

Tauranga District Council
Private bag 12022
Tauranga

26 July 2007

For the attention of [REDACTED]

Mauao Slopes; Monitoring Report; July 2007

Last week we carried out the site work for the ongoing slope inspection/rockfall monitoring program.

Items completed included:

1. Discuss developments with [REDACTED]
2. Full walkover reviewing slopes from all tracks. Spring flows, slip movements, rockfall evidence, vegetation development etc recorded and photographed.
3. Laser EDM survey carried out at 6 benchmark group locations on; West, North, East Bluffs and Zone 6.
4. Sets of photos from locations A to M around summit for scour monitoring.
5. Visit all 2005 slip sites and check for re-vegetation, stability and tension crack development.
6. Report on dropout below 4WD track and new pipeline trench.

A summary of findings regarding these items would be:

1. No significant events reported by Ranger.
2. Occasional evidence of minor rockfall on tracks.
3. No significant movement on rock bluff benchmarks (within accuracy of measurement). Ongoing 50mm of settlement of the Zone 6 scaled boulder, which presents no hazard and continues as anticipated.
4. Scour continuing to develop on steep ground with no vegetation cover.
5. Minor continuing movement and surface ravelling on some of the May 2005 flood event slips.
6. * Dropout below 4WD track reported separately (letter dated 24/7/07).

Attached is a summary of the benchmark and slip monitoring data.

In the period since the herbicide spraying programme has been 'on hold', vegetation continues to re-establish. Although the fastest growth has been in some weed species, they are beneficial from a geotechnical point of view in reducing scour and increasing stability.

Scour of sand from non-vegetated patches has continued as previously and certainly has been the source of much minor rockfall, however, as reported previously the majority of this will have occurred during inclement weather, at which times there are

few persons on the tracks. The majority of the rock likely to fall from these loose surfaces is in the smaller size range (say <150mm).

There has been no wide area loose rock scaling carried out since the initial, 2003 operation and that some slope areas now have significant quantities of loose surface rock.

The rockfall hazard probably continues to be highest in the northern areas where rock climbers exiting from the top of routes will walk over unstable slopes from which any disturbed rock freefalls onto the Oruahine with no warning. This hazard is exacerbated by the fact that peak climbing activity will coincide with track walking (ie; at weekends during fair weather).

Photographs:

Each monitoring report will present a very small selection of photographs to illustrate the ongoing processes and any new developments (a full photographic record is stored in our files).



Photograph 1; Minor shallow slipping continues (slip 34)



Photograph 2 (a,b,c); Surface boulder above slip 34 shows signs of impact and has decaying grass underneath.



Photograph 3 (a & b); 18 months after moving 10m this boulder is well embedded again.



Photograph 4 (a & b); Small rocks on the Oruahine track appear likely to have fallen from above.



Photograph 5 (a & b); Ongoing scour on the camp bluff.



Photograph 6; Vegetation re-establishing on the North Western slopes.

Recommendations:

Very much as per our previous reports:

Although the rockfall risks to individuals on single visits may be acceptable, a calculated fatality return periods in the order of ten years may be unacceptable.

For a person regularly walking the Western Oruahine track (under the rock climbing areas) the rockfall risk may be unacceptably high.

The rockfall risk to individual campers appears likely to be acceptable (unless camping on the boundary row for a month or more per year).

Some contributing factors to the current level of rockfall risk can possibly be mitigated relatively easily:

- *It is recommended that rockfall mitigation options be considered for the North West Oruahine Track, the highest risk area. Measures could include access restriction, rock scaling and possibly the consideration of small catch fences.*
- *The hazard to the Campground is likely to be most cost effectively mitigated by monitoring and controlled scaling at the rockfall source areas (if and when necessary) although catch fences continue to be an option. The landslip hazard may present a greater overall threat here (than rockfall).*

July 26, 2007

- *TDC's planting and weed control programme should give priority to establishing grass to help stabilise the loose colluvium.*
- *Public off track access to the steep upper slopes should be prohibited.*
- *Effective track closures must be in place before any TDC staff or contractors access the steep upper slopes off track. Any persons entering these areas must be suitably experienced, competent, trained, equipped, insured etc.*
- *Monitoring and inspection should continue six monthly.*
- *Annual rock scaling is recommended.*

Our next programmed monitoring will be due in the spring (November).

If Avalon can be of any assistance to you with OSH compliant access to steep areas for vegetation management or other purposes then please give me a call.

Regards

s 7(2)(a) - Privacy

For Avalon Industrial Services Ltd.

Attached: Site records for Nov 2006 Slope Monitoring.



Avalon Industrial Services Ltd

Mauao Survey Benchmark Monitoring

9-Nov-06

Area 1a; "Camp Bluff"

Installed post blasting, November 2003

1a The Camp Bluff



Distance measurement mm

	Nov-03	Jan-04	Nov-04	Mar-05	Dec-05	Mar-06	Nov-06	Jul-07
3 → 4		5211	5209	5208	<i>not possible</i>	5207	5208	5215
3 → 5		4320	4320	4321	<i>due to</i>	4320	4323	4323
3 → 6		5179	5180	5178	<i>public</i>	5180	5181	5178
4 → 5		2258	2260	2260	<i>below</i>	2260	2260	2258

Area 2a; "Blasted Column"

Installed post blasting, November 2003

2a Columns



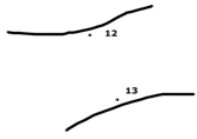
Distance measurement mm

	Nov-03	Jan-04	Nov-04	Mar-05	Dec-05	Mar-06	Nov-06	Jul-07
8 → 11		7917	7910	7907	<i>not possible</i>	7906	7915	7905
8 → 9			9968	9969	<i>due to</i>	9970	9968	9968
10 → 8			3111	3111	<i>public</i>	3112	3126	3126
10 → 9			11636	11636	<i>below</i>	11633	11635	11634
10 → 11			8325	8325		8325	8325	8325

Area 2i; "Elephants Joint"

Installed March 2003

2i Elephant joint



12 → 13

		Distance measurement mm								
		Mar-03	Nov-03	Jan-04	Nov-04	Mar-05	Dec-05	Mar-06	Nov-06	Jul-07
		2885		2884	2882	2887	2887	2887	2887	2885

Area 3a; "North East Bluff"

Installed March 2003

3a Bluff top



14 → 17
 15 → 17
 16 → 17
 15 → 16
 15 → 14

		Distance measurement mm								
		Mar-03	Nov-03	Jan-04	Nov-04	1/03/2005 *	Dec-05	Mar-06	Nov-06	Jul-07
14	→	8110			8122	8124	8129	8129	8135	8130
15	→	5050			5050	5049	5050	5050	5056	5056
16	→	4868			4874	4877	4879	4879	4868	4869
15	→	3575			3581	3571	3577	3577	3575	3575
15	→	7560			7478	7488	7485	7485	7484	7486

*EDM

Blocks above Area 3d; "North Promontary"

Installed March 2003

Above 3d



Distance measurement mm

			Mar-03	Nov-03	Jan-04	Nov-04	1/03/2005 *	Dec-05	Mar-06	Nov-06	Jul-07
18	→	19	5248			5265	5256	5256	5254	#	5253
20	→	19	3380			3385	3373	3376	3376	3377	3375
20	→	18	8038			8065	8050	8056	8050	8053	8053

* EDM WITH BLOCK (=-10)

not recorded

Zone 6 Boulder 6b

Installed December 2005

23 (LH outcrop) 22 (RH Outcrop)
 21 (boulder)

				Dec-05	Mar-06	Nov-06	Jul-07
21	→	23		7560	7590	7615	7663
21	→	22		5799	5830	5865	5999