

1981/52. Slope stability of Lot 1, R. & C.S. Adams subdivision,
Windermere.

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Abstract

A block of land in a known potential landslip area at Windermere was inspected. The topography of the block is complex, with slopes varying between 3° and 15°. This complexity is thought to have been produced by a very old landslip, the toe of which covers much of the block. Basalt boulders are present on the ground surface, with moist, soft, high plasticity clay underlying a thin surface clay layer. One house could be constructed on the block on two alternative sites; the lower site has a considerable slope stability advantage.

INTRODUCTION

A slope stability report was requested by Zeeman and Kable, Barristers and Solicitors, on behalf of a client who wished to purchase Lot 1 of R. and C.S. Adams subdivision at Windermere. This block, covering 2.323 ha, is situated on the eastern side of the River Tamar, approximately 2.5 km from the Windermere turn-off on the East Tamar Highway [EQ017263].

Previous work (Knights, 1973) had shown that Adams Estate possessed unstable slopes, and the area was mapped as Zone III (potential landslip zone) on the Tamar Valley Landslip Zone Map. A site examination of the block was considered necessary, and was carried out on 4 November 1981.

TOPOGRAPHY

The block has a complex topography, with slopes ranging from 3° to 15° (fig. 1). The block is part of the terminal slope of a low ridge that parallels the River Tamar. A narrow, dry, shallow valley is present along the western boundary of the block. The eastern boundary of the block coincides approximately with the valley of a small stream that flows east on the neighbouring block. The north-west corner of Lot 1 is a small section of the ridge crest, with a slope of 3° towards the River Tamar and towards the eastern stream valley. This ridge slope falls by a concave slope of 9° to a narrow bench of 4-5° slope. This bench ends abruptly, with a noticeable break in slope, and the slope steepens to 13-15°. This steep slope flattens gradually to form a long slope of 9°.

At the foot of this slope is a flat river terrace with a slope of 5°. The edge of this terrace is marked by a short slope of 9° to the present river bank, which has a slope of 3°.

The downslope direction swings in an arc from a north-south trend to an almost east-west trend (fig. 1). The ridge crest, the upper bench, and the intervening slope can be traced around the block, as shown in the three sections of Figure 1. In contrast, the steep slope of 13-15°, and its foot slope of 9° merge to form a continuous valley slope of 11° on some parts of the block. The lower terrace, although modified for a farm track, is well marked.

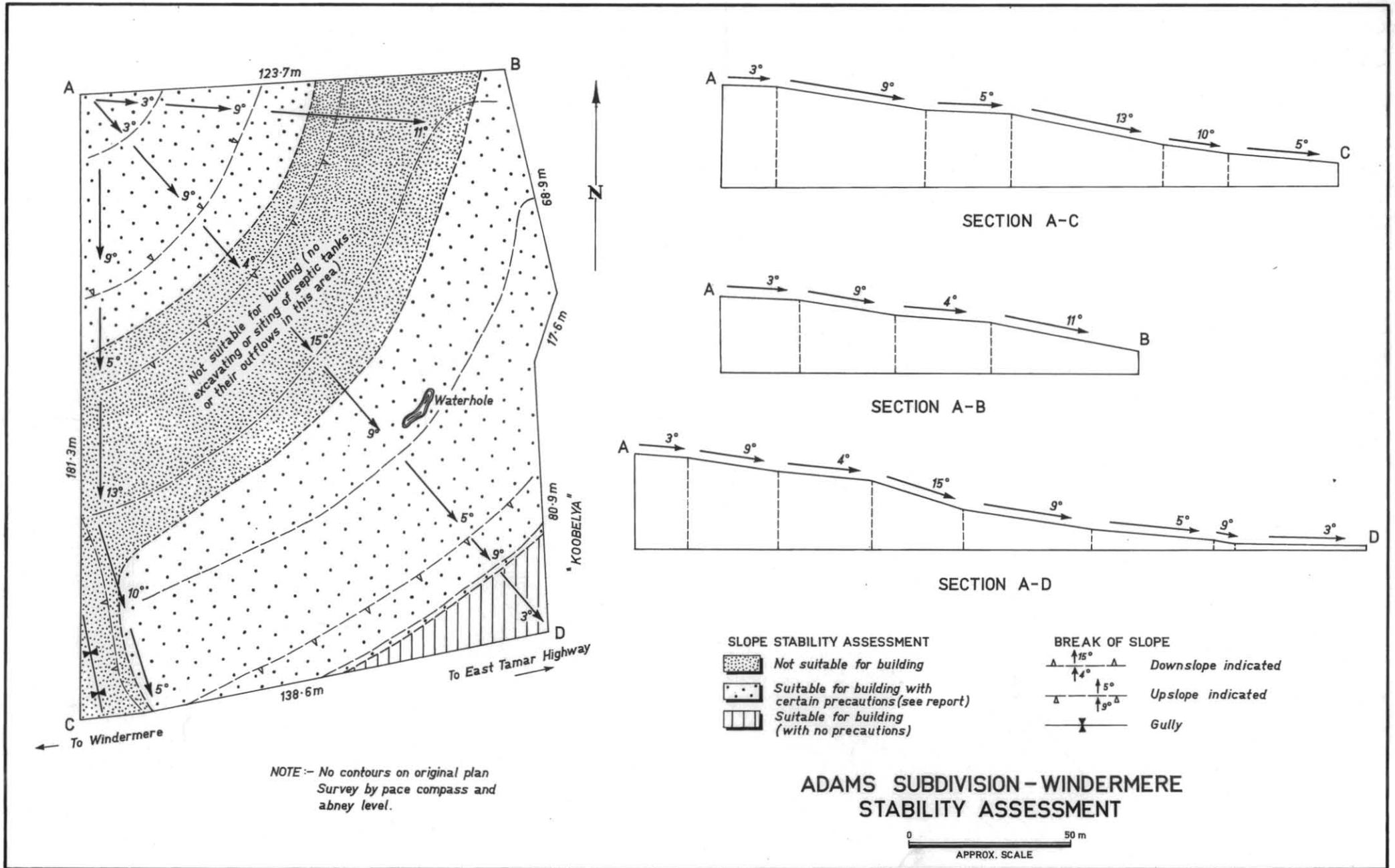


Fig.1

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GEOLOGY

Flat basalt boulders or flags are abundant on the ground surface on the ridge crest, the high bench, and the steep slope. However on the lower slopes and terrace, basalt boulders are few and well scattered.

No basalt rock outcrop exists on the block, and the area is mapped as basalt talus of Quaternary age on the Launceston 1:63 360 geological map sheet (Longman et al., 1964).

A small exposure of the underlying sediments occurs on the side of the western valley, where a surface soil layer 250 mm thick of grey clay with organic material crops out. The clay (CH) possesses a high dry strength, but was very plastic when moistened. A pocket penetrometer gave an unconfined compressive strength of 450 kPa (stiff to hard). The subsoil clay layer (CH) was yellow, very moist, and highly plastic. When tested with a pocket penetrometer, its unconfined compressive strength was between 50-75 kPa, and this clay is classified as firm.

These clays belong to the Launceston Beds of Tertiary age.

MORPHOLOGY

The ridge, the upper bench, and the steep slope that radiate from the north-west corner of the block are thought to be part of the toe of an old landslip. This landslip has flowed from the slopes of Gaunts Hill towards the River Tamar, and is thought to be very old. Both the slip and the low river terrace have been modified by man's activities over time.

The basalt boulders are thought to have been transported to the block by the landslides from Gaunts Hill, where basalt is reported to crop out *in situ*.

SLOPE STABILITY

The presence of an old landslip and plastic clay make all of this block, except for the small area around the river bank and terrace, a potential landslide area. With increasing slope angles this slope sensitivity increases, and for slopes in excess of 9° the risk of failure is too great to warrant building.

Therefore on this block, the prominent steep slope of 11° to 15° (fig. 1) is considered unsuitable for building, and the area where future slope failure would most likely occur. To minimise the risk of failure, no extra water should be drained onto this slope. All stormwater drains, septic tanks, and their overflow drains, should be kept off this slope.

A further precaution is not to load this slope with extra weight. Therefore on the upper bench, a house should be situated at a minimum of ten metres from the bench edge. Equally important is that the foot of this 11-13° slope not be lightened by excavating material from its base. With this in mind, a precautionary border zone of some 15 m of the 9° slope is included in the non-building zone (fig. 1).

CONCLUSIONS

The block is only suitable for one house, as approximately one-third of the area is considered to be too steep and with a high risk of slope failure. The remaining two-thirds is suitable for building, and a house could be sited on two alternative areas (fig. 1):

- (a) the high area in the north-west corner of the block, comprising the crest of the ridge, the high bench with slopes of 4-5°, and the intervening slope of 9°, with the house situated on the bench.
- (b) the lower, larger area of the block between the steep slope and the road.

Of the two locations, the upper one has the potential for landslip, but this risk is considered within acceptable limits provided that the necessary precautions are taken. These precautions are that all excess water from stormwater and the septic tank etc. be piped off the upper bench down the slope to the lower site. The access road to the upper site should not cut into the steep slope, but should follow a route parallel with the eastern boundary and climb the slope up the even 11° slope along the northern boundary (see section A-B, fig. 1).

Of the lower location, there is little or no risk of slope failure on the terrace or on the river bank areas, but there is a possibility that the septic tank overflow may reach the road, particularly in the south-west corner of the block. It would be prudent if no swimming pool or septic tank be located on the 9° slope in this lower area. This location has more area to allow soakage to occur, compared with the high bench area.

RECOMMENDATIONS

- (1) The block be used for only one house.
- (2) No building be undertaken on the steep slope of 11-15°.
- (3) No building should be undertaken in the two bordering areas to this slope. In the upper bench this border zone should be ten metres wide, and at the foot for 15 m down the 9° slope. No excavating should occur in this area, nor should septic tanks or swimming pools be located here.
- (4) If a house is sited on the upper level the risk of a potential failure is accepted. The house should be set ten metres back from the edge of the break in slope. All water and sewage etc. should be piped down this slope to the lower levels, and the access road should climb to the bench by way of the eastern and northern boundaries.
- (5) If the house is positioned on the lower section of the block, a location preferred for slope stability, then care should be taken that septic tank overflow does not reach the road.

REFERENCES

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KNIGHTS, C.J. 1973. Stability of land at Windermere, East Tamar. *Unpubl. Rep. Dep. Mines Tasm.* 1973/91.

[4 December, 1981]