

56-F-214C

Hwy. 401

ETOBICOKE TOWNSHIP

B A 508
56-F-214C

RACEY, MacCALLUM AND ASSOCIATES
LIMITED

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QUEBEC LAND SURVEYOR

THE VIBRATION ENGINEERING COMPANY

REPORT NO: S-500-501/56/T-229-1

310 Odeon Building,
20 Carlton Street,
Toronto, Ontario.

Department of Highways of Ontario,
c/o Lazarides, Lount and Partners,
79 Scollard Street,
TORONTO, Ontario.

23 February 1956.

RE: FOUNDATION INVESTIGATION FOR
HIGHWAY BRIDGE, HIGHWAY 401
EXTENSION, ETOBICOKE TOWNSHIP.

Dear Sirs:

We have completed the soils investigation for the above mentioned bridge site and our report on the subject is attached hereto.

Briefly, our conclusions are as follows:-

1. The soil at the site exists in a very competent condition and no particular foundation problem appears to exist. However, in order to ensure a positive base into the glacial till, and to provide for frost protection, the recommended abutment footing depth is seven feet below the surface, or El.506.3 feet. Ground water will be encountered above this depth, but it should be controllable by pumping from sumps adjacent to the excavation.
2. The safe bearing value of the soil at this depth is 4 tons per sq.ft. It is assumed, of course, that the base of the excavation will be inspected prior to the installation of the abutment footings, to ensure that any local soft spots are removed.
3. The estimated horizontal thrust from the adjacent embankment is 16000 p.l.f. Assuming the abutment footings are cast directly against the natural soil, there should be ample resistance provided by the ground to this load.

We shall be pleased to discuss any matters regarding the soils conditions at this site, at your convenience.

Yours very truly,

RACEY, MacCALLUM AND ASSOCIATES LIMITED,

W.A. Trow

W.A. Trow, P.Eng.

WAT/MD

FOUNDATION INVESTIGATION
FOR
SIDE ROAD OVERPASS
OF
HIGHWAY 401 EXTENSION
ETOBICOKE TOWNSHIP

Report No: S-500-501/56/T-229

Racey, MacCallum and Associates Limited

23 February 1956.

TABLE OF CONTENTS

	<u>Page</u>
DESCRIPTION OF THE SITE	1
SCOPE OF THE INVESTIGATION	1
DESCRIPTION OF THE SOIL	1
DISCUSSION	2
CONCLUSIONS	3

ENCLOSURES

SKETCH OF SITE, SHOWING LOCATION OF BOREHOLES	1
ENGINEERING DATA SHEETS	2 & 3

23 February 1956.

FOUNDATION INVESTIGATION FOR
SIDE ROAD OVERPASS OF HIGHWAY
401 EXTENSION, ETOBICOKE TOWNSHIP.

The purpose of this investigation was to determine the bearing capacity and resistance to horizontal thrust of the subsoil at the site for the above noted bridge, which overpasses the proposed 401 highway extension, approximately half a mile west of highway 27.

DESCRIPTION OF THE SITE.

The location for the proposed bridge is at the eastern edge of a relatively flat vale, which is flanked on the east, south and west, by gently sloping hills. Visual observations of general soil conditions in the area, coupled with information from the borings, suggest that the hills are composed of densely compacted glacial till. Although the flatness of the valley would not encourage rapid drainage, there was no visible evidence of swampy conditions, except for the presence of a Willow tree, immediately to the north. Such vegetation favours high ground water and, of course, a perched water table was encountered in the investigation.

SCOPE OF THE INVESTIGATION

The drill was moved to the site late on 24 January and work was begun on hole no.1 on 26 January, after one day's delay due to sickness of the driller. During this time interval and 2 February, when the equipment was moved from the site, a total of two borings were made into the shale bedrock encountered 20 feet below the surface. Delays were occasioned by the necessity to haul water a distance of half a mile, and by the necessity to drill through the numerous boulders in the glacial till above bedrock.

Sampling was carried out using split spoon and thin walled Shelby tube samplers. In addition, two auger holes were put down adjacent to the borings, in order to obtain vane test measurements of the upper clay and to determine the location of the water table.

DESCRIPTION OF THE SOIL

The main body of soil overlying the soft shale bedrock at the site is a very densely-packed glacial till, which begins about 5 feet below the present ground surface. This material is overlain by stiff silty clay which has a moisture content slightly above its plastic limit and, therefore, exists in a well-consolidated state. The strength of this clay was above

23 February 1956.

1750 p.s.f., the capacity of the vane. The water table established itself in the auger holes, at the contact between the upper clay and the till, when augering below a depth of 5 to 5½ feet. The low moisture content of the underlying till and the low permeability of the soil at greater depths, suggests that this water table represents a perched condition, due to the poor drainage in the flat valley.

Since bedrock in an adjacent well is located at a depth of 18 feet below the surface, the depth of the top of the soft shale appears to be quite uniform in the area.

DISCUSSION

The foregoing description of the soil suggests that there is no particular foundation problem at the site. It will probably be necessary to carry the abutment footings to a depth of about 7 feet below present ground level, in order to escape frost, and to develop the maximum sliding resistance to the thrust of the side road fill approaches.

Since the penetration resistance of the till below 7 feet is very high, and since its moisture content is at or below its plastic limit, the safe capacity of the soil is quite large, being of the order of 4 tons per sq.ft. Assuming an embankment height of 26½ feet against the abutment wall, the horizontal component of the earth pressure thrust for earth pressure at rest conditions will be 16000 p.l.f., and the vertical component acting downward will be 4350 p.l.f.

The resistance to this thrust will be provided by the bridge span and by the passive and sliding resistance of the soil. Although the upper clay appears to be quite stiff, some allowance must be made for changes in compressibility due to seasonal temperature and moisture variations. Using a reduced factor of 1000 p.c.f. as the strength of the clay, its passive resistance will be 14000 p.l.f. for an abutment footing cast in place directly against the natural soil at a depth of 7 feet. The sliding resistance along the base of glacial till will equal $0.4 (W + 4350 L)$, where W is the footing load and L is its length. On the basis of this information, there appears to be ample resistance to the embankment thrust.

The only other concern is the perched ground water, which will probably be encountered in the footing excavation below 5 feet, unless this work is carried out during a very dry period of the year. This difficulty should be controllable by pumping from sumps, located at the ends and mid points of the excavation.

23 February 1956.

CONCLUSIONS

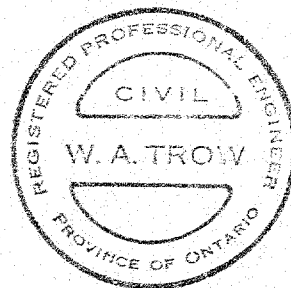
On the basis of the foregoing discussion, the following conclusions can be made:-

1. The soil at the site exists in a very competent condition and no particular foundation problem appears to exist. However, in order to ensure a positive base into the glacial till and to provide for frost protection, the recommended abutment footing depth is 7 feet below the surface, or El.506.3 feet. Ground water will be encountered above this depth, but it should be controllable by pumping from sumps adjacent to the excavation.

2. The safe bearing value of the soil at this depth is 4 tons per sq.ft. It is assumed, of course, that the base of the excavation will be inspected prior to the installation of the abutment footings, to ensure that any local soft spots are removed.

3. The estimated horizontal thrust from the adjacent embankment is 16000 p.l.f. Assuming the abutment footings are cast directly against the natural soil, there should be ample resistance, provided by the ground to this load.

W.A. Trow
W.A. Trow, P. Eng.



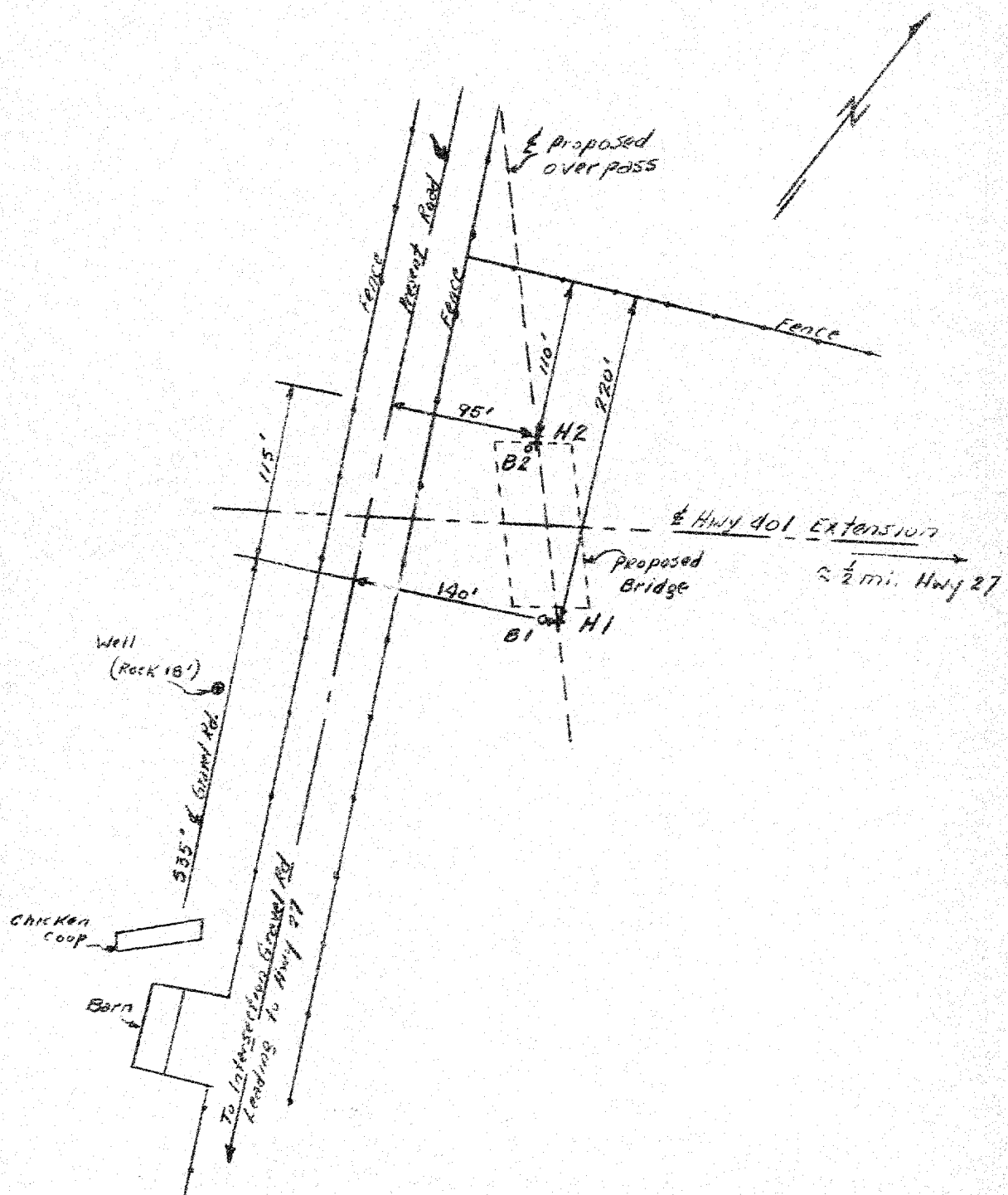
WAT/MD

Original and 3 copies - Dept. of Highways of Ontario, c/o Lazarides,
Lount and Partners, Toronto.

c.c.'s.

- 1 - Racey, MacCallum & Associates Ltd., Montreal.
- 2 - Soils Engineer.

Prep. By W.T.



SKETCH of SITE SHOWING LOCATION OF BOREHOLES

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 1

Project: Etobicoke Bridge

Location: 401 Extension 2 1/2 mile west of Hwy 27

Hole Location See attached sketch

Hole Elevation and Datum: 513.3' M.S.L.

Field Work Begun Jan 26/56 Ended Jan 31/56

Field Supervision: W.T.

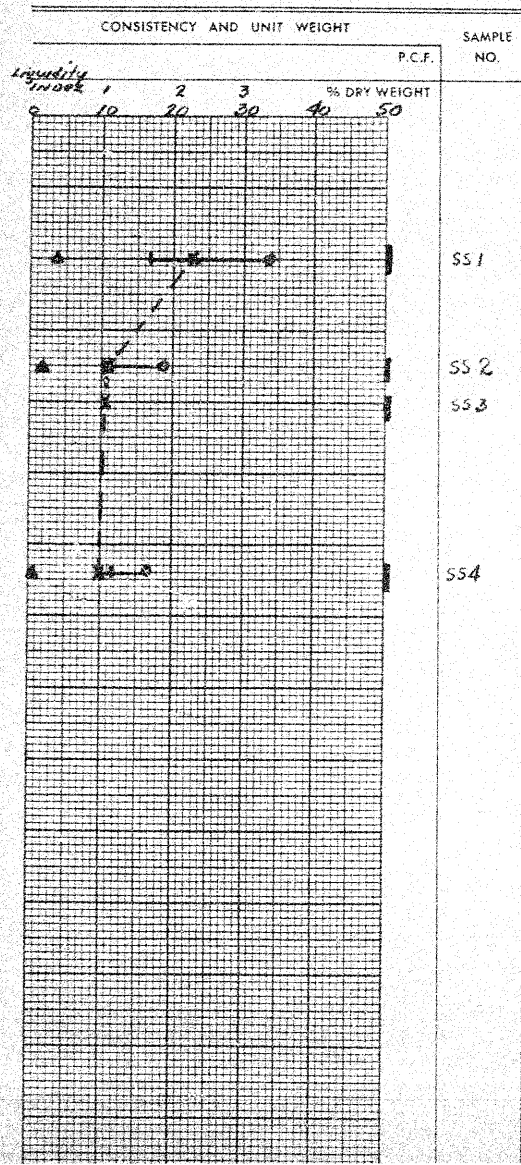
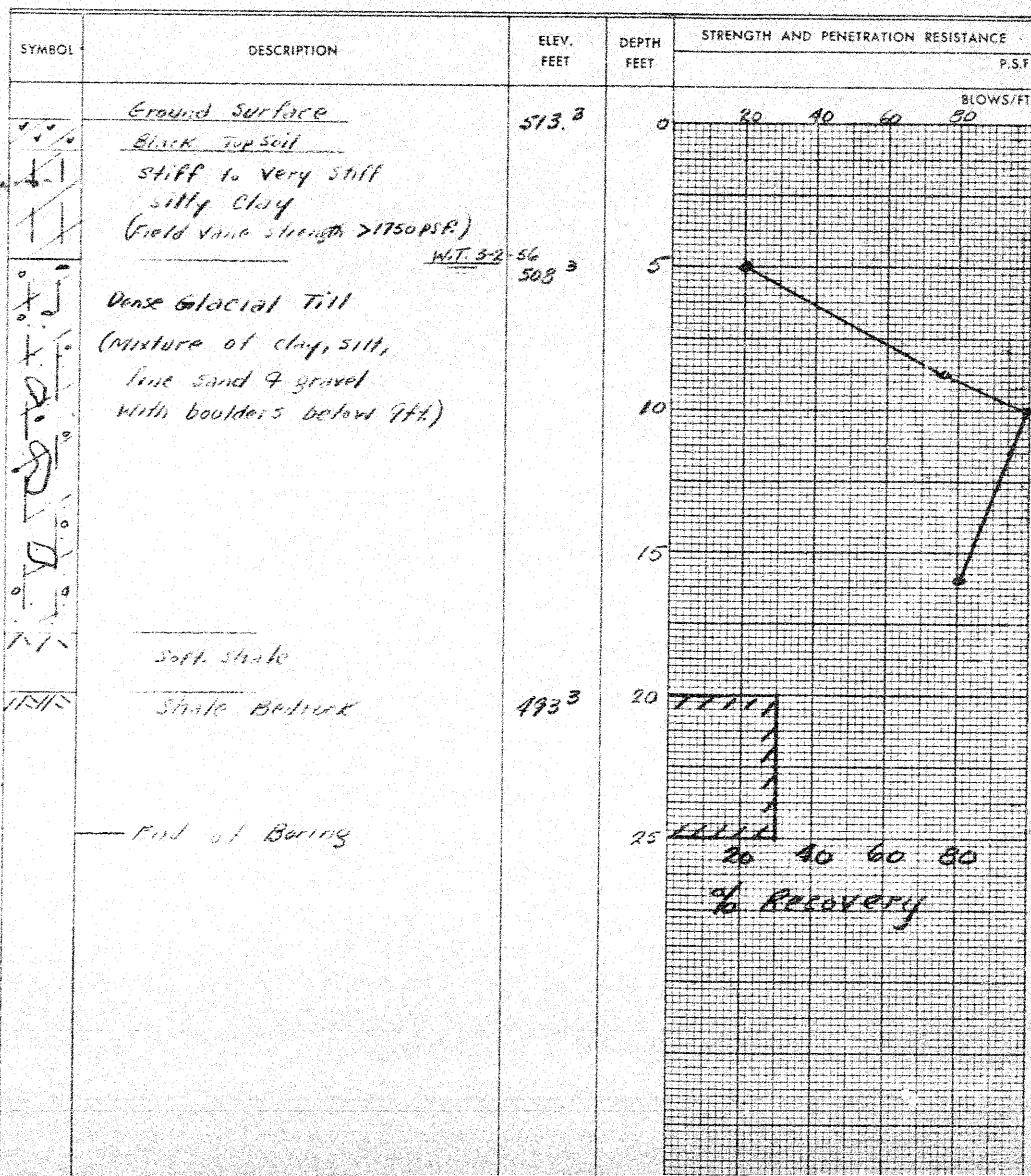
Driller: J.M.

Prep.:

Checked: W.T.

Date:

LEGEND

Sampling Method
2" Dia. split tube
2" Shelby tubePenetration Resistance
2" Split tube
2" Dia. Cone
CasingStrength
Unconfined compression
Vane test and sensitivityConsistency
Natural moisture
Liquid limit
Plastic limit
Liquidity Index
Natural Unit Weight

Order No. 5500-501/56/T229

Enclosure No. 3

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 2

Project: Etobicoke Bridge
 Location: 401 extension to 1/2 mile West Hwy 27
 Hole Location: See Attached Sketch
 Hole Elevation and Datum: 513.5 M.S.L.
 Field Work Begun: Feb 1, 56 Ended: Feb 2, 56

Field Supervision: W.T.
 Driller: J.M.
 Prep.:
 Checked: W.T.
 Date:

LEGEND

Sampling Method
 2" Dia. split tube
 2" Shelby tube



Penetration Resistance
 2" Split tube
 2" Dia. Cone
 Casing



Strength
 1/2 Unconfined compression
 Vane test and sensitivity



Consistency

Natural moisture
 Liquid limit
 Plastic limit
 Liquidity Index
 Natural Unit Weight

