



Tauranga District Council
Private bag 12022
Tauranga

6 August 2010

For the attention of [REDACTED] s 7(2)(f)(ii)

Dear [REDACTED] s 7(2)(f)(i)

Mauao Slopes; Monitoring Report for 10 June 2010

Please find set out below a brief report following the recent slope and rockfall monitoring.

Routine work items completed included:

1. Discuss developments with Ranger.
2. 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.

A summary of findings regarding these items would be:

1. No significant rockfall or slip events have been reported to or observed by Ranger staff since the previous monitoring (December 2009).
2. This walkover found some evidence of recent minor rockfall, which is as would be expected and confirms that rockfall does occasional cross tracks – see photographs 1 & 2.
3. The survey found no significant recent movement of the rock bluff benchmarks, however, analysis of the long term results (detailed later in this report) does now show a general slow creep of the bluffs at rates in the order of mm/year as the rock weathers and joints open (see later notes).
4. Scour is locally ongoing as anticipated on steep colluvial ground where there is little vegetation cover and exposed sand. That said, the vegetation has been very well managed over the last few years and cover continues to improve.
5. The May 2005 flood event slips now appear to have mostly locked up and in general are mostly re-vegetating well. There a few release scarps which are still actively eroding but these pose no risk, see photographs 3 & 4.



Photograph 1 & 2; Minor rockfall evidence alongside Waikorere track.



Photograph 3 & 4; Ongoing minor erosion at 2005 slip crests.



Photograph 5 & 6; Waratah posts (now removed)

Vegetation continues to re-establish well under TDC's management plan. In general appearance Mauao's slopes and tracks appear in excellent condition.

Whilst carrying out the walkover inspection two sets of two 'waratah' posts were found in the 'bowl' area off the end of the 4WD track hairpin bend. The posts did not appear very well embedded or strong. We tried to pull one out to check depth and with very little effort it broke off with brittle failure just above ground level, see photographs 5&6.

Searching our previous monitoring photographs, we found the posts were installed in this location between December 07 and November 08. They appeared likely to have been used

for some height safety/abseiling purpose unknown to TDC or Avalon. At TDC's request Avalon removed them and searched for and removed a number of other posts.

The small 'camp bluff ledge' we monitor as a typical example was inspected and again showed a rearrangement of the rock debris. The following photographs show the changes over the last 6 years, demonstrating how ongoing weathering continues to move around sand, gravel and small rocks on bluff ledges. Occasionally these processes will release rockfall towards the tracks below.



July 2004

May 2005

July 2005



Dec 2005

July 2007

Dec 2008



June 2009

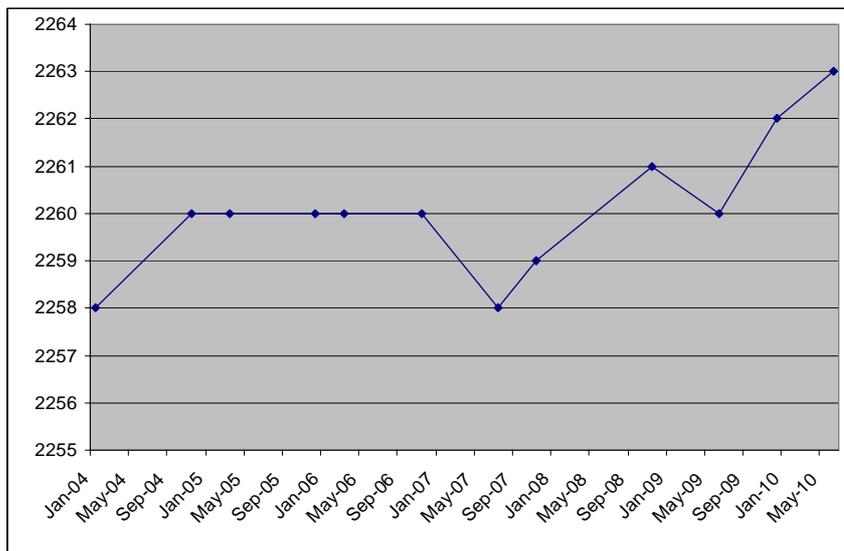
Dec 2009

June 2010

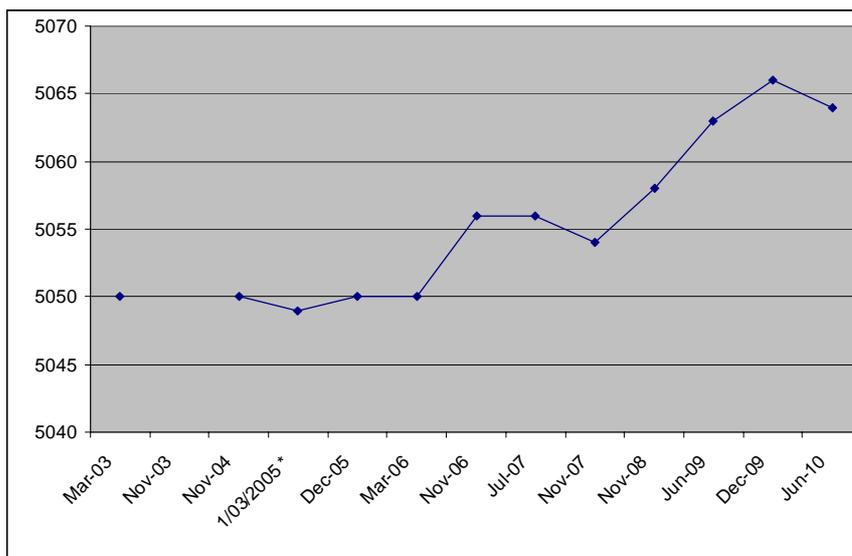
As we are now over 6 years into the monitoring, it is interesting to look at the long term movements on some of the rock outcrops monitored by survey points:

We have a total of 23 survey benchmarks installed in 6 groups. The field measurement technique used is generally accurate to within plus or minus a few mm (depending on distance being measured, wind, rain, surveyor stability etc). Detailed site record sheets are appended to this report.

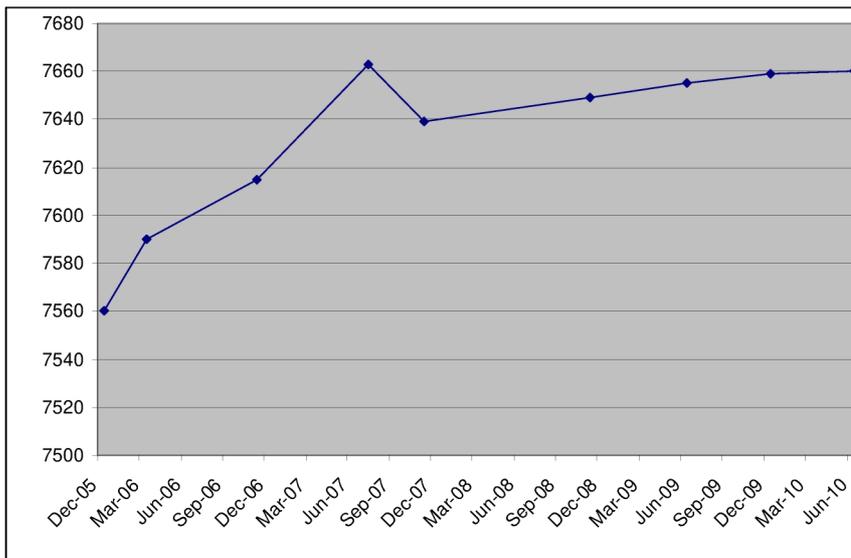
As would be expected, some of the areas show a slow creep movements as weathering opens joints in the rock mass. The following plots are indicative of the type of movement detected.



Camp bluff; Average 1mm/yr over the last few years.



3A NE bluff up to a few mm/yr over the last 4 yrs.



Zone 6B Scaled Boulder; 100mm in 5 yrs, slowing as it settles into the soil.

These movements are not cause for alarm but are another indicator of the fact that erosion is ongoing. Minor rockfall does occur relatively often and larger falls will occur occasionally.

The risk posed to persons by rockfall on Mauao is real but for track walkers, probably acceptable to TDC at present.

As mentioned previously, if campground chalet developments are to go ahead we would recommend serious consideration of measures to mitigate the risks.

Our next programmed monitoring will be due in December

If you have any queries or there are any developments in the meantime please don't hesitate to contact me at any time.

Regards

s 7(2)(a) ... Privacy

Attached: Site records for June 2010 Slope Monitoring.



Area 1a; "Camp Bluff"

1a The Camp Bluff



Distance measurement mm

	Nov-03	Jan-04	Nov-04	Mar-05	Dec-05	Mar-06	Nov-06	Jul-07	Nov-07	Nov-08	Jun-09	Dec-09	Jun-10
3 → 4		5211	5209	5208	5208	5207	5208	5215	5210	5207	5208	5212	5209
3 → 5		4320	4320	4321	4321	4320	4323	4323	4319	4322	4322	4324	4324
3 → 6		5179	5180	5178	5178	5180	5181	5178	5178	5178	5180	5182	5183
4 → 5		2258	2260	2260	2260	2260	2260	2258	2259	2261	2260	2262	2263

Area 2a; "Blasted Column"

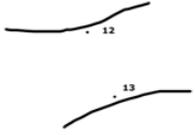
2a Columns



	Nov-03	Jan-04	Nov-04	Mar-05	Dec-05	Mar-06	Nov-06	Jul-07	Nov-07	Nov-08	Jun-09	Dec-09	Jun-10
8 → 11		7917	7910	7907		7906	7915	7905	7906	7905	7910	7913	7913
8 → 9			9968	9969		9970	9968	9968	9964	9973	9971	9971	9968
10 → 8			3111	3111		3112	3126	3126	3126	3114	3114	3113	3115
10 → 9			11636	11636		11633	11635	11634	11634	11634	11630	11636	11636
10 → 11			8325	8325		8325	8325	8325	8320	8327	8325	8326	8323

Area 2i; "Elephants Joint"

2i Elephant joint



12 → 13

Mar-03	Nov-03	Jan-04	Nov-04	Mar-05	Dec-05	Mar-06	Nov-06	Jul-07	Nov-07	Nov-08	Jun-09	Dec-09	Jun-10
2885		2884	2882	2887	2887	2887	2887	2885	2885	2887	2889	2883	2886

Area 3a; "North East Bluff"

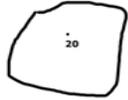
3a Bluff top



		Mar-03	Nov-03	Nov-04	1/03/20C	Dec-05	Mar-06	Nov-06	Jul-07	Nov-07	Nov-08	Jun-09	Dec-09	Jun-10
14	→	17	8110	8122	8124	8129	8129	8135	8130	8132	8128	8130	8132	8129
15	→	17	5050	5050	5049	5050	5050	5056	5056	5054	5058	5063	5066	5064
16	→	17	4868	4874	4877	4879	4879	4868	4869	4880	4880	4882	4879	4880
15	→	16	3575	3581	3571	3577	3577	3575	3575	3573	3581	3583	3579	3575
15	→	14	7560	7478	7488	7485	7485	7484	7486	7486	7488	7487	7486	7482

Blocks above Area 3d
North Promentary

Above 3d



	Mar-03	Nov-03	Nov-04	1/03/200	Dec-05	Mar-06	Nov-06	Jul-07	Nov-07	Nov-08	Jun-09	Dec-09	Jun-10
18 → 19	5248		5265	5256	5256	5254		5253	5253	5255	5256	5255	5257
20 → 19	3380		3385	3373	3376	3376	3377	3375	3374	3376	3379	3378	3377
20 → 18	8038		8065	8050	8056	8050	8053	8053	8054	8057	8056	8062	8057

Zone 6 Boulder 6b

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

	Dec-05	Mar-06	Nov-06	Jul-07	Nov-07	Nov-08	Jun-09	Dec-09	Jun-10
21 → 23	7560	7590	7615	7663	7639	7649	7655	7659	7660
21 → 22	5799	5830	5865	5999	5891			5911	5914