

#58-F-247-C

HWY. #19 E

MUD CREEK

STR.

RACEY, MacCALLUM AND ASSOCIATES
LIMITED

A COMPANY OWNED, DIRECTED AND OPERATED BY

Consulting Engineers
AND ASSOCIATED STAFF

MONTREAL



VANCOUVER

TORONTO

DONALD C. MACCALLUM, B.ENG., M.E.I.C., P.ENG.

H. JOHN RACEY, B.SC., M.E.I.C., P.ENG.

A. ERIC RANKINE, B.SC., M.E.I.C., A.M.I.ELEC.E., P.ENG.

TORONTO DIVISION
27 CARLTON STREET

Reference: S-500/T-1196

21 May, 1958

Department of Highways of Ontario,
280, Davenport Road,
TORONTO - Ontario.

Attention: Mr. J. C. McAllister

RE: FOUNDATION INVESTIGATION FOR PROPOSED
CROSSING AT MUD CREEK AND THE KING'S
HIGHWAY NO.19, ONTARIO.

Dear Sir,

The enclosed report presents the results of
our soil investigation at the above location.

We hope the report is satisfactory to you; if
you have any questions about it do not hesitate to get in
touch with us.

Thank you for this opportunity of being of
service to you.

Yours sincerely,
RACEY, MacCALLUM AND ASSOCIATES LIMITED,

Ronald F. Scott, P.Eng.,
Divisional Soil Engineer.

RFS/YDP

Department of Highways of Ontario,
280, Davenport Road,
Toronto.

FOUNDATION INVESTIGATION FOR PROPOSED
CROSSING AT MUD CREEK AND THE KING'S
HIGHWAY NO.19, ONTARIO.

Reference: S-500/T-1196

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TORONTO DIVISION
27 CARLTON STREET

Reference: S-500/T-1196

21 May, 1958

**RE: FOUNDATION INVESTIGATION FOR PROPOSED
CROSSING AT MUD CREEK AND THE KING'S
HIGHWAY NO. 19, ONTARIO.**

At the above location four borings were carried out to a maximum depth of 31 feet, in order to determine the subsoil conditions for supporting a new overpass structure. A summary of the boring results and recommendations regarding the engineering properties of the soil are presented in the following paragraphs.

FIELD WORK :

The site is located approximately 5 miles north of Woodstock, on the north edge of a series of ground moraines known as the Woodstock Drumlins. This deposit is known to contain much limestone gravel of a pale brown colour, and a relatively granular till soil. The underlying bedrock consists of limestone, known as the Norfolk Formation.

The present overpass consists of a concrete culvert, and the borings were carried out close to the four corners, see the sketch on Enclosure No 1. A standard diamond drill was used and samples of the mainly granular soil were taken by means of a 2-inch outside diameter split spoon sampler. Next to each boring a 2-inch diameter cone was driven, in order to obtain a continuous picture of the soil density. Both standard penetration resistance and cone penetration resistance are recorded on the Engineering Data Sheets, Enclosures No 2, 3, 4 and 5. The water table in each boring was equal to that in the Mud Creek, or approximate Elevation 997 feet.

DISCUSSION OF RESULTS :

The soil at the site consists of a top layer of 4 to 10 feet of relatively recent deposits from the Mud Creek, followed by a sandy, gravelly till of medium density. This layer extends to at least 31 feet depth. It can be considered a suitable base for the

Reference: S-500/T-1196

21 May, 1958

bridge foundations, and it was not found necessary to drill deeper. The standard penetration results in the till layer determine the safe bearing capacity for the bridge foundations. These results must be considered with some reservation, however, because of the presence of gravel of 2 inches and more in size. A stone in front of the sampler will increase the penetration resistance, and consequently the results are no longer representative for the true state of density of the soil. In such cases, it is common practice to use the lowest recorded penetration resistance as a criterion for the density of a soil stratum. In the case under consideration that value is 20 blows per foot. Based on this value, the safe bearing capacity of a footing foundation not exceeding 10 feet in width would be 4000 psf, for greater widths this value would decrease to about 3200 psf for a width of 20 feet. The depth of the foundations would have to be down to Elevation 988 at the north bank of the Creek, and Elevation 994 on the south bank.

It is mentioned in some textbooks that bearing capacities based on standard penetration results should be reduced with a factor of one-half to two-thirds if the ground water table is near the foundation depth. Many engineers feel, however, that the presence of the water table is already reflected in the standard penetration results. Under the present circumstances the above-mentioned values may be adhered to. Settlements under these loads should not exceed one inch.

The excavations for the foundations would be below the ground water table. In the granular soil drainage of the excavation will not be easy. Furthermore, if ordinary sump drainage should be used, the upward movement of water through the bottom of the excavation might harm the bearing properties of the soil. Therefore, lowering of the ground water table by means of a well-point system would be necessary.

The above difficulties with construction and excavation can be eliminated, of course, by founding the overpass on short piles driven, for instance, to approximate Elevation 973 feet on the north bank and Elevation 979 feet on the south bank. One foot diameter timber piles (if permanently below water table), concrete piles or tubular steel piles filled with concrete would be most suitable. Although an accurate evaluation of the bearing capacity of piles in granular soils cannot be given on the basis of standard penetration results, it is felt from previous experience that an average safe bearing value of 20 to 30 tons for a one foot diameter pile, driven at least 15 feet into the medium dense gravelly sand, may be assumed. For a more accurate determination and consequently a more economic design, one or two pile load tests would be required.

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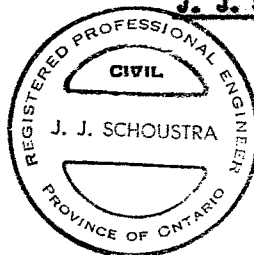
21 May, 1958

CONCLUSIONS :

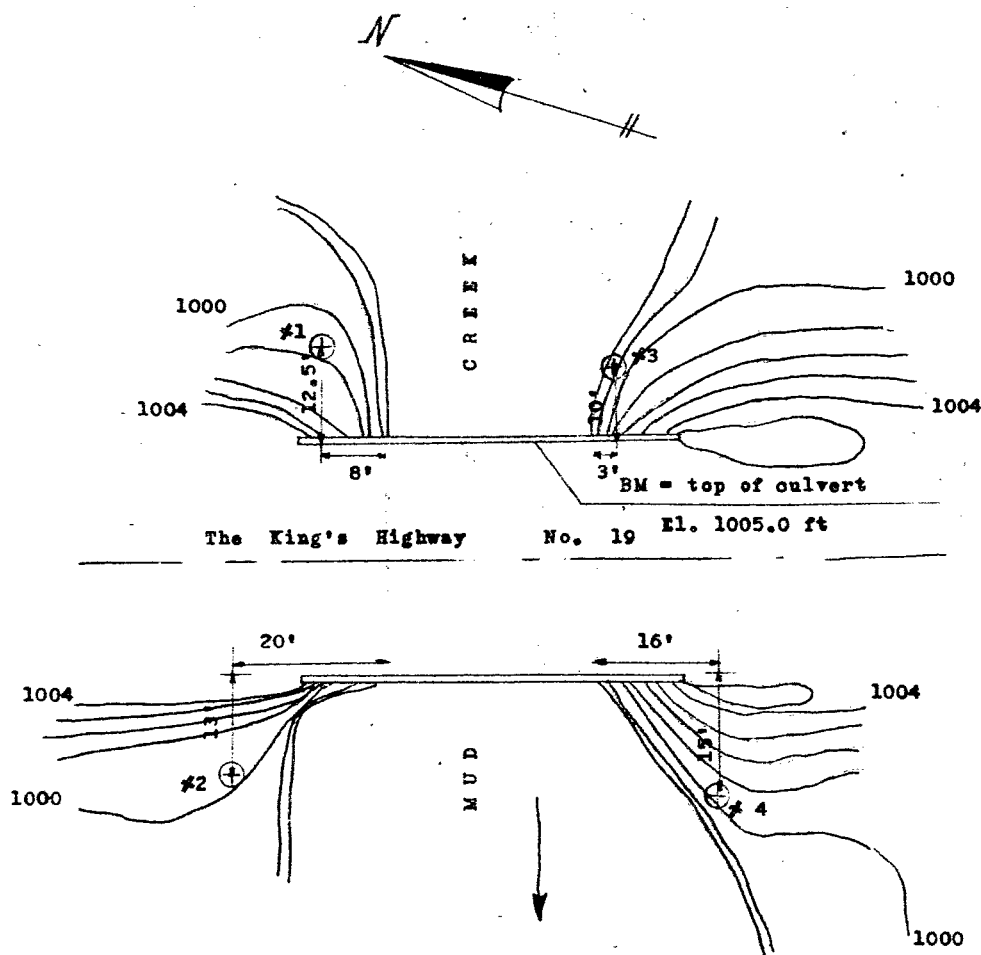
1. The soil at the site consists of a 4 to 10 feet layer of recent Creek deposits, consisting of organic sand with some shells. Below this depth, a medium dense to dense, mainly granular till soil is found to a depth of at least 31 feet.
2. The medium dense till layer would be a suitable base for the bridge footings. The safe bearing values for footing foundations on this layer would be between 4000 and 3200 psf, depending on the width of the footing.
3. Drainage of the footing excavation would have to be carried out by means of a well-point system.
4. A foundation on piles, driven at least 15 feet into the medium dense soil, would also make a suitable foundation. Safe bearing values of the order of 20 to 30 tons for one foot diameter piles may be expected.


J. J. Schoustra, P.Eng.,

JJS/YDP.



Prep. By J. S.



MUD CREEK OVERPASS AT HWY NO. 19

Location of Borings

SCALE: 1 inch = 20 ft.

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: **1**Project: **Mud Creek Overpass at Hwy. #19**Location: **Near Woodstock, Ont.**Hole Location: **See Enclosure No. 1.**Hole Elevation and Datum: **998.9 Ft. M.S.L.**Field Supervisor: **H.G.** Prep.: **J.S.**Driller: **M.C.** Checked: **J.S.**Date: **11-5-58**LEGEND

Shear Strength (C)

Unconfined compression

Vane test and sensitivity (S)

Penetration Resistance (P)

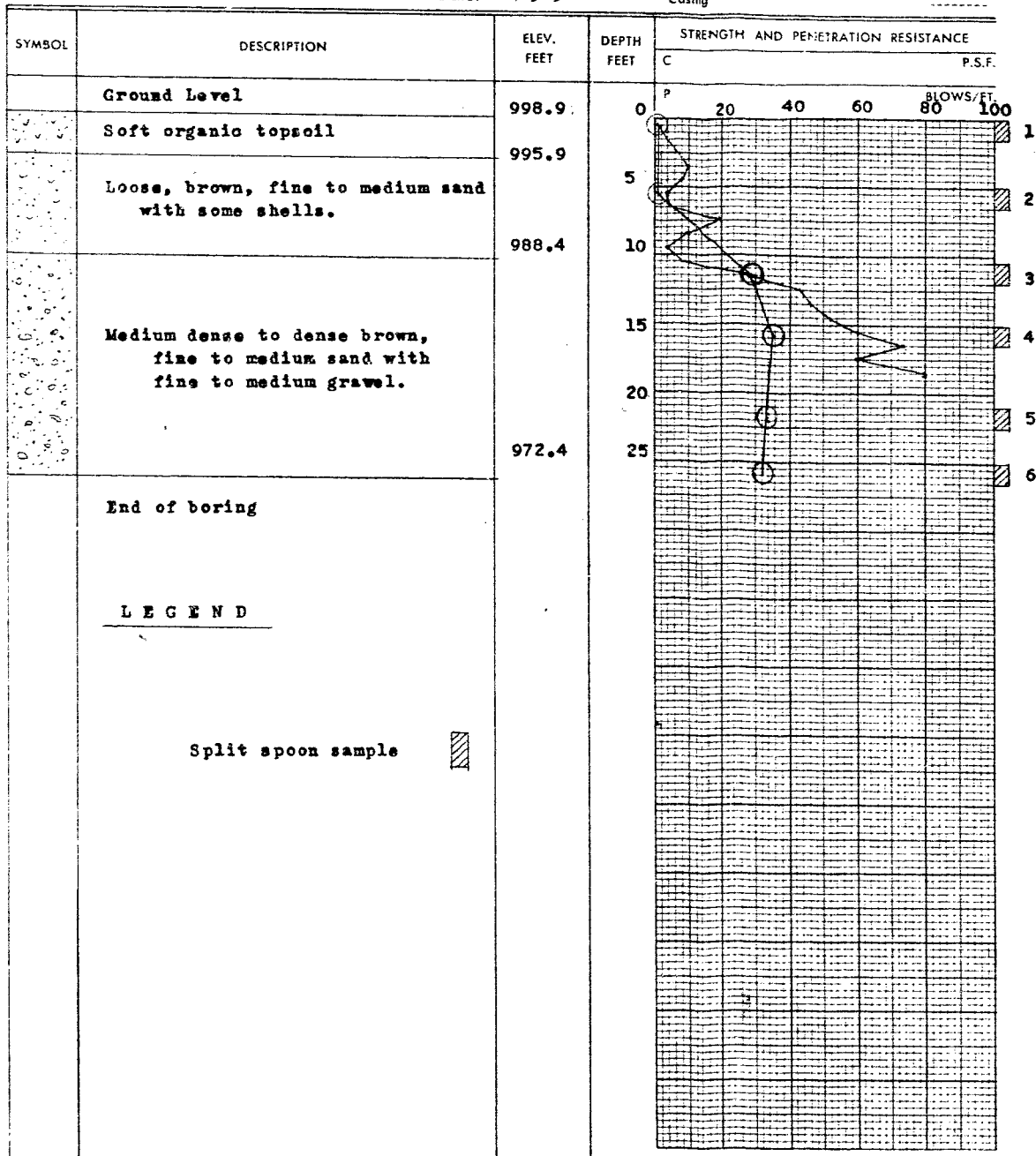
2" Split tube

2" Dia. Cone

Casing

⊕
+³

⊕ ⊕



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Foundation Engineering Division

Engineering Data Sheet for Borehole: 2.

Project: Mud Creek Overpass at Hwy. #19

Location: Near Woodstock, Ont.

Hole Location: See Enclosure No. 1.

Hole Elevation and Datum: 999.1 ft. M.S.L.

Field Supervisor: H.G. Prep.: J.S.

Driller: M.C.

Checked: J.S.

Date: 11-5-58

LEGEND

Shear Strength (C)

Unconfined compression

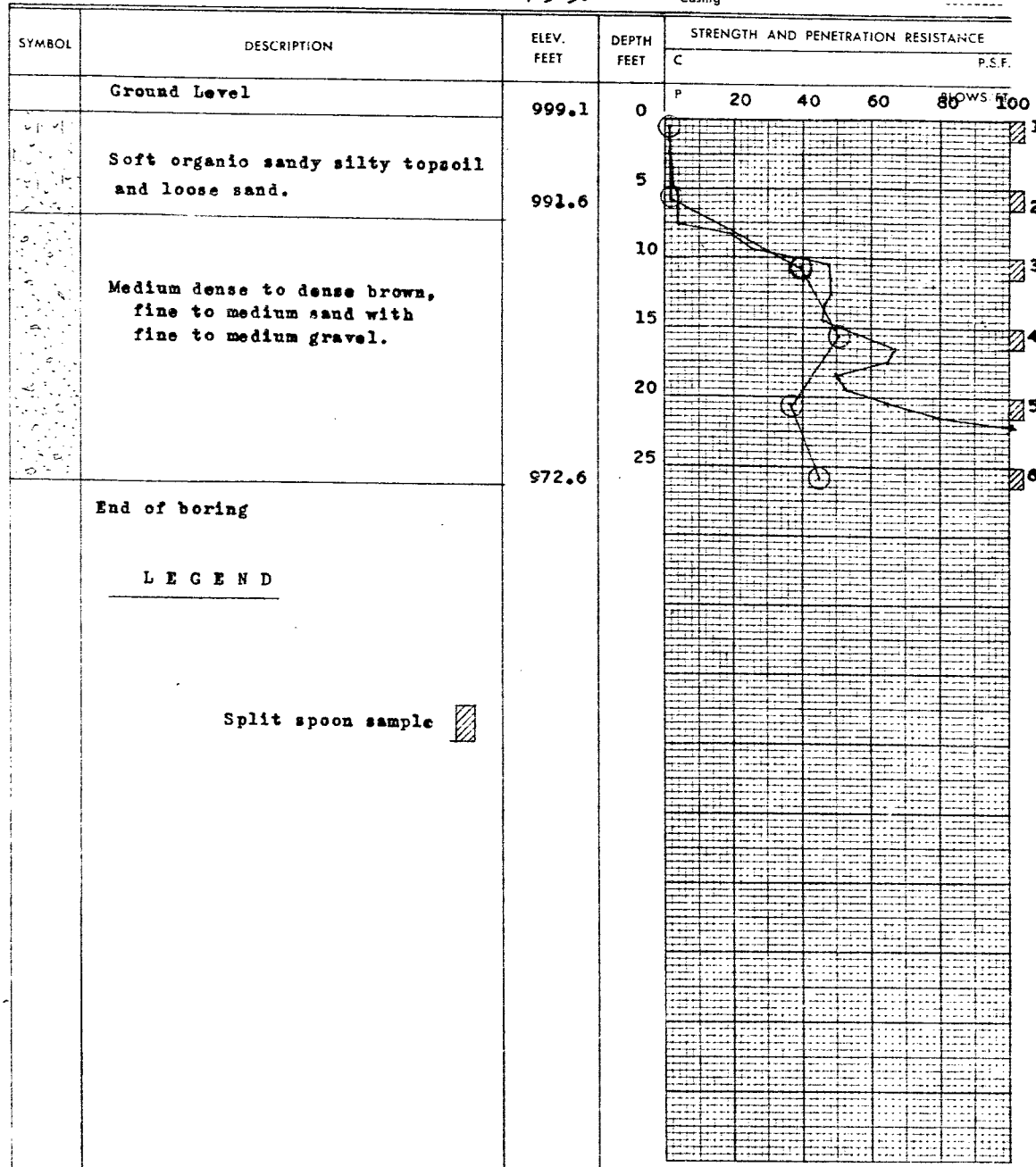
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing

⊕
+5

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Foundation Engineering Division

Engineering Data Sheet for Borehole: 3.

Project: Mud Creek Overpass at Hwy #19

Location: Near Woodstock, Ont.

Hole Location: See Enclosure No. 1.

Hole Elevation and Datum: 998.8 ft. M.S.L.

Field Supervisor: H.G. Prep.: J.S.

Driller: M.C. Checked: J.S. Date: 11-5-58

LEGEND

Shear Strength (C)

Unconfined compression

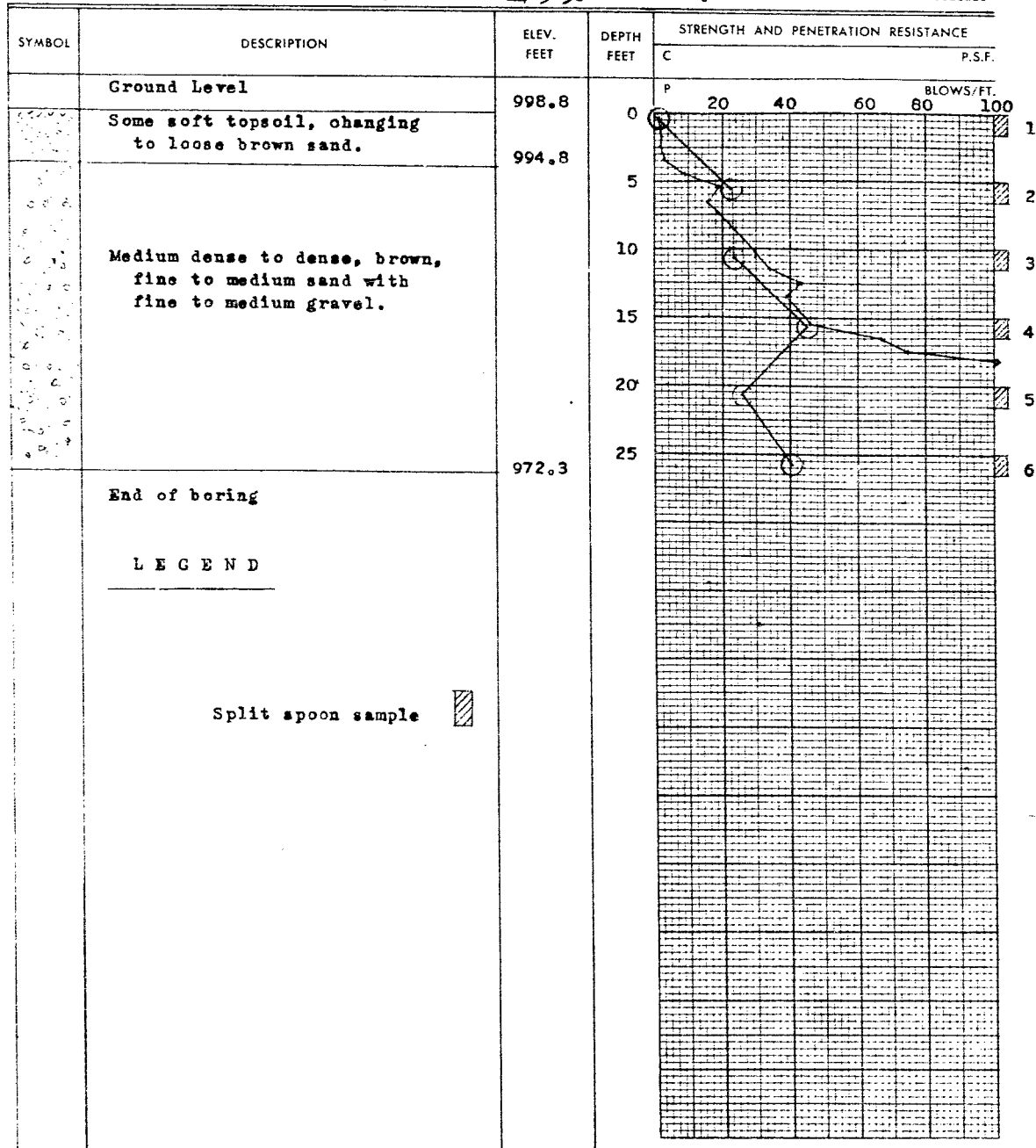
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing

⊕
+5

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 4.

Project: Mud Creek Overpass at Hwy #19

Location: near Woodstock, Ont.

Hole Location: See Enclosure No. 1.

Hole Elevation and Datum: 999.2 ft. M.S.L.

Field Supervisor: H.G. Prep.: J.S.

Driller: M.C.

Checked: J.S.

Date: 11-5-58

LEGEND

Shear Strength (C)

Unconfined compression
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing

⊕
+S

⊕ ⊕

