

UR1982-38

1982/38. Slope stability investigation of a proposed subdivision at Windermere

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Abstract

The slope stability of a 32.0 ha block was examined at Windermere, East Tamar. The block comprises a high flat central basalt ridge with a southern slope of basalt talus and Tertiary clay. This slope is steep and falls by a series of steps thought to be an old multiple landslide, the toe of which extends outside the block to the road. The north-eastern slope is long and uniform and appears to have a high potential for slope failure. Restricted building is recommended, preferably in the most stable area of the basalt ridge.

INTRODUCTION

At the request of G.J. Walkem and Company, Surveyors and Planners, a slope stability investigation was undertaken on a proposed subdivision owned by L. Causby at Windermere. The investigation was carried out on 7 October and was confined to a surface examination of the large 32.0 ha block at the rear of Causby's house. The investigation was required by the Lilydale Municipal Council before the proposed subdivision could be approved.

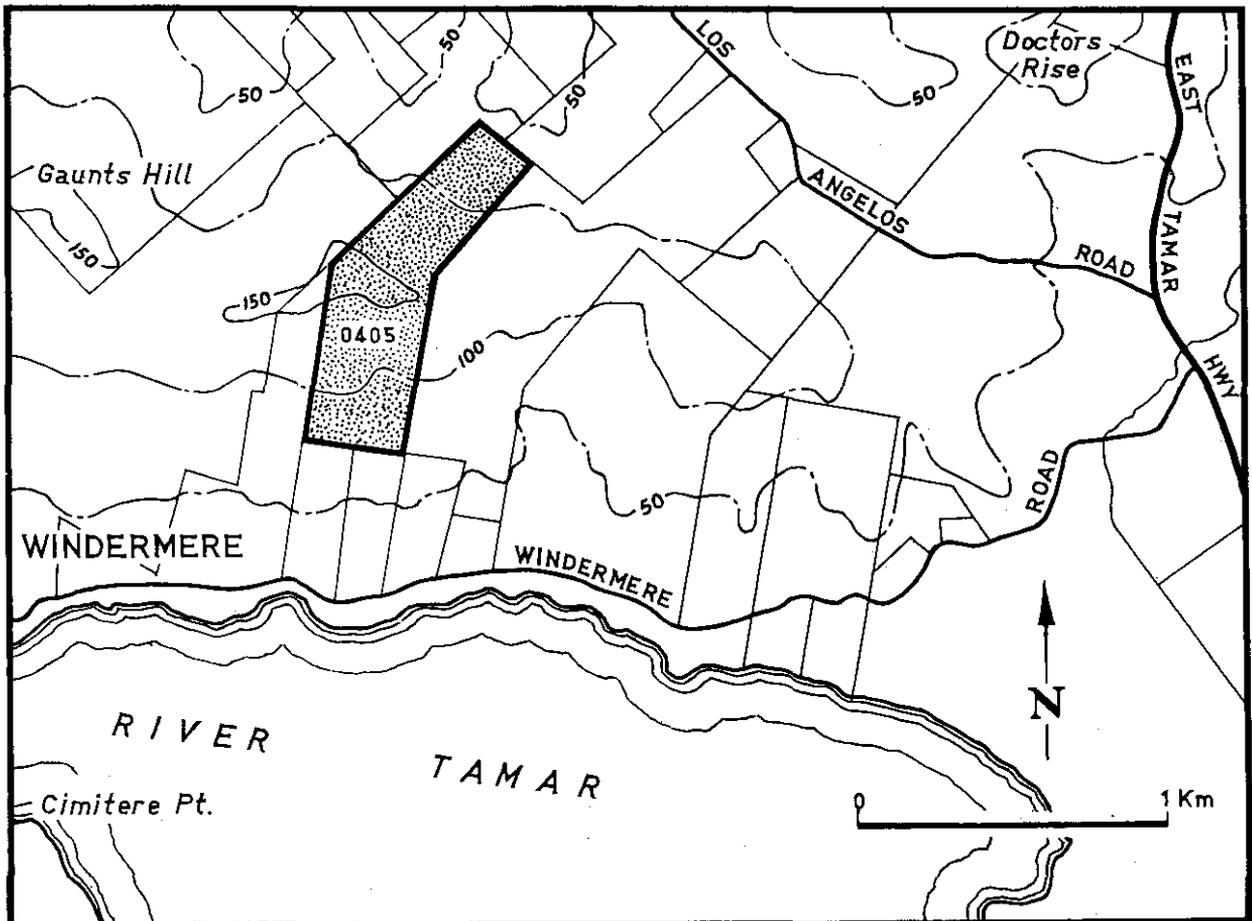
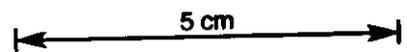


Figure 1. Location of investigation



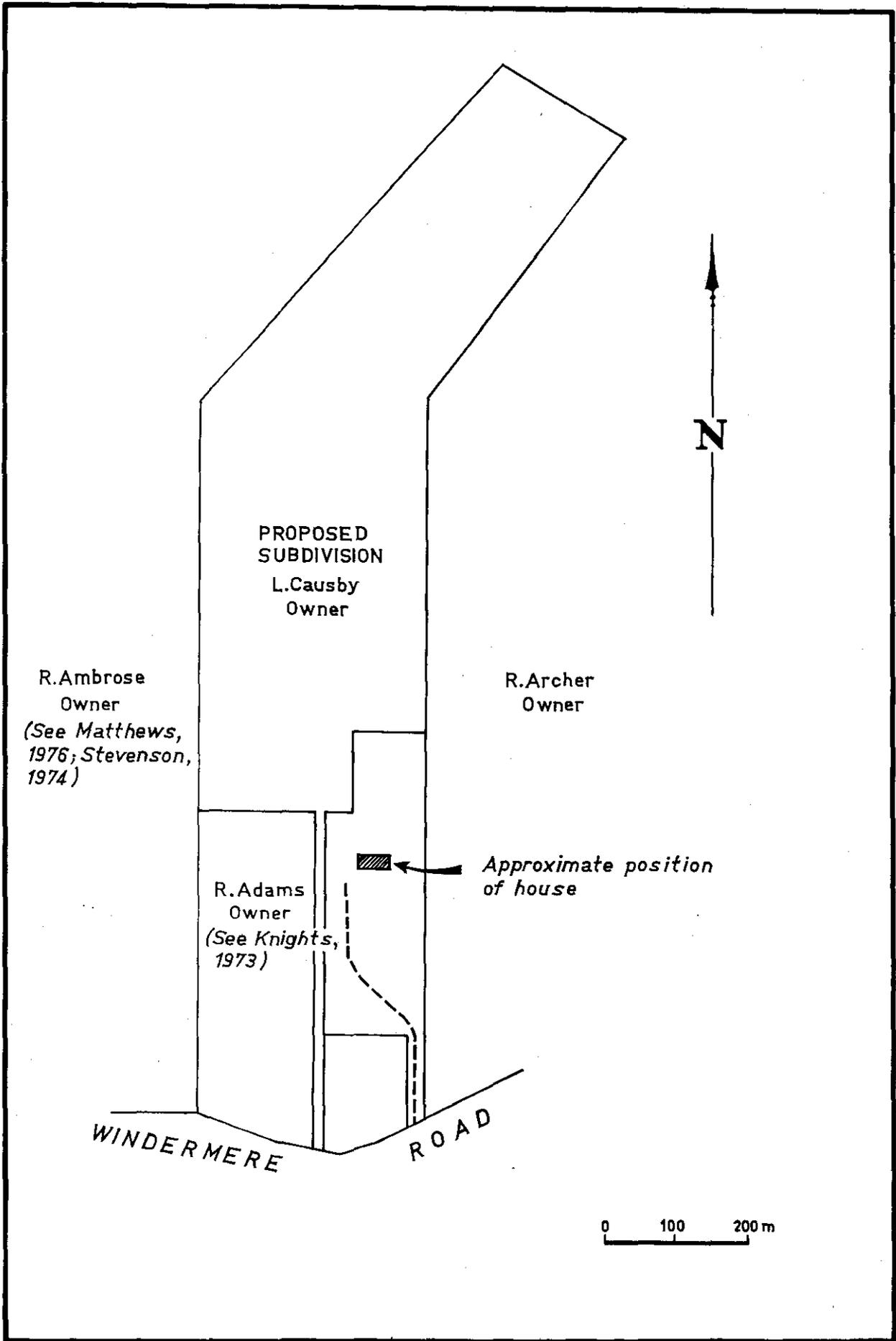
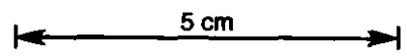


Figure 2.



The block is situated north of Windermere Road [EQ015270] and comprises the majority of the property numbered 0405 on the Dilston 1:25 000 topographic map (fig. 1). The front block of the property 0405 is shown on the proposed subdivision plan submitted by E. Walkem as previously subdivided, with R. Adams as owner (fig. 2). This block has been partly covered by a previous Department of Mines stability report (Knights, 1973; Block 1).

The balance of the land is part of the Gaunts Hill area - a location which is well known for old and active landslides (Knights, 1973; Stevenson, 1974; Matthews, 1976; Moore, 1981), hence the Council's concern even though only one house site is required on the balance of the land. This report deals only with the 32.0 ha northern section of the land, and does not include the three smaller blocks adjoining Windermere Road.

TOPOGRAPHY

Towards the centre of the block is a broad and flat east-west trending ridge with 2 - 3° slopes on the south-eastern and north-eastern margins (fig. 3). This ridge reaches an altitude of 155 m and is an outlier of the Gaunts Hill ridge one kilometre to the north-west.

The south side of the ridge ends with an abrupt steep scarp of 21° at the block's western boundary. This scarp becomes less noticeable eastwards, flattening and finally disappearing towards the eastern end of the ridge. The southern slope is a complex series of steps, composed of short steep scarps and narrow flat terraces at the base of the scarps. The scarps are steep with measured slopes of 19 - 29°. Slope inversion of up to 5° occurs on the flats at the base of the scarps, but the overall slope of the flat terraces is 1 - 2°.

These steps continue to the southern boundary of the block where the slope of 14° flattens to 7° near the water hole. Outside this boundary a break in slope occurs on the neighbouring block, with long slopes of 7 - 8° to Windermere Road. The steps are better developed on the western side of the block and some appear to merge towards the eastern side of the block. In the south-eastern part of the block is an isolated well developed, flat ridge and step with a 19° slope on the south side.

In contrast with the complex southern slope, the north-eastern slope from the ridge towards Los Angelos Road is a simple slope. From the ridge the slope increases to 7 - 8° and then with a break in slope increases to give a long and very uniform slope of 10° to the north-east boundary of the block. The shallow head of a stream valley bisects the block along this boundary. The ground surface is not noticeably hummocky on these long slopes, but cultivation often quickly destroys these small features.

GEOLOGY

The convex broad ridge area is covered with friable red soil (ML) and contains flat outcrops of basalt, as well as isolated patches of pisolitic ironstone pellets - known as 'buck-shot gravel'. Lateritic ironstone boulders are also present. The ridge appears to be underlain by basalt.

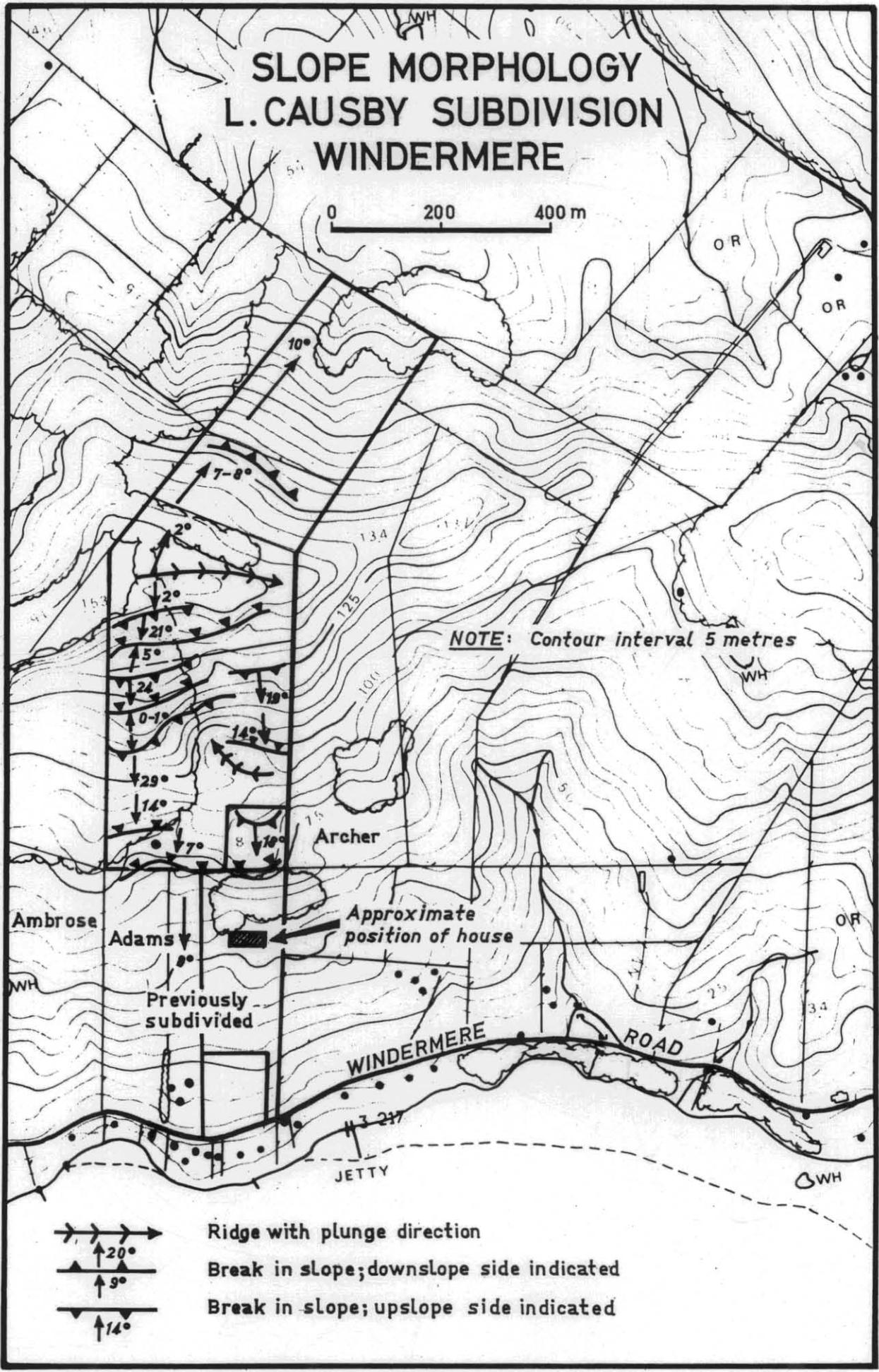
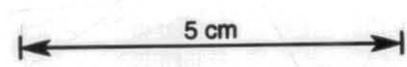


Figure 3.

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Large boulders and blocks of basalt occur with such profusion on the southern slope that the southern half of the block is considered to be a basalt talus slope. Towards the base of this slope around the water hole is highly plastic clay with basalt boulders within the clay (CH) soil forming poor outcrops.

Isolated small basalt boulders and ironstone boulders occur on the north-eastern slope, with some poor outcrops of brown clay of the Launceston Beds of Tertiary age (Longman, 1966). Clay (CH) soils are present on this slope.

LANDSCAPE MORPHOLOGY

The ridge comprises a capping of basalt which has weathered to give a characteristic red soil. Underlying this thin capping of basalt are the clay sediments of the Launceston Beds.

On the southern slope basalt boulders have slumped and have been transported downslope by either a series or one very large old landslide, to form the existing talus slope with its stepped topography. There is no evidence of failure on the north-eastern slope. No talus deposits were seen and the few basalt boulders and their smaller size, and poor outcrops of clay, indicate that the area is underlain by clay of the Launceston Beds. It is unlikely that the basalt flow ever extended northwards over this area.

The presence of a series of scarps and the inversion slopes of the terraces indicate to the writer that the talus slope failed as a large multiple type of landslide. This single failure slide hypothesis appears more likely than a series of small failures causing the basalt ridge to retreat. Stevenson (1974) observed a very large failure on Ambrose's block to the west.

A later parasitic failure probably formed the flat ridge area in the south-east part of the block, or this is possibly a larger segment that has travelled further downslope than the slices on the western side of the block.

There is no evidence of any slope failure on the north-eastern slope towards Los Angeles Road. A series of shallow translational failures of which no surface trace remains is possible. The only evidence for this type of failure is outside the block's boundary to the north-east where an active translational failure of the valley side collapse type is visible on aerial photographs.

Even if this slope has not moved, the potential for movement must be high with such long slopes of 7 - 8° increasing to 10°. These slopes are underlain by clay with properties similar to those tested on Ambrose's neighbouring block (Matthews, 1976).

LANDSLIDE ZONING

This investigation confirms that little modification of the existing regional landslide zoning of the block (fig. 4) is possible. The most stable area of the block (Zone 1) is the flat ridge which is underlain by basalt rock. There is little to no risk of slope failure here, especially if all septic tank overflow and sullage drainage is confined to the ridge area. With such extensive flats this would appear to be no great problem.

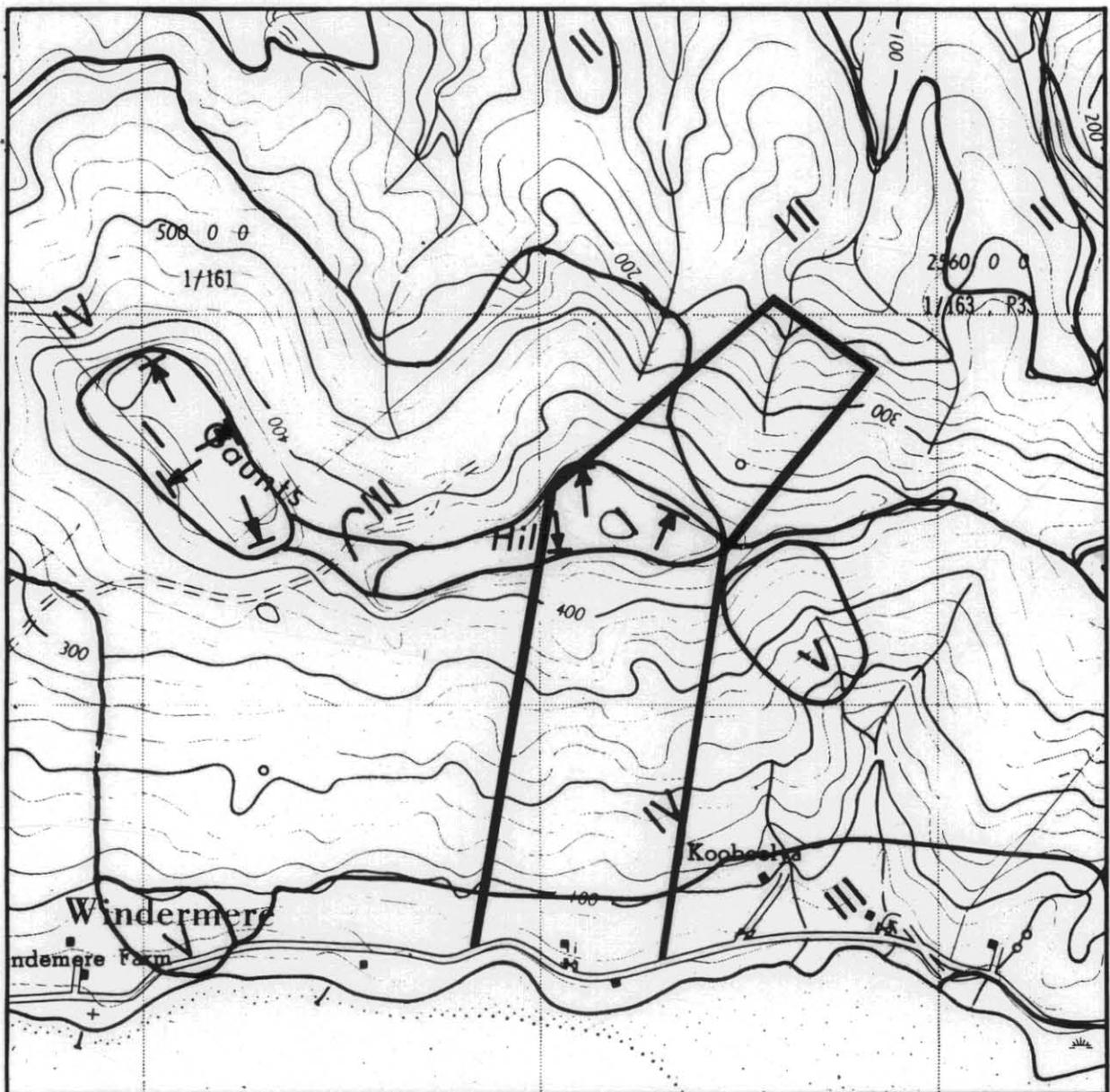
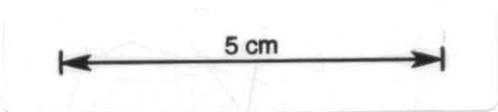


Figure 4. Landslip zone map, Windermere area

- Zone I : Stable ground on hard rocks; no abnormal problems or risks.
- Zone II : Stable ground but on soft rocks; strict adherence to existing building code.
- Zone III : Potential landslip areas; building methods in accordance with a special code.
- Zone IV : Old landslips and adjacent areas; no building without specialised investigation and design.
- Zone V : Active landslips and adjacent areas; no building without specialised investigation and design.



The entire southern slope is considered to compose an old landslide and by definition must remain as a Zone IV area. Of the north-eastern slope, it is possible that the upper 7 - 8° slope should be considered as potential landslide zones rather than as mapped as an old landslide area. With this slope increasing to give long uniform 10° slope the risk of slope failure is considered to be very high, particularly as aerial photographs show in the nearby area what appears to be a shallow translational type of slide. This north-eastern slope area is best considered a Zone IV area.

CONCLUSIONS

(1) Even though this block is 32 ha in area, a large portion is not considered suitable for close subdivision, namely the southern slope and possibly a large portion of the north-eastern slope. The latter will require more detailed subsurface investigation when further subdivision is required. At present close subdivision is not contemplated and according to Mr Walkem, the surveyor and planner of the subdivision, only one house site is required. However future development and closer subdivision appears to be inevitable in such an attractive area as Windermere. Therefore the existing landslip zoning and any restriction placed on the area by the Council because of this risk should remain.

(2) The most stable area is the Zone 1 ridge where little to no stability problems are likely to occur, even with septic tanks and sullage pits, as long as this water is confined to the flat area. Unfortunately to reach this area will require a long access road, which for one house would probably be too expensive to warrant construction.

(3) The only other area on the southern slope large enough for a single house site is the small flat ridge-like area in the south-east part of the block. Even though this structure is thought to have been formed by a later, parasitic slide on an older larger slide, the flat area appears large enough for a single house. The presence of a house would be unlikely to alter the area's stability or reactivate the slide. There is a risk attached to this site but it can be minimised by removing all excess water from sullage and septic tank overflow etc. This site will require further consultation with officers of the Lilydale Municipal Council. The adjoining area with low slopes of 7° appears too limited an area for a house site, especially as all the drainage etc. has to be confined to the block. The existing dam should be drained in the interest of slope stability. If a house site is considered at this locality any cutting into the toe of the 14° slope should be avoided.

RECOMMENDATIONS

(1) Only one house site be considered on the southern slope. This should preferably be situated on the largest available flat area on the ridge in the south-east part of the block. Whether this site is acceptable will depend on if the septic tank water overflow can be drained off this area to the satisfaction of the Lilydale Municipal Council.

(2) The area of least landslide risk is the ridge area and this area is the preferred site for any house.

(3) Any further subdivision, especially on the north-eastern slope, will require further subsurface investigation.

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