From: "Michael Hansen" <Mhansen@rbgengineering.com>
To: <dshaver@andalex.com>, <jlewis@andalex.com>, <jsorensen@andalex.com>, <James_Kohler@blm.gov>, <Jeff_McKenzie@blm.gov>, <Stan_Perkes@blm.gov>, <Steve_Falk@blm.gov>, <steve_rigby@blm.gov>, <ecc@emerytelcom.net>, <mkstilson@hotmail.com>, "Brad Price" <bprice@rbgengineering.com>, "Rob johnson" <robj@rbgengineering.com>, <bretdixon@utah.gov>, <davemarble@utah.gov>, <karlhouskeeper@utah.gov>, <pamgrubaughlittig@utah.gov>, <petehess@utah.gov>, <waynehedberg@utah.gov>
Date: 3/28/2006 8:49:17 AM
Subject: Grassy Trail Dam Seismic Update March 24,2006

Hi,

For the one-week period between March 17 and March 24, 2006 the number of MIS (Mining Induced Seismicity) earthquakes was 13 with a high magnitude of 2.1. The Hillside accelerometer recorded 53 seismic events while the Dam unit recorded 42 events. During the week PGA values decreased from a previous high on the Hillside of 0.348g to 0.219g, and on the Dam from 0.268g to 0.191g.

Also attached are emails discussing corrected inclinometer data. The "re:" email came first with the "Fwd:" email coming second and includes review comments from Brad Price.

Thanks

Michael Hansen
Engineering Geologist

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RB&G ENGINEERING
Grassy Trail Dam, Seismic Summary for March 24, 2006

For the one-week period between March 17 and March 24, 2006 the number of MIS (Mining Induced Seismicity) earthquakes recorded near the site by the UUSS increased from 10 to 13. It should be noted that there were two 1.6 magnitude earthquakes which occurred on the 16th and 17th of last week which were recorded on last weeks instrument readings but were not reported by the UUSS until after our report went out on the 20th. This brings the previous weeks total earthquakes up from 10 to 12.

These MIS earthquakes ranged in magnitude from 1.3 to a high of 2.1. Down from the higher 2.6, 2.3, and 2.2 magnitude earthquakes from the previous week.

The number of events recorded on the Hillside accelerometer increased during the past week from 43 to **53** seismic events. The Dam unit increased from 41 to **42** events.

During the week PGA values decreased from a previous high on the Hillside of 0.348g to **0.219g**, and on the Dam from 0.268g to **0.191g**.

While mining continues to move away from the axis of the dam the lag time between mining and the rock-bursts will likely lead to additional rock-bursts in the area nearest the dam.

Marc Stilson with the Division of Water Rights meet with me at the dam on the 24th to inspect the area. He noted that there appeared to be some surficial sloughing and cracking along the near vertical slope above the outlet works which had been worked on near the end of 2005. As shown in the attached photo the area is just northwest of the seepage area which does not hold snow in James's weekly photos. This movement appears to be related to a combination of wetting and drying, and freeze-thaw on a very steep bare slope. While the depth of movement may only be a few inches deep Mr. Stilson recommended that a few lines of survey points be place across the slope to document future movement. We do not feel that the movement on this steep slope is related to mining or presents a hazardous condition to the dam at this time.

Michael Hansen
RB&G ENGINEERING

Event Report

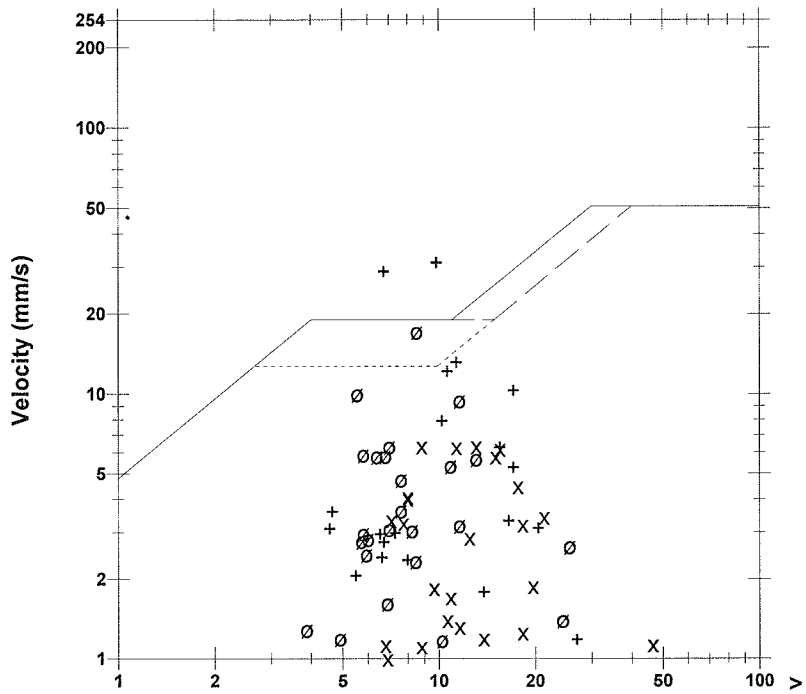
Date/Time	Vert at 19:56:07 March 19, 2006	**Serial Number**	BE9690 V 8.01-8.0 MiniMate Plus
Trigger Source	Geo: 0.600 mm/s	**Battery Level**	6.3 Volts
Range	Geo :31.7 mm/s	**Calibration**	November 29, 2005 by Instantel Inc.
Record Time	8.25 sec (Auto=6Sec) at 1024 sps	**File Name**	K690B2JU.1J0
Job Number:	2		

Notes
Location: Hillside
Client: WEST RIDGE MINE
User Name: RB&G ENGINEERING
General:

Extended Notes

Post Event Notes
Eq mag 2.1 & 0.219g

USBM RI8507 And OSMRE



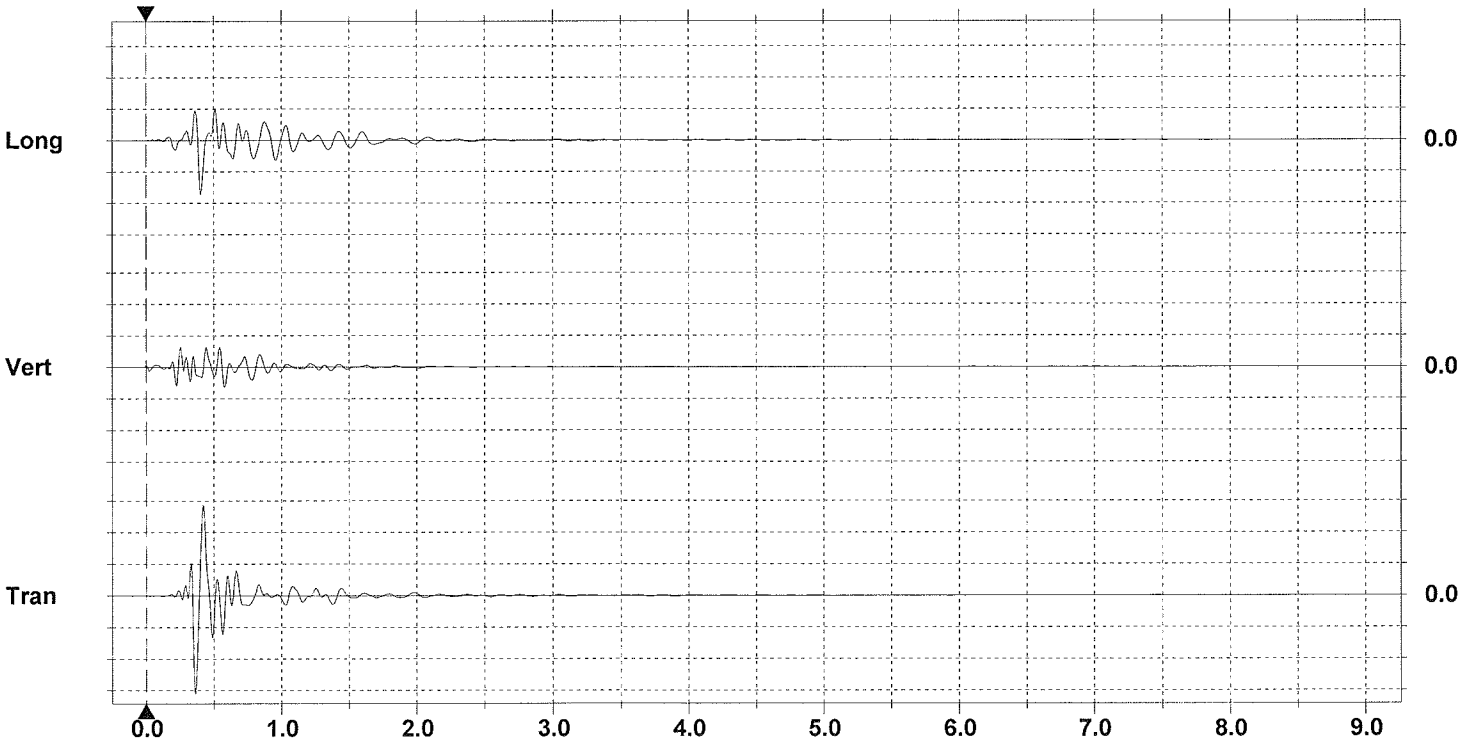
Tran: + Vert: x Long: ø

Microphone Disabled
PSPL N/A
ZC Freq N/A
Channel Test N/A

	Tran	Vert	Long	
PPV	31.1	6.33	17.1	mm/s
ZC Freq	9.8	8.8	8.5	Hz
Time (Rel. to Trig)	0.363	0.442	0.402	sec
Peak Acceleration	0.219	0.0696	0.129	g
Peak Displacement	0.550	0.0947	0.275	mm
Sensorcheck	Passed	Passed	Passed	

Peak Vector Sum 32.5 mm/s at 0.363 sec

N/A: Not Applicable



Time Scale:0.50 sec/div **Amplitude Scale:**Geo: 10.00 mm/s/div
Trigger = ▶— — — —◀

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Instantel®

Event Report

Date/Time	Vert at 19:56:09 March 19, 2006	**Serial Number**	BE9689 V 8.01-8.0 MiniMate Plus
Trigger Source	Geo: 0.600 mm/s	**Battery Level**	6.3 Volts
Range	Geo :31.7 mm/s	**Calibration**	November 9, 2005 by Instantel Inc.
Record Time	9.75 sec (Auto=6Sec) at 1024 sps	**File Name**	K689B2JU.1L0
Job Number:	1		

Notes
Location: Grassy Tr. Dam
Client:
User Name:
General:

Extended Notes

Post Event Notes
Eq mag 2.1 & PGA 0.191g

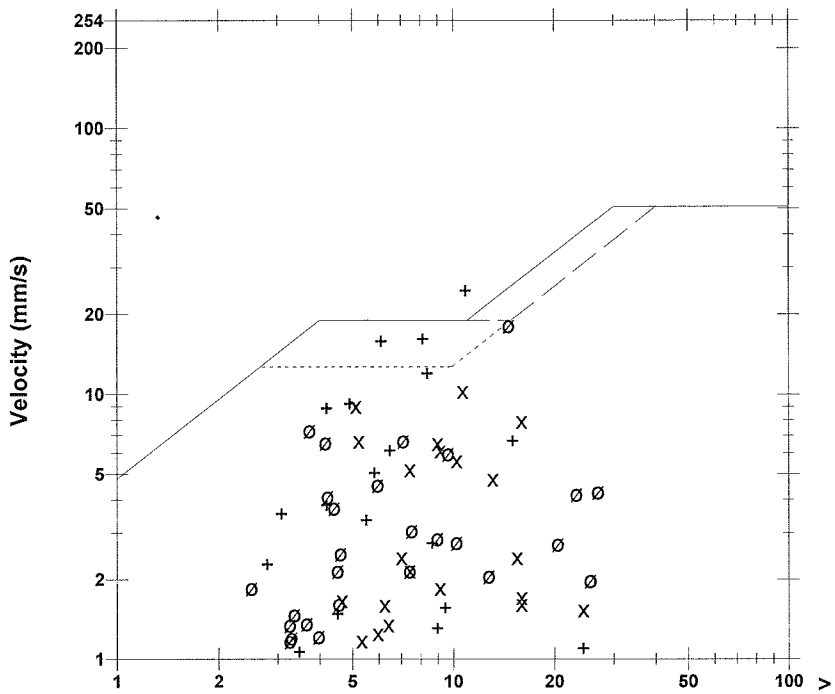
Microphone Disabled
PSPL N/A
ZC Freq N/A
Channel Test N/A

	Tran	Vert	Long	
PPV	24.5	10.3	18.2	mm/s
ZC Freq	11	11	15	Hz
Time (Rel. to Trig)	0.281	0.432	0.270	sec
Peak Acceleration	0.191	0.0845	0.149	g
Peak Displacement	0.359	0.181	0.262	mm
Sensorcheck	Check	Check	Check	

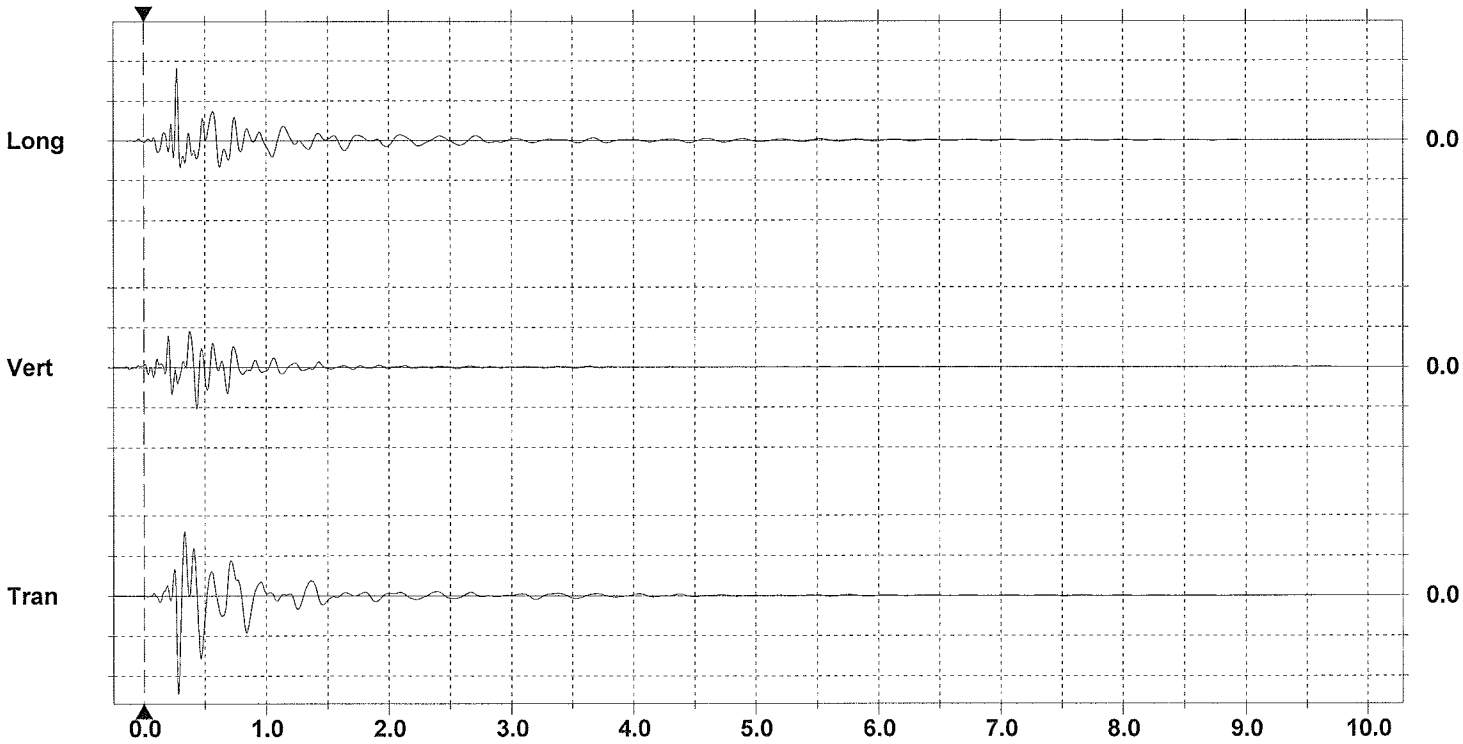
Peak Vector Sum 26.7 mm/s at 0.277 sec

N/A: Not Applicable

USBM RI8507 And OSMRE



Tran: + Vert: x Long: ø



Time Scale: 0.50 sec/div **Amplitude Scale** Geo: 10.00 mm/s/div
Trigger = ▶— — — —◀

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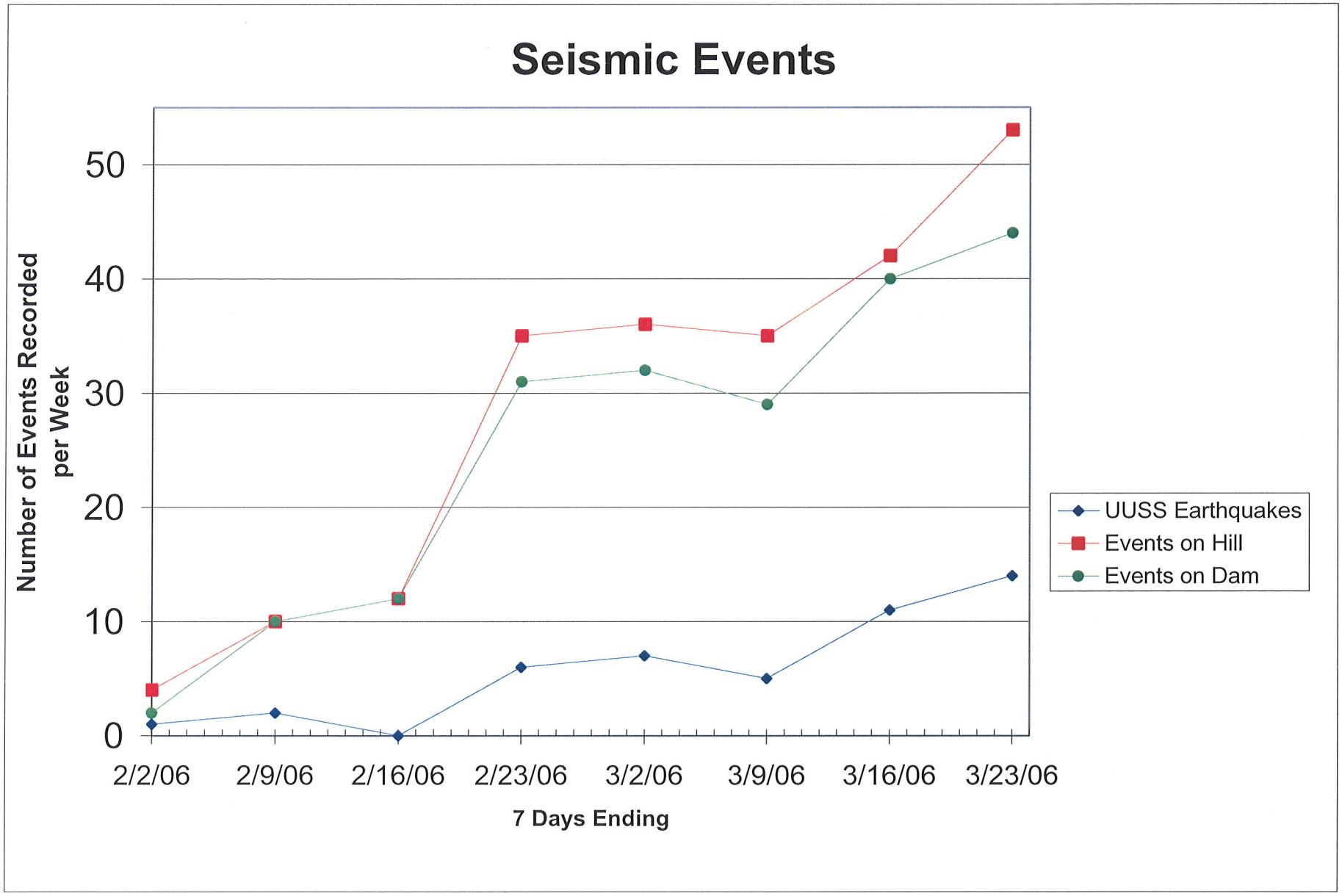
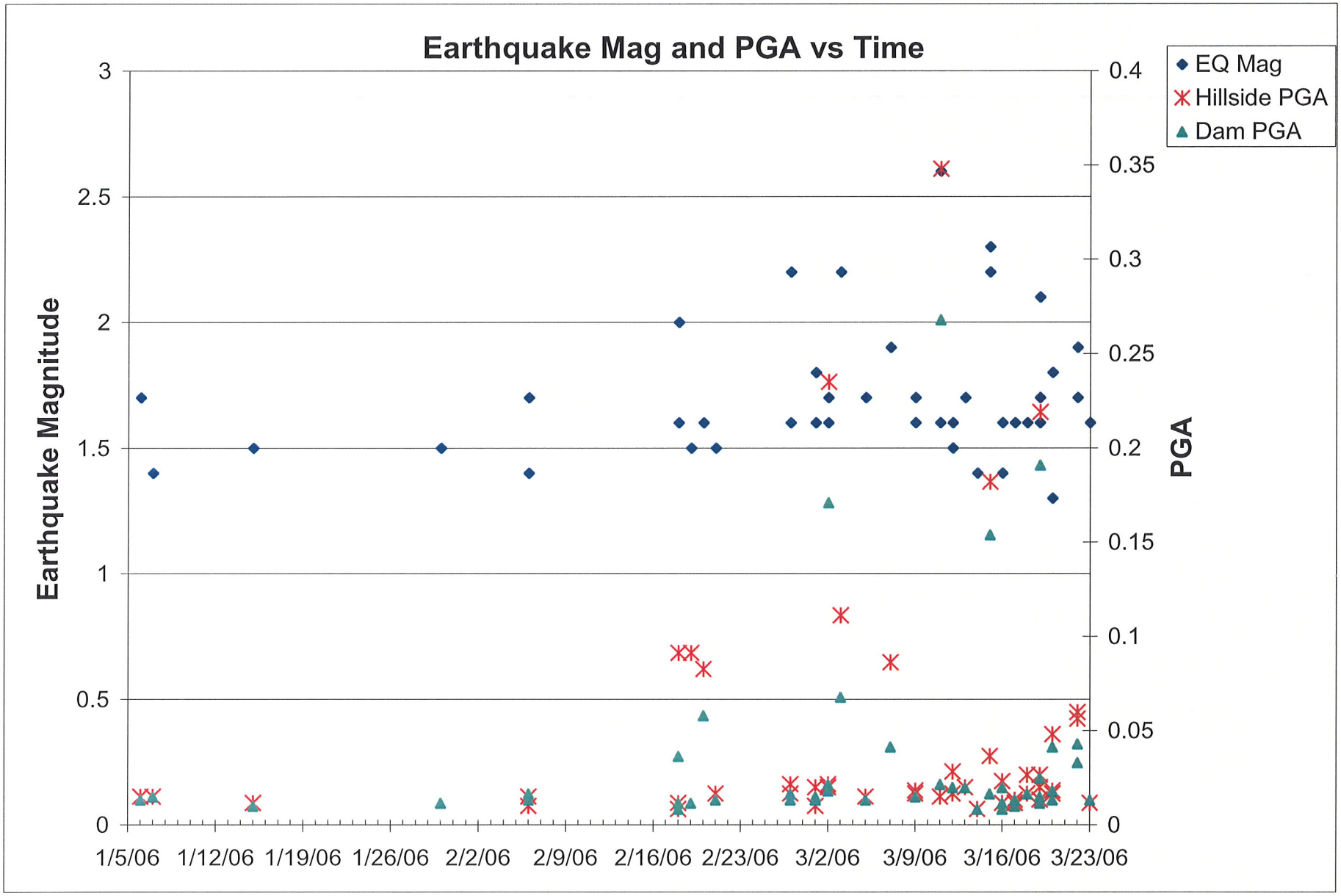
Grassy Trail Dam, Carbon County, Utah
2006 Hillside unit #9690 Dam #9689
Printed: March 27, 2006 (V 4.37 - 4.37) Event Report: Event List - c:\blast\event

Type	Serial No.	Date/Time	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	PVS1 (mm/s)	Trigger	Tran Accel (g)	Vert Accel (g)	Long Accel (g)	Description	Post Event Note first line
LOG	BE9689	Mar 17 /06 09:11:31	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9689	Mar 17 /06 10:01:30	0.873	1.08	2.05	2.17	Vert	0.00829	0.0116	0.0166	Grassy Tr. Dam	
LOG	BE9690	Mar 17 /06 10:11:10	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
LOG	BE9689	Mar 17 /06 10:50:55	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9689	Mar 17 /06 10:52:24	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	Mar 17 /06 12:22:24	0.825	0.667	1.90	1.92	Vert	0.00663	0.00829	0.0133	Hillside	Eq mag 1.6
W	BE9689	Mar 17 /06 12:22:26	1.05	1.05	1.65	1.90	Vert	0.00829	0.00829	0.0133	Grassy Tr. Dam	Eq mag 1.6
W	BE9690	Mar 17 /06 15:45:42	0.651	0.619	1.05	1.20	Vert	0.00663	0.00994	0.00829	Hillside	
W	BE9690	Mar 17 /06 21:15:12	0.381	0.365	0.778	0.815	Long	0.00663	0.00829	0.00829	Hillside	
W	BE9689	Mar 17 /06 21:15:14	0.397	0.349	0.921	0.944	Long	0.00663	0.00663	0.0116	Grassy Tr. Dam	
W	BE9689	Mar 18 /06 05:21:02	0.603	0.317	0.365	0.720	Tran	0.00663	0.00663	0.0166	Grassy Tr. Dam	
W	BE9690	Mar 18 /06 06:19:11	0.587	0.667	0.619	0.821	Vert	0.00663	0.0116	0.00829	Hillside	
W	BE9689	Mar 18 /06 06:19:14	0.429	0.635	0.746	0.792	Vert	0.00829	0.00829	0.0133	Grassy Tr. Dam	
W	BE9689	Mar 18 /06 13:32:24	0.238	0.270	0.746	0.755	Long	0.00663	0.00829	0.00829	Grassy Tr. Dam	
W	BE9690	Mar 18 /06 13:47:09	0.540	0.254	0.889	0.946	Long	0.00663	0.00663	0.00829	Hillside	
W	BE9689	Mar 18 /06 13:47:11	0.429	0.429	0.778	0.840	Long	0.00663	0.00663	0.0182	Grassy Tr. Dam	
W	BE9690	Mar 18 /06 13:56:14	0.444	0.365	0.825	0.838	Long	0.00497	0.00663	0.00829	Hillside	
W	BE9689	Mar 18 /06 13:56:16	0.429	0.413	0.794	0.862	Long	0.00663	0.00663	0.0149	Grassy Tr. Dam	
W	BE9690	Mar 18 /06 16:58:28	3.37	0.730	2.25	3.67	Vert	0.0265	0.0116	0.0166	Hillside	Eq mag 1.6
W	BE9689	Mar 18 /06 16:58:30	1.89	1.78	1.89	2.15	Vert	0.0133	0.00994	0.0166	Grassy Tr. Dam	Eq mag 1.6
W	BE9690	Mar 18 /06 17:13:44	0.349	0.349	0.730	0.763	Long	0.00663	0.00663	0.00663	Hillside	
W	BE9689	Mar 18 /06 17:13:46	0.413	0.317	0.667	0.690	Long	0.00663	0.00663	0.00829	Grassy Tr. Dam	
W	BE9690	Mar 18 /06 23:02:10	2.25	0.921	3.00	3.02	Vert	0.0166	0.00829	0.0166	Hillside	Eq mag 1.6
W	BE9689	Mar 18 /06 23:02:12	1.51	1.32	2.05	2.26	Vert	0.0133	0.00829	0.0166	Grassy Tr. Dam	Eq mag 1.6
W	BE9690	Mar 19 /06 01:42:49	0.587	0.603	0.746	0.808	Vert	0.00829	0.00829	0.00829	Hillside	
W	BE9689	Mar 19 /06 01:42:51	0.365	0.460	1.13	1.13	Long	0.00663	0.00663	0.00994	Grassy Tr. Dam	
W	BE9690	Mar 19 /06 09:34:54	1.57	0.794	2.38	2.44	Vert	0.0116	0.00829	0.0133	Hillside	Eq mag 1.6
W	BE9689	Mar 19 /06 09:34:56	1.05	1.11	1.78	1.90	Vert	0.00829	0.00994	0.0149	Grassy Tr. Dam	Eq mag 1.6
W	BE9690	Mar 19 /06 10:29:36	0.381	0.333	0.667	0.709	Long	0.00663	0.00497	0.00663	Hillside	
W	BE9690	Mar 19 /06 11:44:48	0.333	0.254	0.683	0.711	Long	0.00663	0.00497	0.00663	Hillside	
W	BE9690	Mar 19 /06 12:48:36	2.98	0.841	2.06	3.04	Long	0.0199	0.0133	0.0133	Hillside	Eq mag 1.6
W	BE9689	Mar 19 /06 12:48:38	1.29	0.857	1.32	1.41	Vert	0.0116	0.00829	0.0116	Grassy Tr. Dam	Eq mag 1.6
W	BE9690	Mar 19 /06 14:03:49	0.365	0.333	0.714	0.736	Long	0.00663	0.00663	0.00829	Hillside	
W	BE9689	Mar 19 /06 14:03:51	0.444	0.333	0.635	0.648	Long	0.00663	0.00663	0.00663	Grassy Tr. Dam	
W	BE9690	Mar 19 /06 15:03:44	2.56	1.38	4.00	4.14	Vert	0.0215	0.0133	0.0265	Hillside	Eq mag 1.7
W	BE9689	Mar 19 /06 15:03:46	1.54	2.11	3.70	3.83	Long	0.0149	0.0166	0.0249	Grassy Tr. Dam	Eq mag 1.7
W	BE9690	Mar 19 /06 16:30:24	0.302	0.270	0.619	0.632	Long	0.00497	0.00663	0.00663	Hillside	
W	BE9690	Mar 19 /06 17:21:06	0.302	0.286	0.714	0.736	Long	0.00663	0.00663	0.00663	Hillside	
W	BE9690	Mar 19 /06 18:47:30	0.317	0.270	0.667	0.680	Long	0.00497	0.00497	0.00829	Hillside	
W	BE9690	Mar 19 /06 19:56:07	31.1	6.33	17.1	32.5	Vert	0.219	0.0696	0.129	Hillside	Eq mag 2.1 & 0.219g
W	BE9689	Mar 19 /06 19:56:09	24.5	10.3	18.2	26.7	Vert	0.191	0.0845	0.149	Grassy Tr. Dam	Eq mag 2.1 & PGA 0.191g
W	BE9690	Mar 19 /06 21:51:09	0.492	0.381	0.810	0.849	Long	0.00663	0.00829	0.00829	Hillside	
W	BE9689	Mar 19 /06 21:51:12	0.587	0.413	0.730	0.807	Long	0.00663	0.00663	0.0133	Grassy Tr. Dam	
W	BE9690	Mar 20 /06 01:48:42	1.17	0.508	0.476	1.20	Tran	0.0116	0.00829	0.00829	Hillside	
W	BE9689	Mar 20 /06 01:48:45	0.841	0.603	0.714	0.875	Long	0.00994	0.00663	0.0133	Grassy Tr. Dam	
W	BE9689	Mar 20 /06 03:08:26	0.651	0.302	0.444	0.732	Tran	0.00663	0.00663	0.0133	Grassy Tr. Dam	
W	BE9690	Mar 20 /06 08:59:52	0.317	0.317	0.683	0.705	Long	0.00663	0.00497	0.00663	Hillside	
W	BE9690	Mar 20 /06 09:24:56	0.587	0.460	1.08	1.10	Long	0.00663	0.00663	0.00829	Hillside	
W	BE9689	Mar 20 /06 09:24:58	0.651	0.603	0.968	1.05	Vert	0.00663	0.00663	0.0133	Grassy Tr. Dam	

W	BE9690	Mar 20 /06	10:43:02	6.83	1.78	2.48	7.14	Vert	0.0481	0.0149	0.0215	Hillside		Eq mag 1.8
W	BE9689	Mar 20 /06	10:43:04	4.84	2.27	2.30	5.13	Vert	0.0414	0.0166	0.0232	Grassy Tr. Dam		Eq mag 1.8
W	BE9690	Mar 20 /06	10:49:36	1.35	1.32	2.75	3.01	Vert	0.00994	0.0116	0.0166	Hillside		Eq mag 1.3
W	BE9689	Mar 20 /06	10:49:38	1.16	0.730	1.03	1.62	Vert	0.00829	0.0133	0.0133	Grassy Tr. Dam		Eq mag 1.3
W	BE9690	Mar 20 /06	14:19:44	0.476	0.397	0.968	1.01	Long	0.00663	0.00663	0.00994	Hillside		
W	BE9689	Mar 20 /06	14:19:47	0.603	0.460	0.762	0.801	Long	0.00663	0.00663	0.0116	Grassy Tr. Dam		
W	BE9690	Mar 20 /06	14:24:49	2.41	1.06	3.54	3.64	Vert	0.0166	0.0116	0.0182	Hillside		Eq mag 1.8
W	BE9689	Mar 20 /06	14:24:52	1.81	1.86	3.00	3.31	Vert	0.0149	0.0133	0.0182	Grassy Tr. Dam		Eq mag 1.8
W	BE9690	Mar 20 /06	16:57:03	0.365	0.444	0.651	0.724	Long	0.00663	0.00663	0.00663	Hillside		
W	BE9690	Mar 21 /06	05:55:27	0.635	0.556	1.13	1.29	Long	0.00663	0.00829	0.00829	Hillside		
W	BE9690	Mar 21 /06	08:43:58	0.381	0.333	0.730	0.734	Long	0.00663	0.00497	0.00663	Hillside		
W	BE9690	Mar 21 /06	19:53:17	0.651	0.651	1.43	1.43	Vert	0.00829	0.00829	0.0116	Hillside		
W	BE9689	Mar 21 /06	19:53:20	0.952	0.841	1.43	1.66	Vert	0.00829	0.00663	0.0116	Grassy Tr. Dam		
W	BE9690	Mar 21 /06	22:01:38	0.873	0.635	1.75	1.79	Vert	0.00829	0.00829	0.0133	Hillside		
W	BE9689	Mar 21 /06	22:01:41	1.06	0.921	1.40	1.46	Vert	0.00829	0.00829	0.0182	Grassy Tr. Dam		
W	BE9690	Mar 21 /06	22:05:17	0.365	0.286	0.603	0.620	Long	0.00663	0.00663	0.00663	Hillside		
W	BE9690	Mar 21 /06	23:07:33	0.333	0.302	0.619	0.636	Long	0.00497	0.00663	0.00663	Hillside		
W	BE9690	Mar 22 /06	00:08:50	7.02	2.11	6.16	7.15	Vert	0.0597	0.0215	0.0348	Hillside		Eq mag 1.9
W	BE9689	Mar 22 /06	00:08:53	3.71	2.76	4.16	4.24	Vert	0.0331	0.0199	0.0249	Grassy Tr. Dam		Eq mag 1.9
W	BE9690	Mar 22 /06	06:59:23	1.08	0.460	0.619	1.10	Tran	0.0116	0.00663	0.00829	Hillside		
W	BE9690	Mar 22 /06	11:04:22	0.476	0.349	0.778	0.806	Long	0.00663	0.00663	0.00829	Hillside		
W	BE9690	Mar 22 /06	13:10:28	0.651	0.365	1.14	1.22	Long	0.00663	0.00663	0.00829	Hillside		
W	BE9689	Mar 22 /06	13:10:31	0.730	0.571	0.905	0.970	Long	0.00829	0.00663	0.0116	Grassy Tr. Dam		
W	BE9690	Mar 22 /06	13:30:58	0.524	0.349	0.921	0.953	Long	0.00663	0.00663	0.00829	Hillside		
W	BE9689	Mar 22 /06	13:31:00	0.556	0.444	0.667	0.702	Long	0.00829	0.00663	0.00994	Grassy Tr. Dam		
W	BE9690	Mar 22 /06	14:17:02	0.794	0.587	1.51	1.53	Long	0.00829	0.00829	0.0116	Hillside		
W	BE9689	Mar 22 /06	14:17:04	0.825	0.825	1.30	1.43	Vert	0.00829	0.00663	0.0166	Grassy Tr. Dam		
W	BE9690	Mar 22 /06	16:24:19	6.56	1.59	3.35	6.96	Vert	0.0563	0.0149	0.0282	Hillside		Eq mag 1.7
W	BE9689	Mar 22 /06	16:24:22	3.68	2.25	2.21	4.04	Vert	0.0431	0.0182	0.0199	Grassy Tr. Dam		Eq mag 1.7
W	BE9690	Mar 22 /06	17:32:34	0.587	0.508	1.30	1.36	Long	0.00663	0.00994	0.00994	Hillside		
W	BE9689	Mar 22 /06	17:32:37	0.825	0.635	0.952	1.02	Vert	0.00829	0.00663	0.0149	Grassy Tr. Dam		
W	BE9690	Mar 22 /06	20:54:49	0.889	0.619	1.79	1.83	Vert	0.00663	0.00663	0.0116	Hillside		
W	BE9689	Mar 22 /06	20:54:52	0.905	1.00	1.51	1.64	Vert	0.00829	0.00829	0.0149	Grassy Tr. Dam		
W	BE9690	Mar 22 /06	22:10:54	0.429	0.317	0.714	0.740	Long	0.00663	0.00663	0.00829	Hillside		
W	BE9689	Mar 22 /06	22:10:56	0.492	0.381	0.619	0.645	Long	0.00663	0.00663	0.00994	Grassy Tr. Dam		
W	BE9690	Mar 22 /06	23:01:26	0.508	0.413	0.952	1.05	Long	0.00497	0.00663	0.00829	Hillside		
W	BE9690	Mar 23 /06	08:59:23	1.22	0.635	1.90	2.01	Vert	0.00829	0.00829	0.0116	Hillside		Eq mag 1.6
W	BE9689	Mar 23 /06	08:59:26	0.952	0.762	1.35	1.37	Vert	0.00663	0.00994	0.0133	Grassy Tr. Dam		Eq mag 1.6
W	BE9690	Mar 23 /06	10:02:00	0.635	0.508	1.21	1.25	Long	0.00663	0.00829	0.00994	Hillside		
W	BE9689	Mar 23 /06	10:02:03	0.746	0.571	0.873	0.911	Long	0.00829	0.00663	0.0133	Grassy Tr. Dam		
W	BE9690	Mar 23 /06	11:14:28	0.635	0.460	1.21	1.24	Long	0.00663	0.00663	0.00994	Hillside		
W	BE9689	Mar 23 /06	11:14:31	0.571	0.619	0.984	1.06	Vert	0.00829	0.00663	0.0116	Grassy Tr. Dam		
W	BE9690	Mar 23 /06	13:05:14	1.05	0.825	2.10	2.12	Vert	0.00994	0.00994	0.0133	Hillside		
W	BE9689	Mar 23 /06	13:05:17	1.21	1.08	1.76	1.93	Vert	0.00829	0.00829	0.0116	Grassy Tr. Dam		
W	BE9690	Mar 23 /06	14:55:23	0.476	0.397	0.873	0.913	Long	0.00663	0.00829	0.00663	Hillside		
W	BE9689	Mar 23 /06	14:55:25	0.571	0.413	0.603	0.715	Long	0.00663	0.00663	0.00663	Grassy Tr. Dam		
W	BE9690	Mar 23 /06	18:53:04	0.524	0.349	0.937	0.990	Long	0.00663	0.00663	0.00829	Hillside		
W	BE9689	Mar 23 /06	18:53:07	0.619	0.429	0.683	0.713	Long	0.00663	0.00663	0.00994	Grassy Tr. Dam		
W	BE9690	Mar 23 /06	22:53:23	1.25	0.937	2.41	2.48	Vert	0.00994	0.0116	0.0133	Hillside		
W	BE9689	Mar 23 /06	22:53:26	1.32	1.14	1.71	1.84	Vert	0.00994	0.00829	0.0133	Grassy Tr. Dam		
W	BE9690	Mar 24 /06	02:57:18	0.254	0.302	0.619	0.630	Long	0.00663	0.00663	0.00663	Hillside		
LOG	BE9689	Mar 24 /06	09:03:32	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded.	(Keyboard Exit)
LOG	BE9690	Mar 24 /06	10:25:45	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded.	(Keyboard Exit)


Seismic Events
Number of Events Recorded per Week
50
40
30
20
10
0
2/2/06
2/9/06
2/16/06
2/23/06
3/2/06
3/9/06
3/16/06
3/23/06
7 Days Ending
UUSS Earthquakes
Events on Hill
Events on Dam


Earthquake Mag and PGA vs Time
Earthquake Magnitude
PGA
EQ Mag
Hillside PGA
Dam PGA
3
2.5
2
1.5
1
0.5
0
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1/5/06
1/12/06
1/19/06
1/26/06
2/2/06
2/9/06
2/16/06
2/23/06
3/2/06
3/9/06
3/16/06
3/23/06

03/24/2006

03/24/2006

From: "Brad Price" <Bprice@rbgengineering.com>
To: "Michael Hansen" <Mhansen@rbgengineering.com>
Date: 3/27/2006 8:05:29 PM
Subject: Fwd: Grassy Trail Dam displacements

Michael,
Please forward the e-mails from Erik Mikkelsen, Inclinometer Consultant, to Western Resources, State Engineer, and others. Erik's review and corrections show that no movement is occuring at Inclinometer 1A. Inclinometer 2A shows a total corrected displacement of 1.25 inches since Dec. 2005. The displacement is taking place in the overburden below the embankment fill, between 60 and 120 feet. The direction of movement is to the east-northeast. In our telephone discussion, we decided that you will determine the true bearing during your next trip down on Friday. Inclinometer 3A shows compressional shear displacements up to about 0.2 inches. Inclinometer 4A shows a basal shear from 59 to 60 feet totaling 0.14 inches. As was discussed with Erik this morning, the accerlation in rate of movement in 2A, 3A and 4A appears consistent with proximity of mining. We would expect the rate of movement for 2A to decrease as mining moves further from the dam axis. We would also expect to see evidence of movement at the surface. We should have Westridge's horizontal survey this week. Our survey crew will perform a second baseline survey tomorrow and do a second survey in two weeks. Erik was in agreement that we should be seeing more than 1.25 inches of settlement at the crest based upon Inclinometer 2A.

With regard to Inclinometer 4, the analysis which Erik suggests was performed and is included in the August 2005 report. We anticipate the rate of movement at this location to increase as mining gets closer. I do not believe it necessary to install real time sensors in the inclinometer.
I recommend that we begin taking readings on Inclinometer 2 and 4 weekly until the rate of displacement begins to decrease. Please e-mail a copy of the raw data to Erik for review. He has agreed to review within one day upon request.
Brad

From: "Erik Mikkelsen" <mikkelsen.pe@comcast.net>
To: <bprice@rbgengineering.com>
Date: 3/27/2006 12:16:19 PM
Subject: Grassy Trail Dam displacements

Hi Brad:
Good to talk to you fellows this a.m. Thanks!
I looked a bit closer at available data.
As the attached plot shows the shortest radial distance to 2A has just been bypast and I would expect 2A displacements to slow down.
Weekly readings should indicate the trend better. Please keep me updated.

Here are some other thoughts:
1.. Installing another inclinometer at the highest fill depth of the dam would help understand the spreading issue better vs. the seismic activity. Settlement ring targets can also easily be installed with the inclinometer casing (Sondex) at 10-foot depth intervals.
2.. The mining has not yet reached the closest point with Inclinometer 4 on the west bank landslide area. This situation may be more critical for dam stability than the spreading of the dam (2A). I would make an estimate of the worst case scenario should the entire slide mass rapidly move into the reservoir and see if overtopping could occur. If it is a potential problem, then a very slow drawdown of the resevoir may be considered and/or a slowing or pausing in the mininig activity to see if that could control the situation.
3.. A single in-place inclinometer sensor could be installed in the basal shear zone of 4 to monitor in near-real-time. The data could be telemetered via cellphone or spread spectrum radio.
4.. If you have enough seismic data (ground velocity or acceleration data), its trend should also be corrolated with the attached plot.
Best regards, Erik

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