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GEOTECHNICAL

Tauranga District Council
Private bag 12022
Tauranga

20 January 2014

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

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

Mauao Slopes; Monitoring Report for December 2013

This letter is to report on survey benchmark monitoring and the site geotechnical walkover completed December 2013. Our previous monitoring was in May 2013.

A) Work items completed at this monitoring included:

- Discuss developments with Ranger.
- Walkover reviewing slopes from all tracks. Spring flows, slip movements, rockfall evidence, vegetation development etc. Recorded and photograph.
- Laser EDM survey carried out at 6 benchmark group locations on; West, North, East Bluffs and Zone 6.
- Sets of photos from locations A to M around summit for scour monitoring.
- Check previous slip sites re-vegetation, stability and tension crack development.

B) Summary of findings:

- No significant rockfall or slip events have been reported to the Ranger's staff since the previous monitoring.
- No significant movement was measured on the benchmark surveyed bluffs.
- No indications of significant new slip movement were found.

B) Comments

As usual we have commented on a few points of interest, this time concentrating on the lower slopes.

Our first photographs are of a small eroding slope above and behind one of the camp ground cabin site's retaining walls. In 2012 a small boulder was noted as having very recently rolled out of the bank (Photo 1).

On this visit we found the boulder had moved forward very slightly but appears to have had smaller rocks hand-placed beneath it to add support. Interesting and a good thing that this type of issue is being spotted, presumably by the camp maintenance staff?



Photo 1; September 2012



Photo 2; December 2013



Photo 3; Area above camp ground on harbour side

A thorough walk through this area found no signs of recent instability but was a reminder of how steep these particular slopes are and the fact that they appear to be the scarp of a historic landslide which, if reactivated, could result in a significant debris flow into that area of the camp ground.

A hundred metres or so further west a small rock was found which when rolled had fresh grass below. See photo's 4 & 5, below:



Photo 4 & 5

This rock may have originated from the bank near the active rabbit hole or may have fallen from higher above.



Photo 6. Boulders above the lower 4WD track.

These boulders have been static for some time but are a reminder of how easily some rockfall can be triggered by ongoing erosion or a soil slippage below.

Photo 7, below is of a historic (2005) slip on the north western slope, the crest of which continues to slowly migrate up-slope.



Photo 7.

The next area to be walked over was the fence line indicated on the following photo. This proved interesting as the fence contains evidence of a number of rockfall impacts in an area which would probably not be thought of as particularly hazardous.



Photo 8; Fenceline walked.



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Photo 14

Photo 14, above, is of an actively eroding slope above the western base track. Boulders can be seen in the slope face which will continue to be a source of rockfall and risk to walkers on the track. The reason incidents are not reported more frequently is probably that most occur during inclement weather.



Photo 15

This gully is re-vegetating very nicely. Below is a reminder of it's appearance in 2005.



Photo 16; 2005

We next walked up the closed track which used to link the base track with the 4WD track. This track has been closed for around 10 years. It now contains significant evidence of damage and some rockfall.



Photo 17. Closed track linking base and 4WD on west side.

Just off this track is a large old soil slip which contains more eroding out boulders which are likely to fall on the base track. See photo 18, below.



Photo 18

Some of the soil slips on the lower slopes are at the point where a programmed rock scaling exercise could be of use in proactively removing the marginally stable boulders now protruding from the steep soil faces.

The remainder of the walkover covered the Waikorere, Oruahine and summit areas and found only the usual evidence of ongoing erosion and small rockfall.

Please report any slips and/or rockfall events as soon as possible and we can incorporate them into the next monitoring visit or investigate immediately if required.

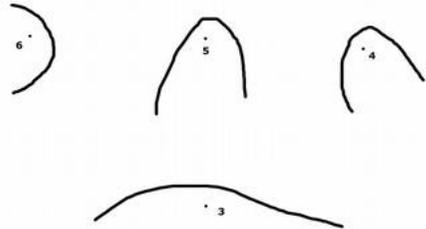
If you have any queries please don't hesitate to contact me at any time.

Regards



Area 1a; "Camp Bluff"

1a The Camp Bluff



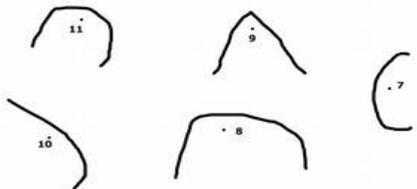
3	→	4
3	→	5
3	→	6
4	→	5
3	→	4
3	→	5
3	→	6
4	→	5

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
	5211	5209	5208	5208	5207	5208	5215	5210	5207	5208
	4320	4320	4321	4321	4320	4323	4323	4319	4322	4322
	5179	5180	5178	5178	5180	5181	5178	5178	5178	5180
	2258	2260	2260	2260	2260	2260	2258	2259	2261	2260
Dec-09	Jun-10	Dec-10	Jul-11	Mar-12	Sept 12	May-13	Dec-13			
	5212	5209	5210	5206	5214	5206	5205	5209		
	4324	4324	4324	4320	4327	4320	4321	4320		
	5182	5183	5182	5178	5171	5182	5182	5182		
	2262	2263	2262	2263	2262	2263	2261	2261		

Area 2a; "Blasted Column"

2a Columns



8	→	11
8	→	9
10	→	8
10	→	9
10	→	11
8	→	11
8	→	9
10	→	8
10	→	9
10	→	11

Nov-03	Jan-04	Nov-04	Mar-05	Dec-05	Mar-06	Nov-06	Jul-07	Nov-07	Nov-08	Jun-09
	7917	7910	7907		7906	7915	7905	7906	7905	7910
		9968	9969		9970	9968	9968	9964	9973	9971
		3111	3111		3112	3126	3126	3126	3114	3114
		11636	11636		11633	11635	11634	11634	11634	11630
		8325	8325		8325	8325	8325	8320	8327	8325
Dec-09	Jun-10	Dec-10	Jul-11	Mar-12	Sept 12	May-13	Dec-13			
	7913	7913	7910	7912	7908	7912	7912	7912		
	9971	9968	9963	9966	9963	9964	9964	9964		
	3113	3115	3113	3115	3114	3113	3112	3112		
	11636	11636	11637	11632	11630	11634	11462*	11637		
	8326	8323	8330	8334	8336	8335	8320	8320		

* suspect should be 11642. All others OK so check next time

Area 2i; "Elephants Joint"

12 → 13

2i Elephant joint



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

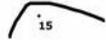


Dec-10	Jul-11	Mar-12	Sept 12	May-13	Dec-13
2885	2883	2886	2885	2881	2882

3a Bluff top



		Mar-03	Nov-03	Nov-04	1/03/200	Dec-05	Mar-06	Nov-06	Jul-07	Nov-07	Nov-08	Jun-09
14	→	17	8110	8122	8124	8129	8129	8135	8130	8132	8128	8130
15	→	17	5050	5050	5049	5050	5050	5056	5056	5054	5058	5063
16	→	17	4868	4874	4877	4879	4879	4868	4869	4880	4880	4882
15	→	16	3575	3581	3571	3577	3577	3575	3575	3573	3581	3583
15	→	14	7560	7478	7488	7485	7485	7484	7486	7486	7488	7487

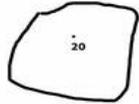


		Dec-09	Jun-10	Dec-10	Jul-11	Mar-12	Sept 12	May-13	Dec-13
14	→	17	8132	8129	8127	8129	8130	8132	8130
15	→	17	5066	5064	5068	5058	5061	5056	5059
16	→	17	4879	4880	4877	4878	4880	4883	4877
15	→	16	3579	3575	3576	3576	3572	3572	3574
15	→	14	7486	7482	7490	7493	7485	7490	7491

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
18	→	19	5248		5265	5256	5256	5254		5253	5253	5255	5256
20	→	19	3380		3385	3373	3376	3376	3377	3375	3374	3376	3379
20	→	18	8038		8065	8050	8056	8050	8053	8053	8054	8057	8056
			Dec-09	Jun-10	Dec-10	Jul-11	Mar-12	Sept 12	May-13	Dec-13			
18	→	19	5255	5257	5254	5256	5248	5257	5253	5252			
20	→	19	3378	3377	3378	3379	3378	3382	3380	3378			
20	→	18	8062	8057	8052	8055	8050	8056	8056	8055			

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	Dec-10	Jul-11	Mar-12	Sept 12	May-13	Dec-13
21	→	23	7560	7590	7615	7663	7639	7649	7655	7659	7660	7665	7671	7679	7699	7700	7702
21	→	22	5799	5830	5865	5999	5891			5911	5914	5920	5929	5939	5959	5962	5968