OGMCOAL DNR <ogmcoal@utah.gov>

Fwd: Grassy Trail / UT000126 Monitoring Update June 10, 2017

Steve Christensen <stevechristensen@utah.gov> Wed, Jun 28, 2017 at 2:13 PM
To: OGMCOAL DNR <ogmcoal@utah.gov>

fyi- West Ridge seismic monitoring report April 13th through June 10th.

-------- Forwarded message --------
From: **Michael Hansen** <mhansen@rbgengineering.com>
Date: Mon, Jun 26, 2017 at 5:58 PM
Subject: Grassy Trail / UT000126 Monitoring Update June 10, 2017
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Here is the Monitoring update from between April 13 to June 10. I was hoping to include survey data in the report but at this time we have not yet received it. I am sending the update without it as it will likely come later in the month.

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Grassy Trail Project Report 6-10-17.pdf
1791K

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PROJECT REPORT

Project No.	201404-006		
Project	Grassy Trail – West Ridge Mine Monitoring		
Dates	Site Visits and readings - May 20, 28, June 3, and 10, 2017		
Report By	Michael N. Hansen	**Position**	Engineering Geologist

Observations / Activities

New readings from Inclinometers I-1, I-2 and 1-3 have not shown any significant movement. Plots of the inclinometer readings taken on June 3, 2017 are attached. Work along the roadway north of the dam had damaged the top of I-4. I was able dig down and find and clean the top of the inclinometer pipe. While the top has been damaged and moved to the south (as observed on the Inclinometer plot) the inclinometer is still functioning.

One accelerometer is located on the crest of the dam. This instrument has not detected any mining induced seismic (MIS) activity between May 13 to June 10, 2017. The "events" which have been recorded take place while removing and replacing the cover back on the instrument as part of downloading and resetting the Accelerometer. Some events may be wind related.

Since the last report on May 13, 2017, no seismic events have been reported within the area of the mine by the University of Utah Seismograph Stations (UUSS). It should be noted that there were two small events located over seven miles east and south of the dam. Based on the locations of these events, they do not appear to be related to previous mining near the dam.

The reservoir and has been overtopping the spillway since the week of April 4, 2017 (8 weeks). Reservoir elevation, seepage and piezometer readings have been taken weekly by RB&G since September 5, 2016. Plots of the reservoir elevations, piezometer and seepage readings are attached. It should be noted that there has been seepage accumulating just above the concrete outlet of the emergency spillway, on the downstream slope of the dam.

At this time, we have not received any new survey data of the dam from Ware Surveying LLC.

The small surficial slump that was previously noted on the hillside above the left (east) abutment has dried out and has not shown any additional movement. Along the right side of the reservoir, the hillside above Inclinometer #4, the slope had been very saturated but has gradually been dry. While it still has some wet seeps, it is significantly drier that it was a month ago. Heavy rains this summer could re-saturate this slope which may bring material down onto the roadway and bury Inclinometer # 4.

No evidence of movement was noted within the hillside of the Right (west) Abutment.

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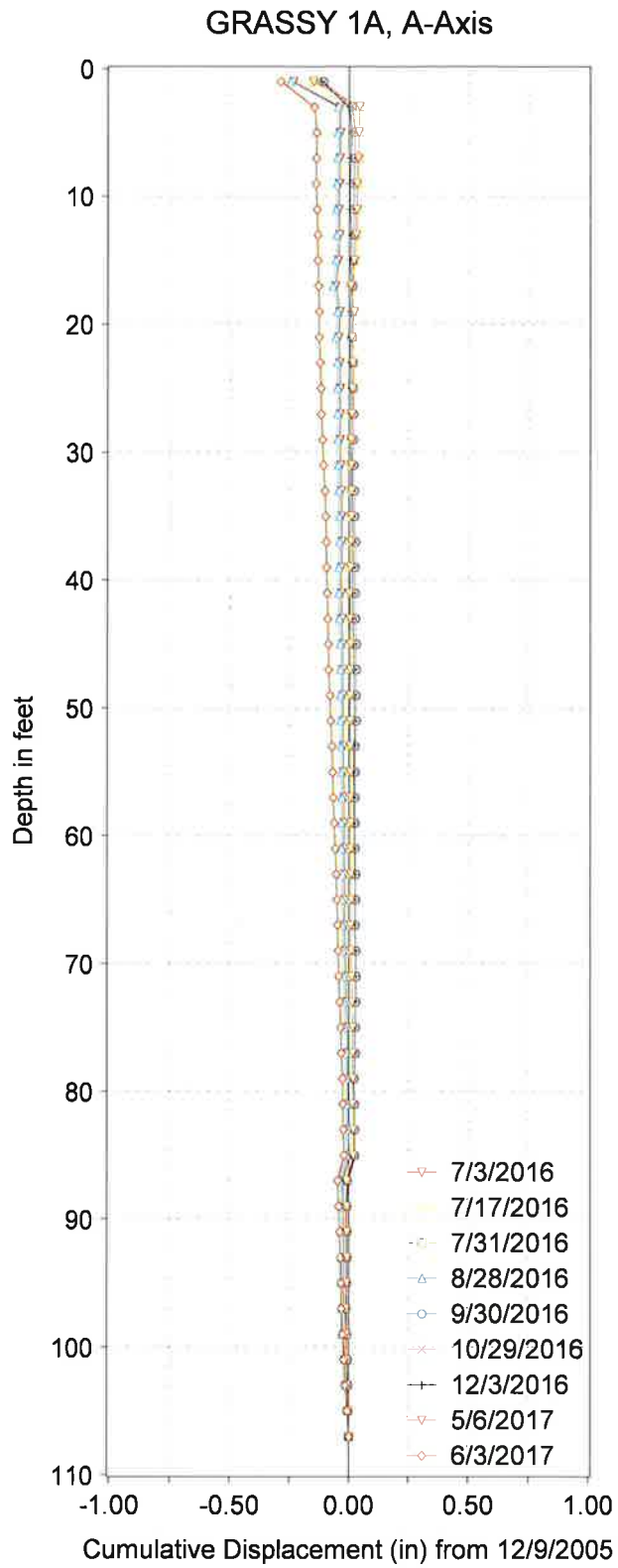
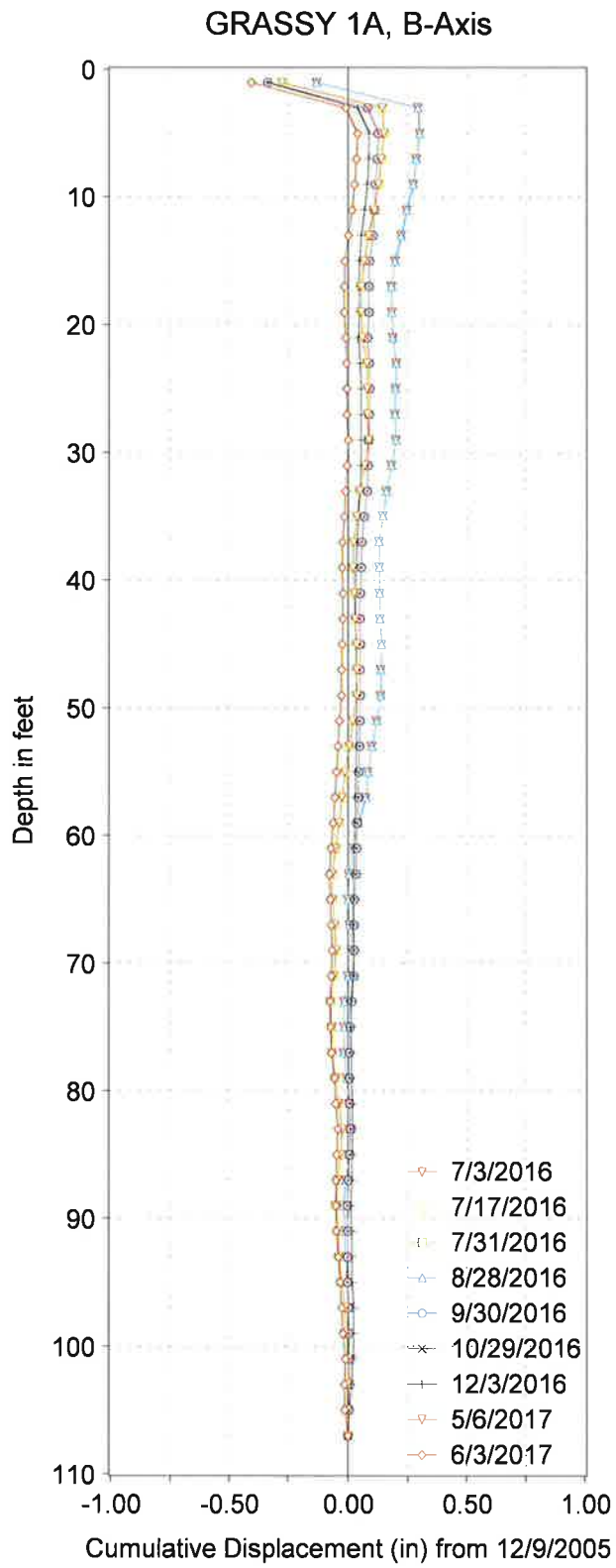
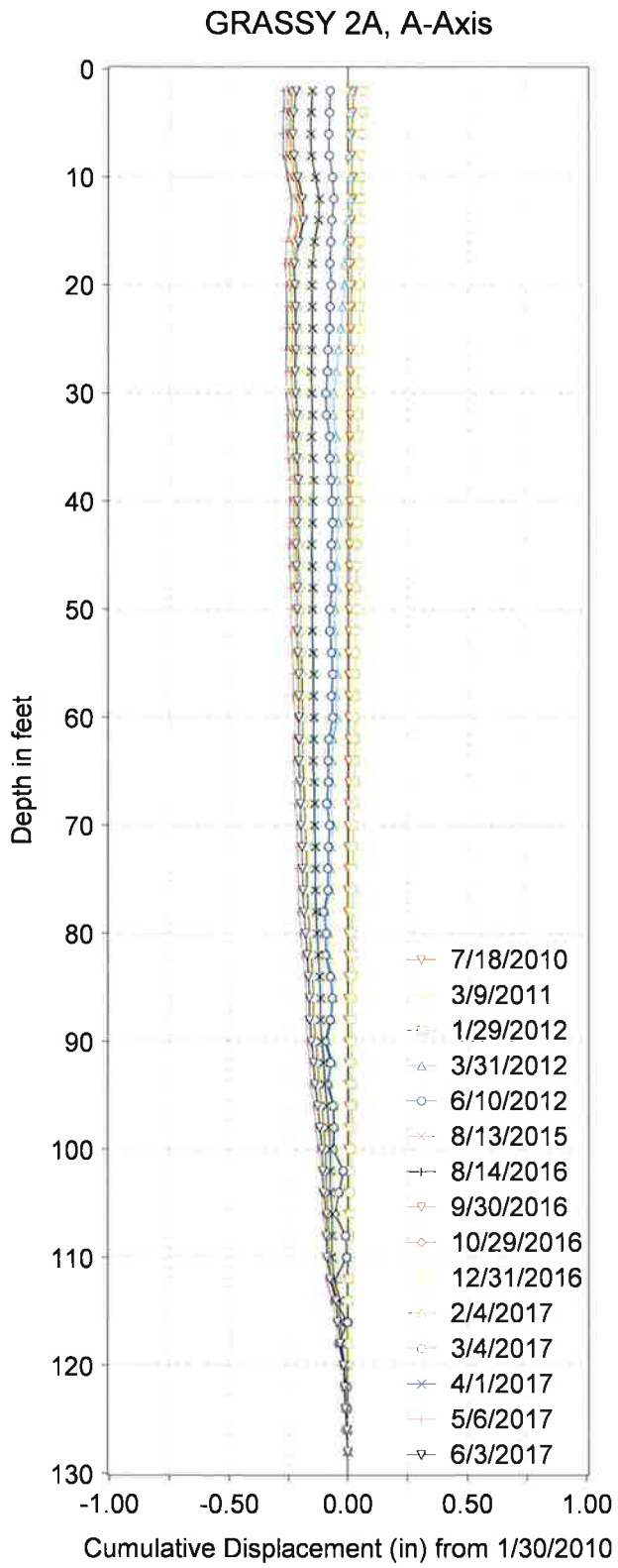
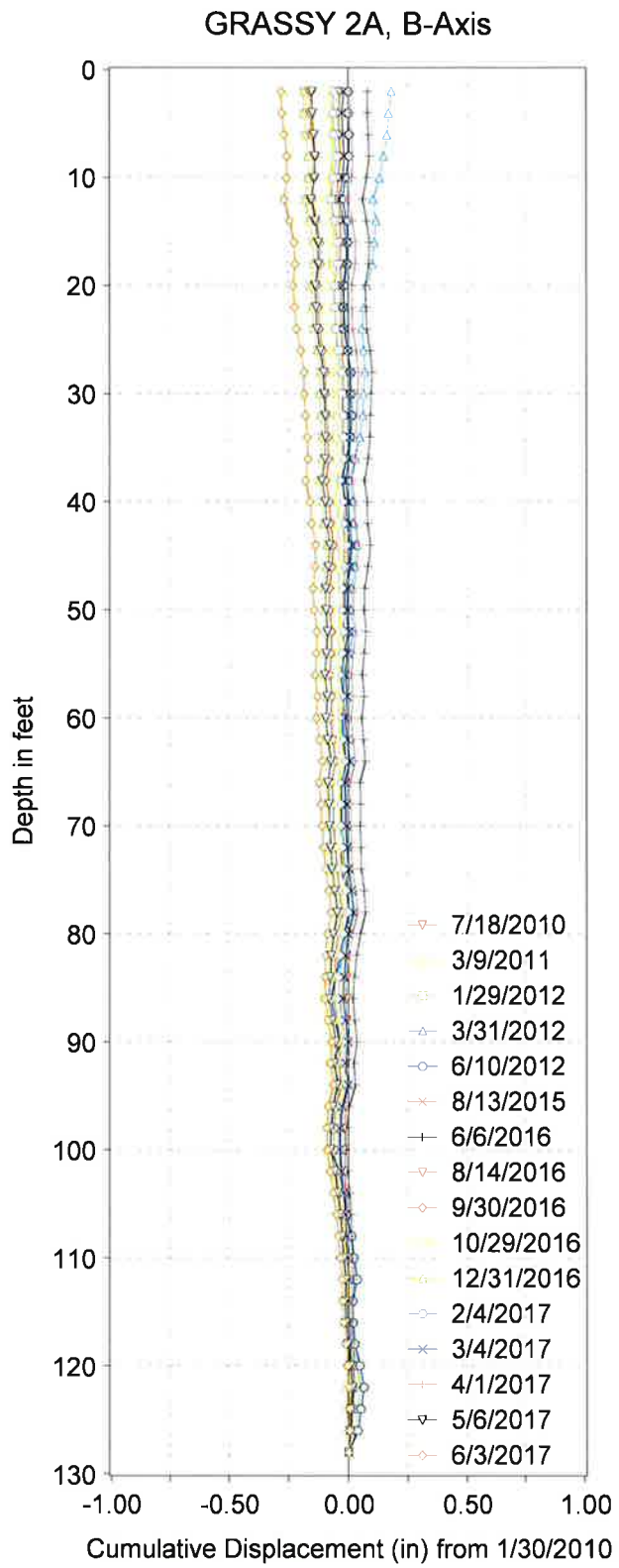




No significant movement observed

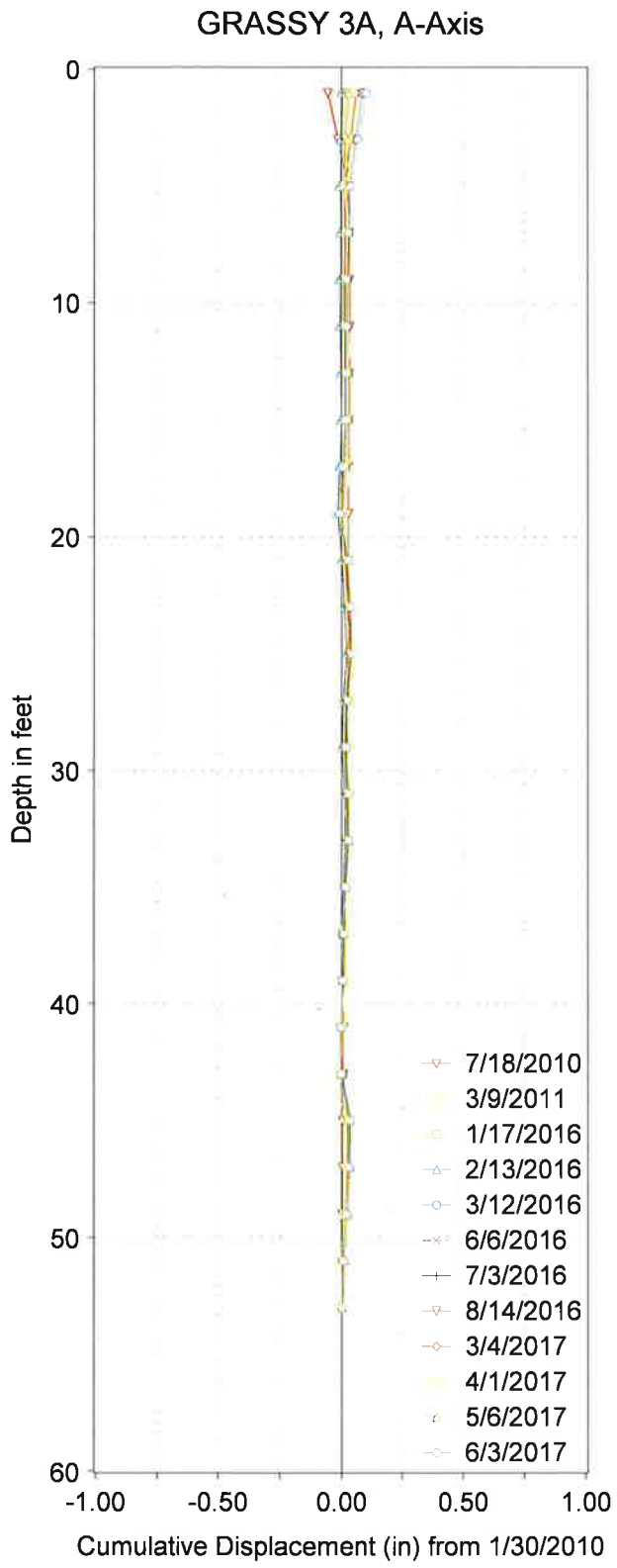
Figure B-1
Inclinometer 1 -Deflection Profiles
Grassy Trail Dam, Carbon County, Utah

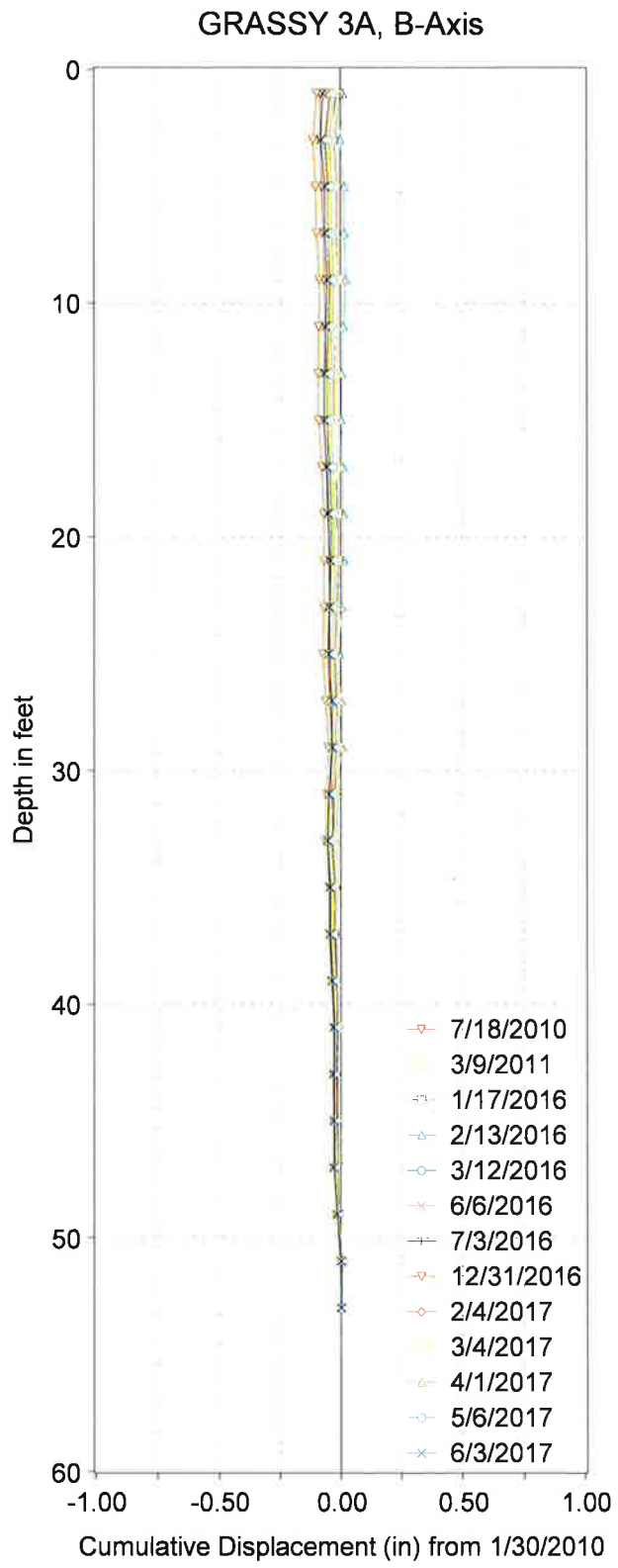




-15 dergree skew
Bias-shift correction

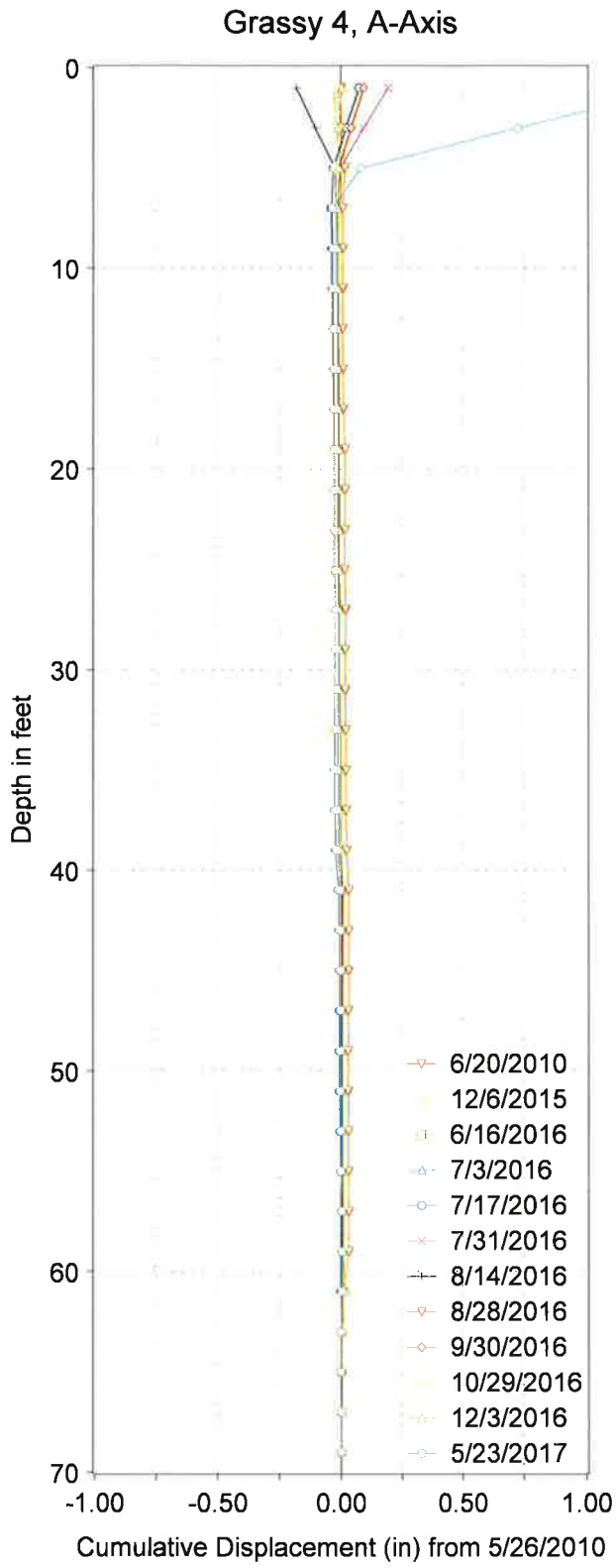
Figure
Inclinometer 2 - Deflection Profile
Grassy Trail Dam, Carbon County, Utah

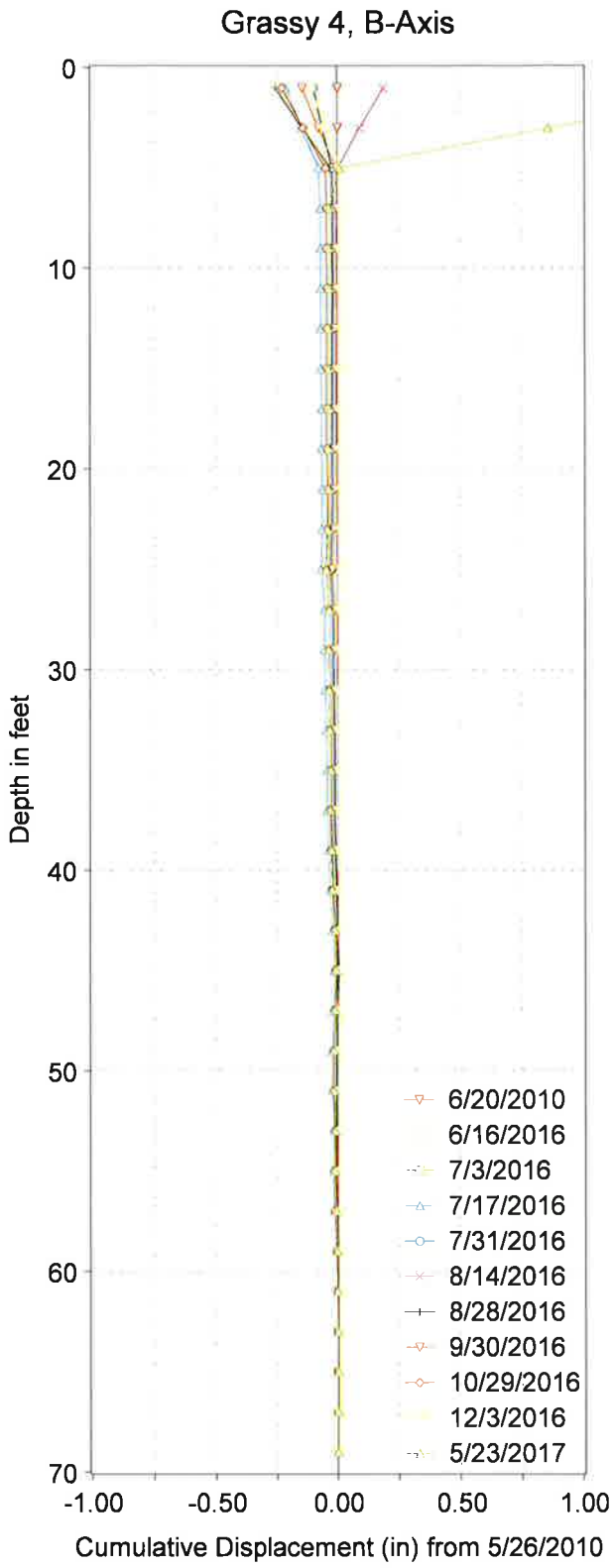




-30 degree skew

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





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

Top few feet of pipe are loose

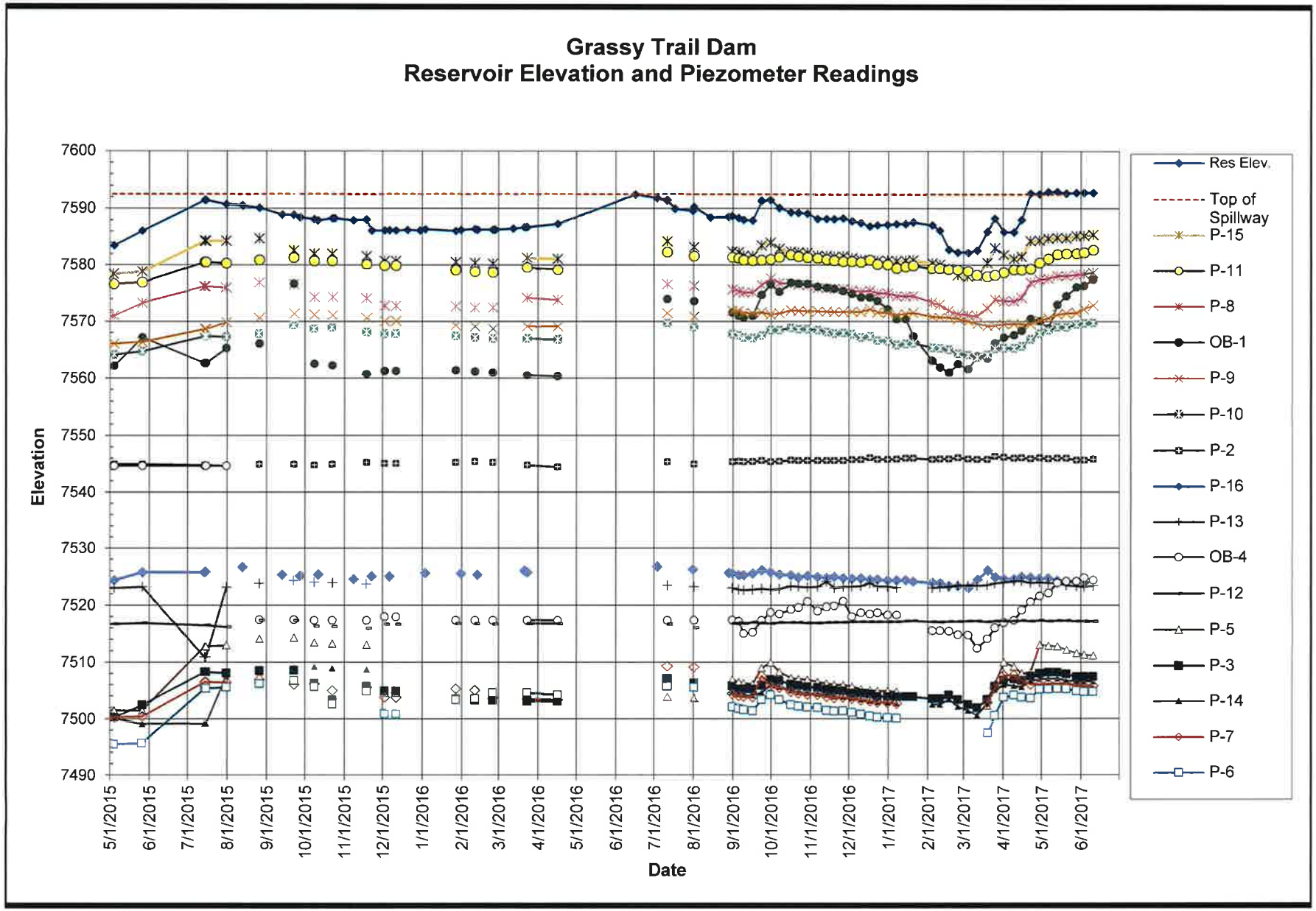
Figure B-8
Inclinometer 4 - Deflection Profile
Grassy Trail Dam, Carbon County, Utah

Grassy Trail Dam MIS Monitoring - Accelerometer located on the Dam Blastware (V10.72-10.74) Event Report Event List

Type	Serial No.	Date	Time	No. Chan	Trigger	Tran Peak (in/s)	Vert Peak (in/s)	Long Peak (in/s)	Tran Accel (g)	Vert Accel (g)	Long Accel (g)	Tran Freq. Hz.	Vert Freq. Hz.	Long Freq. Hz.	Description	Post Event Note first line
LOG	BE9690	13-May-17	5:02:14	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	13-May-17	5:02:21	3	Vert	0.045	0.055	0.01	0.04	0.053	0.027	56.89	56.89	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
W	BE9690	13-May-17	5:02:45	3	Tran	0.055	0.055	0.05	0.093	0.106	0.08	>100	64	73.14	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	13-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	13-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	14-May-17	11:10:32	3	Vert	0.01	0.02	0.015	0.013	0.013	0.027	>100	73.14	>100	GrassyTrailDam2015	*Man Made even*
LOG	BE9690	14-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	14-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	15-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	15-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	16-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	16-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	17-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	17-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	18-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	18-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	19-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	19-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	20-May-17	6:02:35	3	Vert	0.095	0.095	0.02	0.093	0.106	0.04	51.2	64	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	20-May-17	6:02:43	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	20-May-17	7:09:32	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	20-May-17	7:09:57	3	Tran	0.06	0.065	0.065	0.093	0.08	0.119	85.33	85.33	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
W	BE9690	20-May-17	7:10:03	3	Vert	0.045	0.05	0.04	0.08	0.093	0.066	>100	73.14	85.33	GrassyTrailDam2015	*Man Made event while opening or closing cover*
W	BE9690	20-May-17	7:10:08	3	Tran	0.03	0.01	0.02	0.053	0.027	0.04	>100	>100	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
W	BE9690	20-May-17	7:10:15	3	Long	0.01	0.005	0.02	0.013	0.013	0.027	>100	>100	85.33	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	20-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	20-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	21-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	21-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	22-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	22-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	23-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	23-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	24-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	24-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	25-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	25-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	26-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	26-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	27-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	27-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	28-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	28-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	29-May-17	6:17:39	3	Tran	0.04	0.04	0.01	0.04	0.04	0.027	30.12	26.95	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	29-May-17	6:17:44	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	29-May-17	7:22:00	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	29-May-17	7:22:03	3	Vert	0.045	0.045	0.015	0.053	0.066	0.027	73.14	73.14	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
W	BE9690	29-May-17	7:22:07	3	Vert	0.01	0.025	0.025	0.013	0.053	0.04	>100	73.14	73.14	GrassyTrailDam2015	*Man Made event while opening or closing cover*
W	BE9690	29-May-17	7:22:16	3	Long	0.01	0.015	0.02	0.027	0.027	0.027	>100	>100	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	29-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	29-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	30-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	30-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	31-May-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	31-May-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	1-Jun-17	11:58:37	3	Vert	0.045	0.065	0.05	0.053	0.106	0.08	64	28.44	51.2	GrassyTrailDam2015	*Likely Man Made event*
LOG	BE9690	1-Jun-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	1-Jun-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	2-Jun-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	2-Jun-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	3-Jun-17	6:24:17	3	Vert	0.095	0.03	0.05	0.159	0.053	0.08	85.33	85.33	85.33	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	3-Jun-17	6:24:30	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	3-Jun-17	8:33:32	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	3-Jun-17	8:33:42	3	Vert	0.02	0.035	0.005	0.027	0.04	0.027	>100	51.2	***	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	3-Jun-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	3-Jun-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	4-Jun-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	4-Jun-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	5-Jun-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	5-Jun-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	6-Jun-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	6-Jun-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	7-Jun-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	7-Jun-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	8-Jun-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	8-Jun-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	9-Jun-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	9-Jun-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	10-Jun-17	8:55:23	3	Vert	0.195	0.21	0.095	0.477	0.411	0.186	>100	64	85.33	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	10-Jun-17	8:55:37	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)

GRASSY TRAIL DAM PIEZOMETER & OBSERVATION WELL READINGS

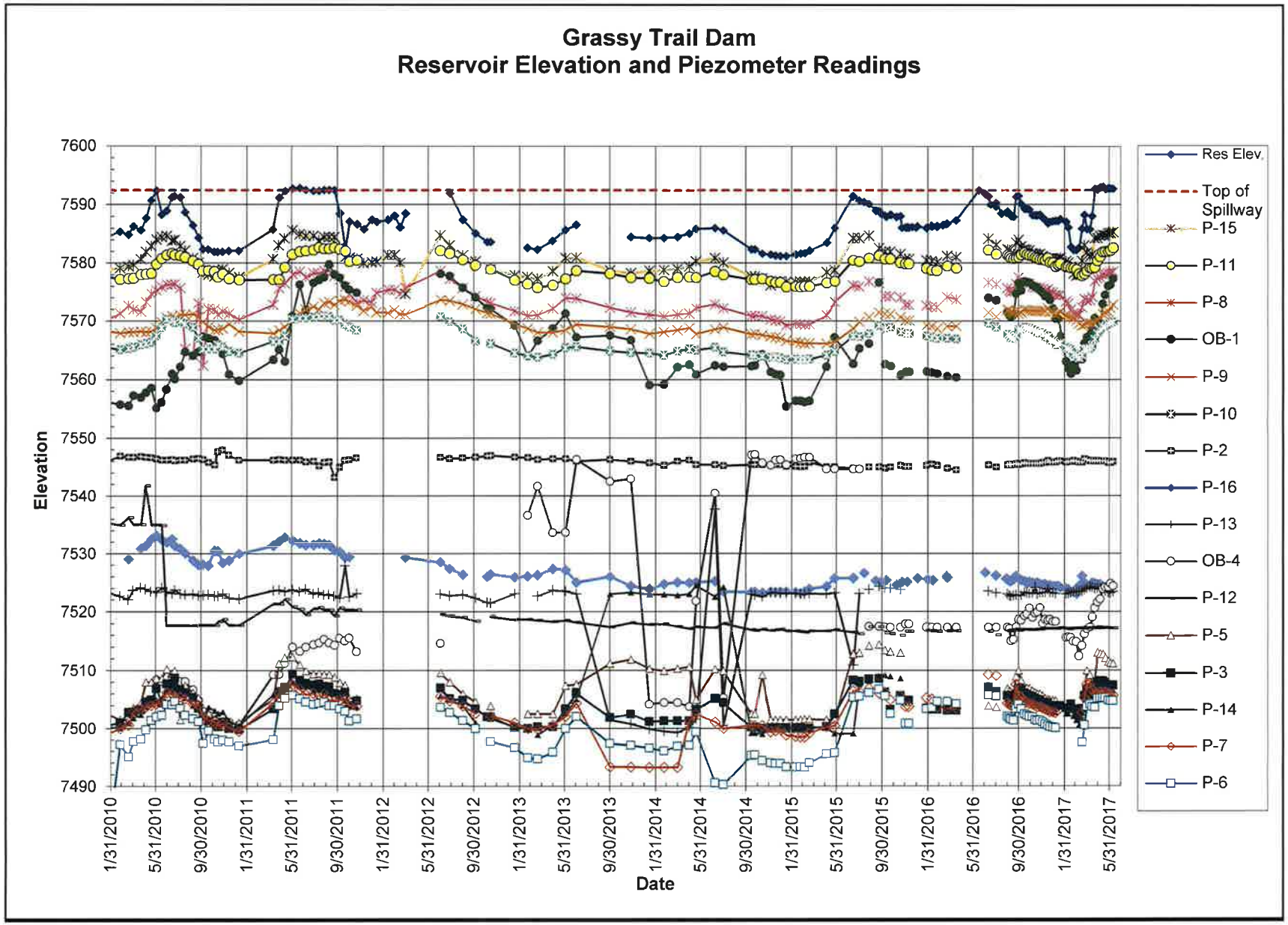
TAKE READINGS AT RIM ELEV		05-2		79-4	98-3		05-4		79-3	05-3A	05-3		98-2	98-4	98-6	06-1	06-1
		5+62		5+15	4+14		~4+14		3+63	2+77	2+71						
Dam Crest Elev	7600.0	PIEZ.	PIEZ.	O.W.	PIEZ.		PIEZ.		O.W.	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ
Spillway Elev.	7592.5	8	9	1	2	3	13	14	4	10	11	12	5	6	7	15	16
Rim 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	7601.5	7601.5
Tip Elev. (ft	(actual)	7554.5	7536.1	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	CREST	CREST	CREST	CREST	D.S. SLOPE	D.S. SLOPE	CREST	CREST	CREST	CREST	TOE	TOE	TOE	CREST	CREST
		EMBANK	FOUND	EMBANK/FOUND	EMBANK	FOUND	EMBANK	FOUND	EMBANK/FOUND	EMBANK	EMBANK	FOUND	FOUND	FOUND	FOUND	FOUND	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'
01/16/15	Values taken from Dam Safety web page submitted by East Carbon City (ECC)	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																
02/25/16	ECC	7586.30	7572.5	7567	7561	7545.3	7503.3			7517.4	7567	7578.7	7516.7	7503.3	7504.7	7503.7	7580.2	7525.4
02/27/16	MH	7586.30																
03/12/16	MH	7586.50																
03/21/16	MH	7586.70																
03/23/16	ECC	7586.75	7574.2	7567	7560.6	7544.8	7503.2			7517.4	7567	7579.5	7516.8	7503.1	7504.7	7503.5	7581.3	7526.1
04/16/16	ECC	7587.33	7573.8	7566.9	7560.4	7544.5	7503.2			7517.4	7566.9	7579.1	7516.8	7503.1	7504.3	7503.4	7581.1	7525.8
06/16/16	MH	7592.52																
07/03/16	ECC	7591.90																
07/11/16	ECC	7591.50	7576.6	7569.7	7574	7545.4	7507.1	7523.5	7505.6	7517.4	7569.7	7582.3	7516.7	7503.9	7505.8	7509.3	7584.2	7526.8
07/17/16	MH	7590.00																
07/31/16	MH	7589.65																
08/01/16	ECC	7590.33	7576.3	7569	7573.6	7545	7506.3	7523.2	7505.5	7517.4	7569	7581.6	7516.1	7503.7	7505.6	7509.1	7583.2	7526.3
08/14/16	MH	7588.46																
08/28/16	MH	7588.6																
08/31/16	EEC	7588.75	7575.7	7571.9	7571.6	7545.4	7505.7	7523	7504.7	7517.4	7567.8	7581.4	7516.8	7506.9	7502.1	7504.4	7582.4	7525.7
09/05/16	MH	7588.40	7575.4	7571.9	7571.0	7545.5	7505.2	7522.7	7504.3	7515.2	7567.6	7581.2	7516.9	7506.5	7501.8	7504.1	7582.1	7525.5
09/09/16	MH/KM	7588.05	7575.1	7571.6	7570.7	7545.4	7505.3	7522.6	7504.2	7515.1	7567.2	7580.9	7516.8	7506.3	7501.6	7504.0	7581.7	7525.3
09/16/16	MH	7587.95	7575.2	7571.5	7571.0	7545.5	7505.2	7522.7	7504.1	7515.3	7567.1	7580.8	7517.0	7506.1	7501.4	7503.8	7581.6	7525.3
09/23/16	MH	7591.40	7576.5	7571.7	7574.8	7545.6	7505.9	7522.9	7504.6	7517.4	7567.5	7580.9	7516.9	7509.0	7503.4	7507.6	7583.5	7525.6
09/30/16	MH	7591.55	7577.6	7571.3	7576.6	7545.4	7506.9	7522.7	7506.0	7518.7	7568.5	7581.0	7516.8	7510.0	7504.2	7505.8	7584.0	7526.2
10/07/16	MH	7590.20	7576.8	7571.5	7575.3	7545.5	7506.7	7522.8	7505.6	7518.5	7568.5	7581.4	7517.0	7508.3	7503.4	7505.5	7582.9	7525.8
10/16/16	MH	7589.38	7576.7	7572.0	7576.9	7545.7	7506.1	7523.3	7505.0	7519.3	7568.9	7581.8	7517.0	7507.2	7502.5	7504.8	7582.4	7525.5
10/22/16	MH	7589.30	7576.6	7571.9	7576.8	7545.6	7505.9	7523.2	7504.7	7519.6	7568.7	7581.5	7517.0	7507.0	7502.3	7504.5	7582.3	7525.3
10/29/16	MH	7589.20	7576.5	7571.9	7576.7	7545.6	7505.7	7523.1	7504.5	7520.6	7568.7	7581.4	7516.9	7506.9	7502.1	7504.3	7582.2	7524.9
11/06/16	MH	7588.25	7576.0	7571.9	7576.2	7545.6	7505.5	7523.2	7504.4	7519.0	7568.5	7581.2	7516.9	7506.5	7502.0	7504.3	7581.7	7525.2
11/13/16	MH	7588.25	7575.9	7571.8	7576.0	7545.6	7505.2	7524.1	7504.2	7519.7	7568.2	7581.0	7517.0	7506.2	7501.5	7503.9	7581.7	7525.0
11/19/16	MH	7588.20	7575.8	7571.8	7575.8	7545.6	7505.0	7523.0	7503.9	7519.9	7567.9	7580.8	7517.0	7506.0	7501.4	7503.7	7581.5	7524.9
11/26/16	MH	7588.35	7575.8	7571.8	7575.4	7545.6	7504.9	7523.2	7503.8	7520.7	7568.0	7580.7	7517.0	7506.0	7501.4	7503.8	7581.6	7525.0
12/03/16	MH	7587.80	7575.6	7571.8	7574.9	7545.8	7504.5	7523.3	7503.7	7518.0	7567.8	7580.7	7517.1	7505.7	7501.1	7503.6	7581.3	7524.8
12/10/16	MH	7587.50	7575.3	7571.8	7574.3	7545.8	7504.5	7523.3	7503.4	7518.7	7567.2	7580.5	7517.1	7505.2	7500.8	7503.3	7581.0	7524.7
12/17/16	MH	7586.90	7575.5	7572.2	7574.3	7546.1	7504.4	7523.8	7503.2	7518.5	7567.4	7580.9	7517.1	7505.1	7500.5	7503.1	7580.8	7524.8
12/23/16	MH	7587.10	7575.0	7571.7	7573.7	7545.8	7503.9	7523.3	7502.9	7518.7	7566.7	7580.2	7517.1	7504.9	7500.3	7502.9	7580.8	7524.5
12/31/16	MH	7587.20	7575.0	7571.6	7572.2	7545.8	7503.9	7523.3	7502.8	7518.3	7566.6	7580.1	7517.1	7504.9	7500.2	7502.9	7580.8	7524.6
01/07/17	MH	7587.30	7574.5	7571.2	7570.5	7545.9	7503.9	7523.1	7502.7	7518.3	7565.9	7579.5	7517.1	7504.8	7500.1	7502.7	7580.7	7524.4
01/14/17	MH	7587.30	7574.5	7571.4	7570.5	7546.0	7503.9	7523.1			7566.1	7579.7	7517.2				7580.8	7524.4
01/20/17	MH	7587.60	7574.6	7571.6	7567.4	7546.0	7503.9	7523.1	Covered with snow		7566.2	7579.9	7517.3	Covered with snow			7580.9	7524.5
01/27/17	MH		unable to make it to dam due to snow, got sluck															
02/04/17	MH	7587.10	7573.4	7570.9	7563.1	7545.8	7503.5	7523.0	7502.5	7515.6	7565.4	7579.4	7517.1				7580.4	7524.2
02/10/17	MH	7586.15	7573.1	7570.8	7561.9	7545.9	7503.5	7523.1	7502.5	7515.6	7565.3	7579.4	7517.1				7580.1	7524.0
02/17/17	MH	7582.80	7572.1	7570.8	7561.0	7545.9	7504.2	7523.2	7503.4	7515.5	7565.1	7579.2	7517.2				7579.4	7523.9
02/24/17	MH	7582.30	7571.4	7570.5	7562.5	7546.1	7503.4	7523.4	7502.1	7514.9	7564.4	7579.2	7517.2				7578.2	7523.4
03/04/17	MH	7582.30	7571.2	7570.1	7561.6	7545.9	7502.5	7523.4	7501.4	7514.8	7564.1	7578.9	7517.2	Dry @			7577.9	7523.4
03/11/17	MH	7582.70	7571.1	7569.6	7563.9	7545.8	7501.9	7523.4	7500.6	7512.5	7563.7	7578.2	7517.2	7502.3	7497.6	7502.8	7578.1	7523.1
03/19/17	MH	7585.95	7572.4	7569.3	7563.5	7545.8	7503.4	7523.5	7502.7	7514.2	7564.2	7577.9	7517.1	7506.1	7500.6	7505.4	7580.4	7524.5
03/25/17	MH	7588.30	7573.9	7569.4	7566.2	7546.4	7505.7	7523.8	7505.2	7516.1	7565.3	7578.2	7517.2	7510.0	7503.8	7507.7	7583.1	7526.2
04/01/17	MH	7585.90	7573.6	7569.6	7567.2	7546.2	7506.8	7524.0	7506.0	7517.0	7565.3	7578.7	7517.2	7509.2	7504.2	7507.7	7581.9	7525.0
04/09/17	MH	7585.85	7573.6	7569.7	7567.6	7546.0	7507.0	7524.2	7505.8	7517.4	7565.3	7579.2	7517.2	7508.0	7503.8	7506.8	7581.1	7524.7
04/15/17	MH	7588.08	7574.2	7569.6	7568.4	7546.1	7506.7	7524.2	7505.6	7519.2	7565.7	7579.2	7517.3	7508.2	7503.7	7506.1	7581.5	7524.6
04/22/17	MH	7592.70	7577.0	7569.6	7570.5	7546.0	7507.5	7523.9	7506.7	7520.6	7566.9	7579.3	7517.2	7513.1	7505.2	7506.1	7584.3	7525.0
04/29/17	MH	7592.60	7577.4	7570.2	7570.1	7546.1	7508.0	7524.0	7507.0	7521.6	7567.9	7580.4	7517.4	7512.9	7505.3	7506.2	7584.4	7524.9
05/06/17	MH	7592.95	7577.6	7570.7	7568.8	7546.0	7508.2	7523.9	7507.1	7522.2	7568.5	7581.1	7517.2	7512.8	7505.4	7506.2	7584.7	7524.7
05/13/17	MH	7593.00	7578.1	7571.3	7573.0	7546.0	7508.2	7523.9	7507.1	7523.9	7569.0	7581.9	7517.3	7512.2	7505.3	7506.2	7584.9	7524.8
05/20/17	MH	7592.70	7578.1	7571.5	7574.6	7546.0	7507.9	7523.5	7506.8	7524.2	7569.0	7582.0	7517.3	7511.6	7505.0	7506.0	7584.8	7524.4
05/28/17	MH	7592.85	7578.3	7571.6	7576.1	7545.7	7507.4	7523.3	7506.6	7524.2	7569.5	7582.1	7517.2	7511.3	7504.8	7505.8	7585.2	7524.1
06/03/17	MH	7592.85	7578.4	7572.3	7576.3	7545.7	7507.5	7523.2	7506.6	7524.8	7569.7	7582.2	7517.2	7511.2	7504.6	7505.8	7585.2	7524.0
06/10/17	MH	7592.80	7578.6	7572.9	7577.4	7545.9	7507.5	7523.4	7506.6	7524.4	7569.8	7582.7	7517.2	7510.9	7504.6	7505.8	7585.4	7524.0



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Piezometer Readings
May 2015 to June 10, 2017

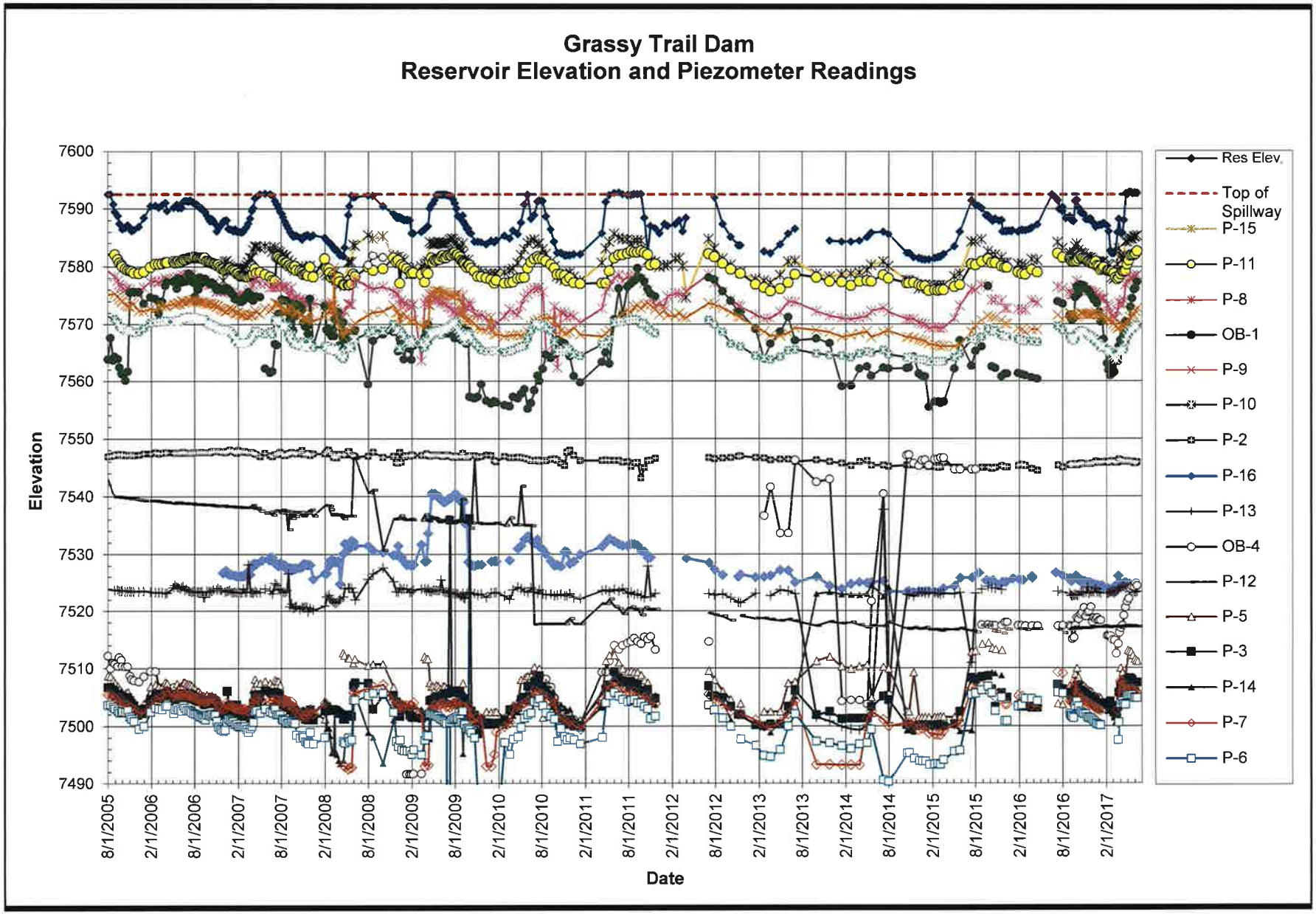
Grassy Trail Dam and Reservoir



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Piezometer Readings
January 2010 to June 10, 2017

Grassy Trail Dam and Reservoir



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Piezometer Readings
August 2005 to June 10, 2017 (some Res Elevations taken by RB&G Eng)

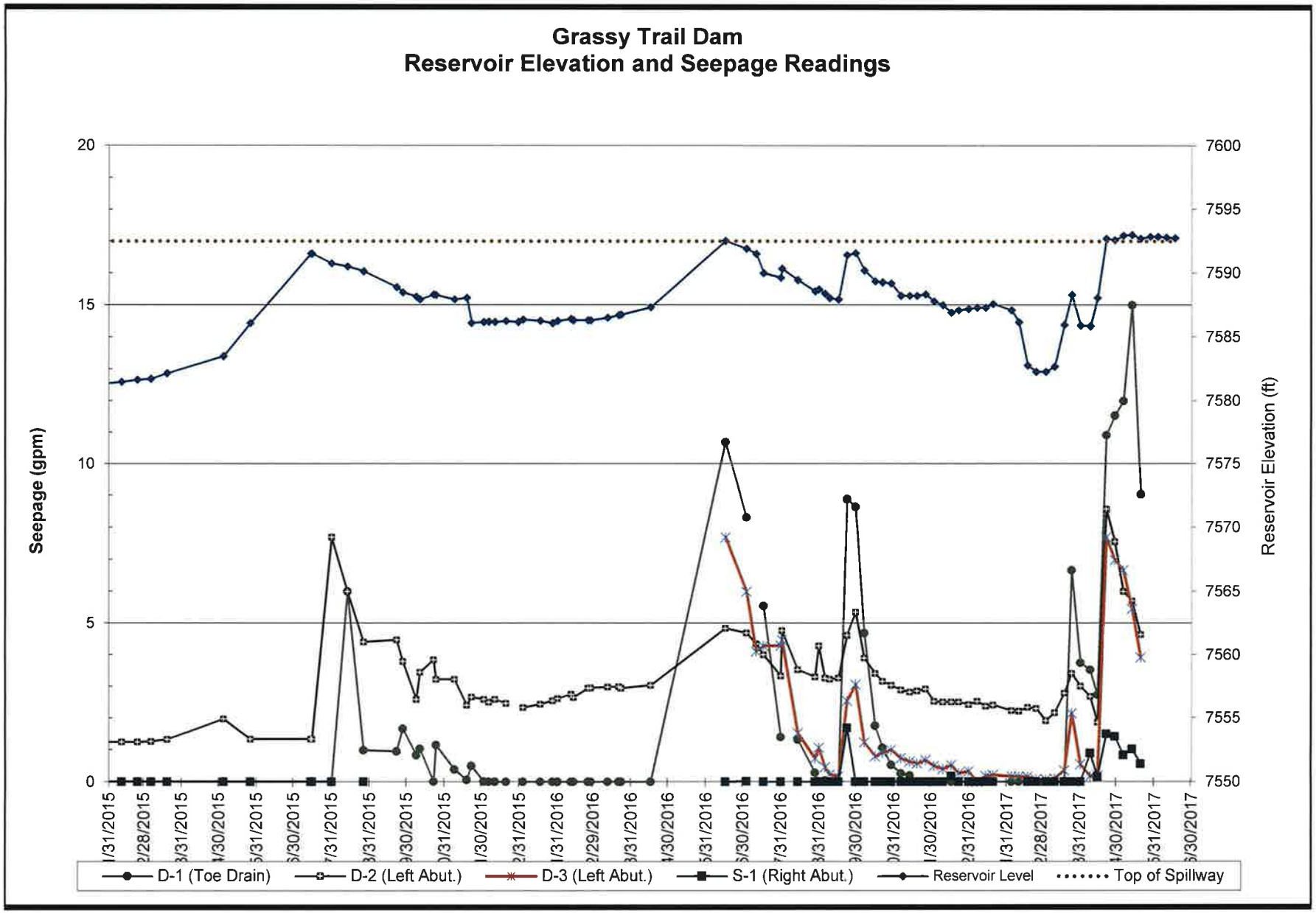
Grassy Trail Dam and Reservoir

GRASSY TRAIL DAM SEEPAGE READINGS

Dam Crest Elev(ft)		7600.0		Drain1:Toe Drain		Drain 2: Left Abutment (East Seep)		Drain 3: Left Abutment (East Additional collection)		Seep 4: 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	add spring 2016		GAL/MIN	Water Characteristics
8/13/15	ECC	7590.5		6	* likely a typo	6					
8/26/15	ECC	7590.1		0.984	clear	4.412	*trace sediment			0.001	
9/22/15	ECC	7588.9		0.952	clear	4.478				0.001	
9/27/15	MH	7588.50	clear	1.67	clear	3.80	*trace sediment			NM	Not Measureat
10/8/15	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 Measureat
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	
11/8/15	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
12/2/15	ECC	7586.2	frozen	0.006		2.59				NM	ice
12/6/15	MH	7586.2	frozen	Dry		2.50				NM	ice
12/11/15	ECC	7586.167	frozen	Dry		2.59				NM	ice
12/20/15	MH	7586.25	frozen	Dry		2.46				NM	ice
12/30/15	ECC	7586.167	frozen	Dry						NM	
1/3/16	MH	7586.35	frozen	Dry		2.33				NM	ice
1/17/16	MH	7586.26	frozen	Dry		2.43				NM	ice
1/27/16	ECC	7586.083	frozen	Dry		2.54				NM	ice
1/31/16	MH	7586.25	frozen	Dry		2.61	*trace sediment			NM	ice
2/11/16	ECC	7586.417	frozen	Dry		2.75				NM	ice
2/13/16	MH	7586.3	frozen	Dry		2.64	*trace sediment			NM	ice
2/25/16	ECC	7586.3	frozen	Dry		2.94				NM	ice
2/27/16	MH	7586.3	frozen	Dry		2.95				NM	ice
3/12/16	MH	7586.5	frozen	Dry		2.98				NM	ice
3/21/16	MH	7586.7	frozen	Dry		2.99				NM	ice
3/23/16	ECC	7586.75	frozen	Dry		2.94					
4/16/16	ECC	7587.33		Dry		3.03					
6/16/16	MH	7592.52	slighty over spillway	10.70		4.84		GAL/MIN	Characteristics	0.002	
7/3/16	MH	7591.9		8.33		4.69		6.00		0.02	
7/11/16	ECC	7591.5				4.35		4.11			
7/17/16	MH	7590		5.56		4.00		4.29		0.001	
7/31/16	MH	7589.65		1.40		3.33		4.30		dry	
8/1/16	ECC	7590.33				4.76		4.48			
8/14/16	MH	7588.46		1.32		3.53		1.53		dry	
8/28/16	MH	7588.6		0.28		3.30		0.73		dry	
8/31/16	ECC	7588.75				4.29		1.07			
9/5/16	MH	7588.4		0.04	clear	3.26	clear	0.46	clear	dry	
9/9/16	MH	7588.05		dry		3.23	clear	0.23	clear	dry	
9/16/16	MH	7587.95		dry		3.26		0.17		dry	
9/23/16	MH	7591.4		8.89		4.62		2.54		1.69	
9/30/16	MH	7591.6		8.65		5.36		3.06		drip	
10/7/16	MH	7590.2		4.69		3.90		1.23		dry	
10/16/16	MH	7589.4		1.76		3.41		0.79		Dry	
10/22/16	MH	7589.3		1.06		3.16		0.90		Dry	
10/29/16	MH	7589.2		0.53		3.03		1.00		Dry	
11/4/17	MH	7588.3		0.26		0.29		0.00		Dry	
11/13/16	MH	7588.3		0.194		2.82		0.63		Dry	
11/19/16	MH	7588.3		Dry		2.86		0.57		Dry	
11/26/16	MH	7588.4		Dry		2.91		0.67		Dry	
12/3/16	MH	7587.8	some ice	Dry		2.52		0.50		Dry	
12/10/16	MH	7587.5	Frozen all ice	Dry		2.5		0.4	some sed	Dry	
12/17/16	MH	7586.9	Frozen	drip		2.5		0.52	some sed	0.17	Very wet snow melt
12/23/16	MH	7587.1	Frozen	Dry		2.5		0.27	some sed	Dry	Ice
12/31/16	MH	7587.2	Frozen	Dry		2.4		0.33	some sed	Dry	Ice
01/07/17	MH	7587.3	Frozen	Dry		2.5		Drip		Dry	ice
01/14/17	MH	7587.2	Frozen	Dry		2.36		0.19		Dry	ice
01/20/17	MH	7587.6	Frozen	Dry		2.4		0.21		Dry	ice
01/27/17	MH		unable to make it to dam due to snow, got stuck								
02/04/17	MH	7587.1	Frozen	Dry		2.22		0.17		Dry	ice
02/10/17	MH	7586.2	Frozen	Dry		2.21		0.17		Dry	ice
02/17/17	MH	7582.8	Frozen	snow covered		2.33		0.16		Dry	ice
02/24/17	MH	7582.3	Frozen	snow covered		2.29		0.08		Dry	ice
03/04/17	MH	7582.3	Frozen	snow covered		1.91		0.07		Dry	ice
03/11/17	MH	7582.70	Frozen	snow covered		2.16		0.11		trickle	snow covered
03/19/17	MH	7585.95	Frozen	snow covered		2.78		0.36		trickle	snow covered
03/25/17	MH	7588.30	Frozen	6.67		3.41		2.14		trickle	snow covered
04/01/17	MH	7585.90	Frozen	3.75		3.00		0.54		trickle	snow covered
04/09/17	MH	7585.85	mostly frozen	3.53		2.68		0.17		0.89	
04/15/17	MH	7588.08	a lot melted	2.73		1.86		0.19		0.16	
04/22/17	MH	7592.70	Ice Melted/flow over top	10.91		8.57		7.69	some sediment	1.50	
04/29/17	MH	7592.60	over top spillway	11.54		7.55		6.99	some sediment	1.42	
05/06/17	MH	7592.95	over top spillway	12.00	stream backed	6.00		6.67	some sediment	0.83	
05/13/17	MH	7593.00	over top spillway	15.00	up to pipe	5.70		5.45	some sediment	1.02	
05/20/17	MH	7592.7	over top spillway	9.04		4.64		3.92	some sediment	0.56	
05/28/17	MH	7592.9	over top spillway	7.79		4.35		3.55	some sediment	0.48	
06/03/17	MH	7592.9	over top spillway	8.82		4.17		3.53	less sediment	0.47	
06/10/17	MH	7592.8	over top spillway	8.22		4.05		3.33	less sediment	0.17	

* notes MH = Michael Hansen RB&G Engineering
ECC= East Carbon City / Sunnyside

Left abut drain D-3 has been added, 2016, to collect more seepage



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Seepage Readings
January 2015 to June 10, 2017
Some additonal readings by RB&G Eng
Grassy Trail Dam and Reservoir

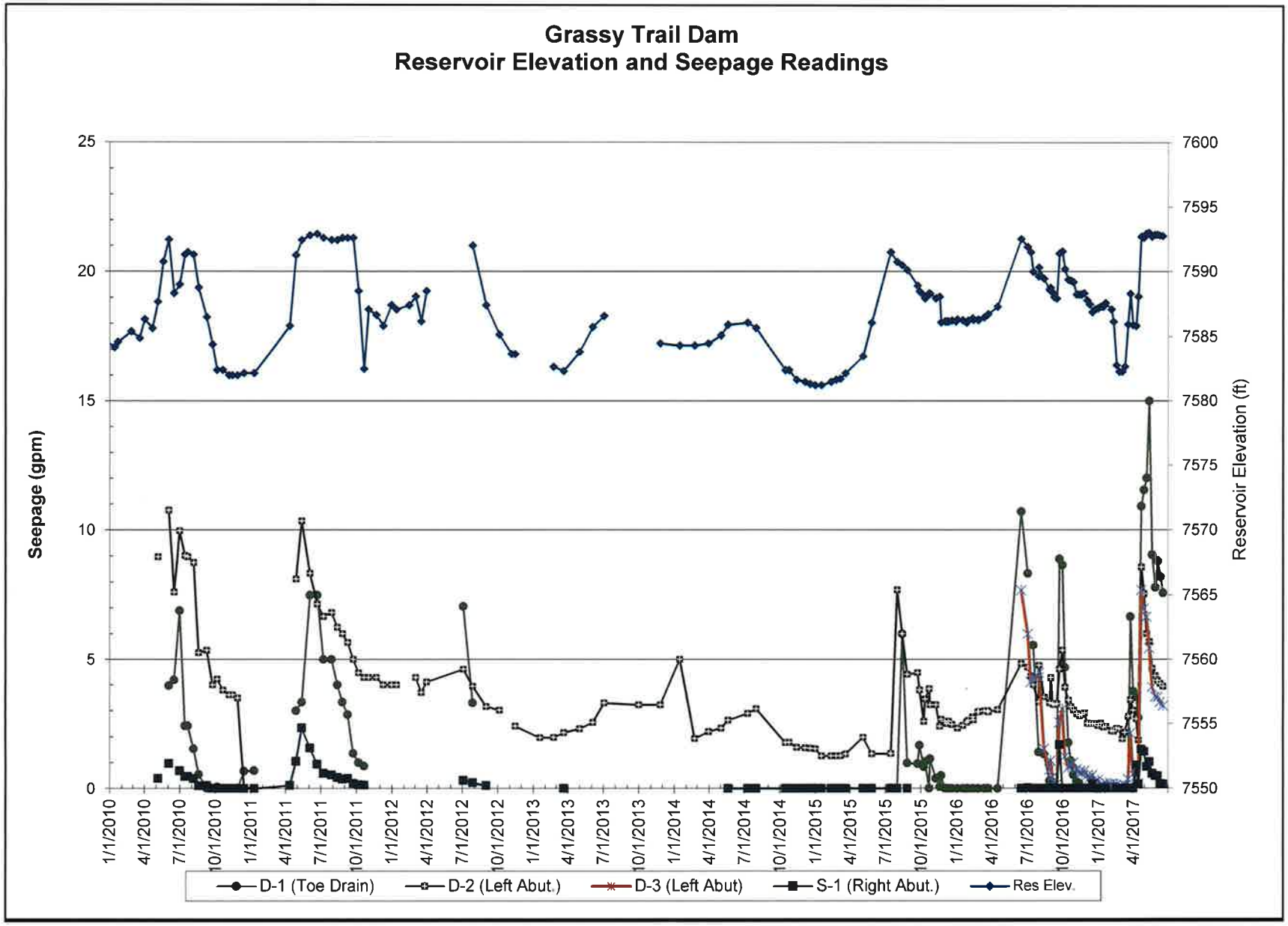


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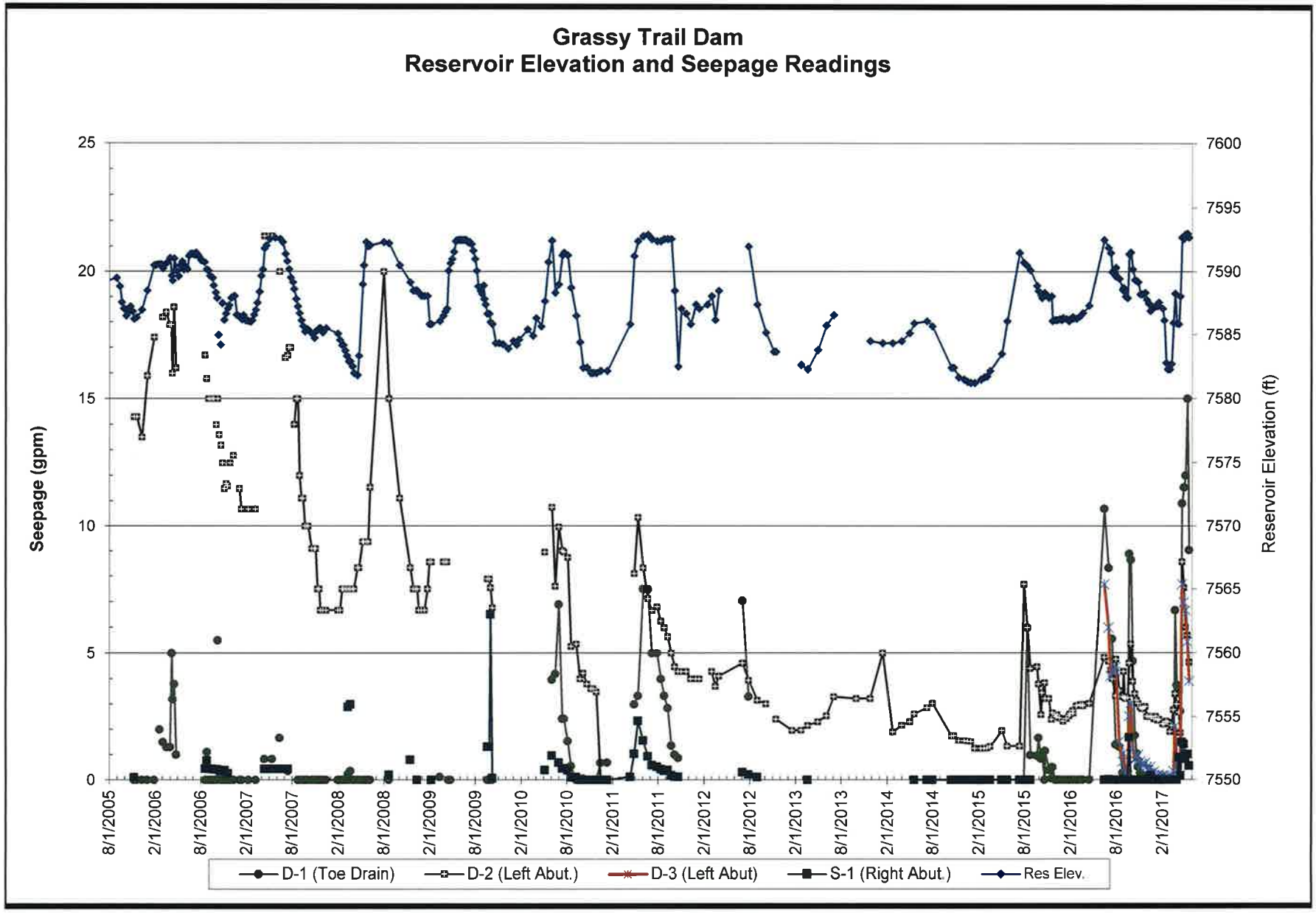
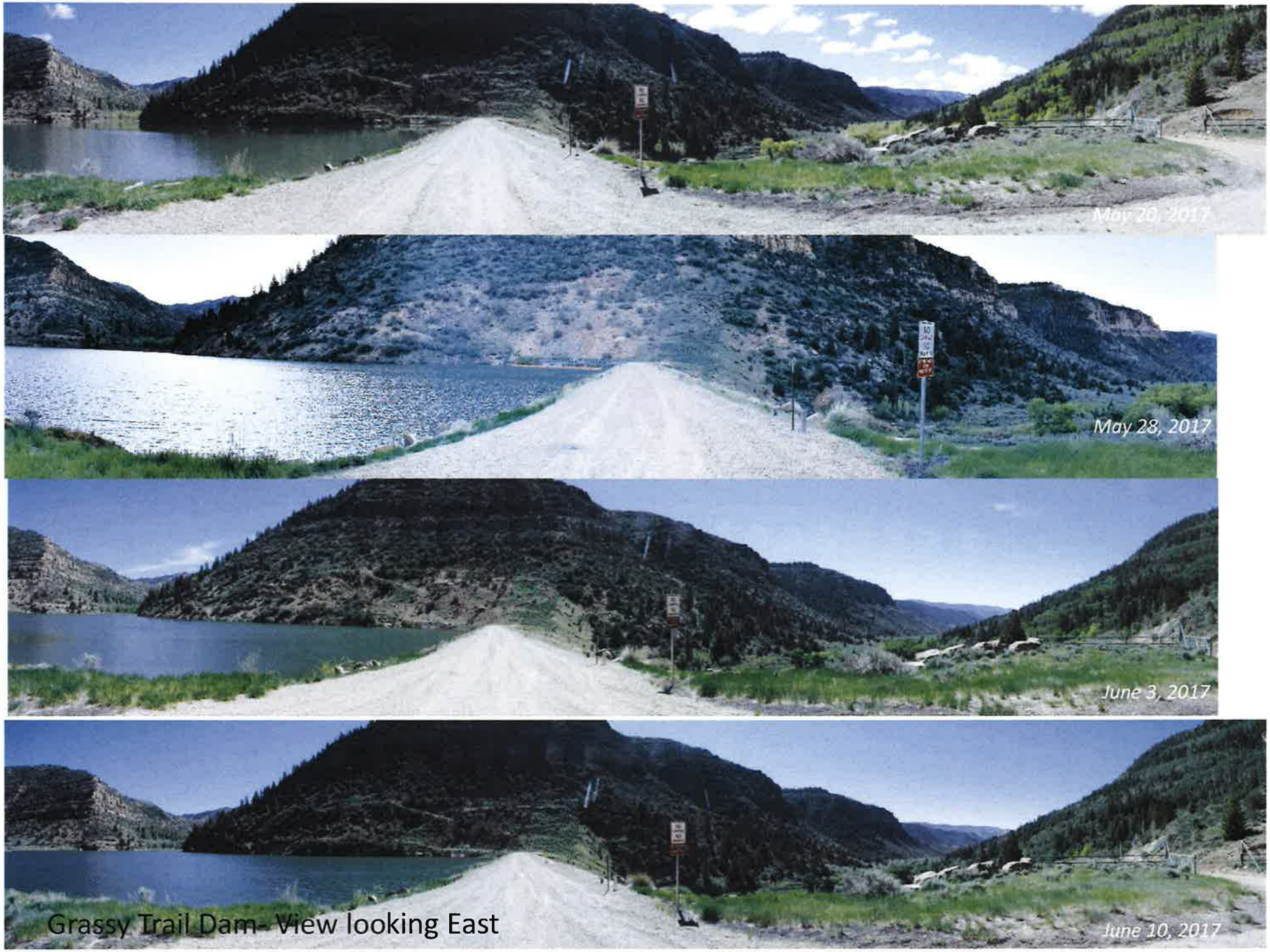
Figure Reservoir Elevation and Seepage Readings
January 2010 to June 10, 2017
Some additonal readings by RB&G Eng
Grassy Trail Dam and Reservoir



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Seepage Readings
August 2005 to June 10, 2017
Some additonal readings by RB&G Eng
Grassy Trail Dam and Reservoir

Grassy Trail Dam- Views looking West to North



Grassy Trail Dam- View looking East

View looking North at downstream slope and toe of dam

View looking Northeast at downstream slope