

Report on a landslip at St Leonards.

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This report describes a landslip situated immediately down hill from two water storage tanks at 510 500 yards E 894 500 yards N near St Leonards. The tanks are a storage on the Tamar Water Supply Scheme of Rivers and Waters Supply Commission and the pipeline from the North Esk intake to the East Tamar runs to and from the tanks.

The slopes on which the storage tanks lie are in the Tertiary sediments and consist of plastic clays with subsidiary beds of sand. The flat surface immediately behind the tanks is formed by a bed of weakly cemented gravel and the wooded hillside behind, of basalt.

The writer's attention was first drawn to the slip on 8 October 1968 and he has visited it on numerous occasions since, mostly recently on 10 April 1972.

DESCRIPTION

When examined in October 1968 the valve pit between the tanks contained some water. This was intended to be carried away downslope by a concrete pipe, but slight movement, possibly only swelling after dessication, had separated the joints in the pipe and caused the water to enter the ground rather than flow away over the surface as had been intended. The water had so softened the clay and added to its weight that the slope was locally unable to support itself and it failed along a shallow surface, concave upward, generally parallel with the surface and intersecting it in an ellipse with the long axis downslope. It was not clear at that time whether any previous failure had taken place as natural surface features had been obscured by spoil from the digging of the tank bases.

As is normal with failures of this kind (Stevenson, 1971a; Stevenson and Jennings, 1971; Jennings, 1971) the surface of the slipped mass broke up into slices roughly parallel with the upper (heel) end of the slip with notable backward rotation of each slice and consequent disturbance of normal surface drainage. The fissures resulting from the slicing allowed rapid infiltration of later rainfall and the retention of surface water.

The lower (toe) end of the slip over-rode the original surface and receiving the drainage from higher up, flowed as a slow mud flow. Since then, dry seasons have temporarily stabilised the slip but at the same time cracked the surface by dessication and shrinkage, so that succeeding wet seasons have reloaded and remobilised it. Its area is now five or six times its original extent, the surface having been broken and rebroken, thrust and crumpled and has most significantly left the ground uphill towards the tanks unsupported so that this has in turn failed down hill. The heel has in fact eaten back towards the tanks by some feet.

RECOMMENDATIONS

No complete remedy exists economically in our present state of knowledge. An attempt has been made to improve drainage of the slipped mass by digging surface trenches and by deep stone-filled drains, but further movement has disrupted these devices and the slip, at least in winter and spring, is out of control. A long term cure may be to plant high transpiration trees such as willows and poplars, but temporary stability is required over some years to enable these to become established. Piling or retaining walls have not found favour in the Tamar region due to the high cost and the usual absence

of any firm stratum in the clays.

Any prediction of the slip's behaviour must rely heavily on past history and there is no sign that any long term natural stability is in sight. It is probable that slow advance of the slipped mass down hill will continue, winter by winter, and that eating back toward the tanks will continue.

It must therefore appear prudent that the tanks be drained and put out of use and that the pipe line be diverted away from the slip area.

REFERENCES

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