0085

Incoming C0070041 OK

From: "Michael Hansen" <Mhansen@rbgengineering.com>
To: <James_Kohler@blm.gov>, <Jeff_McKenzie@blm.gov>, <Stan_Perkes@blm.gov>, <Steve_Falk@blm.gov>, <steve_rigby@blm.gov>, <jllewelyn@co.carbon.ut.us>, <ecc@emerytelcom.net>, <sunny1@emerytelcom.net>, "Brad Price" <bprice@rbgengineering.com>, "Rob johnson" <robj@rbgengineering.com>, <bretdixon@utah.gov>, <davemarble@utah.gov>, <karlhouskeeper@utah.gov>, <marcstilson@utah.gov>, <pamgrubaughlittig@utah.gov>, <petehess@utah.gov>, <waynehedberg@utah.gov>, <dshaver@utahamerican.com>
Date: 9/18/2006 5:48:23 PM
Subject: Grassy Trail Dam Seismic Update 9/16/06

Attached are the current seismic, inclinometer and piezometer reading for Sept 16,2006.

Michael N. Hansen, P.G.
Engineering Geologist

RB&G ENGINEERING Inc.
1435 West 820 North
Provo Ut. 84601

Ph 801-374-5771
SLC 801-521-5771
Fax 801-374-5773

email mhansen@rbgengineering.com

RB&G ENGINEERING
Grassy Trail Dam, Seismic Summary for September 16, 2006

For the 15 day period between September 1 and September 19, 2006 the number of MIS (Mining Induced Seismicity) earthquakes recorded near the site by the UUSS increased from 23 to 45, with most of these events occurring during one week. For comparison the following table summarizes the number of earthquakes and events recorded on the dam and Hillside units during the past three-week period ending on Thursdays. It should be noted from the table that the number of seismic events recorded on the dam and hillside units has decreased during the past two weeks while the number of earthquakes has fluctuated. On September 15 very strong winds generated a lot of background noise on the University of Utah Seismograph Station near the mine (Book Cliffs East Station (BCE)). This wind also appears to have generated about 45 false events recorded on the Dam unit. MIS earthquakes ranged in magnitude from 0.8 to a high of 1.9. During the past two weeks only 5 of the 45 earthquakes reported were recorded on the Dam and Hillside monitoring units.

7 Days Ending	Earthquakes	Hillside	Dam
31-Aug	9	12	14
7-Sept	34	8	9
14-Sept	9	3	3

During the past two weeks the highest Peak Ground Acceleration (PGA) value recorded on the Hillside decreased slightly from the previous high of 0.0166 to **0.0116g**.The highest PGA value on the Dam decreased slightly from 0.0199 to **0.0182g**. The largest, a 1.9 earthquake did not generate the highest PGA values. The highest PGA value of 0.0182g was recoded on the dam during several different earthquake events, and once during an event not documented by the UUSS.

Inclinometer I-3 continues to show similar movements as the last readings. Inclinometers I-2, and I-4 appear to show a decrease in movement. Inclinometer I-2 which had been showing the greatest movement during the year, showed only very slight movement during the past two weeks. This gives us four weeks in a row with very little movement.

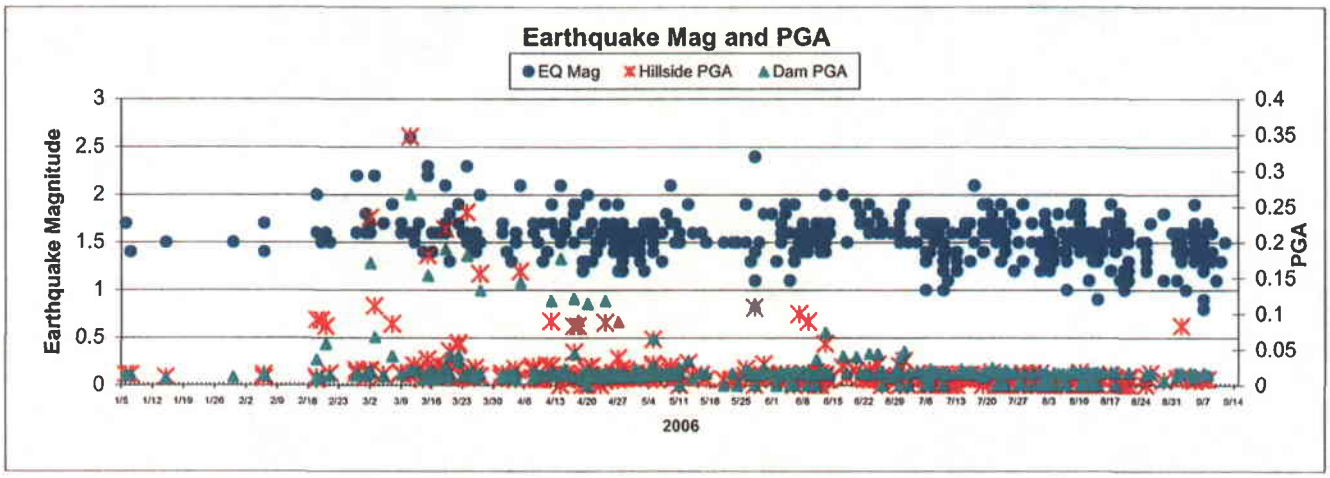
Piezometer readings are also similar to the previous reading.

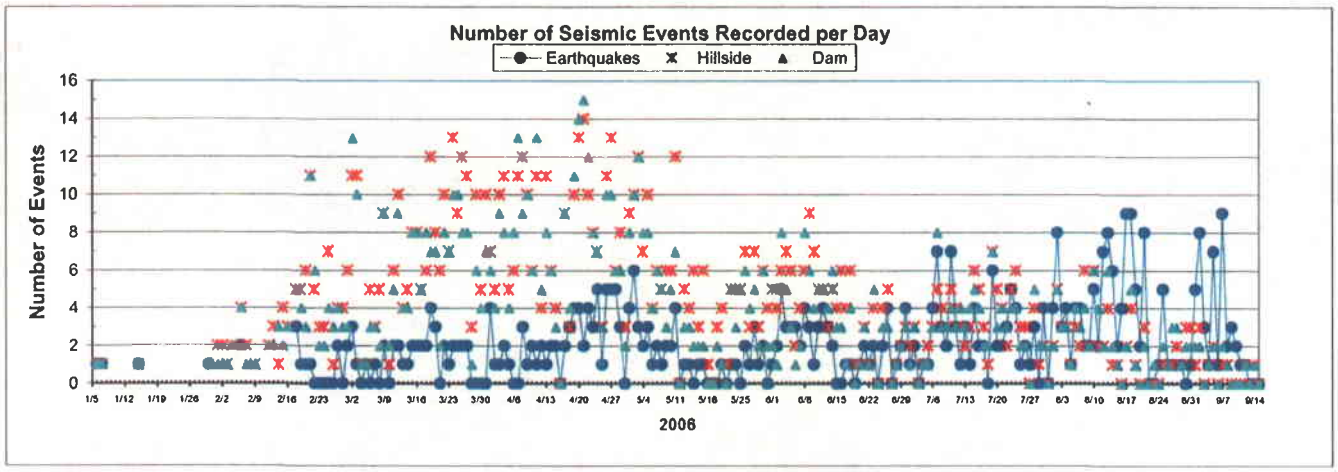
No cracks or signs of movement were noted on the dam or abutments above the dam. No significant changes in seepage readings were observed.

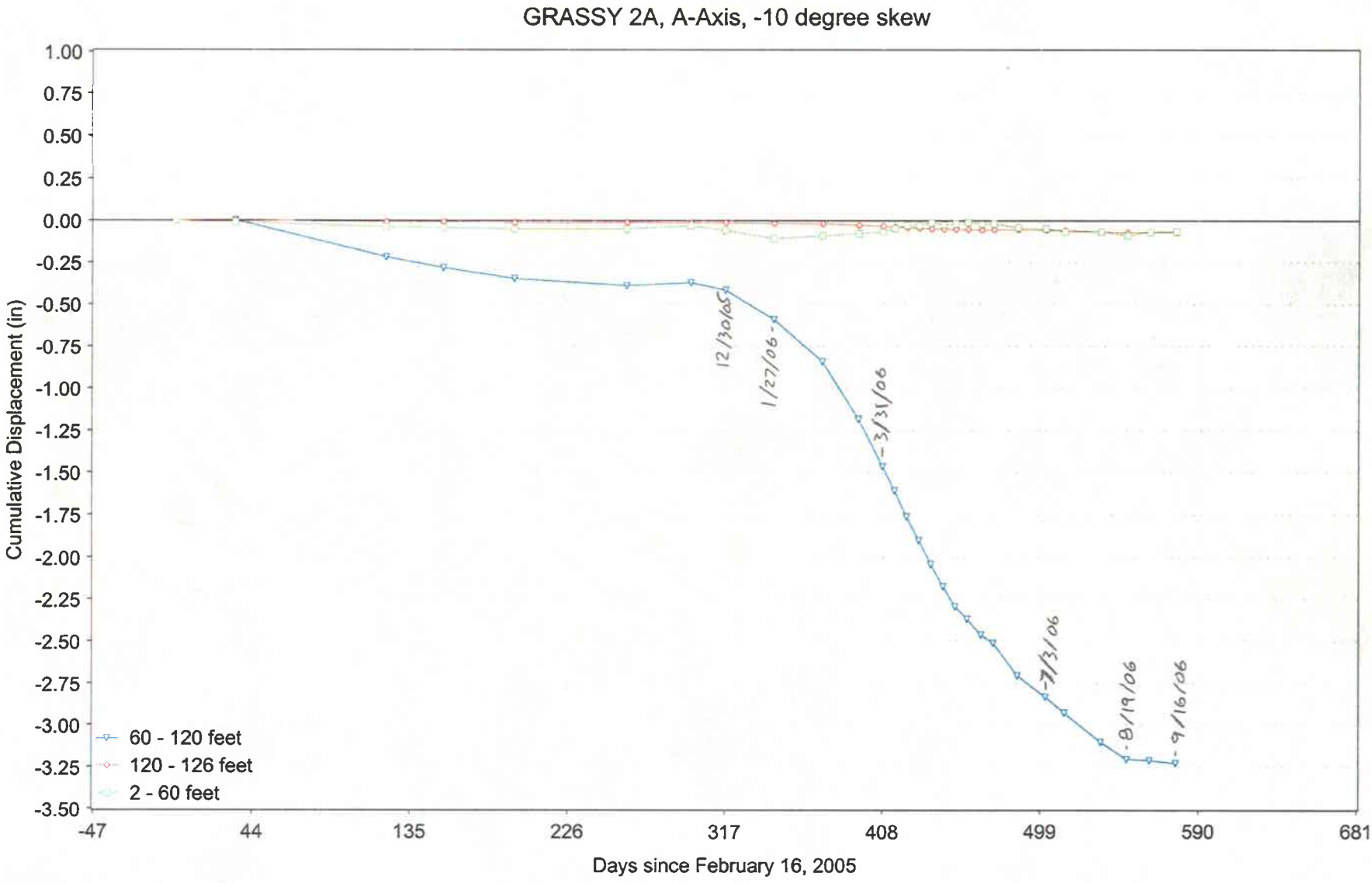
Michael Hansen
RB&G ENGINEERING

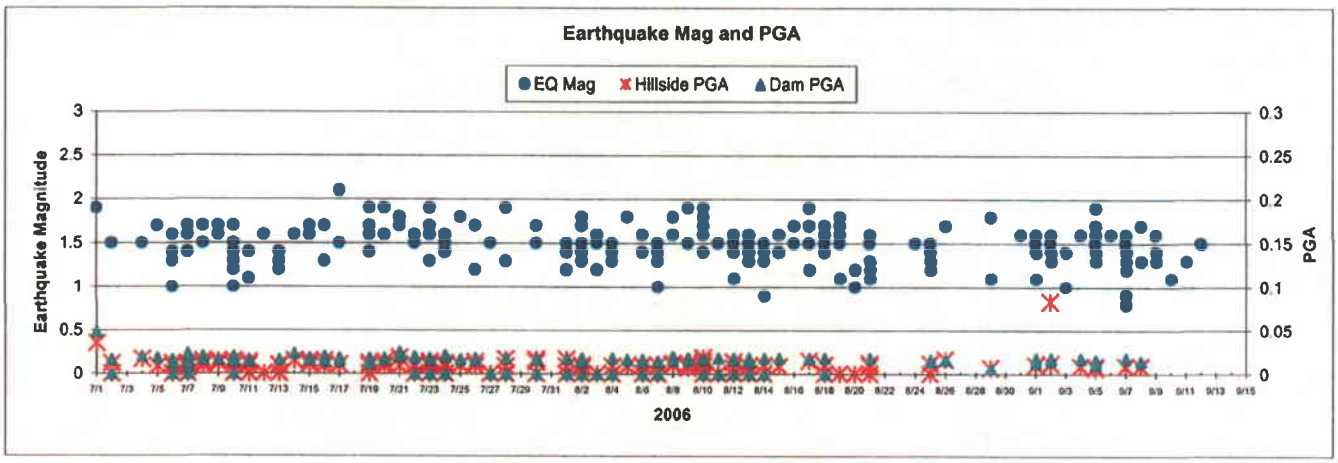
Grassy Trail Dam, Carbon County, Utah
September 1, 2006

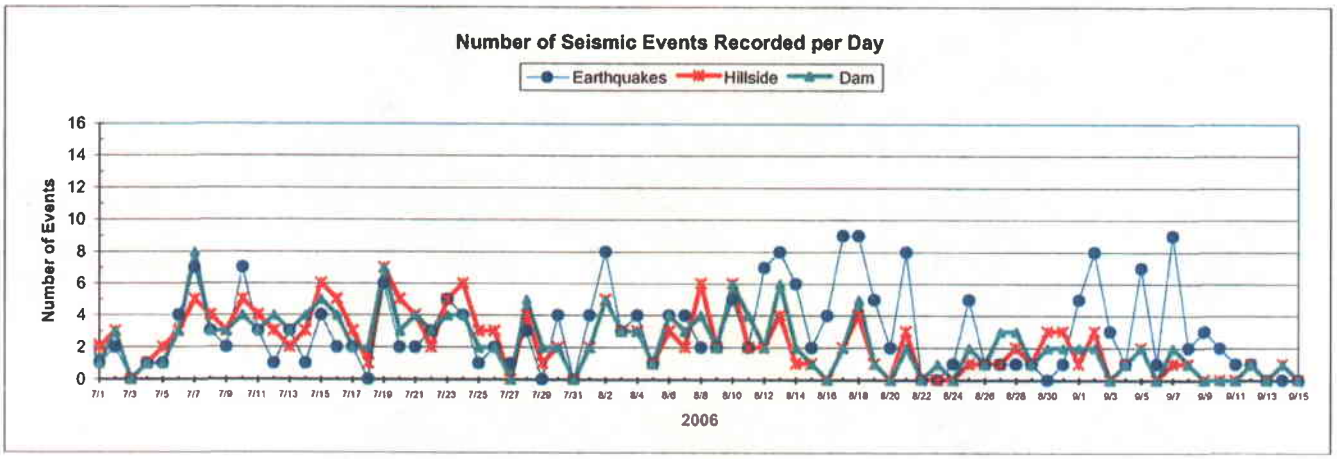
Type	Serial No	Date	Time	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	PVS1 (mm/s)	Tran Freq. Hz.	Trigger	Tran Accel (g)	Vert Accel (g)	Long Accel (g)	Description	Event Note First line	
LOG	BE9689	9/1/06	11:20:26	***	***	***	***	***	***	***	***	***	Start Monitoring	Monitoring	
LOG	BE9690	9/1/06	12:06:13	***	***	***	***	***	***	***	***	***	Start Monitoring	Monitoring	
W	BE9689	9/1/06	12:48:13	0.603	0.143	0.54	0.614	4.79	Tran	0.00663	0.00663	0.0182	Grassy Tr. Dam	EQ mag	1.5
W	BE9689	9/1/06	12:50:52	1.22	1.05	1.03	1.45	8.26	Tran	0.0133	0.00994	0.0166	Grassy Tr. Dam	EQ mag	1.6
W	BE9690	9/1/06	12:50:53	1.08	0.333	1.17	1.19	9.66	Long	0.00994	0.00663	0.00994	Hillside	EQ mag	1.6
W	BE9689	9/2/06	4:03:06	1.03	0.73	0.984	1.2	8.39	Long	0.00994	0.00663	0.0166	Grassy Tr. Dam	EQ mag	1.6
W	BE9690	9/2/06	4:03:06	0.857	0.286	0.968	0.994	9.14	Long	0.00829	0.00663	0.0116	Hillside	EQ mag	1.6
W	BE9689	9/2/06	8:55:48	1.24	1.05	0.635	1.31	7.53	Tran	0.00994	0.00829	0.0182	Grassy Tr. Dam	EQ mag	1.6
W	BE9690	9/2/06	8:55:48	1	0.381	0.873	1.04	9.14	Tran	0.00829	0.00663	0.00663	Hillside	EQ mag	1.6
W	BE9690	9/2/06	16:52:53	0.587	0.524	0.984	1.15	18.3	Long	0.00829	0.00994	0.0116	Hillside		
W	BE9690	9/4/06	17:57:04	0.857	0.238	0.714	0.86	8.98	Long	0.00829	0.00663	0.00663	Hillside	EQ mag	1.6
W	BE9689	9/4/06	17:57:05	1	0.556	0.587	1.07	8.39	Tran	0.00829	0.00663	0.0182	Grassy Tr. Dam	EQ mag	1.6
W	BE9690	9/5/06	1:41:14	0.587	0.19	0.635	0.671	7.76	Long	0.00663	0.00663	0.00663	Hillside	EQ mag	1.5
W	BE9689	9/5/06	1:41:15	0.698	0.476	0.413	0.716	7.53	Tran	0.00663	0.00829	0.0116	Grassy Tr. Dam	EQ mag	1.5
W	BE9690	9/5/06	15:12:25	1.11	0.524	0.984	1.12	7.53	Long	0.00829	0.00829	0.00829	Hillside	EQ mag	1.9
W	BE9689	9/5/06	15:12:26	1.78	1.02	1.25	2.05	6.65	Tran	0.0116	0.00994	0.0166	Grassy Tr. Dam	EQ mag	1.9
W	BE9689	9/7/06	9:31:47	0.667	0.508	0.587	0.871	11.9	Tran	0.00829	0.00663	0.0182	Grassy Tr. Dam		
W	BE9690	9/7/06	22:29:03	0.556	0.254	0.667	0.68	9.31	Long	0.00663	0.00663	0.00829	Hillside	EQ mag	1.4
W	BE9689	9/7/06	22:29:05	0.698	0.556	0.683	0.981	12.2	Long	0.00829	0.00663	0.0182	Grassy Tr. Dam	EQ mag	1.4
LOG	BE9689	9/8/06	17:28:02	***	***	***	***	***	***	***	***	***	Keyboard Stop		
LOG	BE9689	9/8/06	17:28:25	***	***	***	***	***	***	***	***	***	Start Monitoring		
W	BE9690	9/8/06	22:13:32	0.667	0.302	0.778	0.792	8.68	Long	0.00663	0.00663	0.00829	Hillside	EQ mag	1.7
W	BE9689	9/8/06	22:13:35	1.02	0.556	0.714	1.18	7.11	Tran	0.00663	0.00663	0.0149	Grassy Tr. Dam	EQ mag	1.7
W	BE9689	9/9/06	16:53:05	0.349	0.746	0.302	0.861	>100	Vert	0.0331	0.0613	0.0249	Grassy Tr. Dam	Man Made	
W	BE9690	9/12/06	23:12:00	0.603	0.349	0.46	0.614	9.14	Tran	0.00663	0.00663	0.00663	Hillside		
W	BE9689	9/12/06	23:12:04	0.921	0.54	0.571	1.03	7.11	Tran	0.00829	0.00663	0.0166	Grassy Tr. Dam		
W	BE9690	9/14/06	4:32:33	0.635	0.286	0.635	0.702	7.21	Tran	0.00663	0.00497	0.00829	Hillside		
W	BE9689	9/14/06	15:27:58	0.698	0.476	0.492	0.823	7.21	Tran	0.00829	0.00663	0.0166	Grassy Tr. Dam		
W	BE9689	9/15/06	8:03:20	0.238	0.143	0.603	0.638	56.9	Long	0.0116	0.00994	0.0215	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	8:33:17	0.254	0.143	0.635	0.687	56.9	Long	0.0133	0.00994	0.0249	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	10:01:20	0.27	0.127	0.603	0.62	56.9	Long	0.0116	0.00994	0.0215	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	11:23:35	0.254	0.206	0.635	0.641	64	Long	0.0116	0.0116	0.0265	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	11:46:24	0.27	0.143	0.603	0.65	56.9	Long	0.0149	0.0116	0.0265	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	11:47:14	0.254	0.127	0.603	0.648	56.9	Long	0.0149	0.00994	0.0215	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	11:51:26	0.333	0.206	0.683	0.715	56.9	Long	0.0133	0.0133	0.0265	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	12:05:40	0.302	0.159	0.778	0.804	73.1	Long	0.0116	0.00829	0.0265	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	12:06:50	0.286	0.175	0.603	0.652	73.1	Long	0.0182	0.00994	0.0249	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	12:07:20	0.238	0.143	0.635	0.665	73.1	Long	0.0149	0.0116	0.0215	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	12:12:42	0.222	0.159	0.603	0.634	56.9	Long	0.0116	0.00829	0.0265	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	12:14:18	0.286	0.159	0.603	0.65	56.9	Long	0.0133	0.00994	0.0232	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	12:16:18	0.27	0.127	0.603	0.653	64	Long	0.0149	0.00994	0.0215	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	12:21:59	0.27	0.127	0.603	0.633	64	Long	0.0116	0.00829	0.0199	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	12:35:06	0.286	0.159	0.651	0.706	51.2	Long	0.0166	0.00829	0.0232	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	12:36:23	0.317	0.143	0.651	0.698	64	Long	0.0149	0.00994	0.0249	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	12:36:30	0.254	0.127	0.603	0.661	56.9	Long	0.0149	0.00829	0.0215	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	12:38:25	0.286	0.175	0.603	0.626	64	Long	0.0149	0.00994	0.0282	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	12:40:28	0.286	0.19	0.698	0.741	64	Long	0.0149	0.0116	0.0282	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	12:46:43	0.317	0.19	0.651	0.67	73.1	Long	0.0149	0.00994	0.0265	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	13:27:55	0.286	0.175	0.683	0.732	73.1	Long	0.0166	0.00994	0.0282	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	13:30:27	0.27	0.127	0.603	0.658	85.3	Long	0.0149	0.00829	0.0249	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	13:36:48	0.238	0.143	0.619	0.663	64	Long	0.0116	0.00994	0.0199	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	14:36:56	0.317	0.143	0.603	0.635	64	Long	0.0149	0.0133	0.0232	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	14:37:37	0.286	0.143	0.603	0.62	56.9	Long	0.0116	0.00663	0.0199	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	14:38:08	0.222	0.159	0.603	0.625	51.2	Long	0.0116	0.00829	0.0182	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	14:40:24	0.27	0.19	0.651	0.674	56.9	Long	0.0133	0.00829	0.0232	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	14:54:50	0.254	0.143	0.667	0.704	64	Long	0.0116	0.00994	0.0232	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	15:20:31	0.302	0.159	0.603	0.625	56.9	Long	0.0149	0.00994	0.0249	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	15:47:24	0.19	0.175	0.619	0.627	64	Long	0.00829	0.0116	0.0232	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	16:00:49	0.254	0.143	0.603	0.636	64	Long	0.0133	0.0116	0.0199	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	16:34:23	0.238	0.175	0.603	0.616	73.1	Long	0.0149	0.0116	0.0249	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	16:34:58	0.27	0.143	0.603	0.644	51.2	Long	0.0149	0.0133	0.0249	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	16:41:40	0.349	0.143	0.619	0.684	56.9	Long	0.0149	0.0116	0.0232	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	16:45:27	0.333	0.175	0.635	0.656	>100	Long	0.0166	0.0116	0.0249	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	16:56:34	0.254	0.159	0.603	0.624	56.9	Long	0.0149	0.0116	0.0199	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	16:57:49	0.27	0.175	0.603	0.649	46.5	Long	0.0149	0.0116	0.0199	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	17:03:59	0.333	0.143	0.619	0.648	64	Long	0.0149	0.00994	0.0232	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	17:19:12	0.333	0.143	0.619	0.65	56.9	Long	0.0182	0.0133	0.0249	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	17:21:17	0.27	0.175	0.619	0.656	64	Long	0.0149	0.0116	0.0215	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	17:32:11	0.317	0.175	0.619	0.664	64	Long	0.0215	0.0133	0.0249	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	17:39:33	0.286	0.159	0.603	0.641	64	Long	0.0149	0.0116	0.0215	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	17:41:30	0.349	0.175	0.603	0.686	64	Long	0.0166	0.0149	0.0232	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	17:48:07	0.27	0.127	0.603	0.626	56.9	Long	0.0149	0.00829	0.0232	Grassy Tr. Dam	Wind?	
W	BE9689	9/15/06	17:52:38	0.27	0.206	0.619	0.662	64	Long	0.0149	0.0116	0.0249	Grassy Tr. Dam	Wind?	
LOG	BE9689	9/16/06	11:55:40	***	***	***	***	***	***	***	***	***	Keyboard Stop		
LOG	BE9690	9/16/06	12:24:00	***	***	***	***	***	***	***	***	***	Keyboard Stop		

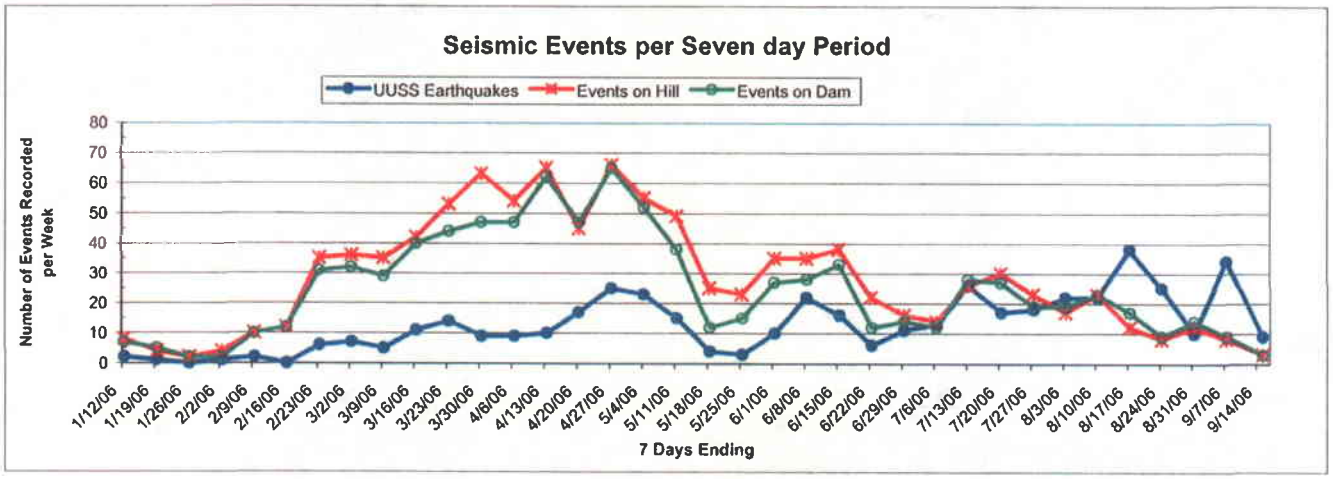

Earthquake Mag and PGA
EQ Mag
Hillside PGA
Dam PGA
Earthquake Magnitude
PGA
2006

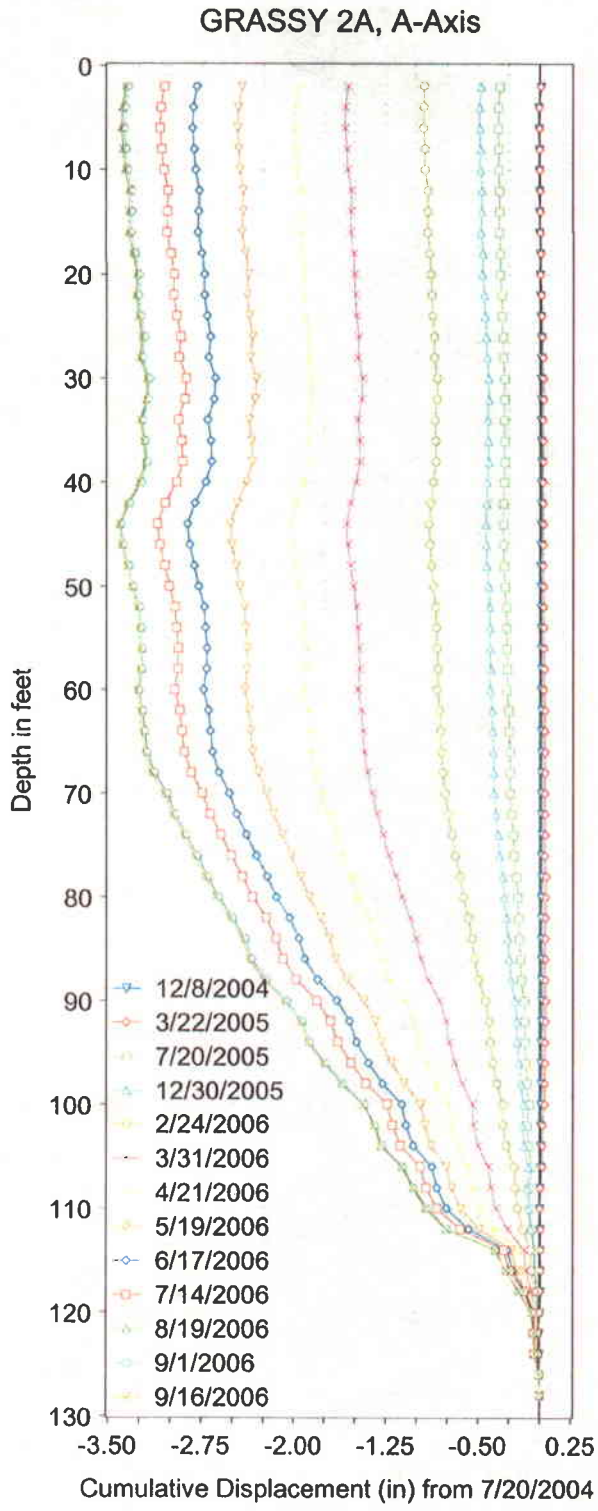

Number of Seismic Events Recorded per Day
Earthquakes
Hillside
Dam
Number of Events
2006

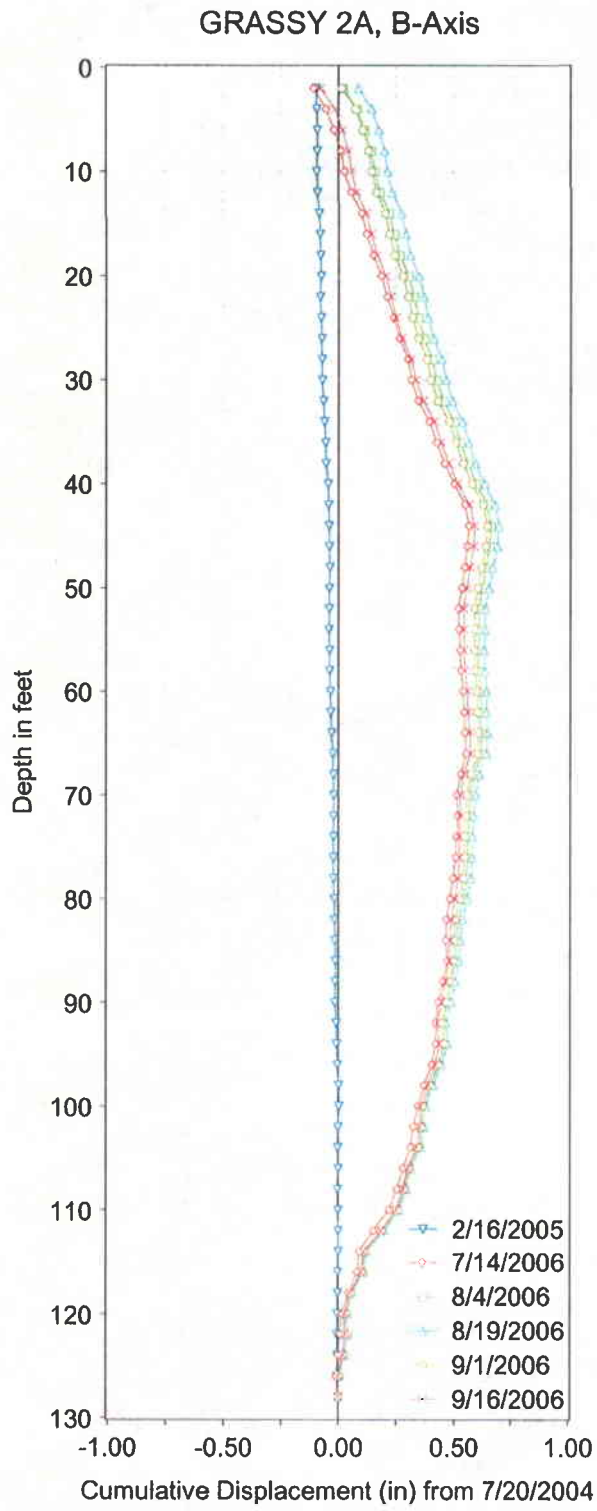

GRASSY 2A, A-Axis, -10 degree skew
Cumulative Displacement (in)
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
-0.75
-1.00
-1.25
-1.50
-1.75
-2.00
-2.25
-2.50
-2.75
-3.00
-3.25
-3.50
-47
44
135
226
317
408
499
590
681
Days since February 16, 2005
60 - 120 feet
120 - 126 feet
2 - 60 feet
12/30/05
1/27/06
3/31/06
7/3/06
8/19/06
9/16/06

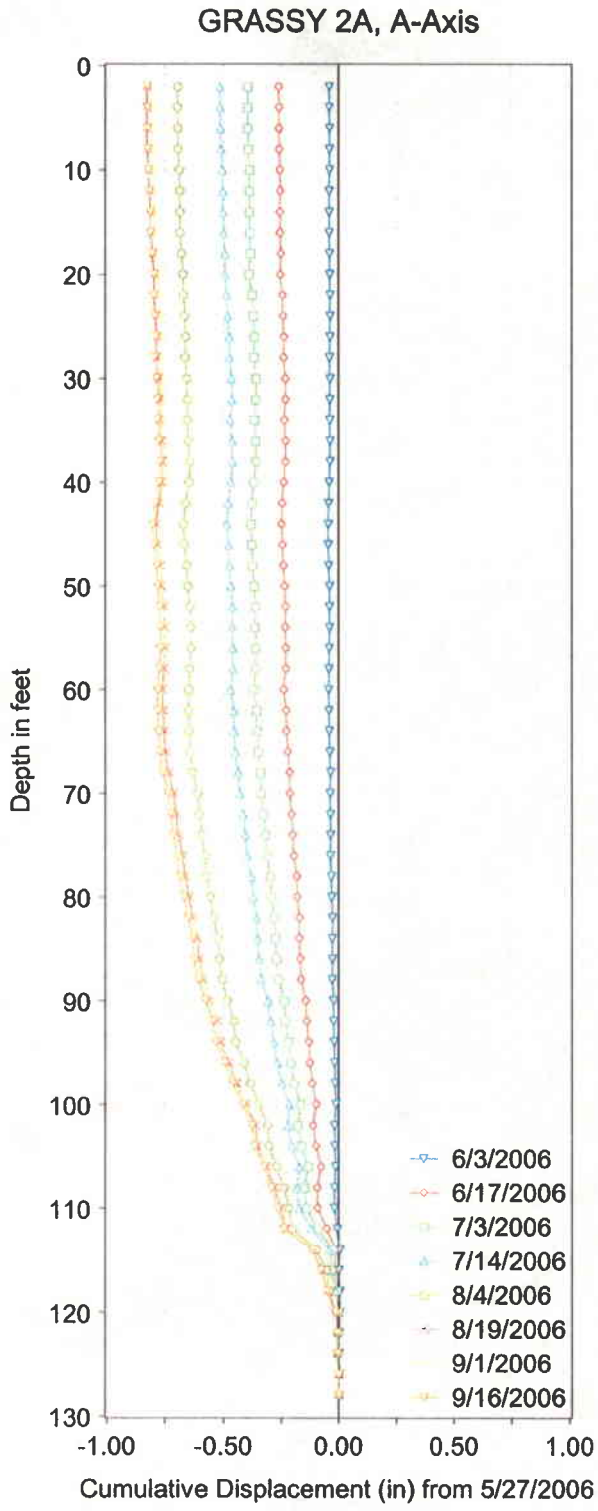

Earthquake Mag and PGA
EQ Mag
Hillside PGA
Dam PGA
Earthquake Magnitude
PGA
2006

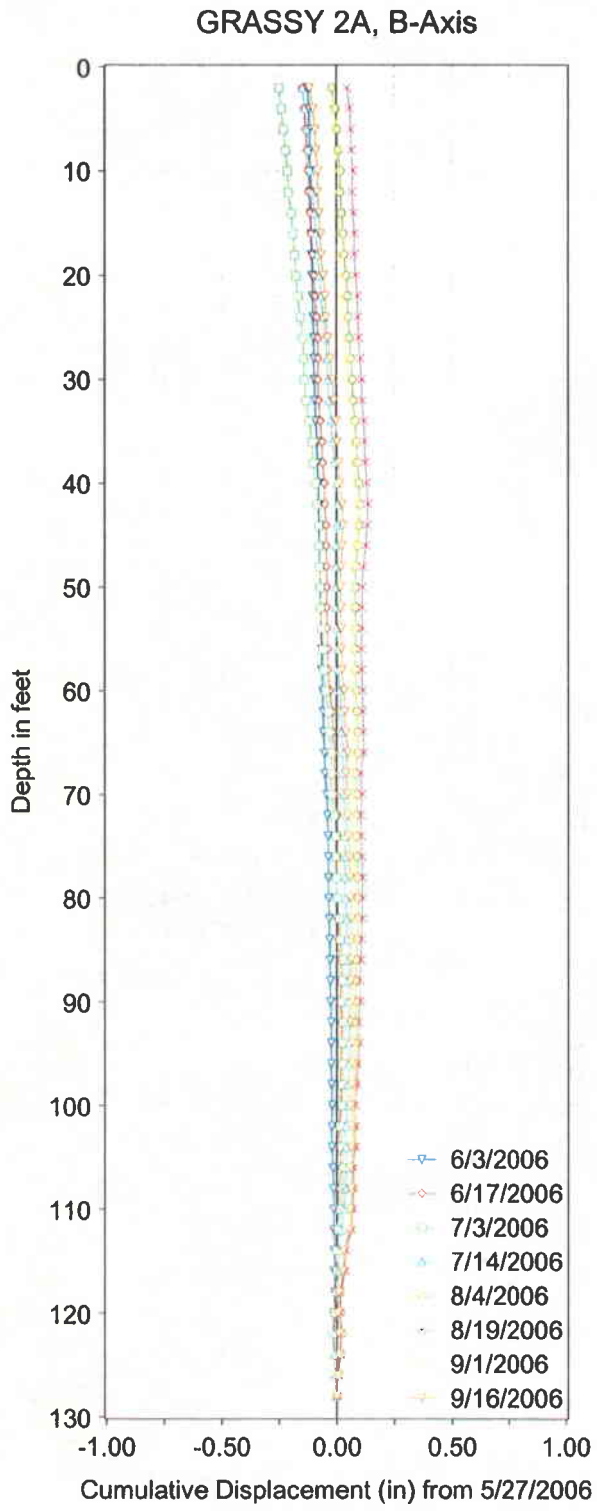

Number of Seismic Events Recorded per Day
Earthquakes
Hillside
Dam
Number of Events
2006

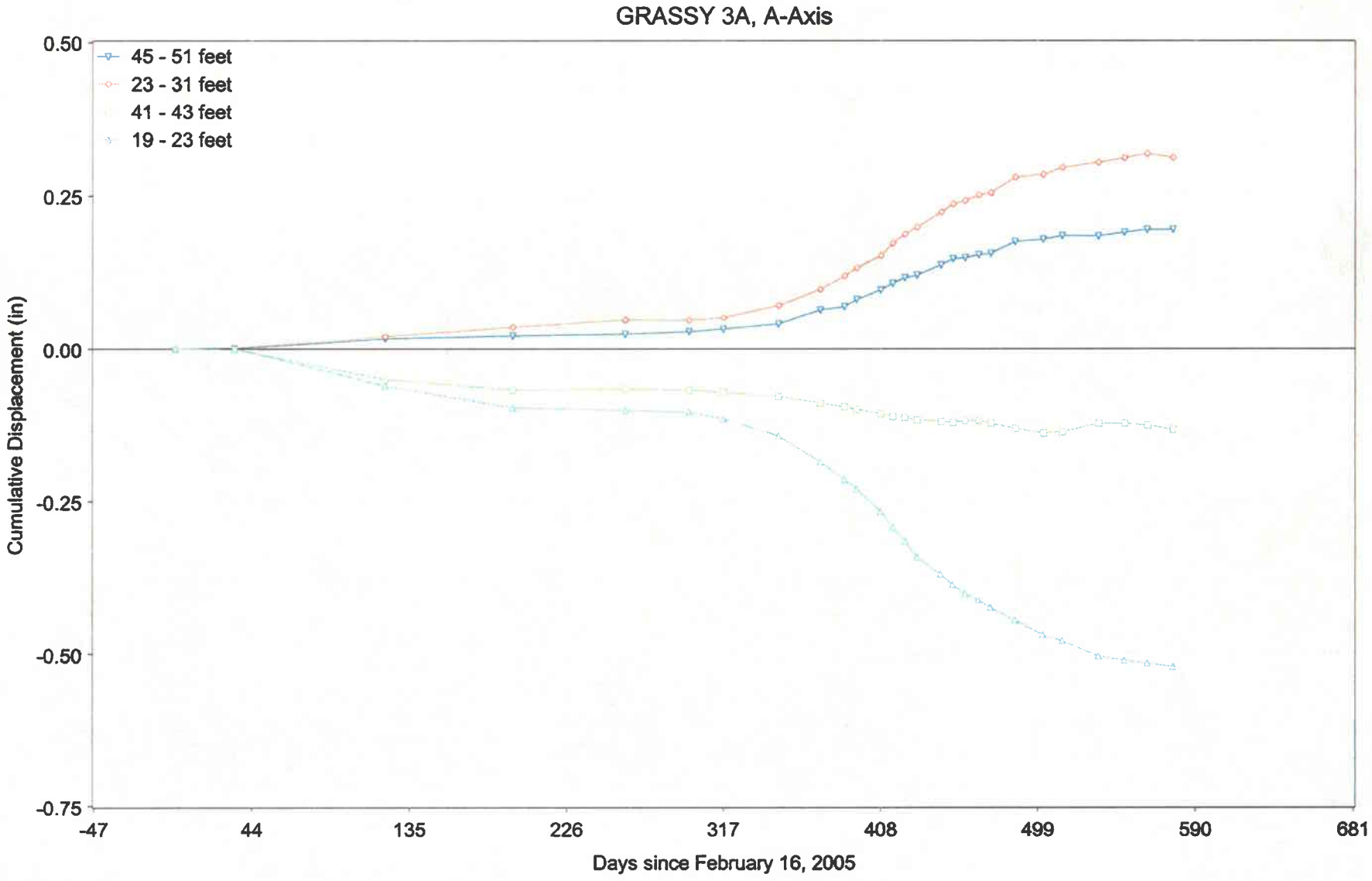

Seismic Events per Seven day Period
UUSS Earthquakes
Events on Hill
Events on Dam
Number of Events Recorded per Week
7 Days Ending

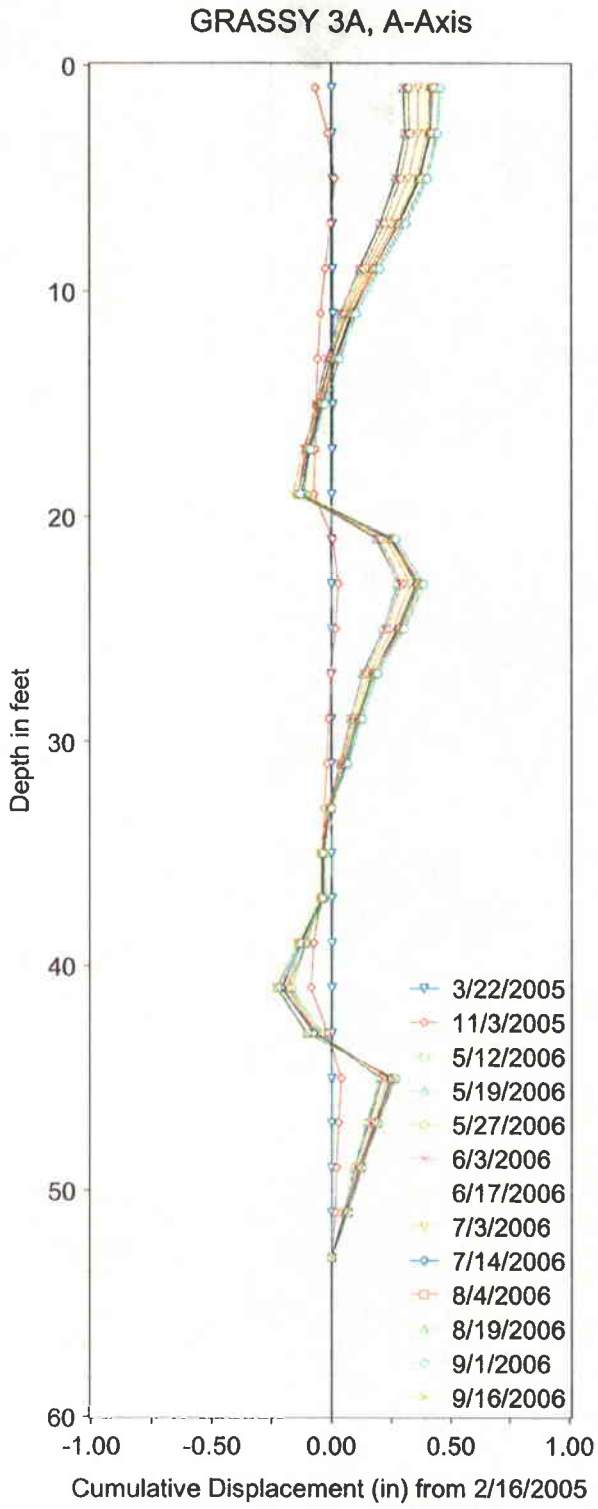

GRASSY 2A, A-Axis
Depth in feet
0
10
20
30
40
50
60
70
80
90
100
110
120
130
-3.50
-2.75
-2.00
-1.25
-0.50
0.25
Cumulative Displacement (in) from 7/20/2004
12/8/2004
3/22/2005
7/20/2005
12/30/2005
2/24/2006
3/31/2006
4/21/2006
5/19/2006
6/17/2006
7/14/2006
8/19/2006
9/1/2006
9/16/2006

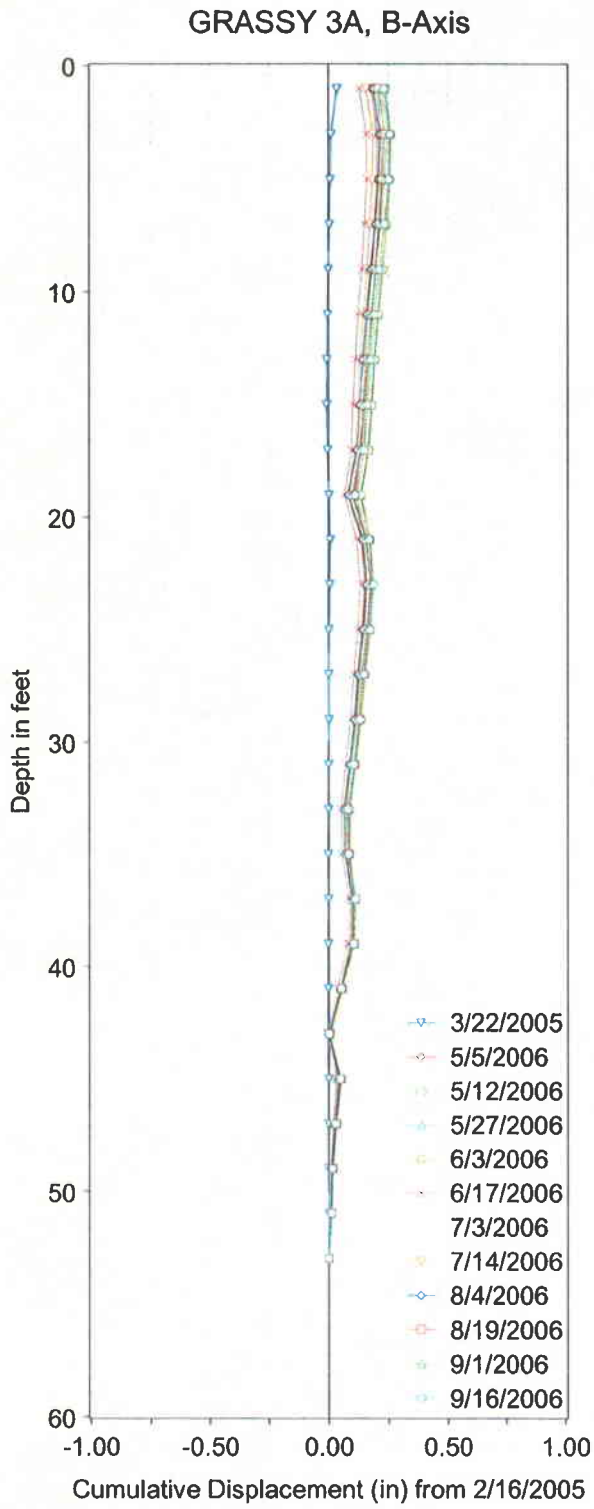

GRASSY 2A, B-Axis
Depth in feet
0
10
20
30
40
50
60
70
80
90
100
110
120
130
-1.00
-0.50
0.00
0.50
1.00
Cumulative Displacement (in) from 7/20/2004
2/16/2005
7/14/2006
8/4/2006
8/19/2006
9/1/2006
9/16/2006


GRASSY 2A, A-Axis
Depth in feet
0
10
20
30
40
50
60
70
80
90
100
110
120
130
-1.00
-0.50
0.00
0.50
1.00
Cumulative Displacement (in) from 5/27/2006
6/3/2006
6/17/2006
7/3/2006
7/14/2006
8/4/2006
8/19/2006
9/1/2006
9/16/2006

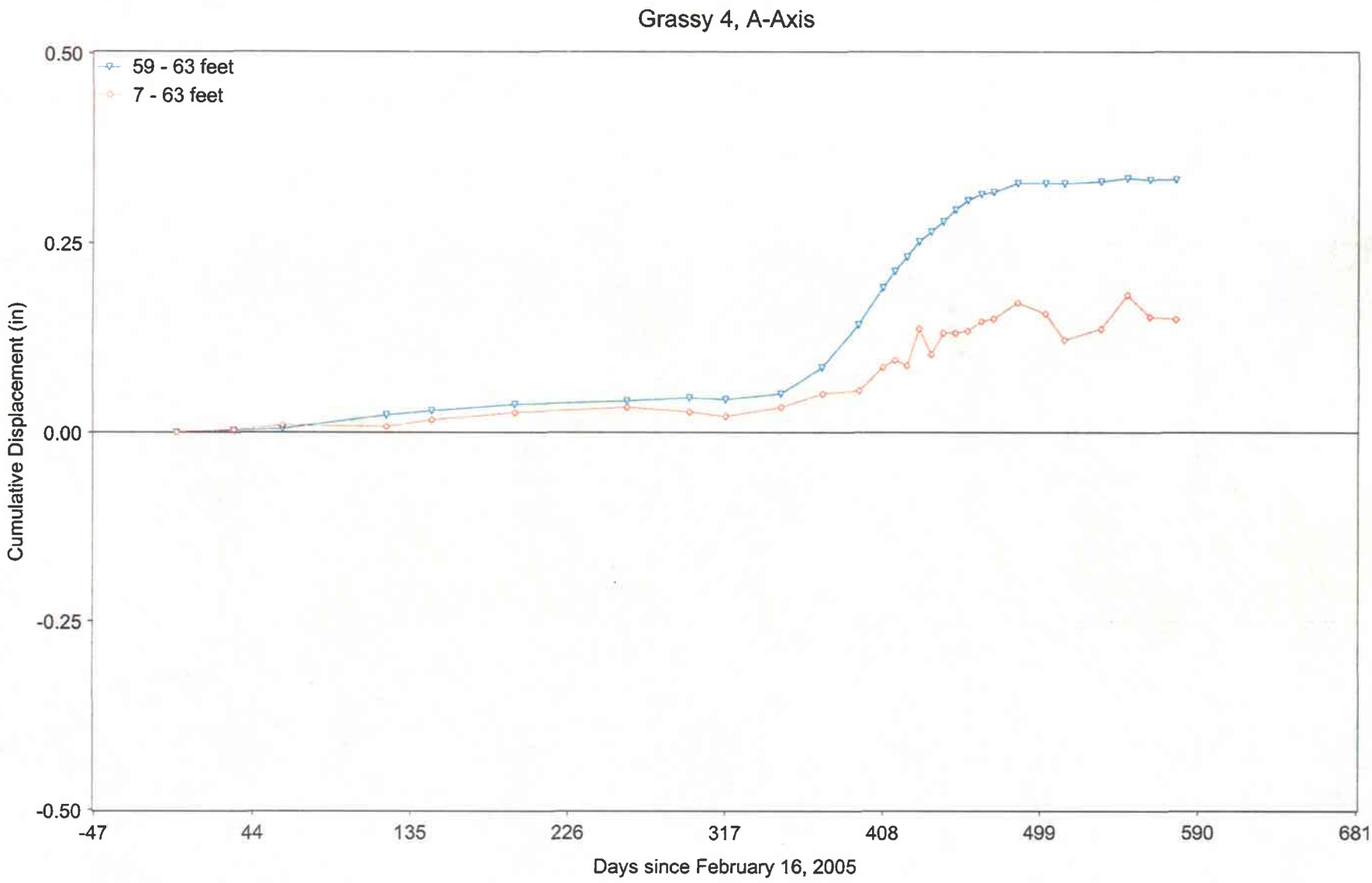

GRASSY 2A, B-Axis
Depth in feet
0
10
20
30
40
50
60
70
80
90
100
110
120
130
-1.00
-0.50
0.00
0.50
1.00
Cumulative Displacement (in) from 5/27/2006
6/3/2006
6/17/2006
7/3/2006
7/14/2006
8/4/2006
8/19/2006
9/1/2006
9/16/2006

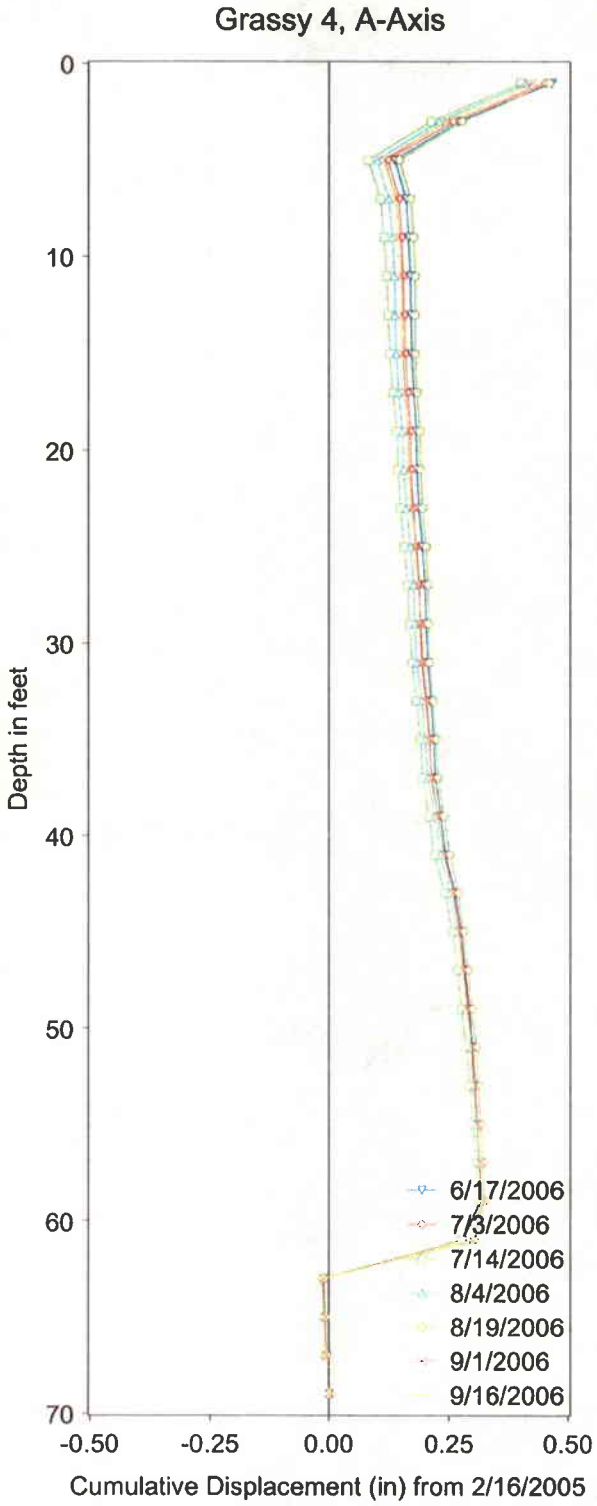

GRASSY 3A, A-Axis
45 - 51 feet
23 - 31 feet
41 - 43 feet
19 - 23 feet
0.50
0.25
0.00
-0.25
-0.50
-0.75
Cumulative Displacement (in)
-47
44
135
226
317
408
499
590
681
Days since February 16, 2005

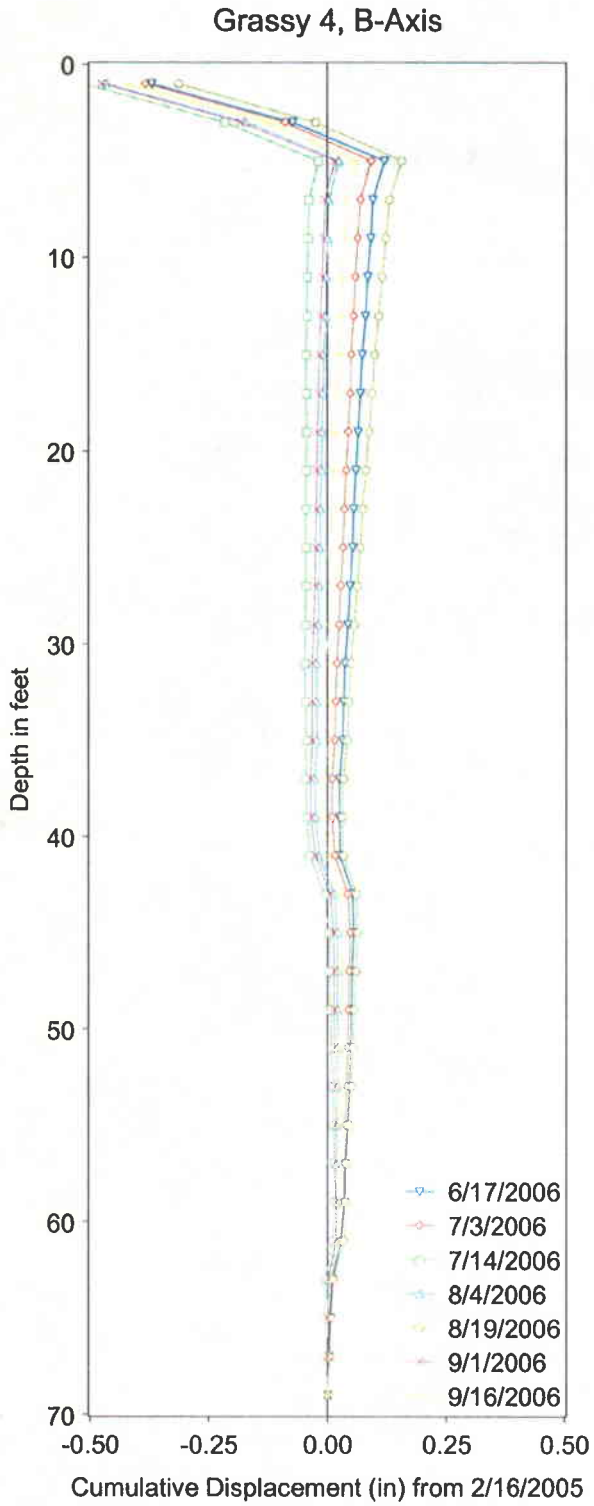




-30 degree skew


Grassy 4, A-Axis
59 - 63 feet
7 - 63 feet
0.50
0.25
0.00
-0.25
-0.50
Cumulative Displacement (in)
-47
44
135
226
317
408
499
590
681
Days since February 16, 2005


Grassy 4, A-Axis
Depth in feet
0
10
20
30
40
50
60
70
-0.50
-0.25
0.00
0.25
0.50
Cumulative Displacement (in) from 2/16/2005
6/17/2006
7/3/2006
7/14/2006
8/4/2006
8/19/2006
9/1/2006
9/16/2006


Grassy 4, B-Axis
Depth in feet
0
10
20
30
40
50
60
70
-0.50
-0.25
0.00
0.25
0.50
Cumulative Displacement (in) from 2/16/2005
6/17/2006
7/3/2006
7/14/2006
8/4/2006
8/19/2006
9/1/2006
9/16/2006