1983/47. Stability investigations at Robert Street, Beauty Point

D.J. Sloane

Abstract

Investigation of a proposed subdivision at Robert Street, Beauty Point has shown that *in situ* basalt does not extend under the area from an adjacent escarpment. A steep embankment adjacent to the street is underlain by unconsolidated materials with a low seismic velocity, probably clay or sandy silt containing basalt boulders.

The stability classification of the area has not been altered as a result of the investigation. A survey of the morphology of the area has shown that the slope features are displaced when compared to those shown on the Beauty Point Landslip Zone map.

It is considered that an amendment to the Beauty Point Landslip Zone map is required in order to correct the discrepancies.

INTRODUCTION

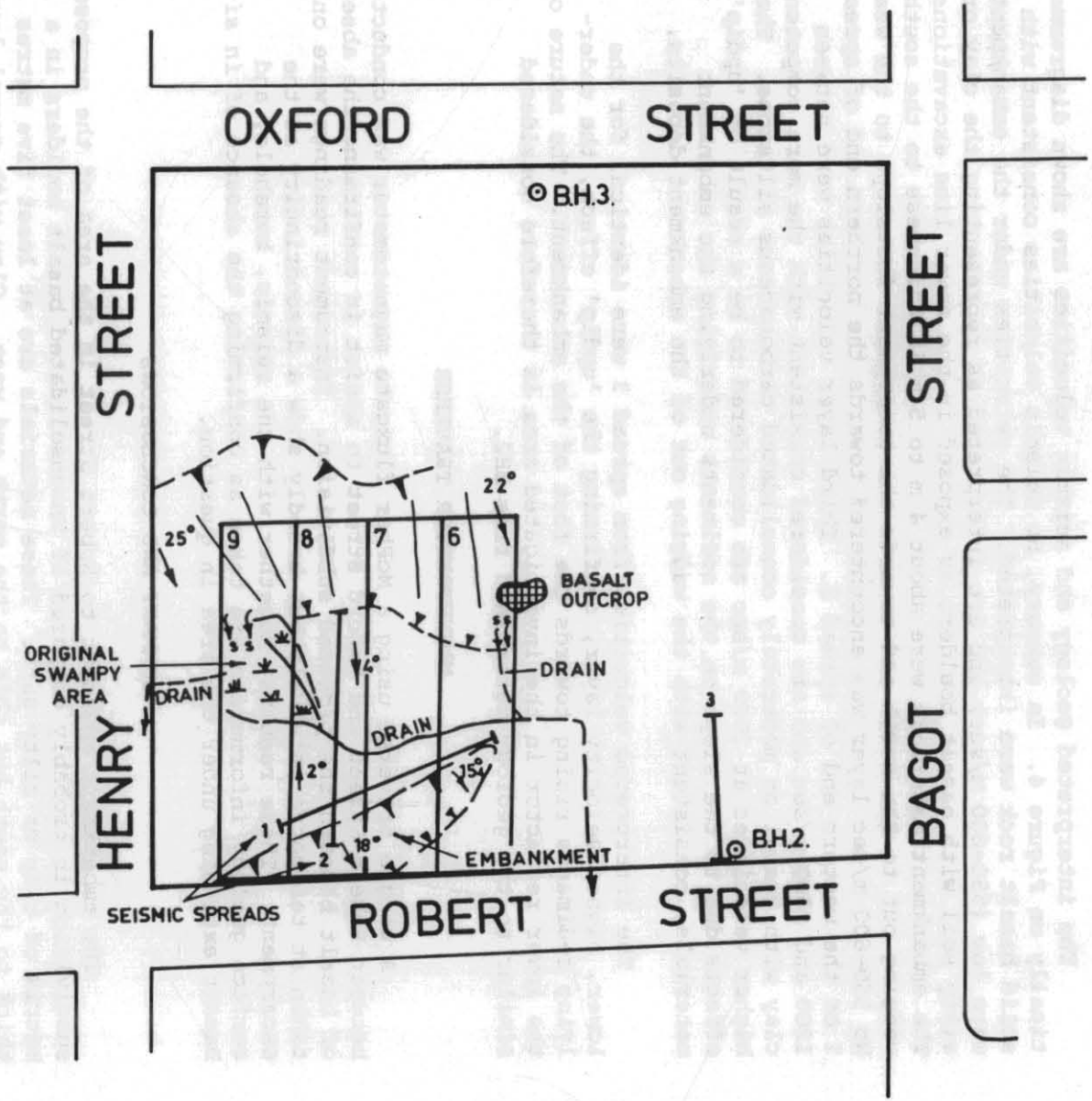
At the request of landowner Mr C. Dyke of Beauty Point a seismic and morphologic survey was conducted on an area of land at Robert Street, Beauty Point. Part of the land is designated landslip 'A' and 'B' under Statutory Rule No. 119 of 1977. A subdivision of four lots is proposed on the western side of Robert Street. The excavation of a sewer line indicated that basalt could be present to a depth of at least four metres under one of the proposed lots. Basalt is exposed on the steep slopes some 50 m to the west, and the possibility was considered that a shelf of basalt may extend under the land adjacent to Robert Street. A steep embankment adjacent to Robert Street was previously thought to have been part of an old landslip feature. Consequently this area has been designated landslip 'A'. In view of the information supplied from excavations, the presence of basalt rock is likely to change the stability category of the area, thereby indicating a possible revision of the Landslip Zone map.

MORPHOLOGY

The morphology of the area is shown in Figure 1, the plan being based on the results of surveying by G. Benn. To the west, adjacent to Oxford Street, the area is part of a virtually flat plateau, the plateau edge dropping steeply as an escarpment in the area of the western lot boundary. Escarpment slopes are between 22° and 25°, with occasional rock outcrops present. The central section of the proposed subdivision is of low slope (3° to 5°). A small drain collects water from seepages at the foot of the escarpment slope. A small swampy seepage area on Lot 9 has been drained to the south along Henry Street (C. Dyke, pers. comm.). This area was dry when inspected. A seepage to the rear of Lot 6 has been piped to Robert Street. A steep embankment adjacent to Robert Street has slopes of 15° to 18° and the continuation of this slope segment can be traced to the south-east across the adjacent 'Pedders Orchard', to the rear of the main active landslip area.

GEOLOGY

Tertiary basalt is exposed on the steep embankment slope. This basalt is overlain by clayey sand and gravel, exposed in a small road cut along Bagot Street. The embankment surface adjacent to Robert Street shows basalt boulders in a silty sand topsoil.



MORPHOLOGY OF PROPOSED LOTS 6 TO 9, ROBERT ST.

D.J. SLOANE

SCALE 160 FT TO 1 INCH

Seepage

Break of slope-downslope side indicated

Break of slope-upslope side indicated

2° *Slope angle and direction*

5 cm

Fig 1.

2/7

47-2

Information from Bore Hole 2 in Robert Street and BH3 in Oxford Street was used to determine a proposed geological structure (fig. 3). The Oxford Street borehole intersected ten metres of clayey sand and gravel overlying 26 m of basalt. Below the basalt is a thick sequence of silt and sandy silt, moderately consolidated, and containing coal and carbonaceous plant fragments. The Robert Street borehole has about eight metres of clay with gravel layers and some basalt boulders overlying the moderately consolidated, low strength silt and sandy silt containing carbonaceous material.

On the basis of the information from the drill holes, it was considered unlikely that the basalt from the escarpment continued under the subdivision area. It is likely that the embankment is composed of basalt boulders in a silty soil or clay matrix.

SEISMIC SURVEY

Three seismic spreads were placed as shown on Figure 1. One was placed parallel to the embankment ridge, with one almost at right angles. The third spread was located adjacent to BH2 in an attempt to correlate seismic velocities with known geological information.

The interpreted geology and seismic velocities are shown diagrammatically on Figure 4. In summary, no seismic velocities consistent with solid basalt rock were interpreted. The velocities under the embankment were low (550-600 m/sec) and are interpreted as representing the clay or silty soil with basalt boulders as exposed in the sewer line excavations. The embankment materials were about 4 m to 5 m in thickness to the south, wedging out to the north and towards the escarpment footslope to the west. No 550-600 m/sec layer was encountered towards the northern end of spread 1 or the western end of spread 2. Third layer velocities were between 1200 and 2000 m/sec and are considered consistent with the more competent clay with gravel or moderately consolidated carbonaceous siltstone. The higher velocities at 2000 m/sec are considered to be a result of 'updip' effects due to the slope on the sediments underlying the embankment materials, consistent with the wedging out of the embankment deposits.

The interpreted velocities from spread 3 were identical for the lower, higher velocity layer, confirming the 'updip' effect, the underlying sediments rising towards the foot of the embankment. The nature of the lower refractor in the investigated area is therefore considered similar to the geology determined from BH2.

MAGNETOMETER TRAVERSE

A single traverse using a McPhar fluxgate magnetometer was conducted between Robert Street and Oxford Street to assist in confirming the absence of basalt beneath the proposed subdivision. Instrument readings were only taken at ten metre intervals but broadly show a discontinuity at the escarpment. These results, together with the seismic, borehole, and surface geology information are taken as confirming the absence of *in situ* basalt extending under the area in question.

SUMMARY AND CONCLUSIONS

The embankment adjacent to Robert Street in the area of the proposed subdivision is probably composed of unconsolidated basalt boulders in a matrix of clay or silty sand. These materials are at least five metres thick to the south but thin to the north and west. Clay with gravel layers

and basalt boulders or moderately unconsolidated siltstone and sandy siltstone with abundant carbonaceous fragments underly the embankment materials, and have an easterly dip.

The seismic survey, magnetometer survey, borehole and surface geology information do not indicate that *in situ* basalt bedrock exists under the area of the proposed subdivision. The embankment adjacent to Robert Street may, in part, be man-made as a saw-mill was apparently located in this area. Some alteration of the slope may have occurred but as this morphological feature may be traced to the south for some distance it is unlikely that there has been any major alteration.

In summary, there is no new information on which a reassessment of the stability classification can be made. The 'A' landslip boundary was originally drawn around the embankment slope because of the degree of slope, the relationship with the overall slope profile and areas of known failure, the underlying geology, the presence of surface seepages and a high water table. However when the landslip 'A' and 'B' zone lines and the morphology of the Beauty Point Landslip Zone map are overlain onto the surveyed morphologic map of the proposed subdivision area, the embankment features do not coincide. In hindsight, the reason for the mismatch is due to the lack of contour and locational control on the original town map. Mapping was originally based on 160 feet to 1 inch town maps with a 5 foot contour interval. The region bounded by Oxford Street, Bagot Street, Robert Street and Henry Street contained no contours and very few houses. It is therefore proposed to alter the position of the 'A' and 'B' zone lines in this area, subject to accurate survey. The lines will, as before, be related to the morphological features considered to be of questionable stability. The proposed 'A' zone line in the area of the proposed subdivision has been shown on Figure 2. When this line is re-proclaimed the remainder of the area may be developed subject to the 'B' regulations.

It is advisable that vegetation be planted on the steep embankment adjacent to Robert Street to maintain stability. If fill is to be placed in the landslip 'B' area, any regrading must be in accordance with the 'B' regulations. The fill should be properly compacted and provision made for adequate drainage of any seepages or swampy areas.

[16 September 1983]

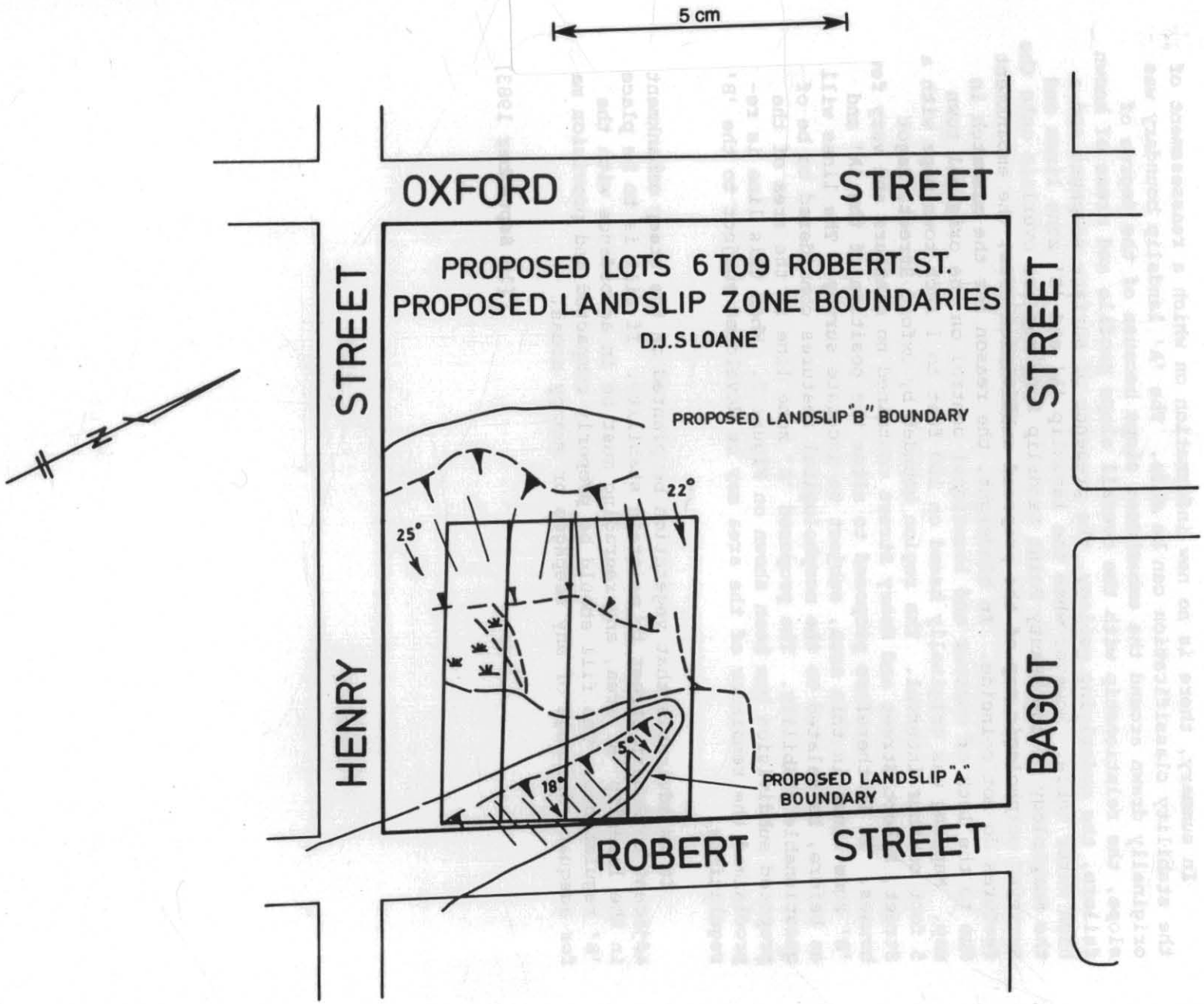

5 cm
OXFORD STREET
HENRY STREET
BAGOT STREET
ROBERT STREET
PROPOSED LOTS 6 TO 9 ROBERT ST.
PROPOSED LANDSLIP ZONE BOUNDARIES
D.J.SLOANE
PROPOSED LANDSLIP "B" BOUNDARY
PROPOSED LANDSLIP "A" BOUNDARY
22°
25°
18°
5°
N

Fig. 2

5/7

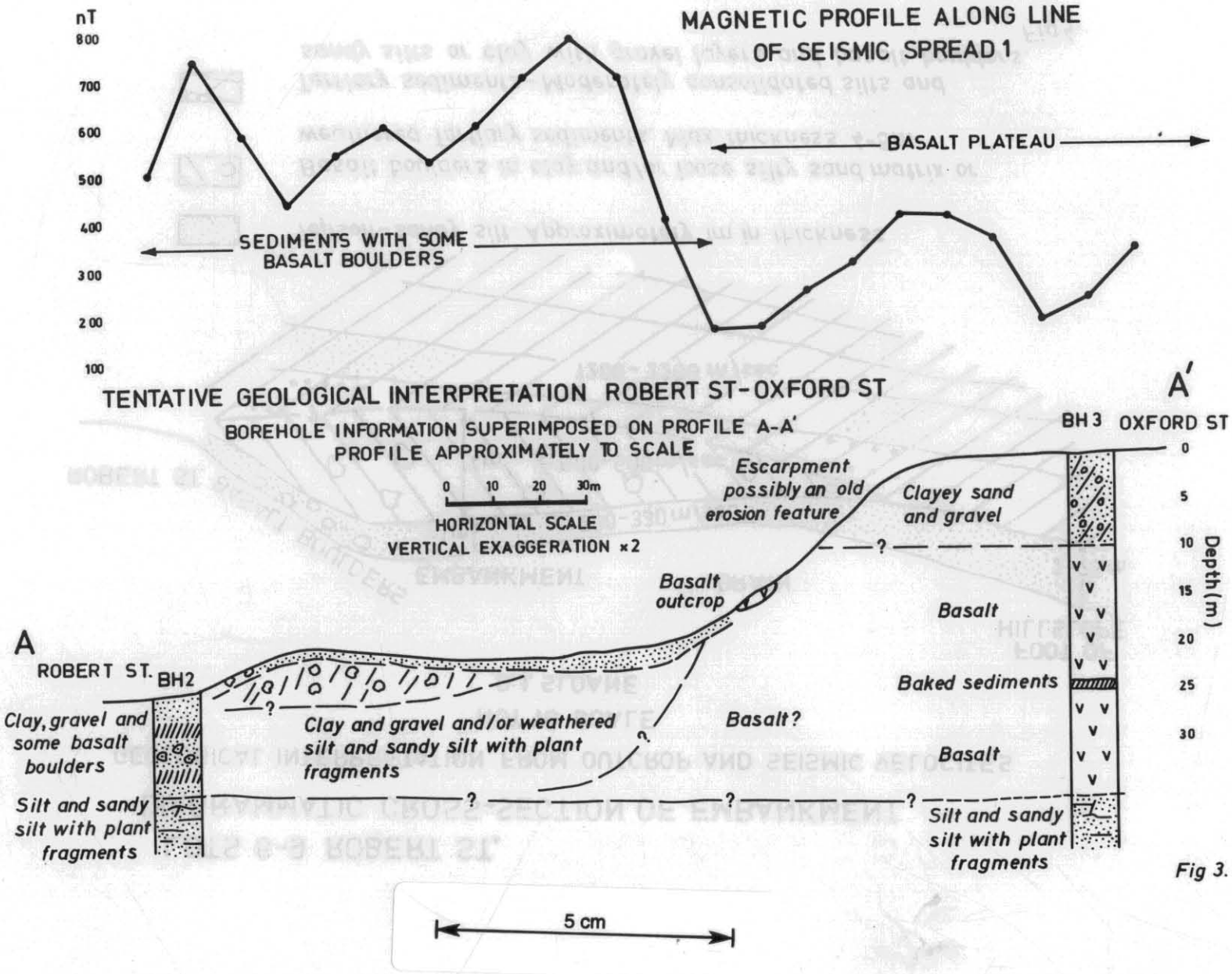

MAGNETIC PROFILE ALONG LINE OF SEISMIC SPREAD 1
nT
800
700
600
500
400
300
200
100
BASALT PLATEAU
SEDIMENTS WITH SOME BASALT BOULDERS
TENTATIVE GEOLOGICAL INTERPRETATION ROBERT ST-OXFORD ST
BOREHOLE INFORMATION SUPERIMPOSED ON PROFILE A-A'
PROFILE APPROXIMATELY TO SCALE
0 10 20 30m
HORIZONTAL SCALE
VERTICAL EXAGGERATION ×2
A
A'
ROBERT ST.
BH2
BH3
OXFORD ST
Escarpment possibly an old erosion feature
Clayey sand and gravel
Basalt outcrop
Basalt
Baked sediments
Basalt?
Clay, gravel and some basalt boulders
Clay and gravel and/or weathered silt and sandy silt with plant fragments
Silt and sandy silt with plant fragments
Silt and sandy silt with plant fragments
Depth (m)
0
5
10
15
20
25
30
5 cm

Fig 3.

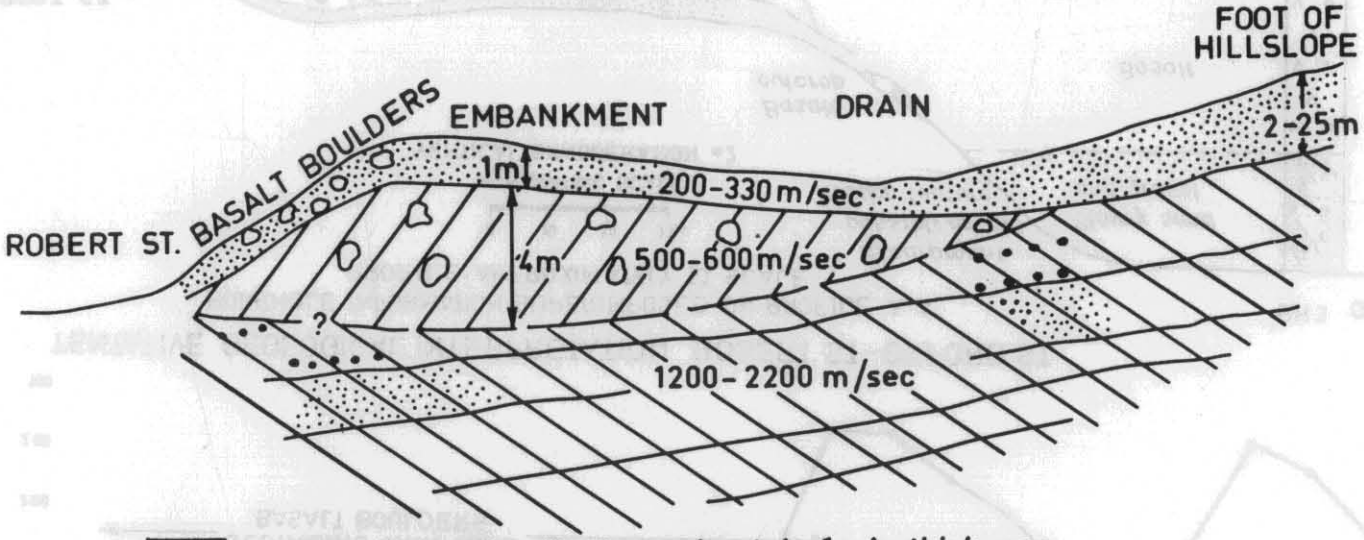
6/7

LOTS 6-9 ROBERT ST.
DIAGRAMMATIC CROSS-SECTION OF EMBANKMENT

GEOLOGICAL INTERPRETATION FROM OUTCROP AND SEISMIC VELOCITES

NOT TO SCALE

D.J. SLOANE



Topsoil-sandy silt. Approximately 1m in thickness

Basalt boulders in clay and/or loose silty sand matrix or weathered Tertiary sediments. Max. thickness 4-5m

Tertiary sediments-Moderately consolidated silts and sandy silts or clay with gravel layers and basalt boulders.

Fig 4.