

TR8-92-99

1. SLOPE STABILITY AT BEAUTY POINT

by I. Jennings.

A request has been received from the Beaconsfield Council for advice on the stability of slopes in the vicinity of Beauty Point. The area was studied by Blake (1961) and more recently by the writer in connection with landslips affecting the West Tamar Highway in this vicinity. A further examination of the district was made on the 12th and 13th June, 1963.

PHYSIOGRAPHY

Beauty Point township has been built upon the east facing slopes of a low escarpment trending roughly parallel to the shores of Port Dalrymple. To the west of this escarpment the topography is subdued and the drainage system poorly defined. In front of

the escarpment, to the east, the country falls sharply from about 160 feet ASL to a marked bench lying between 80 and 100 feet ASL and then declines fairly uniformly to the sea. The bench was originally occupied by a series of swamps which have been drained by the Public Works Department in order to improve the stability of the slope below. This bench is thought to represent the heel of a major ancient landslide extending from Inspection Head to south of the Beauty Point Wharf. However, it may possibly be an erosional feature related to an earlier cycle of erosion. There is no positive evidence on this point at this stage, but the landslide hypothesis appears to fit the present topography more realistically. Similar major landslide zones may be observed at Bell Bay.

Below this bench the area has been considerably modified by road works, houses and gardens so that the original morphology has been largely obscured. Nevertheless it is possible to recognize the characteristic hummocky topography of a landslide district. At present there are at least 2 active landslips on this slope and geological and historical evidence indicates a general history of instability.

The instability of this and other slopes around Port Dalrymple is by no means unique. The fundamental process of coastline development consists of undermining shorelines by wave and current action and then transporting the material above these marine platforms to the sea. The transport may be effected by a variety of methods, but soil creep, earth flows and landslips are standard mechanisms under appropriate conditions. At Beauty Point the geological conditions favour the mass transport of sediments to the sea by these processes and it is within a zone of this nature that the Beauty Point township has been built.

GEOLOGY

Much of the country around Beauty Point is covered by superficial deposits. However, the recent diamond drilling which has been carried out for the Public Works Department has provided much useful information. The following sequence should only be regarded as provisional and is subject to amendment as more information becomes available.

Quaternary

- (1) Soil, talus, filling, &c.
- (2) Mottled clay and pebbly clay.

Tertiary

- (3) Quartz gravel and sand.
- (4) Basalt.
- (5) Clay and silt with minor sand beds and lignite intercalations.

Brief descriptions of these units are given below:—

Quaternary

Soils, &c.

The hillside at Beauty Point is covered by a variable thickness of soil, landslide debris, talus, redistributed Tertiary gravel and artificial filling. The various materials comprising this blanket merge into one another in an irregular fashion. In some places large boulders of Tertiary basalt are present.

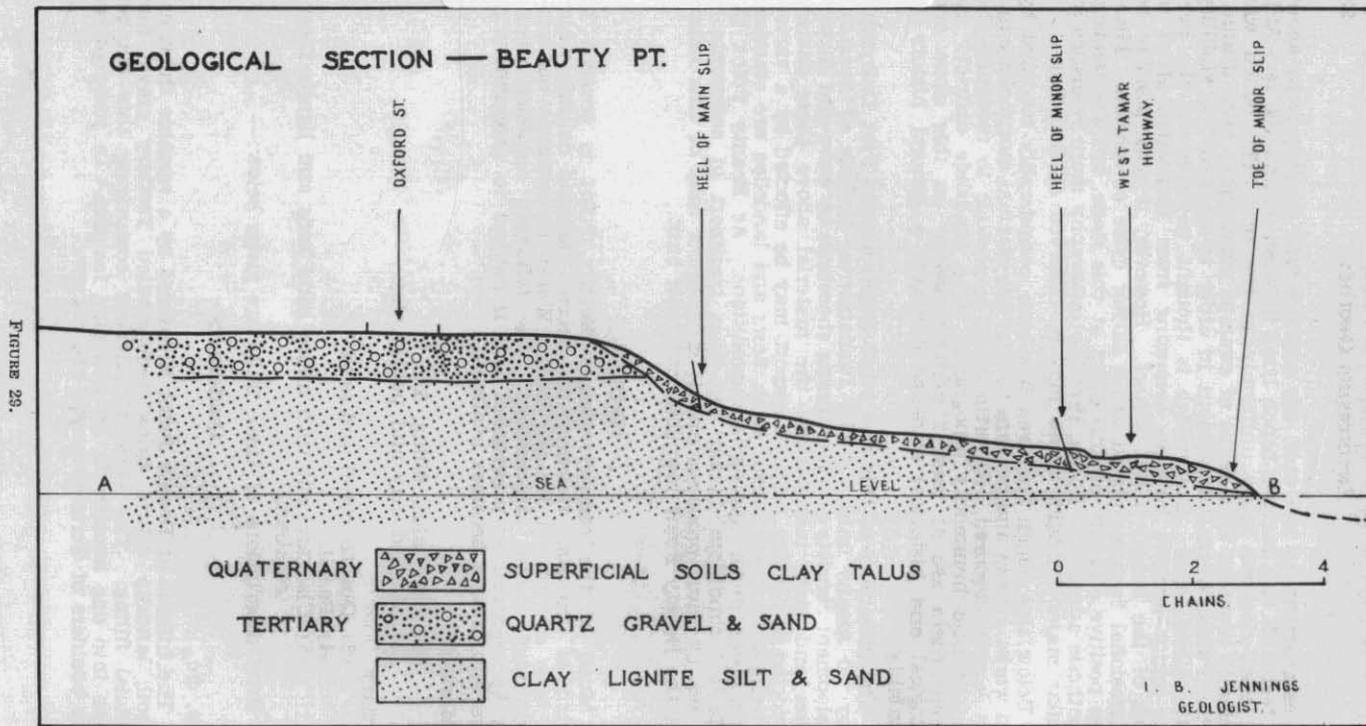


FIGURE 29.

Mottled Clay, &c.

In the course of recent diamond drilling in this area a variable, and possibly discontinuous, layer of clay and pebbly clay was encountered lying between the soil and the Tertiary clay. Unlike the soil and superficial material, this horizon is firm enough to give core in diamond drilling but unlike the underlying Tertiary clay it contains occasional basalt boulders. The maximum thickness of this unit so far encountered is about 30 feet. It probably represents an old talus accumulation.

Tertiary

Quartz Gravel and Sand

The plateau behind Beauty Point is covered by a layer of clean quartz gravel and sand, at least 40 feet thick. This material is widely used for roadworks and as a concrete aggregate. The gravel is very highly siliceous but contains occasional iron stained and somewhat clayey concretions up to several feet across. South of Beauty Point the quartz gravel is underlain by similar gravel but with a brown clay matrix. However, the regional distribution of the varieties of gravel has not been studied in detail. In the Department of Public Works Drill Hole No. 6, drilled from the top of the hill behind Beauty Point, the gravel overlies Tertiary clay directly.

Basalt

Just north of Inspection Head Wharf, Tertiary clay is overlain by about 50 feet of basalt which forms a small steep sided knoll. About halfway up the eastern slope of this knoll there is a distinct bench which indicates either a layer of soft material or an old erosional bench. This outcrop is the only basalt noted in situ in the area although numerous boulders may be seen at other points in the vicinity.

Clay, &c.

These rocks are the oldest noted in the immediate vicinity of Beauty Point. They consist of more than 200 feet of firm clay and silt with occasional sandy beds, numerous fragments and lenses of lignite. Generally the clay is quite firm but when wet it quickly becomes plastic and slippery. Mica is developed along the bedding planes, particularly in the silty layers. In the vicinity of the present road subsidence a bed or lense of coarse waterlogged sand, apparently interbedded with the clay, was noted. However, no similar horizon was encountered during further drilling in the vicinity of Inspection Head Wharf and its distribution appears to be restricted.

SLOPE STABILITY

The slow downslope creep of unconsolidated material is a fairly common feature in Tasmania and several affected areas have been built on without prohibitive risk. There are many causes of creep: frost lifts soil particles slightly and they are then redeposited slightly downslope as the ice crystals melt; surface and sub-surface drainage moves particles downslope, and every opening in the soil whether made by plants, animals or dessication, is closed from the uphill side. Movements of this kind are commonly very slow and do not generally impose destructive forces on properly constructed structures.

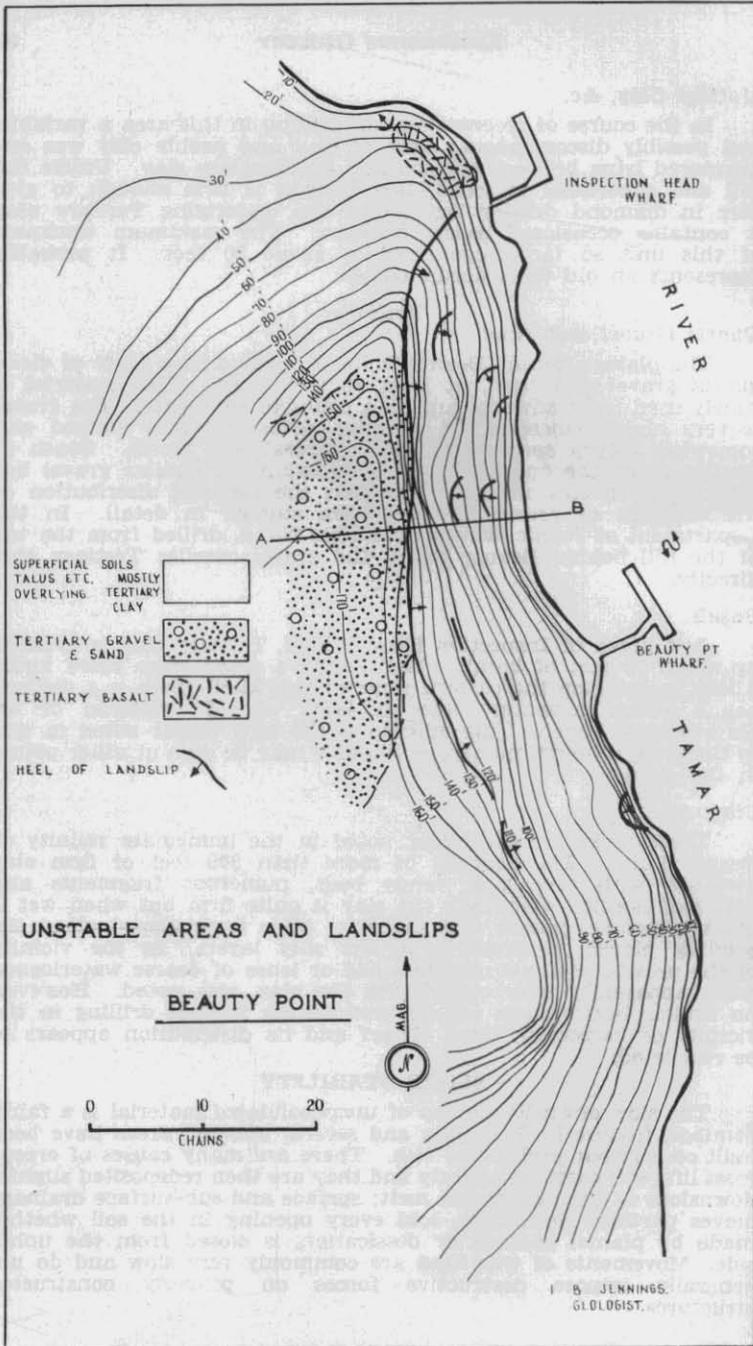
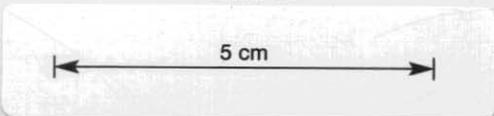


FIGURE 30.



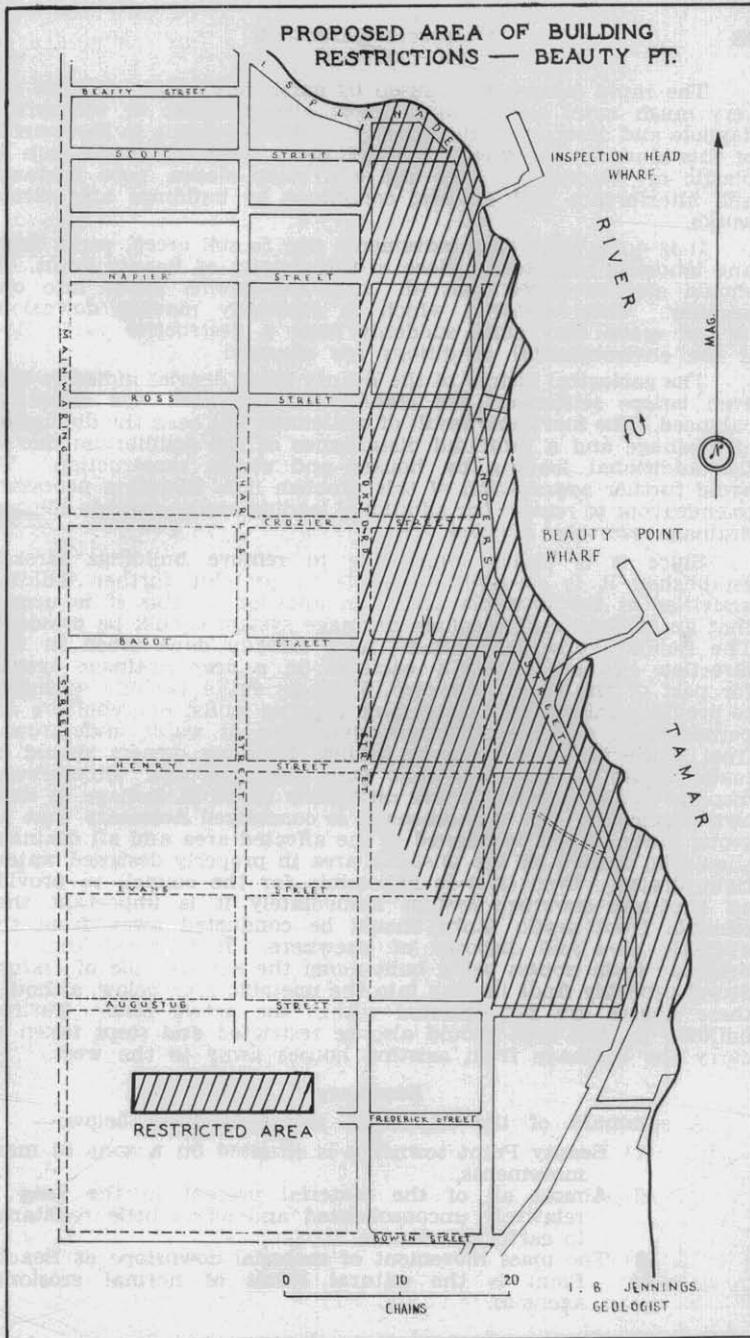
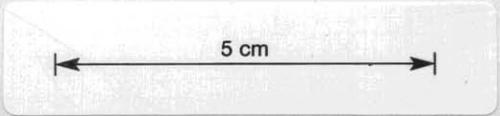


FIGURE 31.



The rapid movements caused by earth flows and landslips are very much more serious and almost always result in widespread damage and destruction to property. Factors leading to movements of this kind are the presence of relatively weak sediments such as plastic or waterlogged clay and silt, steep slopes, poor drainage and interference with natural conditions by buildings and earth-works.

It is quite clear that movements due to soil creep, earth flows and landslips have taken place in the vicinity of Beauty Point. It should also be noted that all these movements grade into one another. Thus material which is gradually moving downslope by soil creep may quite suddenly form a destructive earth flow if the environmental conditions are changed.

The geological history of the Beauty Point district indicates that even before settlement the stability of the area was delicately balanced. The inevitable result of settlement has been the disruption of drainage and a profound disturbance of the equilibrium due to the additional loading by houses and street construction. To avoid further aggravation of this problem it is therefore necessary to endeavour to remove the additional loading and to provide efficient drainage over the affected area.

Since it is clearly impossible to remove buildings already established it is certainly desirable to prohibit further building activities in the unstable area. In addition to this it is urgent that an efficient and adequate drainage system should be provided. The Public Works Department have already done much in this direction and are currently engaged on a deep drainage system for part of the area. However, it seems futile for one authority to provide drainage at considerable expense whilst householders are permitted to divert considerable quantities of water underground from septic tanks and french drains. Property owners should be made aware of the fact that poor drainage and underground disposal of septic effluents will ultimately result in damage to their own properties. For this reason it is considered necessary that all septic tanks should be banned in the affected area and all drainage should be carried off the unstable area in properly designed water-tight drains. Even if it is impossible for the council to provide an adequate sewerage system immediately it is important that effluents from septic tanks should be conducted away from the unstable area and disposed of elsewhere. It is noted that the drainage from houses being built along the eastern side of Oxford Street probably finds its way into the unstable area below, although these houses are not situated within the active zone. Further building in that area should also be restricted and steps taken to carry the drainage from existing houses away to the west.

Summary

A summary of the important points is given below:—

- (1) Beauty Point township is situated on a zone of mass movements.
- (2) Almost all of the material present in the area is relatively unconsolidated and offers little resistance to earth movements.
- (3) The mass movement of material downslope at Beauty Point is the natural result of normal erosional agencies.

- (4) The movement generally is extremely slow, but rapid and destructive movements of relatively small areas can be anticipated. There is no reliable method of predicting which areas are most likely to move and when.
- (5) Development of the area has accelerated movements in an area already unstable.
- (6) The condition can best be improved by restricting further development and by providing adequate drainage.

RECOMMENDATIONS

(1) No further building should be permitted in the area indicated on the enclosed plan.

(2) No stormwater or domestic drainage from this area should be permitted to pass underground. It should be conducted away from the affected area in adequate watertight conduits.

(3) No further permits for septic tanks should be approved in this area.

(4) Priority should be given for the installation of a sewerage system and in the meantime efforts should be made to pipe septic tank effluents out of the area.

(5) Drainage from houses along Oxford Street should not be permitted to pass into the affected area.

(6) Further development of the area should proceed to the west of Oxford Street but before any subdivisions are approved adequate drainage should be provided.

(7) Septic tanks should also be banned to the west of Oxford Street or else facilities provided to conduct the effluents well away from the affected area.

REFERENCE

BLAKE, F., 1961.—Landslips at Beauty Point. *Tech. Rep. Dep. Min. Tas.*, 5, 194-196.