

Mauao Slope Failures 29 January 2011

Notes on first impressions from the site walk over (s 7(2)(a) - Privacy)
9.30am

Background

The slope failures occurred during or after a period of intense rain, possibly up to 200mm overnight, following a similar amount of rain five days earlier. There were many springs and large surface flows around the slopes four hours after the rain ceased.



Typical flow

Slip above north end of camp ground

This slip occurred in a narrow spur where the end of the spur has been cut away to form the base track and a camp site. It occurred after sunrise and debris flowed across the base track and partially flattened one small tent. The slip was about 5m wide and had excavated about 4m of soil at the top leaving a high vertical headscarp. There was one tension crack about 300mm behind the headscarp and some minor cracking along both edges of the very steep sides of the void.

There was a small seepage of water into the void part way down the left side of the void (looking up from the base) and a large water flow down the valley to the north (beside the boxed steps to the historic stone steps).

The failure appeared to be on a surface of pale sensitive clayey ash (Pahoia Tephra?) removing the younger brown and orange brown ashes from the

slope and leaving these less sensitive ashes standing in the steep faces around the void. There was no obvious Rotoehu sandy ash layer.

The slope failure was probably the result of a rapid increase in ground water pressure combined with an over-steepened toe.

It was considered that as the water pressure within the spur had been relieved there should only be small failures of the head scarp in the short term. It was recommended that the two tents below the slope could be removed, provided someone observed the head scarp while this was carried out. The area was then to be cordoned off until long term stabilisation is carried out. The tent site below the slip should probably be permanently abandoned.

In light of this slip and previous failures in the slopes above the camping ground, it is suggested that the construction of a debris collection bund along the back boundary of the camping ground be considered.

The complex geology of Mauao, with loose boulders in an ash matrix, lava flows, voids etc. appears to encourage concentrations in subsurface water flow which are difficult to predict and renders conventional slope stability analysis procedures impractical.

Slip above reservoir road

There were several slips in the slope immediately above the reservoir access road. These are considered to be due to the over-steepening of the toe of the slopes due to road formation and the high rainfall. Some occurred in areas of previous instability. Further up the slope were some shallow failures of saturated surface soils. Most of the debris was caught on the road.



Shallow surface failure

The main, dramatic slip occurred well up the south-west trending spur above the reservoir road. This slope is well terraced and there is a series of kumara/whare pits along the spur, plus an exposed shelly midden just above the slip.



Pits along spur and shelly midden
(top of slip to the left)



Head scarp

The slip formed about a 2m high head scarp at the top of the slope. There was a deeper gut part way down the slip where it passed through a terrace. There appeared to be some Rotoehu sand towards the base of the head

scarp. The slip appears to have removed the surface soil down through two or three terraces. Below these the slip debris has been washed over the slope and onto the reservoir road. It was considered that there was no movement in the road itself and the buried water mains were undamaged.



Looking down the slip

It appears that the intense rainfall was concentrated in the pits at the top of the slope (which may have been excavated down to the sand layer), it then rapidly soaked through to the sand layer and caused a blow out further downslope due to the high water pressure. The sand layer may already have been under some pressure due to the previous week's rain. The porous midden at the top of the slip may also have contributed to the seepage. A pit full of water was observed elsewhere on the slopes.

Base track

The base track walk over started at the Pilot Bay end of the track. Generally the surface of the track was in good condition except where there was scour due to blocked culverts and concentrated flows.

Along the first section of the track there were several small to moderate sized slumps in the cut faces above the track. The first of these was at the gate. Just past the shelly beach area large flows across the track had scoured out the slope below the small stone wall supporting the track, leaving an almost vertical face below the wall foundation. These foundations need to be checked before any machines travel along the track above. It may be necessary to carry out some remedial work on this slope before progressing around the track .



Scoured wall foundations

Further into the bush section intensive flows have scoured the soil off the slope below the track and caused the fill on the outside of the track to slump (2 to 3m width). The cracking extends almost half way across the track. This will have to be repaired before any machines go beyond this point.



Flow coming down from grassed area above bush

Beyond this slump conditions get progressively worse. There are several extensive slumps above the track reaching to the change in grade at the top of the bush line or above. These slumps have deposited thick mud across the track and down slope into the sea. In the middle of one slump is a pohutukawa which looks partially undermined and precarious, and possibly has another slipped tree caught up behind it (?). This tree should be carefully investigated and remedial work undertaken if necessary before any work is carried out below it.

Just before the direct track going up the slope, there is a major, but narrow slide in a gully which has completely taken out the base track and extends down to the sea. It has deposited knee deep mud on the track to the south and left a large rock balanced where the track was. Progress across this slip was not considered safe in the conditions.

It was considered that the whole Mauao Reserve should be closed and a thorough inspection of all the tracks should be carried out once the extensive water flows had ceased.

Failures below the base track will need to be repaired progressively along the track to allow safe machine access to repair the slips above the track. The slopes above the track will need to be inspected to ensure workers are safe when working below. It may be necessary to halt work and re-inspect the slopes after future periods of intense rain until all the repairs are completed.

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