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## Landslides at Burnie

by Terence D. Hughes

Portion of the hillside between Avon Street and Bay Street in the Burnie suburb of Parklands has recently moved and caused damage to outbuildings, fences and back gardens on the properties of Messrs. W. J. Davis and B. T. Hope, of Avon Street.

A request was received from the Burnie Municipal Council for a report to determine:—

1. The causes of the slip.
2. Methods of avoiding further slips.

Parklands is a western suburb of Burnie and is situated on the waterfront of Bass Strait between the main town and Cooeee. Behind a narrow coastal plain ranging in height from ten to thirty feet, the hillside rises steeply to one hundred and fifty feet, and then gradually to the general basalt plateau level of two to three hundred feet. Avon Street is parallel to the coastline and the Bass Highway at an elevation of about thirty feet and from this Bay Street sidles up the steep hillside.

Along the seafront is exposed an excellent section of Precambrian rocks, consisting of slates and quartzites, with dolerite intrusions. The top of these rocks can be seen in a cutting in Bay Street at an elevation of one hundred feet above sea level. Above the Precambrian rocks and forming an extensive plateau are large flows of Tertiary basalt. The top of the Precambrian rocks, however, is not horizontal but contains several basalt-filled depressions. One of these occurs just to the east of Bay Street and behind the two houses in question.

Slips are apt to occur at any time in the forward slopes of these basalt hills, but usually they are accentuated by some abnormal absorption of water. In this case there are apparently two factors that have caused the increased seepage of water. They are—

1. The extra run-off of water from the domestic supplies of several new houses built on the brow of the hill adjacent to Bay Street. Much of this water has run into an open drain on the up-hill side of Bay Street. This drain has been choked by weeds and grass and much of the water has then run across Bay Street and soaked into the basalt talus and soil forming the hill-slope. Some of the excess water from the drainage of these houses has also soaked down through the soil of the hillside under the road and further saturated the permeable material. Near the base of the steeper slope of the hill and adjacent to the southern boundaries of the properties

in question is a bed of clay. Water has seeped down to this through basalt, basalt soil and talus, collecting particularly in the basalt-filled depression in the Precambrian rocks. This water has stopped at the impervious clay bed but has lubricated the top of it, forming a greasy head on which the surface of the hill has slipped. It should be noted that the earth movement has occurred at the toe of the hill only.

2. Another factor to aggravate this situation has been the abnormal periods of heavy rainfall this winter. The May rainfall for Burnie amounted to 991 points, compared with an average of 352 points. Much of this water falling on the basalt plateau has been absorbed and has gradually soaked down through the rock and soil until it reached the comparatively impervious Precambrian strata below. It might have taken two or three months before the bulk of this water reached this level. A contributory cause of the slip has been suggested. This is that the increasingly heavy loads carted by large vehicles up the hill of Bay Street have caused sufficient vibration to unsettle the slope. This may have had some effect on the stability of the slope but in my opinion this effect is only of minor nature and the chief cause of the slip is the saturation by excess water.

The provision of adequate drainage is essential in this area to prevent further slipping of the hillside. These earth movements could proceed well up the hillside and even endanger the road. A start has already been made to improve the drainage by cleaning out the drain on the top side of Bay Street. This is an open drain leading into a trap from which the water is piped away. Even when the water is flowing freely down this, a certain percentage must seep through the permeable material underlying it and soak under the road. It is therefore recommended that this drain be concreted. Another drain should be dug near the base of the hill at least a foot into the clay bed, behind the affected properties and parallel to their back fences. This should prevent excess water reaching the earth that has already moved.

In conclusion it must be stressed that municipal councils should exercise extreme care in the granting of permits for sub-division and houses located on the edge of basalt hills. If permits are granted, then it should be only on the understanding that adequate plans for all drainage water have been completed.