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PROJECT REPORT

Project No.	201404-006		
Project	Grassy Trail – West Ridge Mine Monitoring		
Dates	December 6, 20, 2015 and January 3, 2016	**Weather**	Sunny to cold and snowy
Report By	Michael N. Hansen	**Position**	Engineering Geologist

Observations / Activities

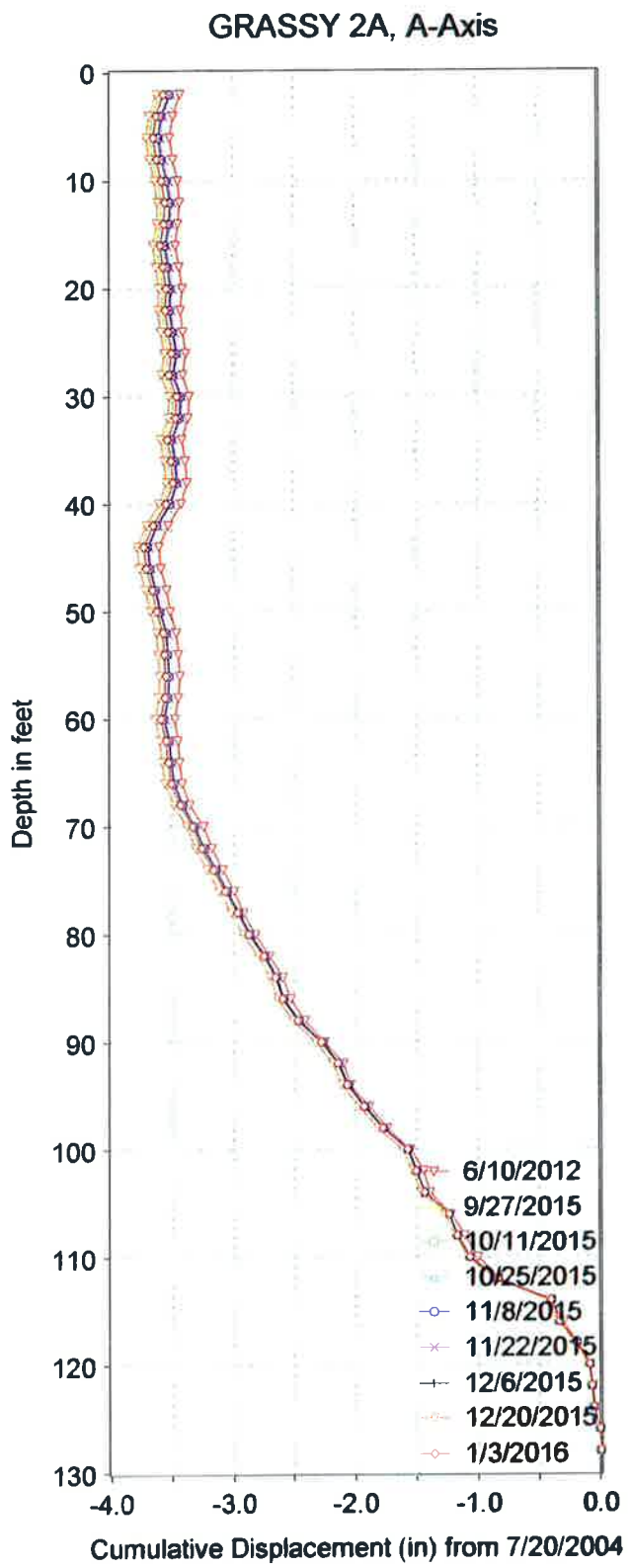
Inclinometers I-2, I-3, and I-4 have been read every two weeks. Readings were taken on Inclinometers I-2, I-3, and I-4 on December 6th, and readings were taken on December 20, 2015 and January 3, 2016 on Inclinometers I-2 and I-3. Since the December 6th reading on Inclinometer I-4, the cover has been buried under about a foot of ice and is no longer accessible during the winter months. Inclinometers I-2, I-3 and I-4 have not shown any significant movement. Plots of the inclinometer readings are attached.

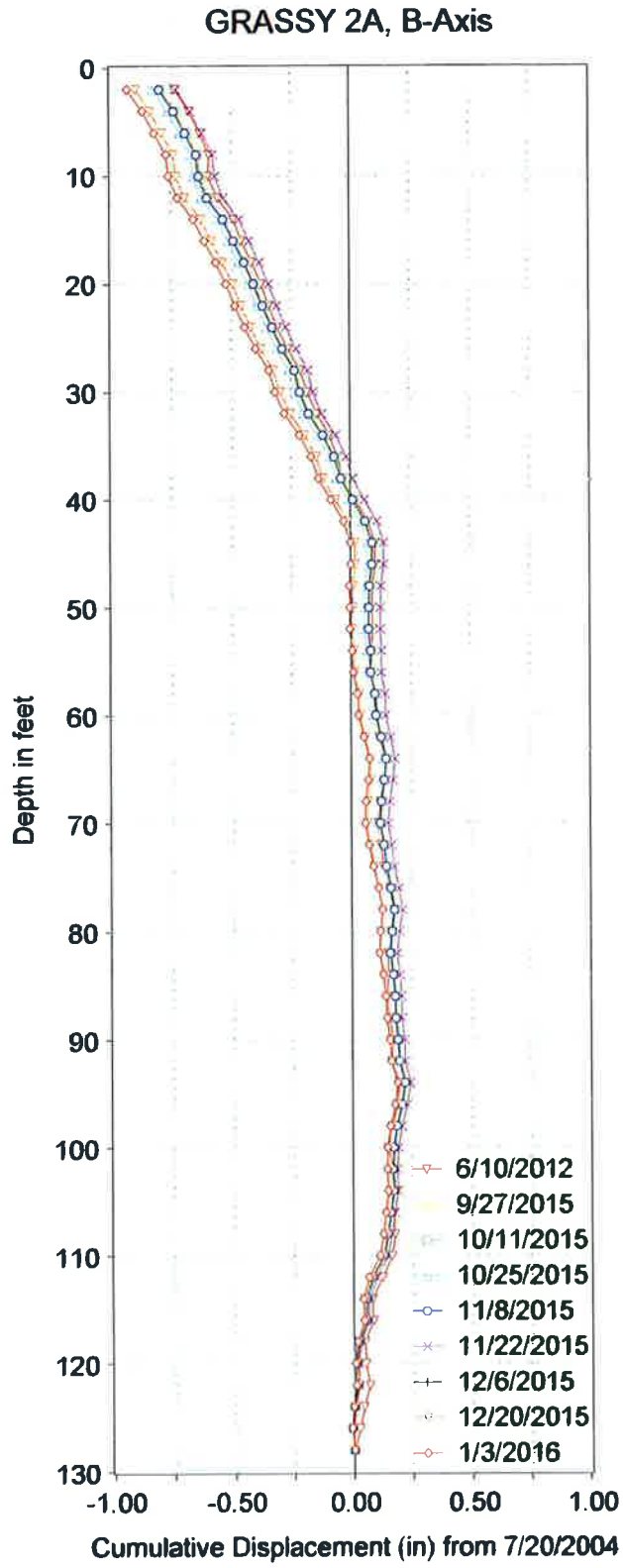
One accelerometer is located on the crest of the dam. This accelerometer has been read every two weeks and has not shown any mining induced seismic activity from November 22, 2015 through January 3, 2016.

Since the last report on November 22nd, no seismic events have been reported within the area of the mine by the University of Utah Seismograph Stations (UUSS).

Reservoir elevation and piezometer readings are generally being taken by East Carbon City every 2 weeks, and this data should be available online at the Dam Safety Website. At the time of this report, the website data had not been updated since Dec 11, 2015. Additional readings of the reservoir elevation and seepage are also being taken by RB&G during site visits. At the time of these site visits, the reservoir was frozen. The water level in the reservoir had come up slightly from 6.4 feet below the spillway on November 8th, to 6.32 feet on December 6th. Since November 22nd, the reservoir level has risen slightly from 7586.1 ft to 7586.35 ft. This may be due to accumulations of ice and snow. Seepage rates have been declining, with the toe drain now being dry. The right abutment seep is frozen. Plots of the reservoir elevations and piezometer and seepage readings are attached.

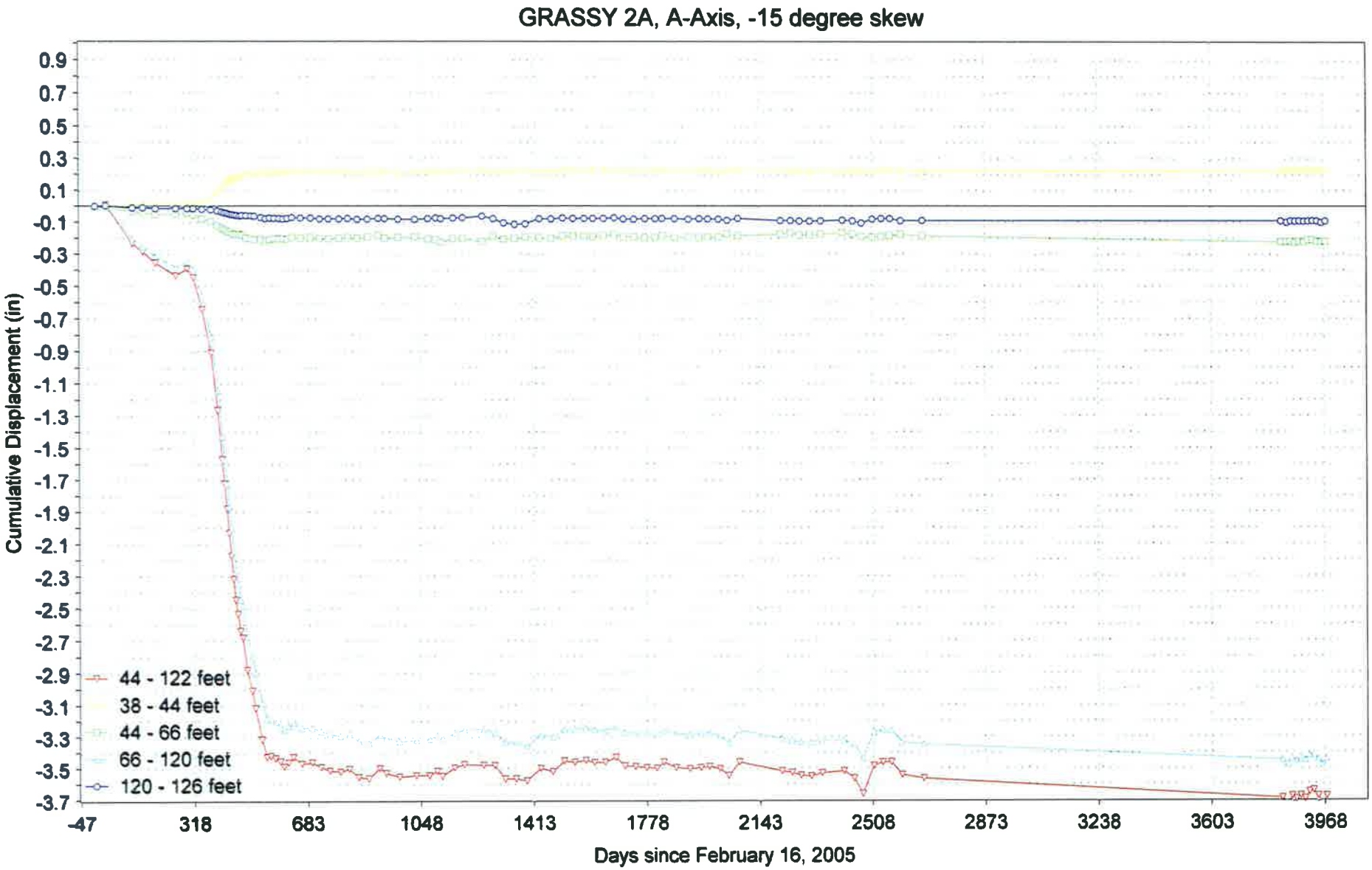
During the site visit, no sign of significant landslide movement was noted on the hillsides or at the dam.





-15 dergree skew
Bias-shift correction

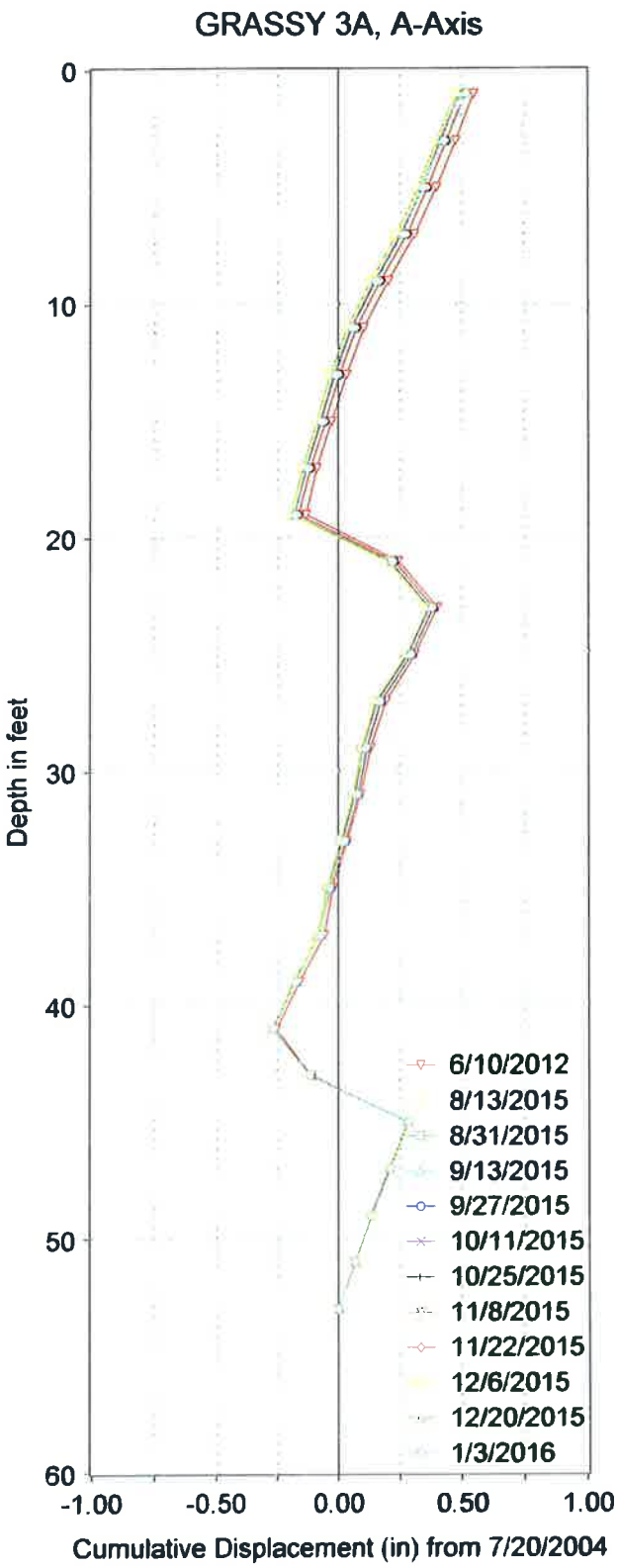
Figure
Inclinometer 2 - Deflection Profile
Grassy Trail Dam, Carbon County, Utah

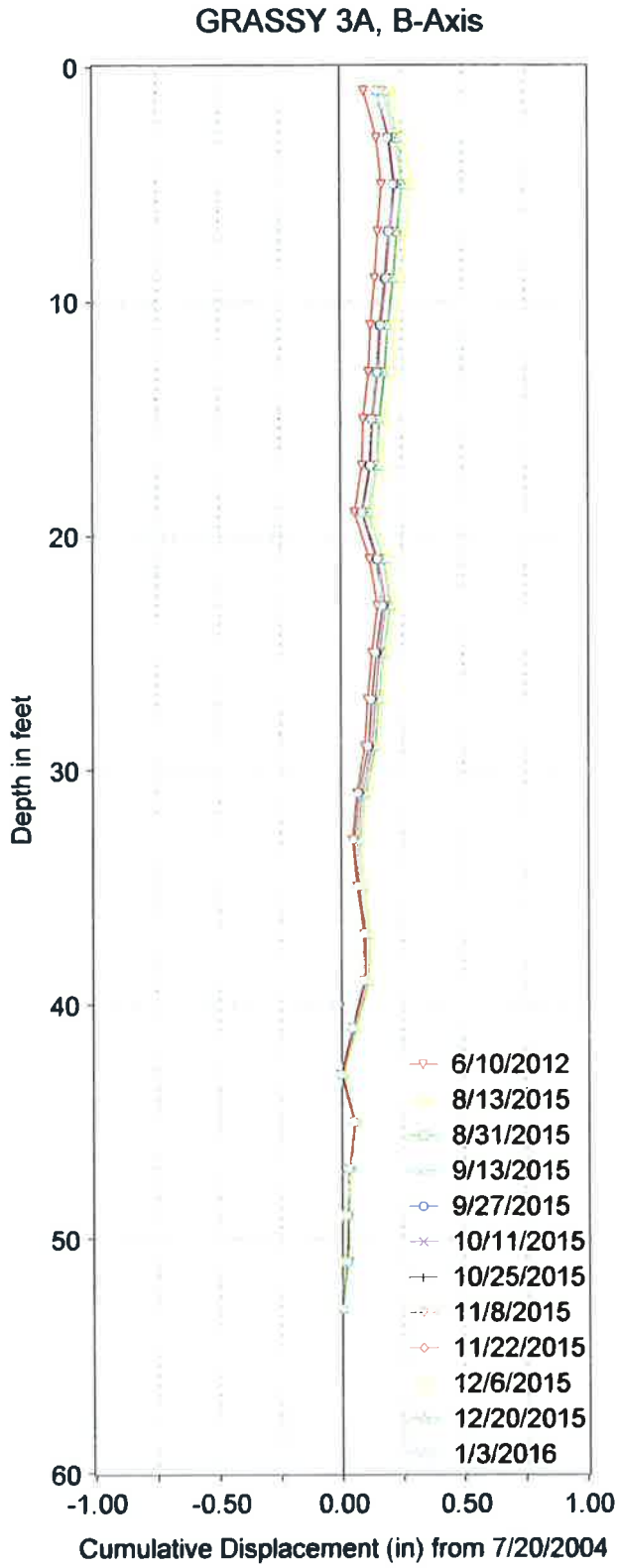


Inclinometer I-2 Located on Dam 01/03/16 with -15 degree skew

Figure

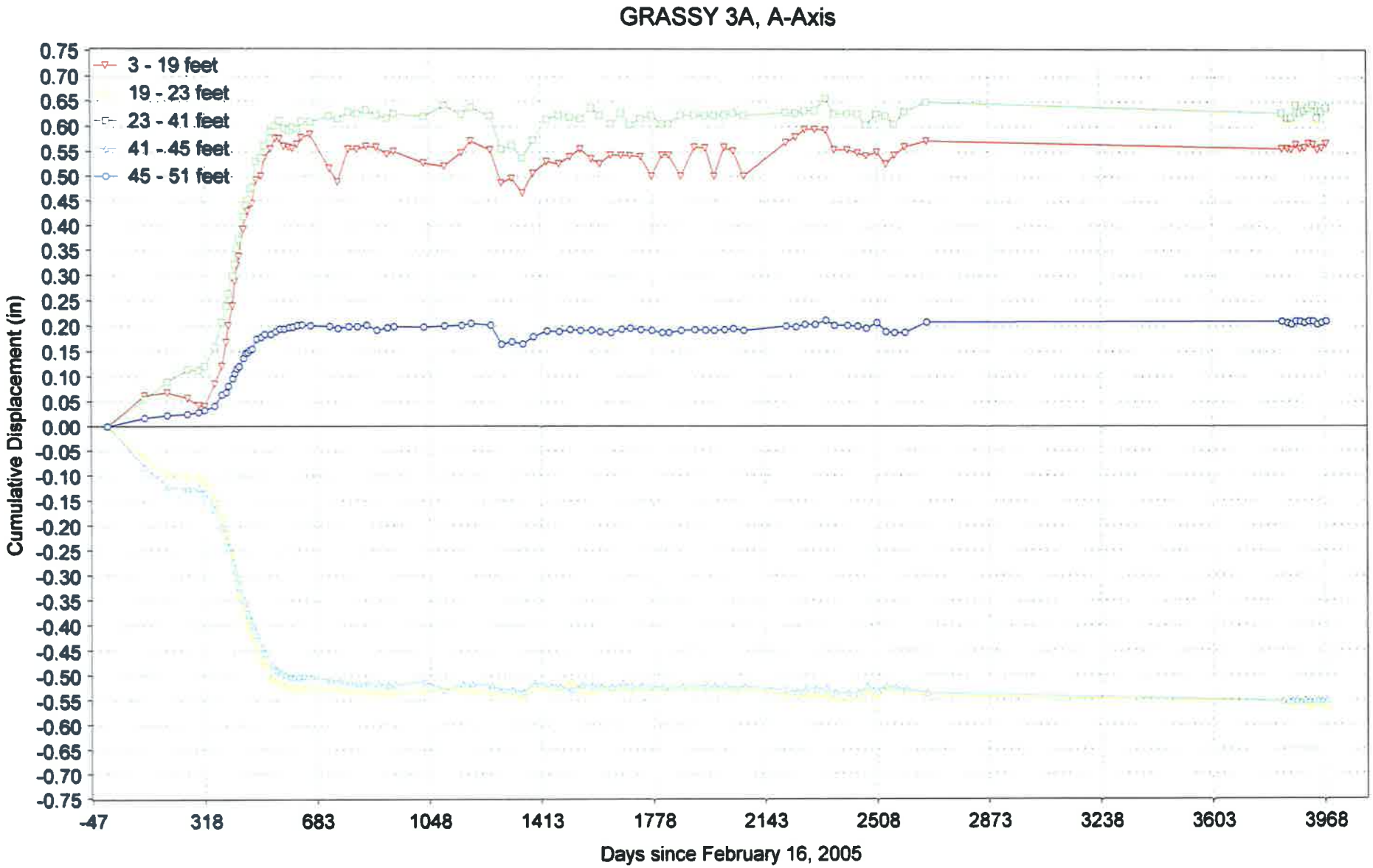
Inclinometer 2 - Deflection versus Time
Grassy Trail Dam, Carbon County, Utah



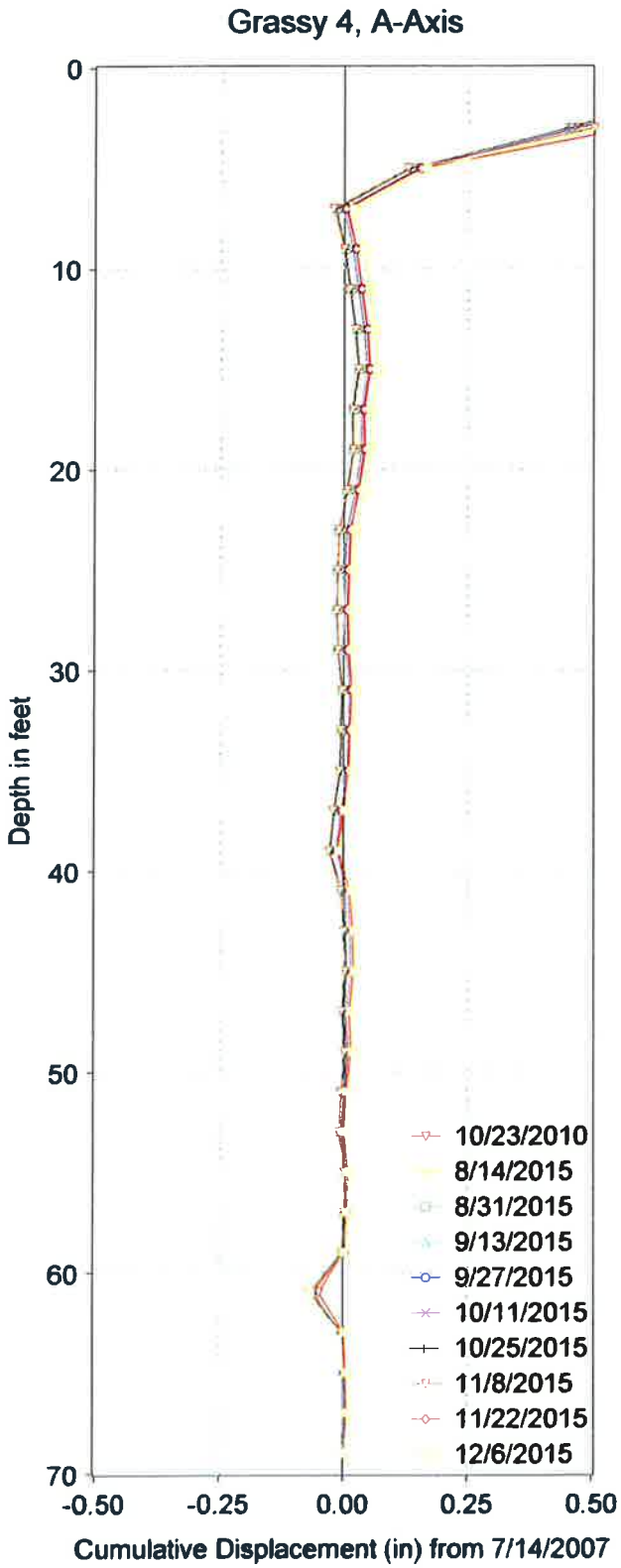


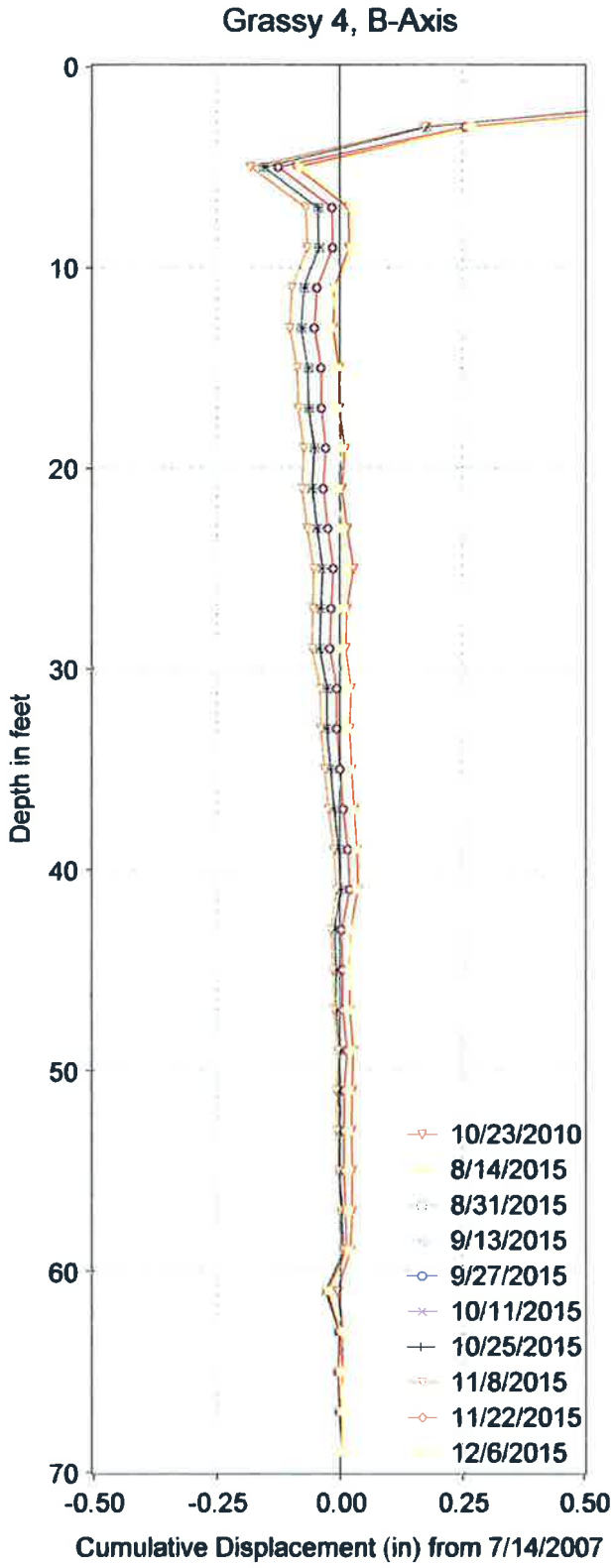
-30 degree skew

Figure
Inclinometer 3 - Deflection Profile
Grassy Trail Dam, Carbon County, Utah



I-3 West/Right Abutment 01/03/16	Figure Inclinometer 3 - Deflections versus Time Grassy Trail Dam, Carbon County, Utah

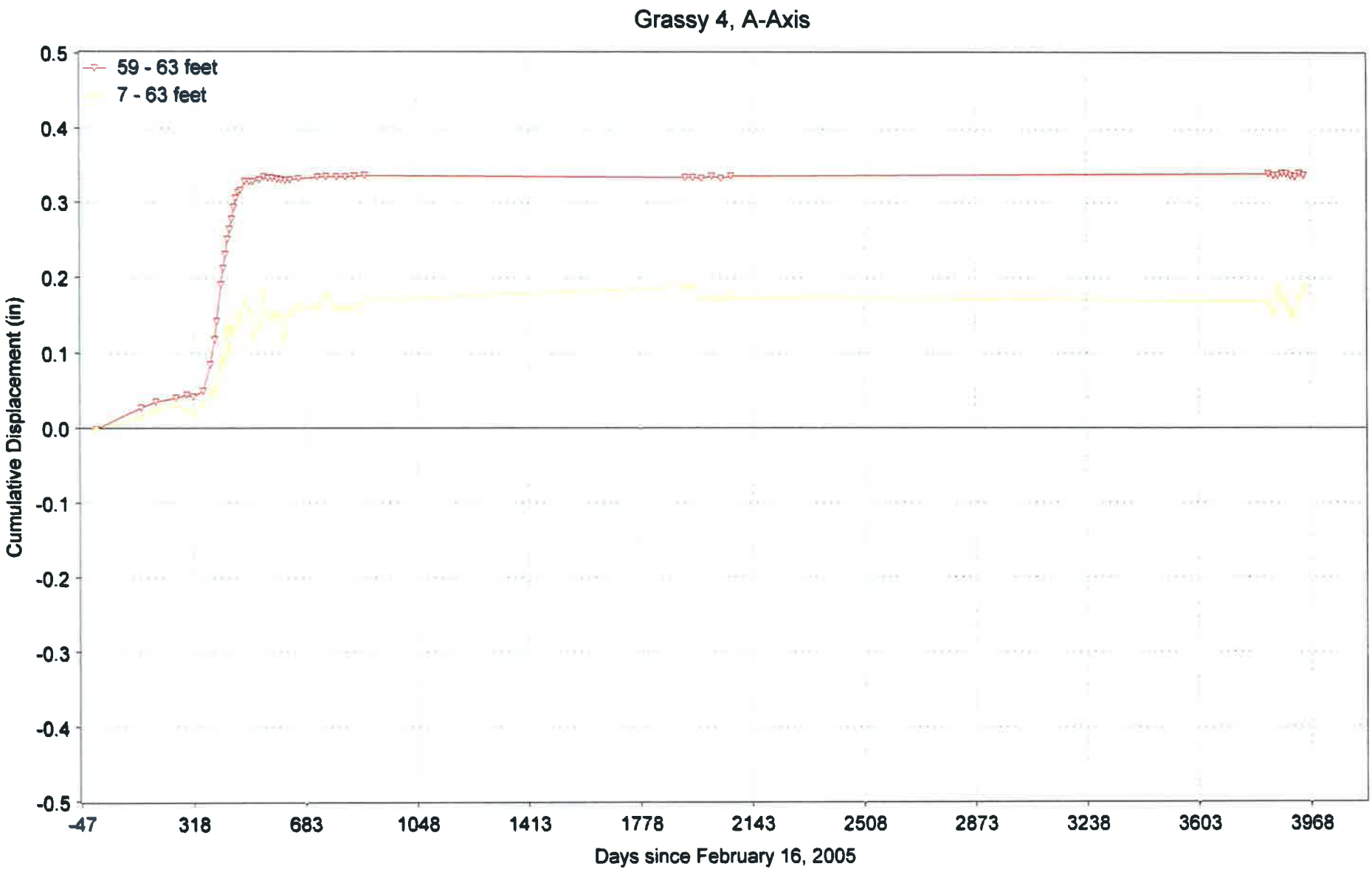




Repairs made 5/26/10 new survey
may not match true with old surveys

Top few feet are loose

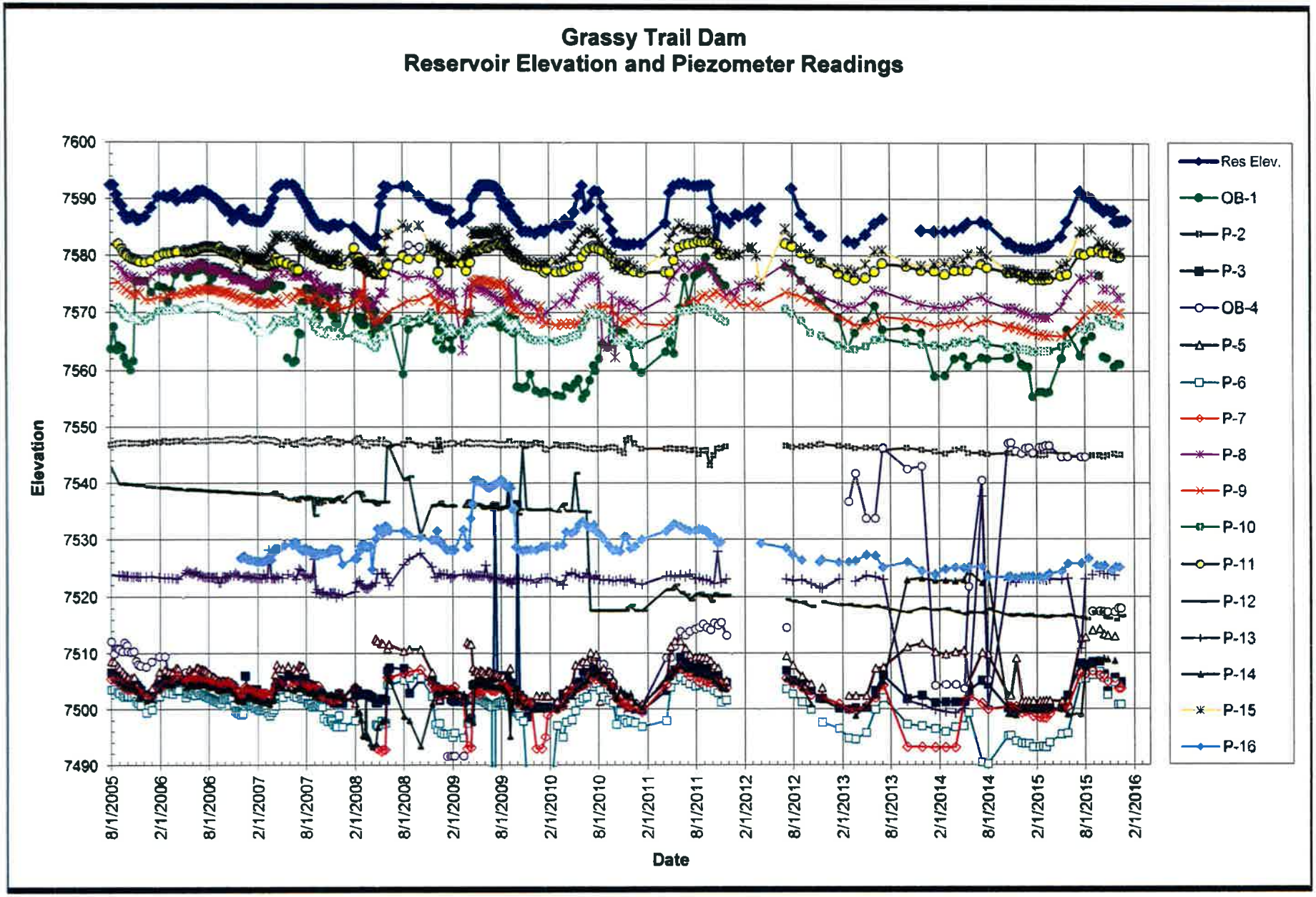
Figure
Inclinometer 4 - Deflection Profile
Grassy Trail Dam, Carbon County, Utah



12/06/15	Figure Inclinometer 4 - Deflection verse Time Grassy Trail Dam, Carbon, County, Utah

GRASSY TRAIL DAM PIEZOMETER & OBSERVATION WELL READINGS

TAKE READINGS AT RIM ELEV.			05-2		79-4	98-3		05-4		79-3	05-3A	05-3		98-2	98-4	98-6	06-1	06-1
			5+62		5+15	4+14		~4+14		3+63	2+77	2+71						
Dam Crest Elev		7600.0	PIEZ.	PIEZ.	O.W.	PIEZ.		PIEZ.		O.W.	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ
Spillway Elev.		7592.5	8	9	1	2	3	13	14	4	10	11	12	5	6	7	15	16
Rim Elev. (ft)			7601.5		7601.8	7601.7		7558.9	7558.9	7601.7	7601.8	7601.7	7601.7	7528.8	7512.0	7519.5		
Tip Elev. (ft	(actual)		7554.5	7535.1	7491.8	7525.4	7491.0	7521.0	7499.5	7491.7	7550.8	7572.0	7529.5	7501.5	7479.5	7493.0		
Piezometer Location			CREST EMBANK.	CREST FOUND.	CREST EMBANK/FOUND	CREST EMBANK.	CREST FOUND.	D.S. SLOPE EMBANK.	D.S. SLOPE FOUND	CREST EMBANK/FOUND	CREST EMBANK.	CREST EMBANK.	CREST FOUND.	TOE FOUND	TOE FOUND	TOE FOUND	CREST FOUND.	CREST BED ROCK
Date	Initials	Reservoir Elevation	45.75' (47')	65' (66.4')	110'	76.2' (76.3')	110.7'	36.5' (37.9')	58.8' (59.4')	110'	49.5' (51')	28.5' (29.7')	84.0' (72.2')	27.3'	32.5'	26.5'	35.5'	100.0'
10/15/14	Values taken from Dam Safety web page submitted by East Carbon City (ECC)	7582.42	7570.9	7567.7	7562.3	7545.4	7500.2	7522.9	7499.2	7547.1	7564.2	7577.2	7516.9	7502.5	7495.3	7500.5	7577.7	7523.5
10/24/14		7582.42	7570.9	7567.8	7562.4	7545.4	7500.2	7522.8	7499.2	7547.2	7564.1	7577.2	7516.8	7502.5	7495.4	7500.5	7577.7	7523.4
11/13/14		7581.67	7570.9	7567.6	7564.3	7545.4	7500.0	7522.5	7499.0	7545.7	7564.0	7577.3	7517.0	7509.2	7494.4	7500.5	7577.4	7523.5
12/05/14		7581.50	7570.3	7567.3	7561.3	7545.3	7500.0	7523.2	7500.1	7545.3	7563.8	7576.9	7516.8	7501.5	7494	7499.4	7576.2	7523.3
12/18/14		7581.33	7570.1	7567.2	7560.9	7545.4	7500.0	7523.2	7500.1	7546.2	7563.8	7576.7	7516.9	7501.5	7493.9	7499.6	7576.9	7523.5
12/31/14		7581.25	7570.0	7567.0	7560.8	7545.4	7500.0	7523.1	7500.0	7546.3	7563.7	7576.7	7517.0	7501.5	7493.9	7499.8	7576.9	7523.4
01/16/15		7581.25	7569.3	7566.6	7555.5	7545.1	7500.0	7523.1	7500.0	7545.4	7563.4	7575.9	7516.7	7501.5	7493.3	7498.8	7576.8	7523.5
02/10/15		7581.50	7569.5	7566.4	7556.4	7545.1	7500.0	7523.1	7500.0	7546.4	7563.5	7576.0	7516.7	7501.5	7493.3	7498.6	7576.8	7523.5
02/23/15		7581.67	7569.4	7566.3	7556.4	7545.0	7500.0	7523	7500.0	7546.5	7563.4	7575.9	7516.6	7501.5	7493.4	7498.5	7576.8	7523.4
03/06/15		7581.75	7569.3	7566.1	7556.2	7545.1	7500.0	7522.9	7500.1	7546.7	7563.4	7576.0	7516.5	7501.6	7493.3	7498.5	7576.8	7523.2
03/19/15		7582.17	7569.4	7566.2	7556.4	7545.8	7500.0	7523.1	7500.3	7546.7	7563.5	7576.0	7516.7	7501.6	7494.1	7499.2	7576.8	7523.5
05/04/15		7583.50	7571.1	7566.1	7562.2	7545.0	7500.3	7523	7500.1	7544.7	7564.2	7576.6	7516.7	7501.5	7495.6	7500.3	7578.4	7524
05/26/15		7586.08	7573.3	7566.4	7567.2	7545.0	7502.5	7523.2	7499.1	7544.7	7564.8	7576.9	7516.9	7501.5	7495.8	7500.4	7578.8	7524.4
07/14/15		7591.50	7576.2	7568.7	7562.7	7544.8	7508.3	7510.9	7499.2	7544.7	7567.4	7580.5	7516.5	7512.8	7505.4	7506.5	7584.3	7525.8
07/15/15		7591.50	7576.2	7568.7	7562.7	7544.8	7508.3	7510.9	7499.2	7544.7	7567.4	7580.5	7516.5	7512.8	7505.4	7506.5	7584.3	7525.8
07/31/15		7590.75	7576.0	7569.9	7565.3	7544.7	7508.1	7523.1	7507.6	7544.7	7567.3	7580.3	7516.2	7513	7505.6	7506.4	7584.3	7525.9
08/13/15		7590.50																
08/26/15		7590.13	7576.9	7570.7	7566.1	7545.0	7508.5	7523.8	7508.2	7517.5	7567.8	7580.9	7517.4	7514.2	7506.2	7506.9	7584.7	7526.7
09/13/15	MH	7588.95																
09/22/15	ECC	7588.92	7576.6	7571.5	7576.7	7545	7508.6	7524.3	7509	7517.5	7569.3	7581.3	7517.4	7514.4	7506.8	7506.1	7582.6	7525.4
09/27/15	MH	7588.50																
10/08/15	ECC	7588.17	7574.3	7571.3	7562.6	7544.8	7506.3	7524	7509.2	7517.4	7568.7	7580.7	7516.4	7513.5	7505.7	7506.2	7582	7525.2
10/11/15	MH	7587.95																
10/22/15	ECC	7588.33	7574.3	751.2	7562.3	7545	7506.3	7523.9	7509	7517.4	7568.9	7580.7	7516.3	7513.3	7502.6	7505	7582	7525.4
10/24/15	MH	7588.30																
11/08/15	MH	7588.00																
11/18/15	ECC	7588.08	7574.1	750.7	7562.8	7544.3	7506.7	7523.7	7508.7	7517.4	7568.1	7580.1	7516	7513.1	7504.9	7505.6	7581.6	7524.6
11/22/15	MH	7586.10																
12/02/15	ECC	7586.17	7572.8	7570.1	7561.3	7545.1	7504.9	NA	NA	7518	7567.8	7579.9	7516.7	7504.6	7500.9	7503.8	7580.7	7525.1
12/06/15	MH	7586.18																
12/11/15	ECC	7586.17	7572.8	7570.1	7561.3	7545.1	7504.9	NA	NA	7518	7567.8	7579.9	7516.7	7504.6	7500.9	7503.8	7580.7	7525.1
12/20/15	MH	7586.25																
01/03/16	MH	7586.35																



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Piezometer Readings
August 2005 to December 11 2015 (Res Elev to January 3 2016 by RB&G Eng)

Grassy Trail Dam and Reservoir

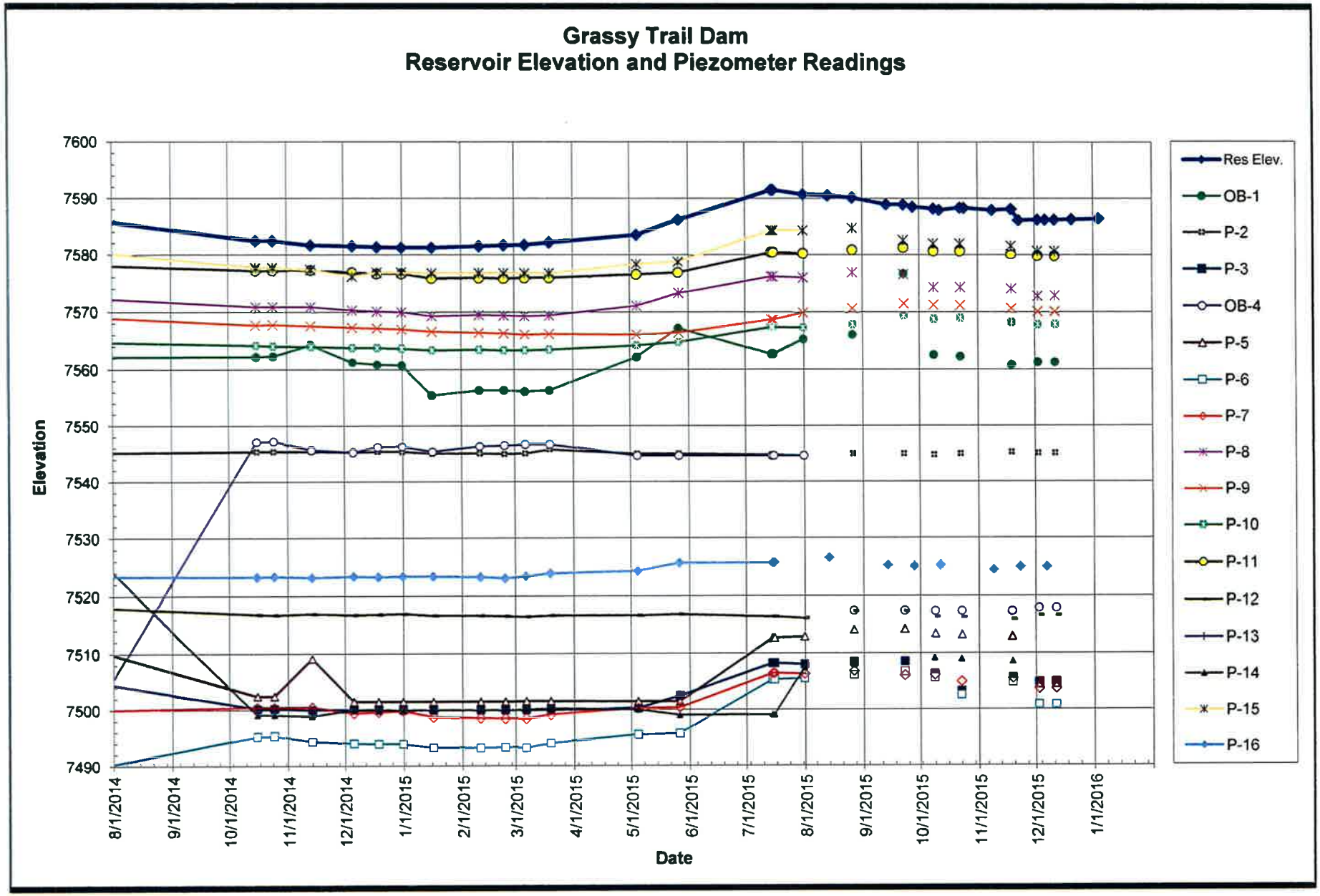


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Figure Reservoir Elevation and Piezometer Readings
August 2014 to December 11 2015 (Res Elev to January 3 2016 by RB&G Eng)

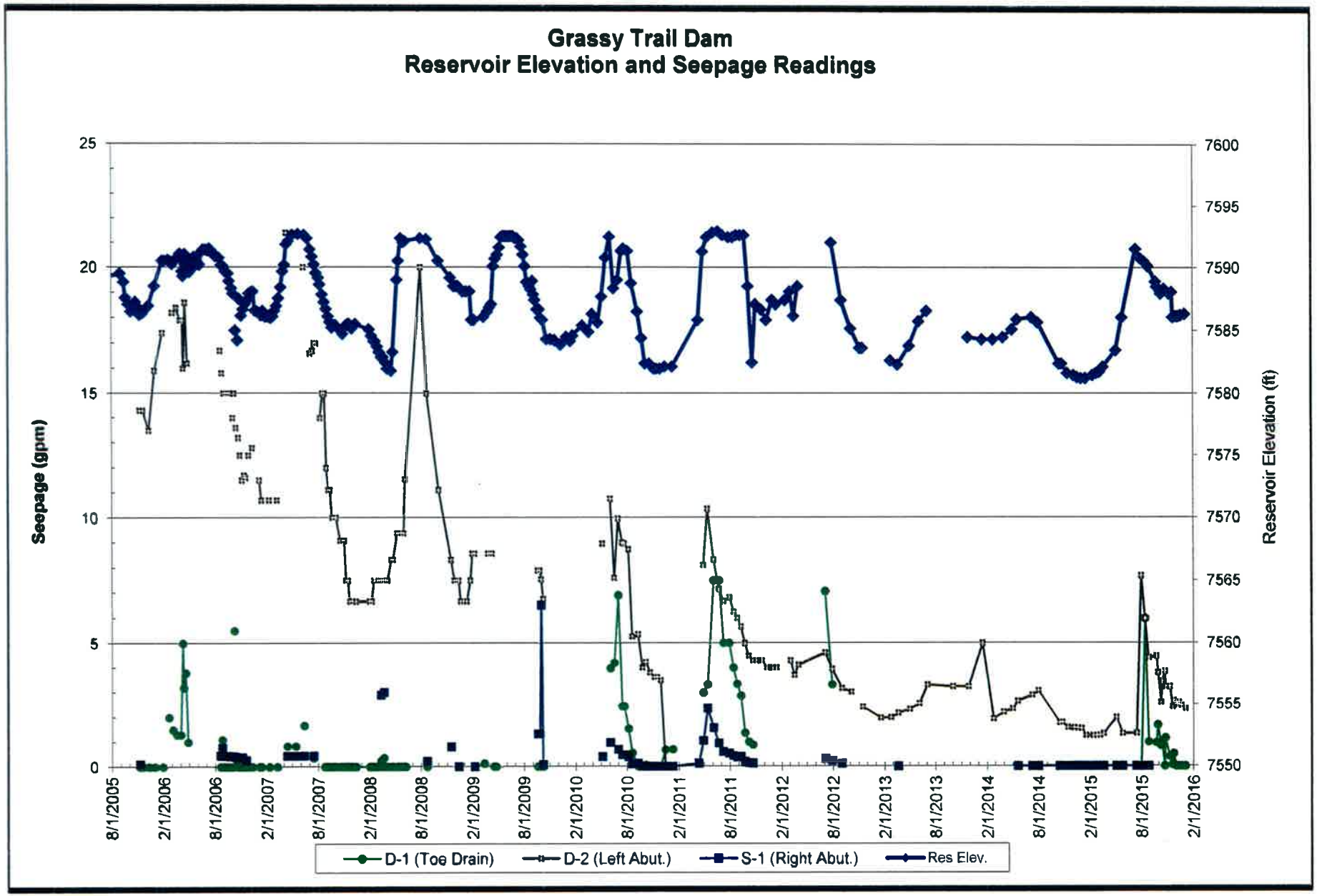
Grassy Trail Dam and Reservoir

GRASSY TRAIL DAM SEEPAGE READINGS

Dam Crest Elev(ft)		7600.0		Seep1:Toe Drain		Seep 2: Left Abutment (East Seep)		Seep 3: Right Abutment (West Seep)			
Spillway Elev. (ft)		7592.5									
		Seep Location:									
Date	Initials	Reservoir Elev.	Reservoir Characteristics	GAL/MIN	Water Characteristics	GAL/MIN	Water Characteristics	GAL/MIN	Water Characteristics	Weather Conditions	Temperature (°F)
10/15/2014	Values taken from Dam Safety web page submited byEast Carbon City (ECC)	7582.417		0.006		1.765		0.001			
10/24/2014		7582.417		0.006		1.775		0.001			
11/13/2014		7581.667		0.001		1.579		0.001			
12/5/2014		7581.5		0.006		1.563		0.001			
12/18/2014		7581.333		0.006		1.546		0.001			
12/31/2014		7581.25		0.006		1.531		0.001			
1/16/2015		7581.25		0.006		1.25		0.001			
2/10/2015		7581.5		0.006		1.245		0.001			
2/23/2015		7581.667		0.006		1.25		0.001			
3/6/2015		7581.75		0.006		1.261		0.001			
3/19/2015		7582.167		0.006		1.327		0.001			
5/4/2015		7583.5		0.006		1.974		0.001			
5/26/2015		7586.083		0.006		1.333		0.001			
7/14/2015		7591.5		0.006		1.339		0.001			
7/15/2015		7591.5		0.006		1.339		0.001			
7/31/2015		7590.75		0.006		7.692		0.001			
8/13/2015		7590.5		6	* likely a typo	6					
8/26/2015		7590.1		0.984	clear	4.412	*trace sediment	0.001			
9/22/2015	ECC	7588.9		0.952	clear	4.478		0.001			
9/27/2015	MH	7588.50	clear	1.67	clear	3.80	*trace sediment	NM	Not Measureable		
10/08/2015	ECC	7588.17		0.833		2.59	clear	0.001			
10/11/2015	MH	7587.95	clear	1.03	clear	3.45	clear	NM	Not Measureable		
10/22/2018	ECC	7588.33		0.006		3.85		NM			
10/24/2015	MH	7588.30	clear	1.15	clear	3.23	clear	NM			
11/8/2015	MH	7587.95	trace Ice on edges	0.39	clear	3.23	clear	NM			
11/18/2015	ECC	7588.08		0.06		2.40		NM			
11/22/2015	MH	7586.10	trace Ice on edges	0.050	clear	2.66	clear	NM	ice	sunny	34
12/02/15	ECC	7586.2	frozen	0.006		2.59			ice		
12/6/2015	MH	7586.2	frozen	Dry		2.50			ice		
12/11/15	ECC	7586.167	frozen	Dry		2.59			ice		
12/20/15	MH	7586.25	frozen	Dry		2.46			ice		
01/03/16	MH	7586.35	frozen	Dry		2.33			ice		

* notes - Michael Hansen RB&G Engineering

Left abut drain has been redone and is not collecting all of the seepage
small amount of sediment passing through drain



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Seepage Readings
August 2005 to January 3 2016
Some additonal readings by RB&G Eng

Grassy Trail Dam and Reservoir

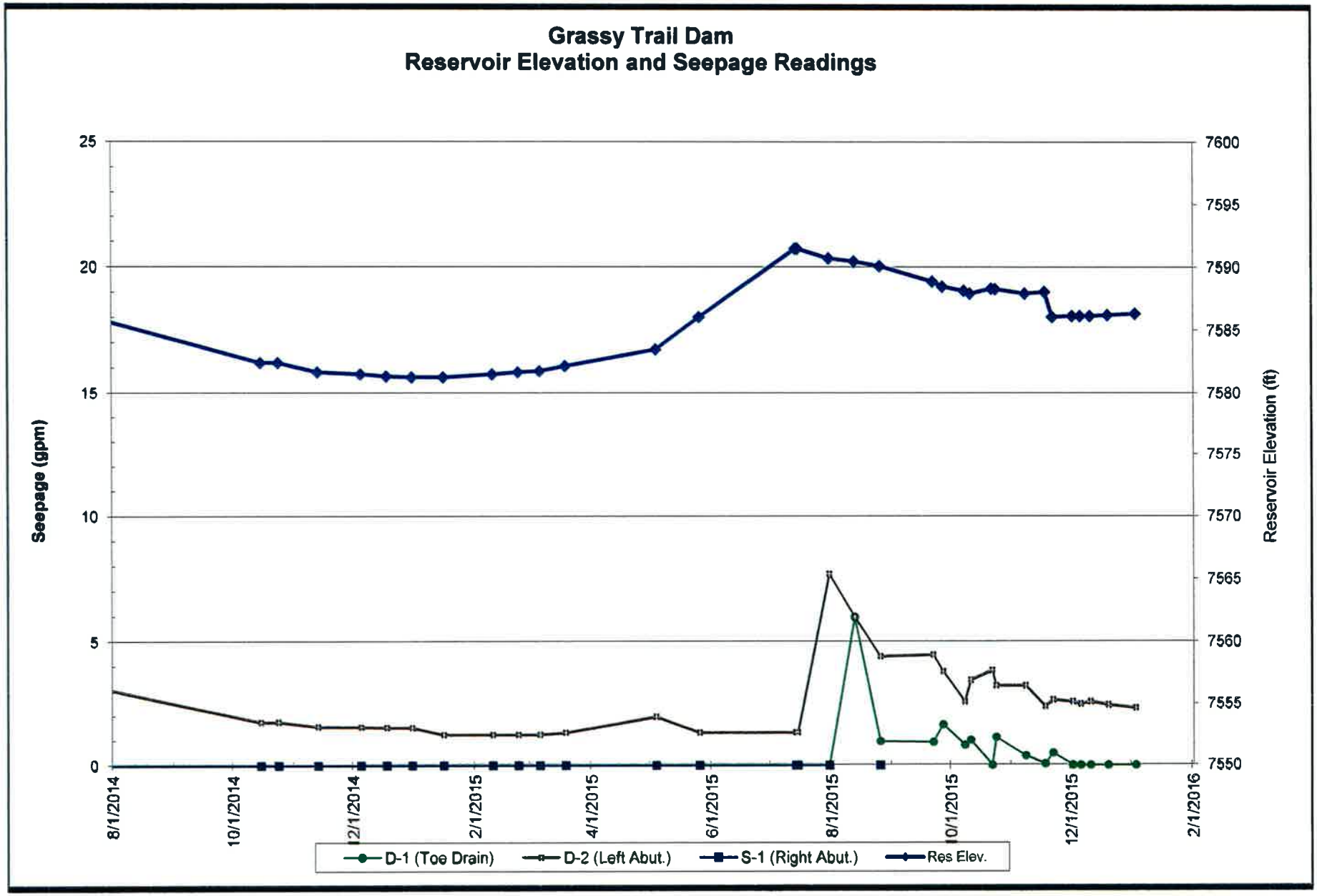


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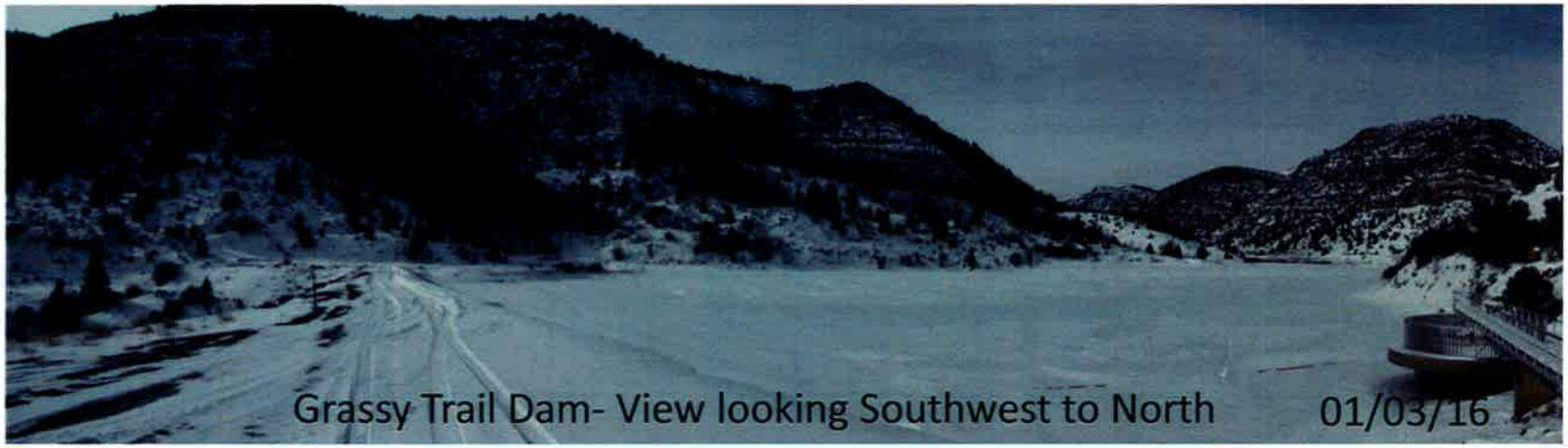
Figure **Reservoir Elevation and Seepage Readings**
August 2014 to January 3 2016
Some additonal readings by RB&G Eng

Grassy Trail Dam and Reservoir

12/06/15

12/20/15


Grassy Trail Dam- View looking Southwest to North
01/03/16

Grassy Trail Dam- View looking North at downstream slope and toe of dam