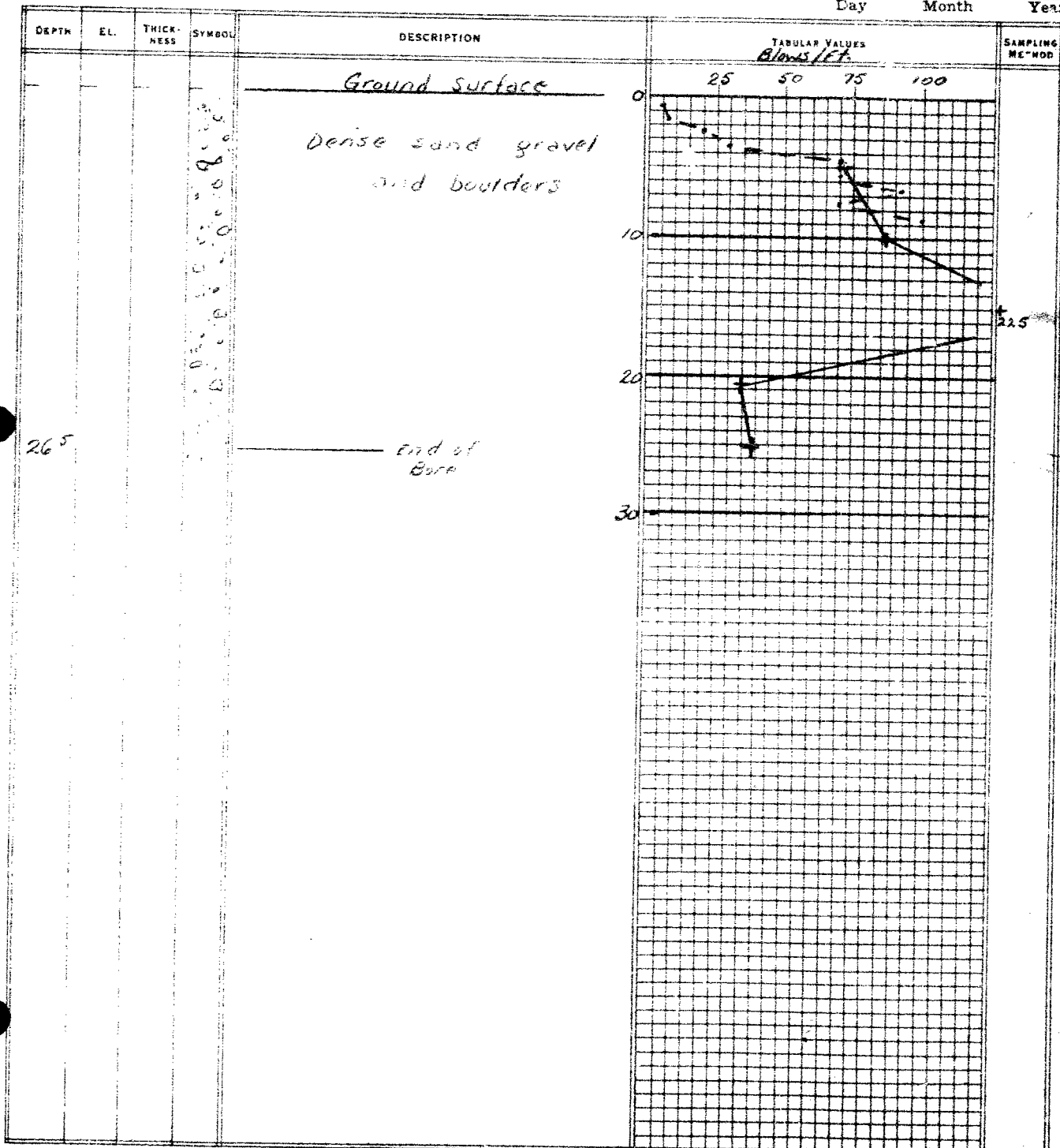
Job Located: ~ 10 mi. West White River Qnt

Checked by _____

Hole Located: See encl. No. 1

Hole Elevation: 1140 Datum: Taken from D.H.O. Dwg. No. E 3123-1

Day _____ Month _____ Year _____



Encl No. 3

Order No.: 5500-504/7442 RACEY, MACCALLUM AND ASSOCIATES
LIMITED

Hole Begun _____ Foundation Engineering Division

Driller _____

Hole Ended _____ Engineering Data Sheet for Borehole: 2

Helper _____

Job Name: Bremner Crossing White R. Hwy 17

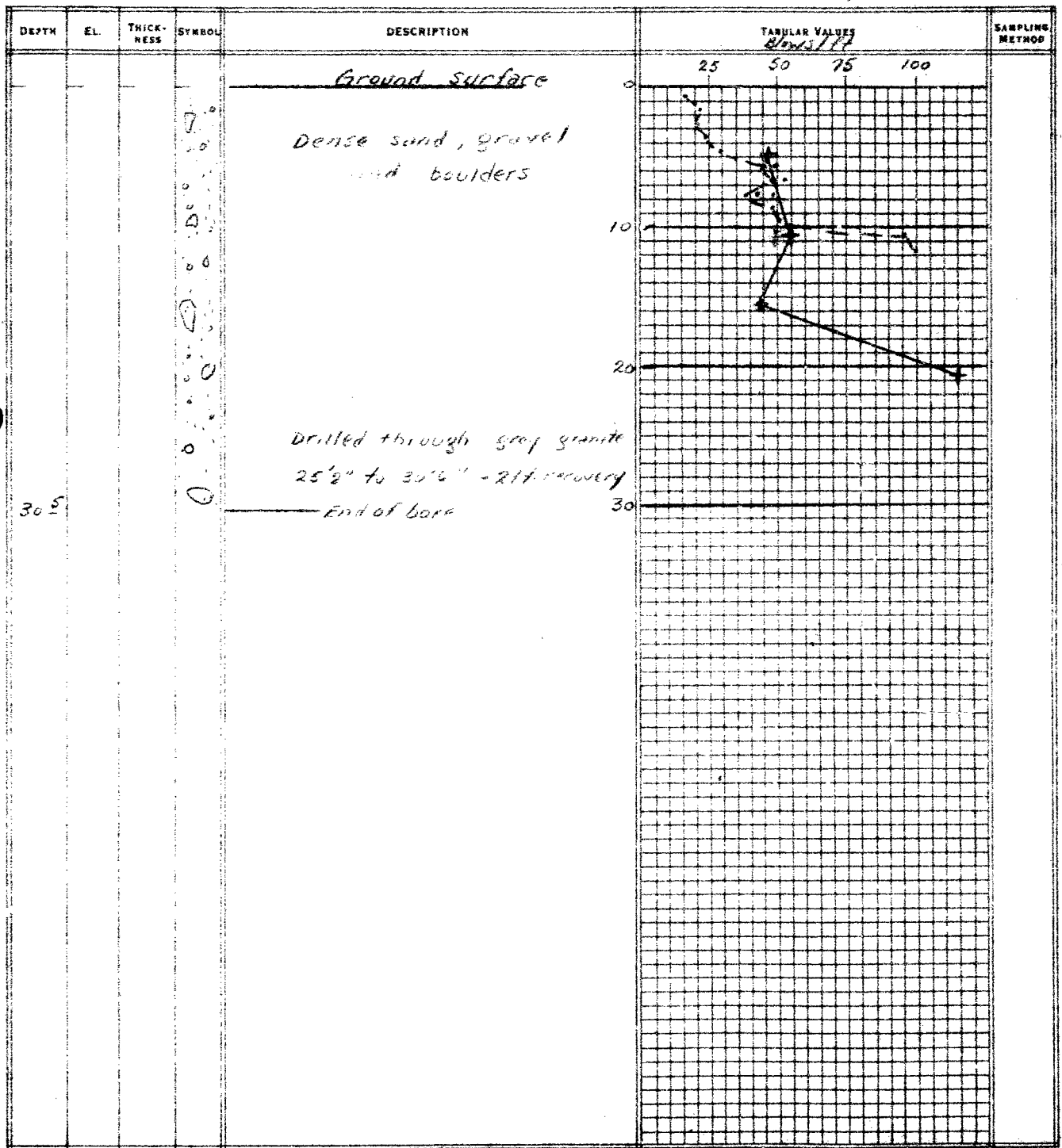
Checked by _____

Job Located: ≈ 10 mi. West White River, Ont

Hole Located: See encl. no 1

Hole Elevation: 1128 Datum: Taken from D.H.Q. D-13 No. E 3123-1

Day _____ Month _____ Year _____



Encl. No. 4

Order No. 5500-5047442 RACEY, MACCALLUM AND ASSOCIATES

LIMITED

Hole Begun _____

Foundation Engineering Division

Driller _____

Hole Ended _____

Engineering Data Sheet for Borehole: 3

Helper _____

Job Name: Bremner Crossing White R. Hwy 17

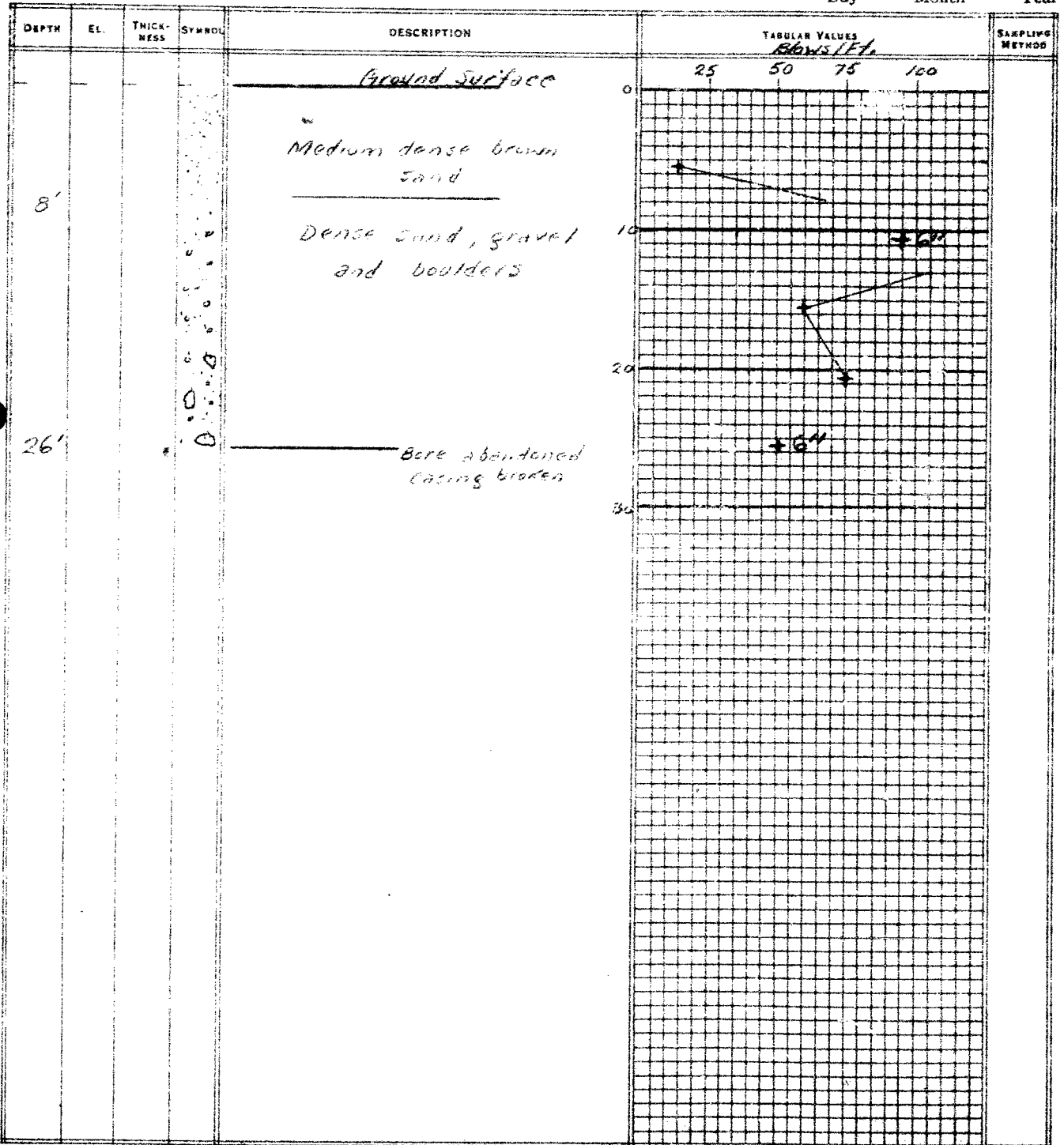
Job Located: ~10 mi. West White River Cuts

Checked by _____

Hole Located: See encl. No. 1

Hole Elevation: 1131 Datum: Taken from D.H.O. Proj. No. E 3122-1

Day _____ Month _____ Year _____



Order No.: 3500-504/7442 RACEY, MACCALLUM AND ASSOCIATES

LIMITED

Driller

Hole Begun

Foundation Engineering Division

Hole Ended

Engineering Data Sheet for Borehole: 4

Helper

Job Name: Bremner Crossing White R. Hwy 17

Job Located: ~ 10 mi. W White River Ont

Checked by

Hole Located: See encl. No. 1

Hole Elevation: 1136' Datum: Taken from D.H.O. DWG. No E. 3123-1

Day Month Year

