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PROJECT REPORT

Project No.	201404-006		
Project	Grassy Trail – West Ridge Mine Monitoring		
Dates	January 17, 31, and February 13, 2016	**Weather**	Sunny to cold and snowy
Report By	Michael N. Hansen	**Position**	Engineering Geologist

Observations / Activities

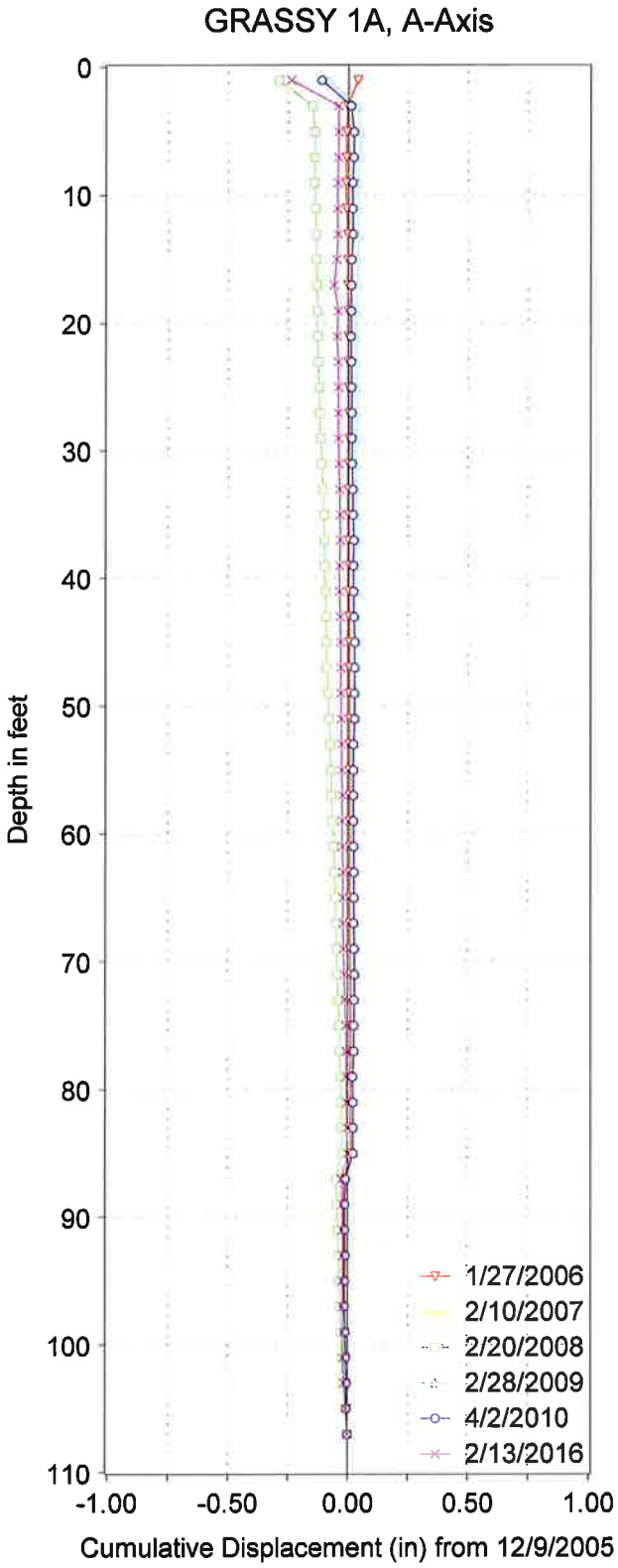
Inclinometers I-2, I-3 have been read several times since the last report on January 3. Inclinometer I-1 located near the left (east) abutment has not been read in some time as it was buried under new fill material on the dam. With the use of a metal detector the cover for I-1 was located on the crest of the dam beneath 12 inches of frozen fill material. While the cover is damaged the inclinometer casing is still in place and operational. I-4 is currently buried under more than a foot of ice since the December 6th reading, and is no longer accessible during the winter months. New readings from inclinometers I-1, I-2, and I-3 have not shown any significant movement. Plots of the inclinometer readings are attached.

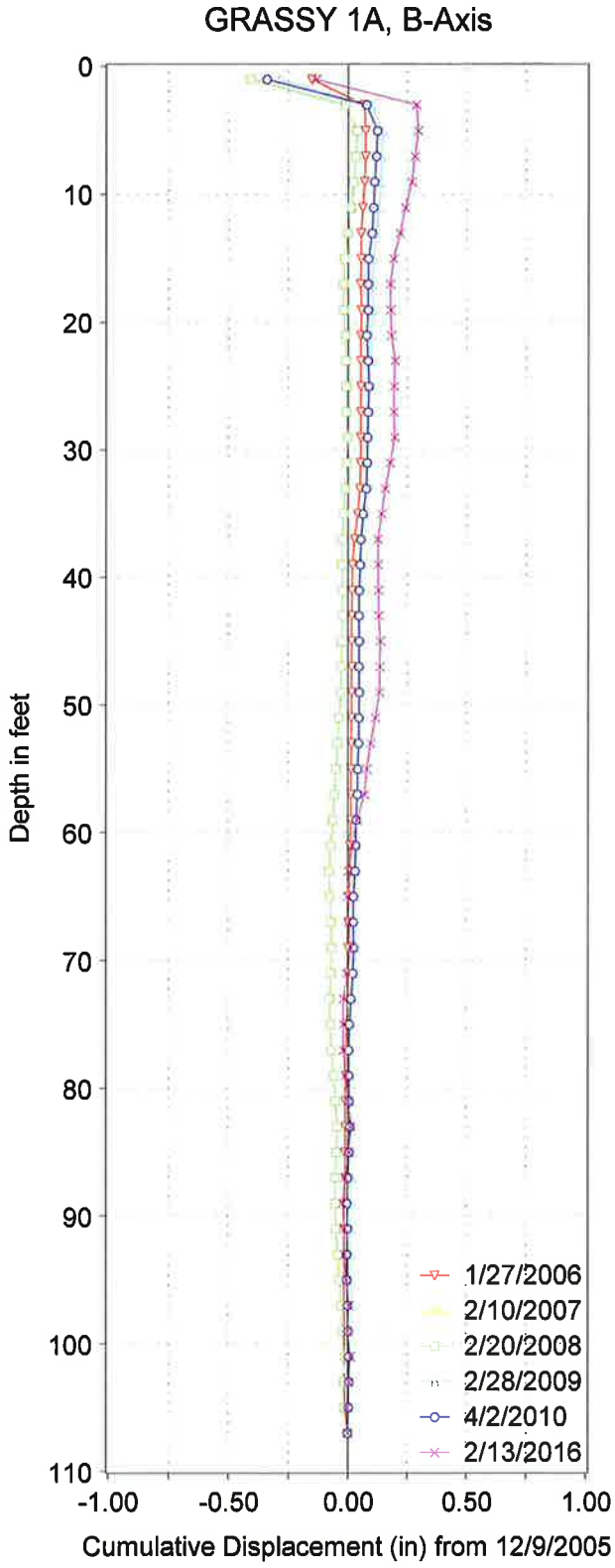
One accelerometer is located on the crest of the dam. This accelerometer has been read several times between January 3 and February 13, 2016. No MIS events were recorded on the instrument.

Since the last report on January 3, 2016 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 (Sunnyside) about every 2 weeks and this data should be available online at the Dam Safety Website. 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 surface was frozen. Seepage rates have been declining, with the toe drain now being dry. And the right abutment seep is frozen. Plots of the reservoir elevations and piezometer and seepage readings are attached.

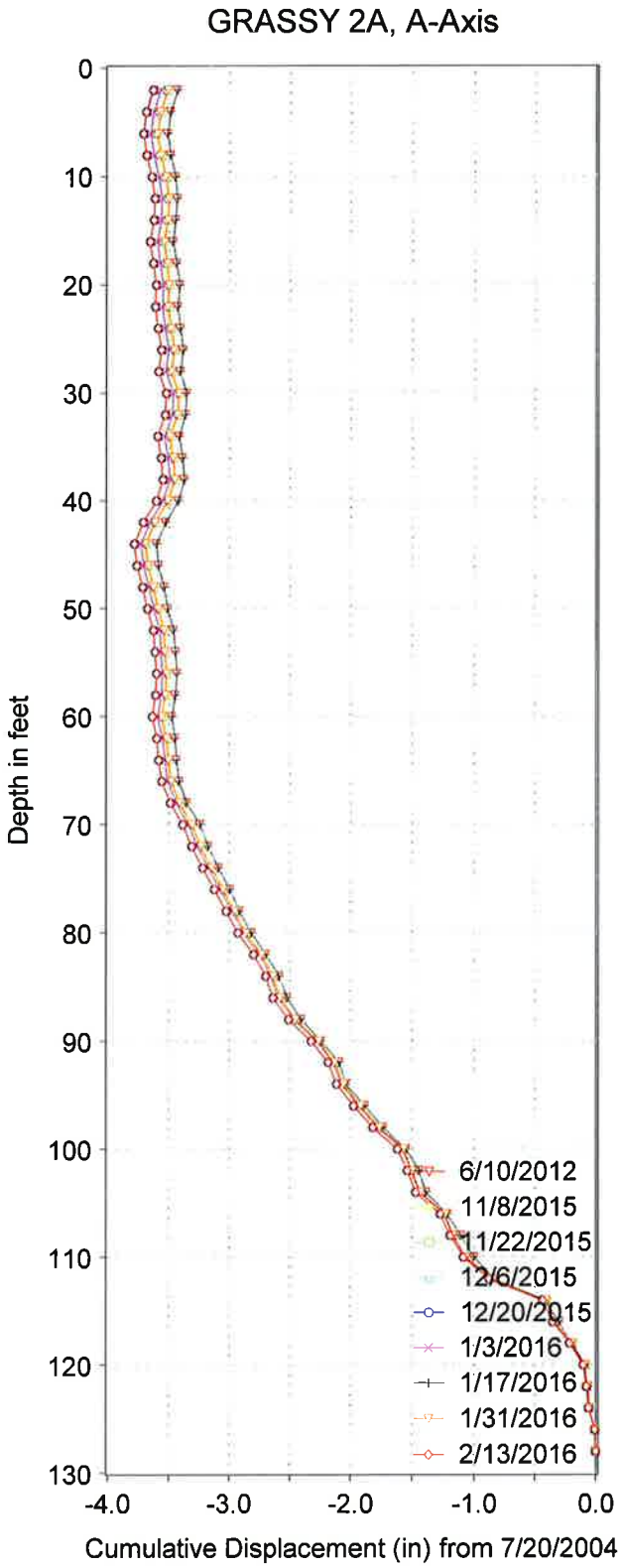
During the site visit, no sign of significant landslide movement was noted on the hillsides or at the dam.

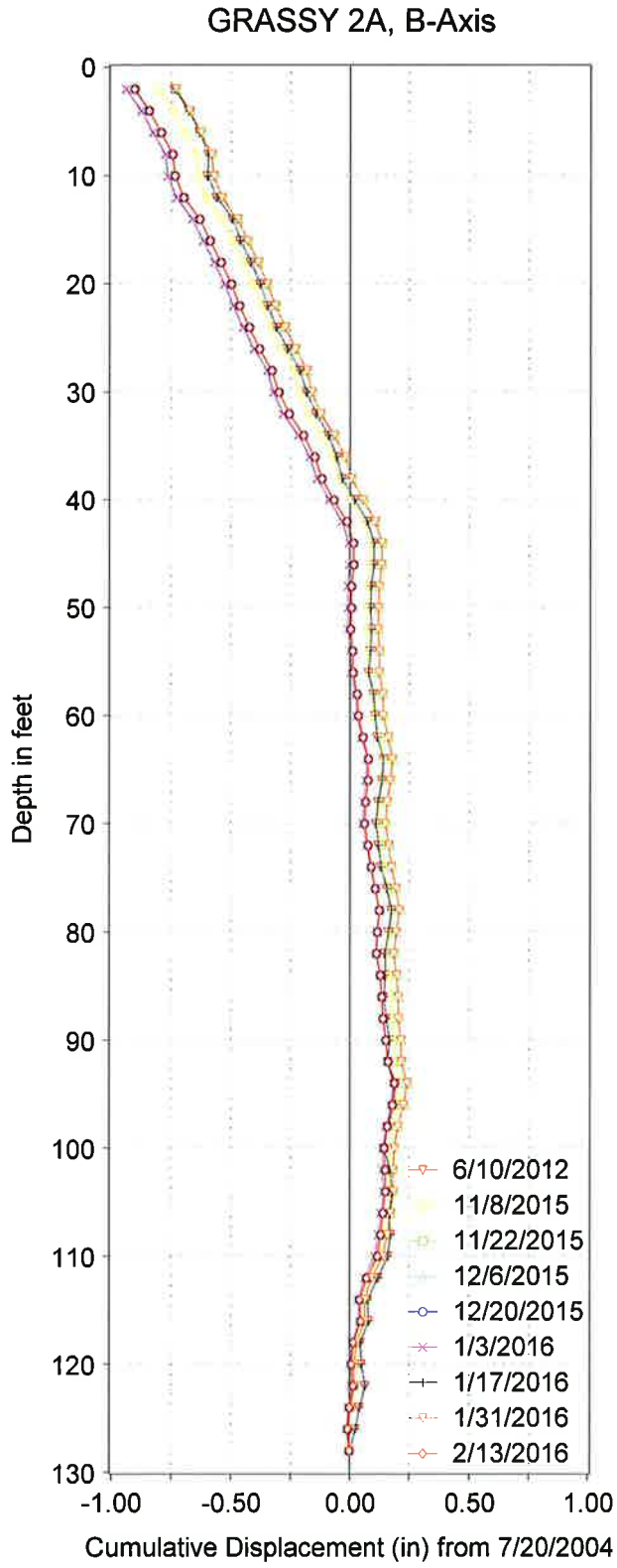




No significant movement observed

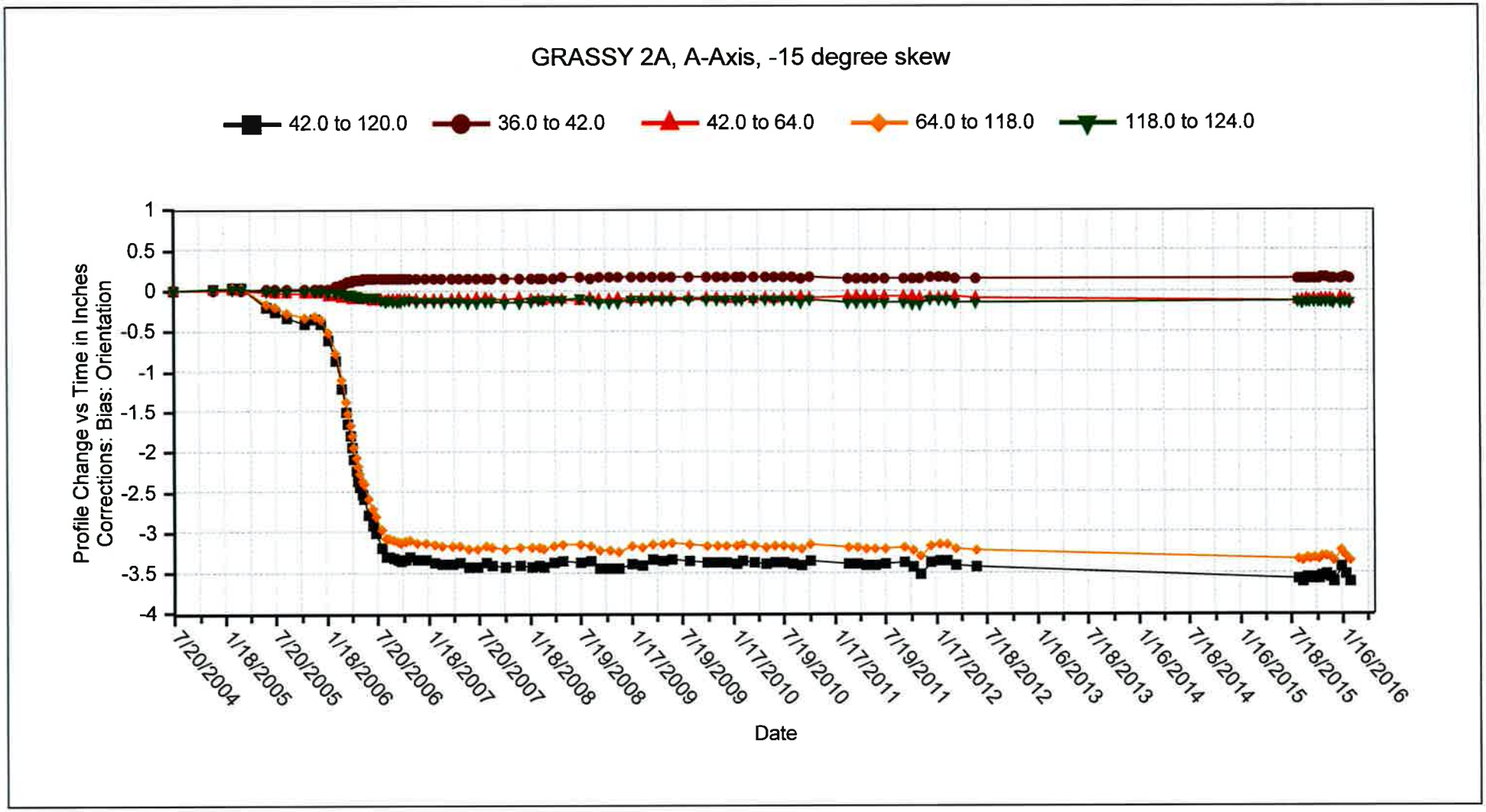
Figure B-1
Inclinometer 1 -Deflection Profiles
Grassy Trail Dam, Carbon County, Utah





-15 dergree skew
Bias-shift correction

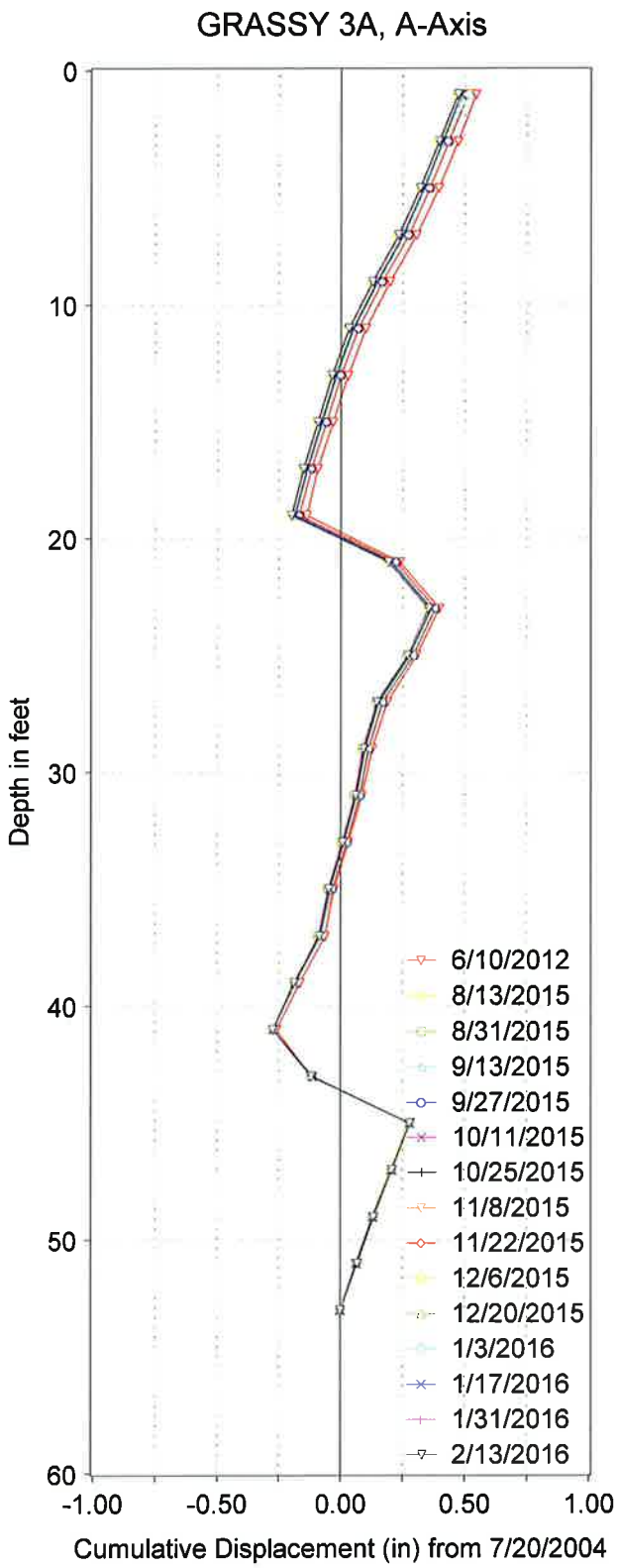
Figure B-2
Inclinometer 2 - Deflection Profile
Grassy Trail Dam, Carbon County, Utah

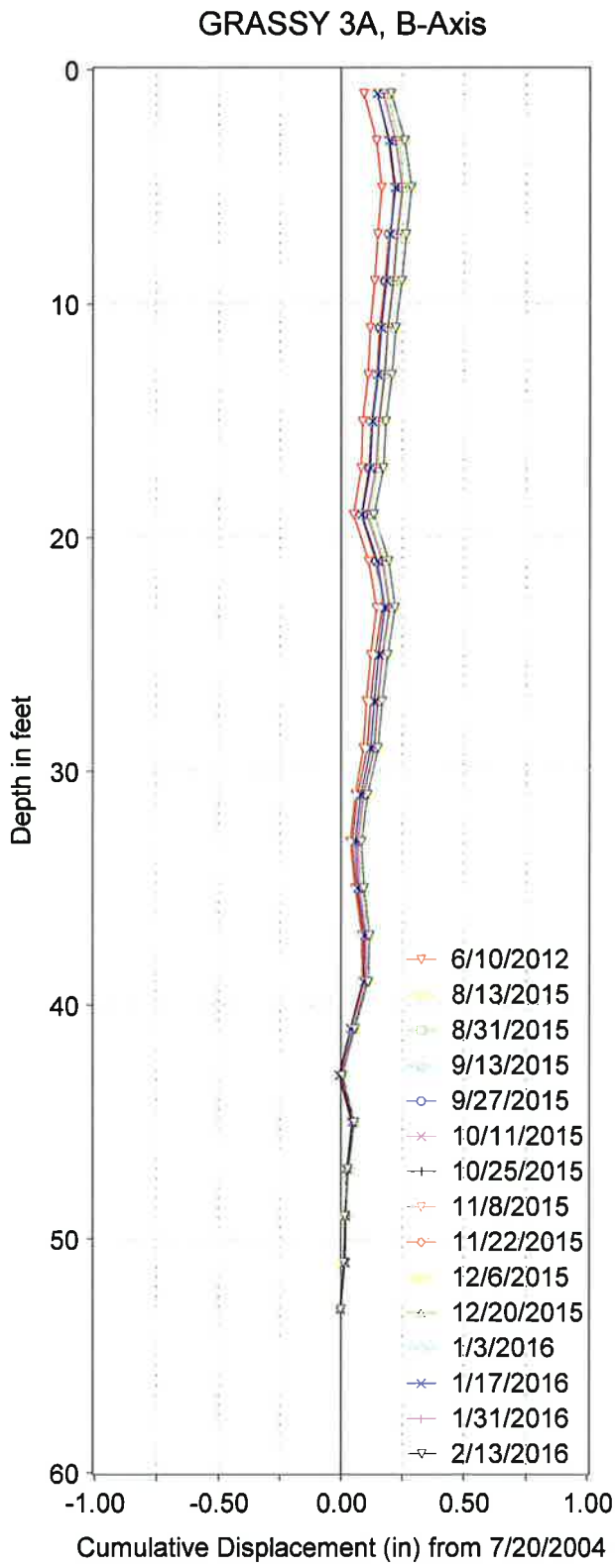


Inclinometer I-2 Located on Dam 02/13/16
with -15 degree skew

Figure B-4

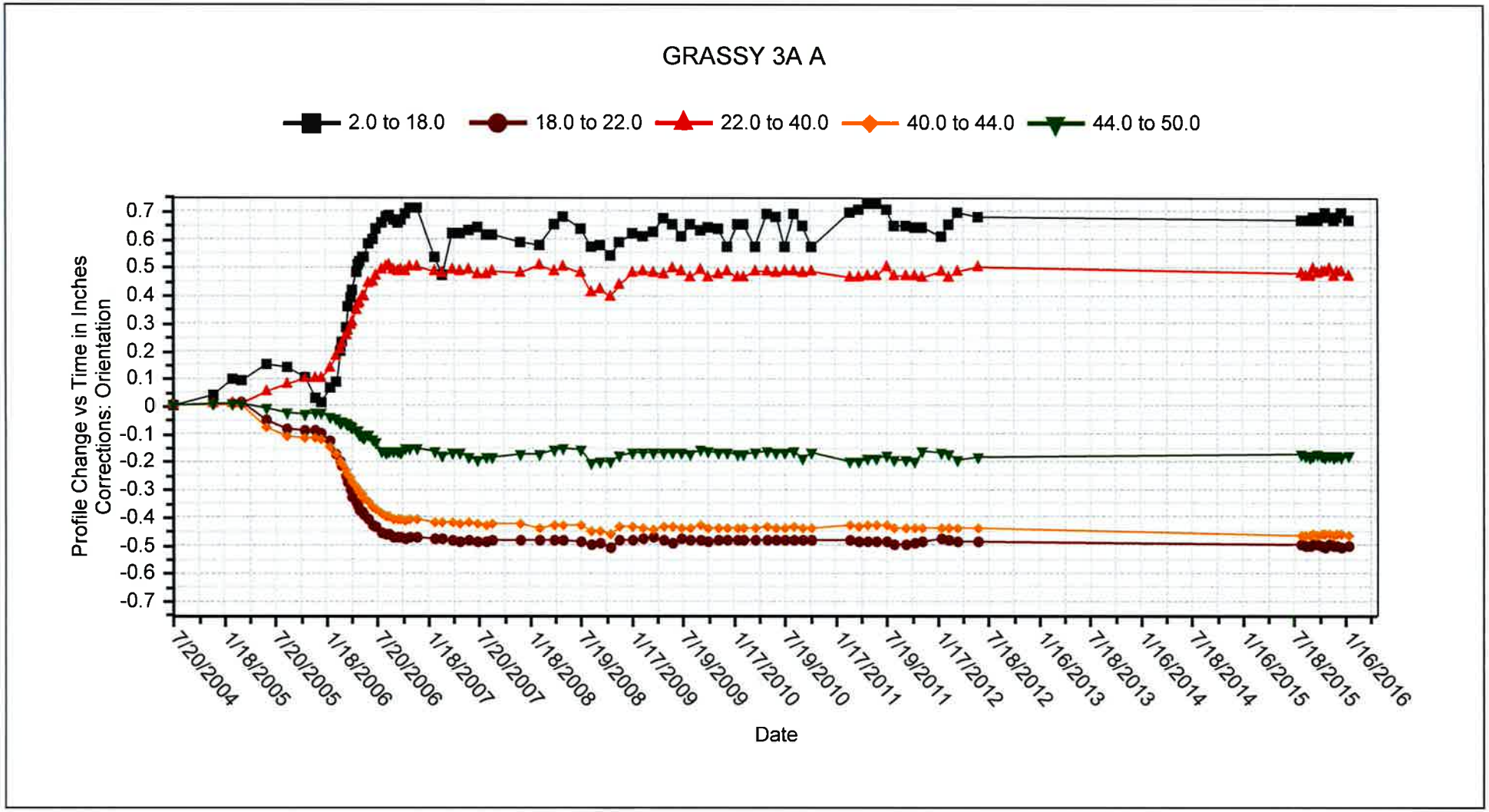
Inclinometer 2 - Deflection versus Time
Grassy Trail Dam, Carbon County, Utah





-30 degree skew

Figure B-5
Inclinometer 3 - Deflection Profile
Grassy Trail Dam, Carbon County, Utah



I-3 West/Right Abutment
End Date 02/13/16

Figure B-7

Inclinometer 3 - Deflections versus Time
Grassy Trail Dam, Carbon County, Utah

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			
09/22/15	ECC	7588.9		0.952	clear	4.478		0.001			
09/27/15	MH	7588.50	clear	1.67	clear	3.80	*trace sediment	NM	Not Measureable		
10/08/15	ECC	7588.17		0.833		2.59	clear	0.001			
10/11/15	MH	7587.95	clear	1.03	clear	3.45	clear	NM	Not Measureable		
10/22/18	ECC	7588.33		0.006		3.85		NM			
10/24/15	MH	7588.30	clear	1.15	clear	3.23	clear	NM			
11/08/15	MH	7587.95	trace Ice on edges	0.39	clear	3.23	clear	NM			
11/18/15	ECC	7588.08		0.06		2.40		NM			
11/22/15	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		
12/06/15	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		
12/30/15	ECC	7586.167	frozen	Dry							
01/03/16	MH	7586.35	frozen	Dry		2.33			ice		
01/17/16	MH	7586.26	frozen	Dry		2.43			ice		
01/27/16	ECC	7586.083	frozen	Dry		2.54			ice		
01/31/16	MH	7586.25	frozen	Dry		2.61	*trace sediment		ice	snowy	20's
02/11/16	ECC	7586.417	frozen	Dry		2.75			ice		
02/13/16	MH	7586.3	frozen	Dry		2.64	*trace sediment		ice	sunny	40

* notes MH - 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

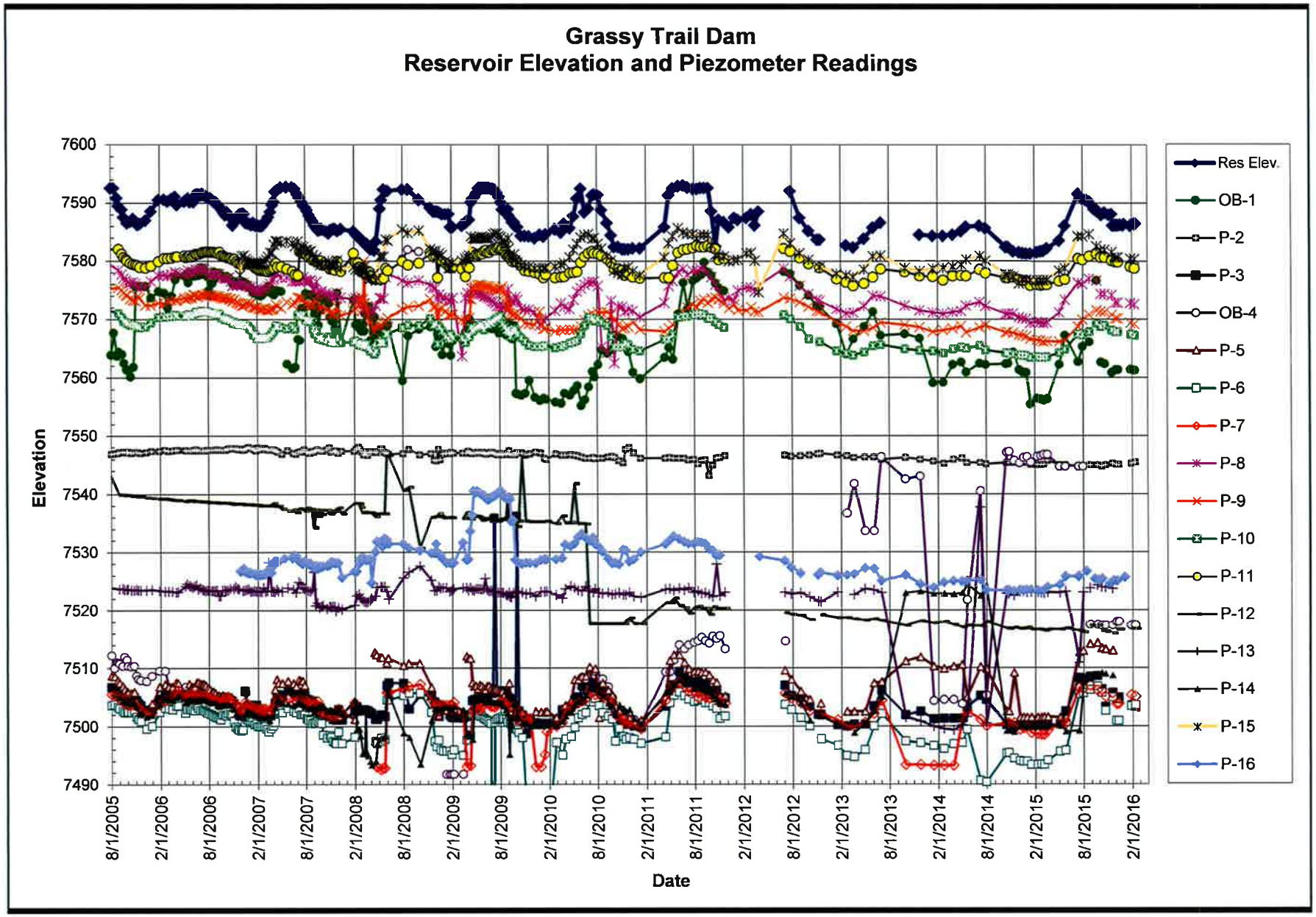


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Figure Reservoir Elevation and Piezometer Readings
August 2005 to February 11 2016 (Res Elev to February 13 2016 by RB&G Eng)

Grassy Trail Dam and Reservoir

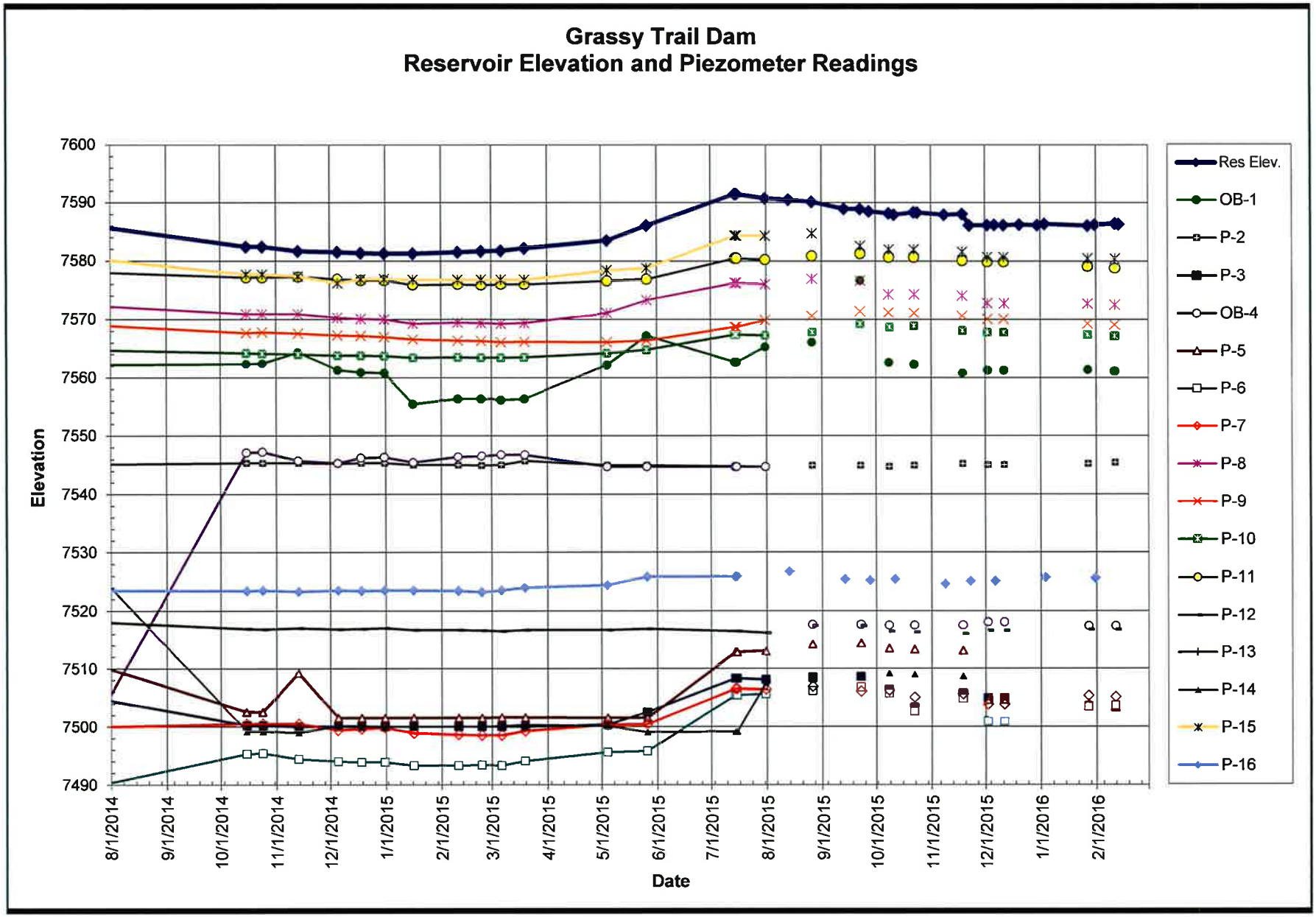

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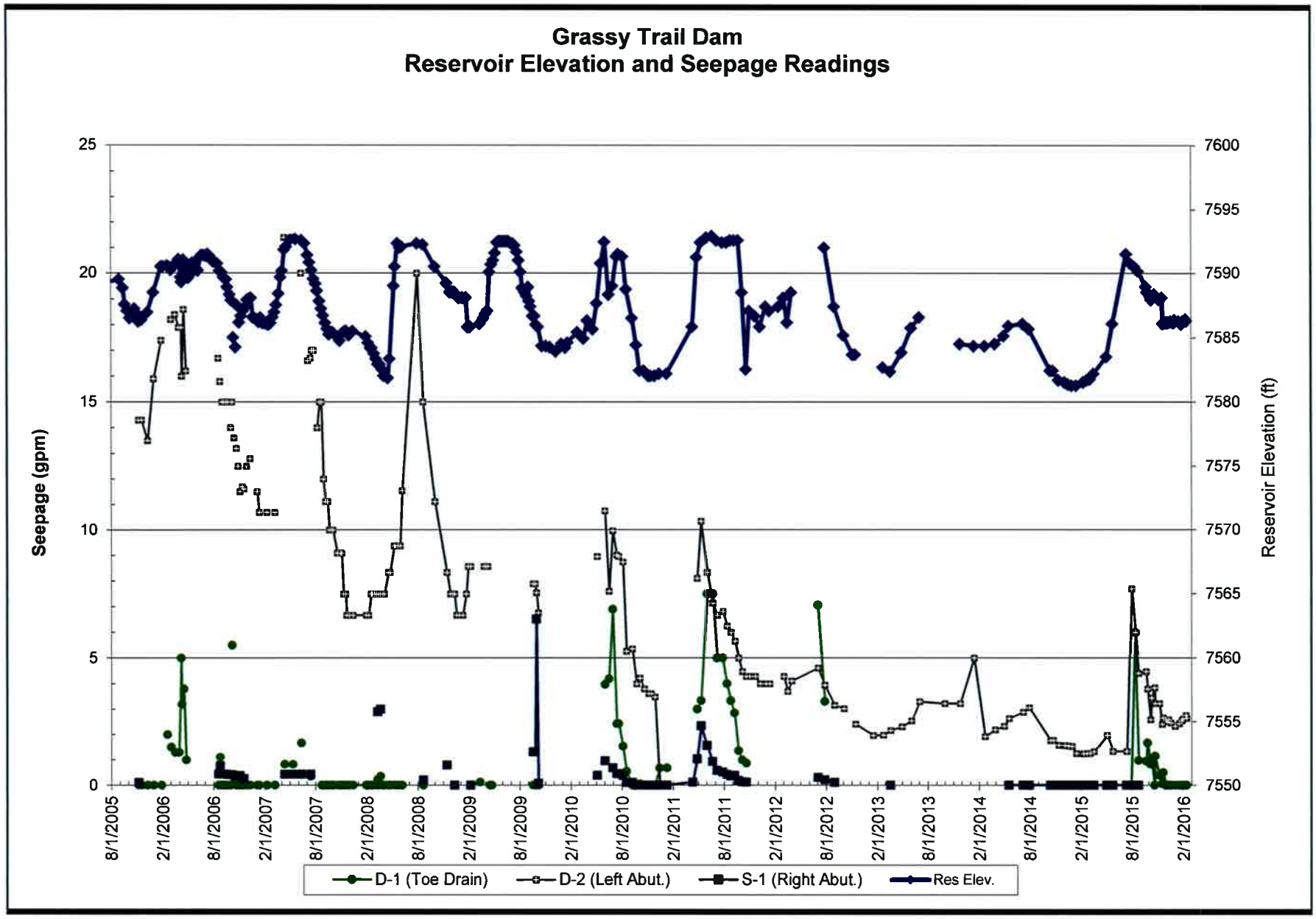
Figure Reservoir Elevation and Piezometer Readings
August 2014 to February 11 2016 (Res Elev to February 13 2016 by RB&G Eng)

Grassy Trail Dam and Reservoir

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	[illegible]	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																
12/30/15	ECC	7586.167																
01/03/16	MH	7586.35																
01/17/16	MH	7586.26																
01/27/16	ECC	7586.083	7572.7	7569.3	7561.4	7545.3	7503.5			7517.4	7567.4	7579.1	7516.8	7504	7503.4	7505.3	7580.5	7525.7
01/31/16	MH	7586.25																
02/11/16	ECC	7586.417	7572.5	7569.1	7561.2	7545.5	7503.3			7517.4	7567.2	7578.8	7516.8	7503.8	7503.6	7505.1	7580.4	7525.6
02/13/16	MH	7586.30																



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Seepage Readings
August 2005 to February 13 2016
Some additonal readings by RB&G Eng

Grassy Trail Dam and Reservoir

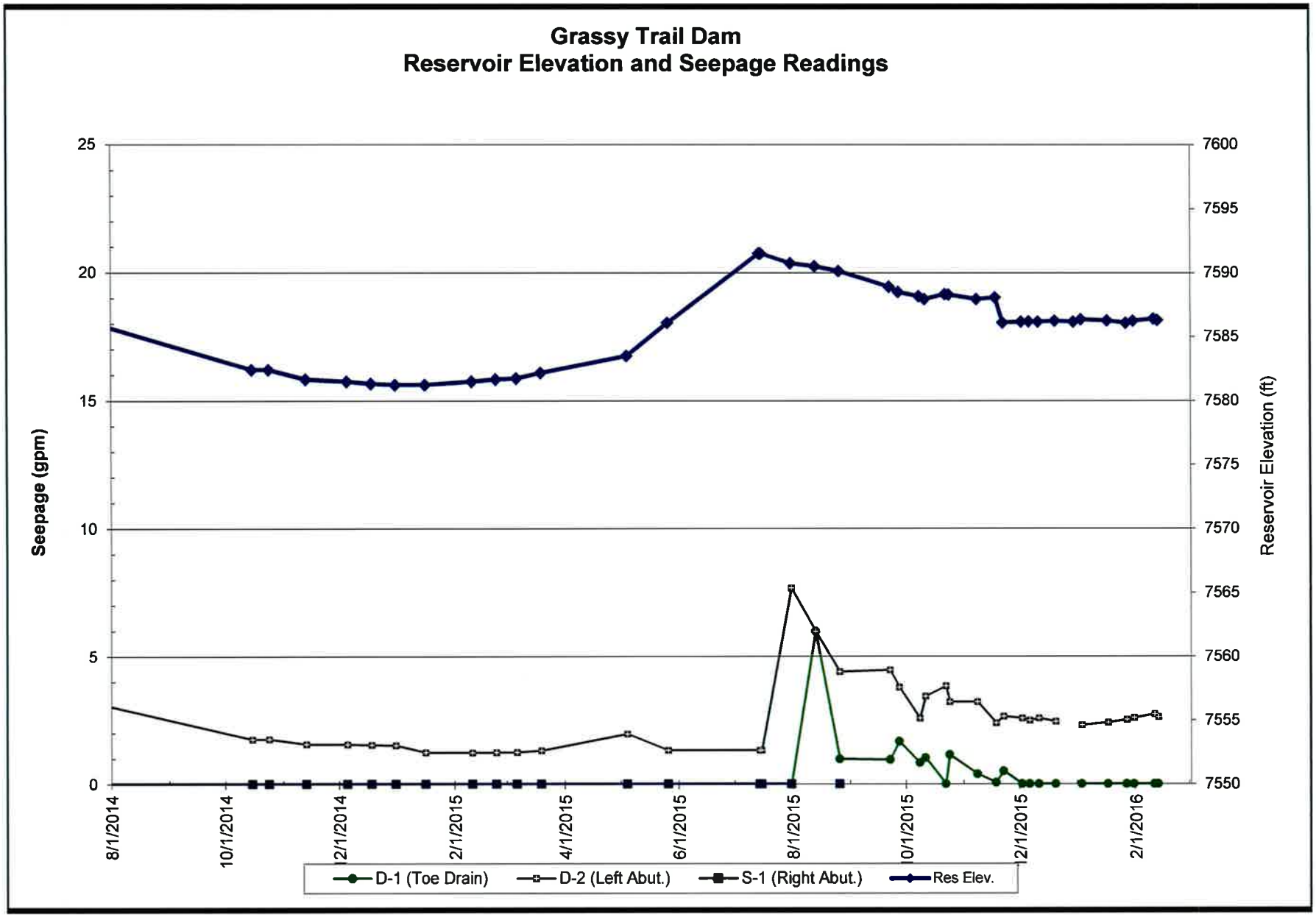


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Figure Reservoir Elevation and Seepage Readings
August 2014 to February 13 2016
Some additonal readings by RB&G Eng

Grassy Trail Dam and Reservoir

Grassy Trail Dam- View looking Southwest to North

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