OGMCOAL DNR <ogmcoal@utah.gov>

Grassy Trail Inclinometer Installation

Madsen, Karin <kmadsen@coalsource.com> Thu, Oct 5, 2017 at 10:22 AM
To: "jmckenzi@blm.gov" <jmckenzi@blm.gov>, "mglasson@blm.gov" <mglasson@blm.gov>, "Stan_Perkes@blm.gov" <Stan_Perkes@blm.gov>, "Steve_Falk@blm.gov" <Steve_Falk@blm.gov>, "steve_rigby@blm.gov" <steve_rigby@blm.gov>, "Hibbs, David" <dhibbs@coalsource.com>, "ecc@emerytelcom.net" <ecc@emerytelcom.net>, "sunny1@emerytelcom.net" <sunny1@emerytelcom.net>, "djavery1971@gmail.com" <djavery1971@gmail.com>, Brad Price <bprice@rbgengineering.com>, June Lund <jlund@rbgengineering.com>, Michael Hansen <Mhansen@rbgengineering.com>, Rob johnson <rjohnson@rbgengineering.com>, "bretdixon@utah.gov" <bretdixon@utah.gov>, "danadean@utah.gov" <danadean@utah.gov>, "daronhaddock@utah.gov" <daronhaddock@utah.gov>, "davemarble@utah.gov" <davemarble@utah.gov>, "karlhouskeeper@utah.gov" <karlhouskeeper@utah.gov>, "marcstilson@utah.gov" <marcstilson@utah.gov>, "ogmcoal@utah.gov" <ogmcoal@utah.gov>, "stevechristensen@utah.gov" <stevechristensen@utah.gov>, "stevedemczak@utah.gov" <stevedemczak@utah.gov>, "tomfaddies@utah.gov" <tomfaddies@utah.gov>, "douglasparsons53@yahoo.com" <douglasparsons53@yahoo.com>

Good Morning,

RB&G Engineering has completed the installation of the 2 inclinometers we agreed to install to complete the requirements for the cessation of seismic monitoring at Grassy Trail Dam.

Please call me with any questions regarding this installation.

Thanks,

Karin Odendahl-Madsen

Environmental Engineering Technician

UtahAmerican Energy Inc.

435-888-4026

2 attachments

Memo.09-25-17.pdf
3692K

ProjectRpt. 9-5-17.pdf
2450K

Grassy Trail
Inclinometers

Carbon County, Utah

RB&G
ENGINEERING, INC.

1435 West 820 North
Provo, Utah 84601
801-374-5771 Provo
801-521-5771 Salt Lake City
801-374-5773 Fax

MEMORANDUM

To: West Ridge Resources

From: Brad Price, P.E.

Date: September 25, 2017

New inclinometers were installed between September 5th and September 12th, 2017 to replace Inclinometers 2 and 3. Inclinometer 2A was installed adjacent to Inclinometer 2 at about Station 5+05. Inclinometer 3A was installed about 15 feet west of Inclinometer 3 at about Station 7+29.

Attached is a Vicinity Map and Site Plan showing the inclinometer locations. Also included is a copy of the boring logs and photos of the core recovered from each boring, along with the 1998 boring logs showing lithology of the embankment and overburden soils.

If there are any questions regarding the information contained herein, please call.

RB&G ENGINEERING, INC.

Bradford E. Price

Bradford E. Price, P.E.

RB&G ENGINEERING, INC.

Figure 1 VICINITY MAP

Grassy Trail Dam Inclinometer Replacement

Carbon County, Utah

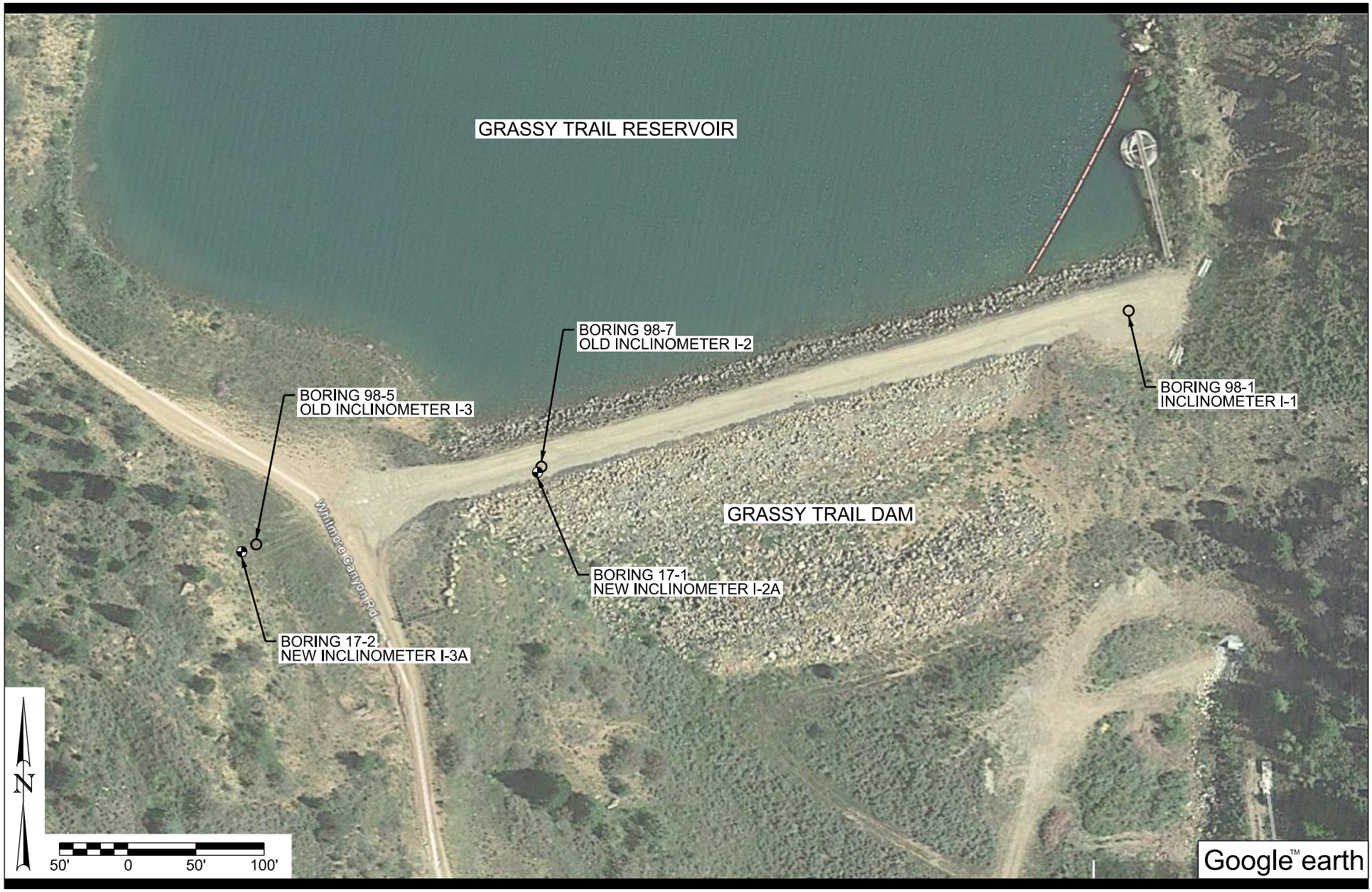

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Figure 2 SITE PLAN & TEST HOLE / INCLINOMETER LOCATIONS

Grassy Trail Dam Inclinometer Replacement

Carbon County, Utah

DRILL HOLE LOG

BORING NO. 17-1 / I-2A

PROJECT: GRASSY TRAIL DAM INCLINOMETER REPLACEMENT
CLIENT:
LOCATION: STATION ~5+05, DAM CREST NEAR RIGHT ABUTMENT
DRILLING METHOD: 08-CME-55 / H.S.A. TO 50', 3-7/8" TO 111', H.Q. CORE
DRILLER: T. KERN
DEPTH TO WATER - INITIAL: ▽ 20.0' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200404.006
DATE STARTED: 9/5/17
DATE COMPLETED: 9/12/17
GROUND ELEVATION:
LOGGED BY: M. HANSEN

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description	Inclinometer Installation Detail
							DAM EMBANKMENT (not sampled) See Test Hole 98-7 for Lithology	4"x4" Locking Cover w/2' Stickup; Grout & Bentonite Mixture; 2.75" Inclinometer Casing
							NATIVE ALLUVIUM (not sampled)	

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40, 45

▽ 20

DH_LOG_V8-2014-1 GRASSYTRAIL_2017.GPJ US EVAL.GDT 9/20/17

RB&G ENGINEERING, INC.

LEGEND:

2" OD Split Spoon (SPT)
2.5" OD Split Spoon
3" OD Split Spoon

Split Spoon Sample: 2,3,2,(6) — Blow Count per 6"; $(N_1)_{60}$ Value; *T 0.45* — Torvane (tsf); *PP 2.0* — Pocket Penetrometer (tsf); * — With Liners
Core: 95,60 — Percent Recovery, R.Q.D.
Thin-Walled Tube Sample: Pushed; *T 0.45* — Torvane (tsf); *PP 2.0* — Pocket Penetrometer (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
Chem. = pH, Resistivity, Sulfate, Chloride
Hyd. = Hydrometer

DRILL HOLE LOG

BORING NO. 17-1 / I-2A

PROJECT: GRASSY TRAIL DAM INCLINOMETER REPLACEMENT
CLIENT:
LOCATION: STATION ~5+05, DAM CREST NEAR RIGHT ABUTMENT
DRILLING METHOD: 08-CME-55 / H.S.A. TO 50', 3-7/8" TO 111', H.Q. CORE
DRILLER: T. KERN
DEPTH TO WATER - INITIAL: ▽ 20.0' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200404.006
DATE STARTED: 9/5/17
DATE COMPLETED: 9/12/17
GROUND ELEVATION:
LOGGED BY: M. HANSEN

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description	
	55							
	60							Grout & Bentonite Mixture
	65							
	70							
	75						NATIVE ALLUVIUM (not sampled)	2.75" Inclinometer Casing
	80							
	85							
	90							
	95							

DH_LOG_V8-20114-1 GRASSYTRAIL_2017.GPJ US EVAL.GDT 9/20/17

RB&G ENGINEERING, INC.

LEGEND:

2" OD Split Spoon (SPT)
2.5" OD Split Spoon
3" OD Split Spoon

Split Spoon Sample: 2,3,2,(6) — Blow Count per 6"; $(N_1)_{60}$ Value; *T 0.45* — Torvane (tsf); *PP 2.0* — Pocket Penetrometer (tsf); * With Liners
Core: 95,60 — Percent Recovery, R.Q.D.
Thin-Walled Tube Sample: Pushed; *T 0.45* — Torvane (tsf); *PP 2.0* — Pocket Penetrometer (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
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Chem. = pH, Resistivity, Sulfate, Chloride
Hyd. = Hydrometer

DRILL HOLE LOG

BORING NO. 17-1 / I-2A

PROJECT: GRASSY TRAIL DAM INCLINOMETER REPLACEMENT
CLIENT:
LOCATION: STATION ~5+05, DAM CREST NEAR RIGHT ABUTMENT
DRILLING METHOD: 08-CME-55 / H.S.A. TO 50', 3-7/8" TO 111', H.Q. CORE
DRILLER: T. KERN
DEPTH TO WATER - INITIAL: ▽ 20.0' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200404.006
DATE STARTED: 9/5/17
DATE COMPLETED: 9/12/17
GROUND ELEVATION:
LOGGED BY: M. HANSEN

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description	
	105							
	110						ALLUVIUM	
	115							Grout & Bentonite Mixture
	120			43	Core 72,32	-	-	
						-	MUDSTONE	
						-	lt. brown, avg. hard rock — SANDSTONE W/CLAY SEAMS	
	125							2.75" Inclinometer Casing
				60	Core 100,100		lt. gray, avg. hard rock — SANDSTONE	
	130					-	lt. gray, avg. hard rock	
				54	Core 90,54	-	~~gray, ext. soft rock~~ — CLAYEY SHALEY MUDSTONE	
						-	gray, very soft rock — SHALEY MUDSTONE	
						-	~~gray~~ — MUDSTONE shaley clayey layers	
						-	brown-gray — MUDDY SILTSTONE	
	135					-	lt. brown — SHALEY MUDSTONE shell fragments	
				62	Core 104,92	-	gray — MUDSTONE marble texture	
						-	dk. gray — SILTSTONE some shell fragments	
						-	gray — MUDSTONE shell fragments	Grout Valve
							MUDSTONE shaley lenses	Sluff
	140						BOH	
	145							

DH_LOG_V8-20114-1 GRASSYTRAIL_2017.GPJ US EVAL.GDT 9/20/17

LEGEND:

- 2" OD Split Spoon (SPT)
- 2.5" OD Split Spoon
- 3" OD Split Spoon
- Split Spoon Sample
- Core
- Thin-Walled Tube Sample

2,3,2,(6) ← Blow Count per 6" $(N_1)_{60}$ Value
T 0.45 ← Torvane (tsf)
PP 2.0 ← Pocket Penetrometer (tsf)
With Liners
Core 95,60 ← Percent Recovery, R.Q.D.
Pushed
T 0.45 ← Torvane (tsf)
PP 2.0 ← Pocket Penetrometer (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
Chem. = pH, Resistivity, Sulfate, Chloride
Hyd. = Hydrometer

RB&G ENGINEERING, INC.

DRILL HOLE LOG

BORING NO. 17-2 / I-3A

PROJECT: GRASSY TRAIL DAM INCLINOMETER REPLACEMENT
CLIENT:
LOCATION: STATION ~7+29, RIGHT ABUTMENT
DRILLING METHOD: 08-CME-55 / H.S.A. TO 39.5', H.Q. CORE
DRILLER: T. KERN
DEPTH TO WATER - INITIAL: ▽ 18.0' **AFTER 24 HOURS:** ▼ 18.0'

PROJECT NUMBER: 200404.006
DATE STARTED: 9/6/17
DATE COMPLETED: 9/8/17
GROUND ELEVATION:
LOGGED BY: M. HANSEN

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description		Inclinometer Installation Detail
							ALLUVIUM (not sampled) See Test Hole 98-5 for Lithology		4"x4" Locking Cover w/2' Stickup
	5								
	10								Grout & Bentonite Mixture
	15								
	▽▼								
	20						BEDROCK - MUDSTONE, SANDSTONE & SOME SILTSTONE		2.75" Inclinometer Casing
	25								
	30								
	35								
	40			60	Core 100,96	-	red-brown	MUDSTONE w/some green	
						-	lt. green	SILTY MUDSTONE	
						-	lt. green	SILTY SANDSTONE some siltstone layers	

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LEGEND:

- 2" OD Split Spoon (SPT)
- 2.5" OD Split Spoon
- 3" OD Split Spoon

Split Spoon Sample: 2,3,2,(6) — Blow Count per 6" $(N_1)_{60}$ Value; *T 0.45* — Torvane (tsf); *PP 2.0* — Pocket Penetrometer (tsf); * — With Liners

Core: 95,60 — Percent Recovery, R.Q.D.

Thin-Walled Tube Sample: Pushed; *T 0.45* — Torvane (tsf); *PP 2.0* — Pocket Penetrometer (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
Chem. = pH, Resistivity, Sulfate, Chloride
Hyd. = Hydrometer

RB&G ENGINEERING, INC.

DRILL HOLE LOG

BORING NO. 17-2 / I-3A

PROJECT: GRASSY TRAIL DAM INCLINOMETER REPLACEMENT
CLIENT:
LOCATION: STATION ~7+29, RIGHT ABUTMENT
DRILLING METHOD: 08-CME-55 / H.S.A. TO 39.5', H.Q. CORE
DRILLER: T. KERN
DEPTH TO WATER - INITIAL: ▽ 18.0' **AFTER 24 HOURS:** ▼ 18.0'

PROJECT NUMBER: 200404.006
DATE STARTED: 9/6/17
DATE COMPLETED: 9/8/17
GROUND ELEVATION:
LOGGED BY: M. HANSEN

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Rec. (in)	See Legend	USCS (AASHTO)	Material Description	
				60		-	lt. green	
				60	Core 100,100	-	lt. brown, soft rock to avg. hard rock	SANDSTONE
	50			59	Core 98,98	-	lt. brown, soft rock to avg. hard rock	
	55					-	lt. gray, soft rock to avg. hard rock	SANDSTONE some carbonaceous lenses
				62	Core 104,85	-	lt. brown, soft rock to avg. hard rock	
	60			60	Core 100,62	-	lt. brown, soft rock to avg. hard rock	SANDSTONE 100% water loss at 61', open fracture w/staining at 61'-62.5'
	65			36	Core 120,43	-	brown, very soft rock to avg. hard rock	SANDSTONE TO MUDSTONE; CLAYSTONE TO DRY CLAY some siltstone & sandstone layers
				30	Core 100,88	-	white, very soft rock to avg. hard rock	MUDSTONE W/PYRITE
	70					-	black-gray, very soft rock to avg. hard rock; gray, avg. hard rock	SILTSTONE some bioturbation
				63	Core 105,88	-	very soft rock	SHALEY MUDSTONE
						-	lt. gray-green, soft rock	SILTY MUDSTONE
						-	lt. gray, soft rock	SILTSTONE fracture w/clay infilling at 73.9'-75'
	75					-	lt. gray, soft rock	
				61	Core 102,70	-	lt. gray-green, soft rock	MUDSTONE
						-	red-brown, very soft rock	SHALEY MUDSTONE highly fractured
	80							BOH
	85							

Grout & Bentonite Mixture
2.75" Inclinometer Casing
Grout Valve
Sluff

DH_LOG_V8-2014-1 GRASSYTRAIL_2017.GPJ US EVAL.GDT 9/20/17

LEGEND:

- 2" OD Split Spoon (SPT)
- 2.5" OD Split Spoon
- 3" OD Split Spoon
- Split Spoon Sample
- Core
- Thin-Walled Tube Sample

2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value
T 0.45 ← Torvane (tsf)
PP 2.0 ← Pocket Penetrometer (tsf)
Core 95,60 Pushed ← Percent Recovery, R.Q.D.
T 0.45 ← Torvane (tsf)
PP 2.0 ← Pocket Penetrometer (tsf)

* With Liners

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
UU = Unconsolidated, Undrained
CU = Consolidated, Undrained
Chem. = pH, Resistivity, Sulfate, Chloride
Hyd. = Hydrometer

RB&G ENGINEERING, INC.

Top
119.5’

HQ size core

Bottom 139.5’

RB&G ENGINEERING, INC.

Figure *Core - Drill Hole #17-01*
Project *Grassy Trail Dam Site*
Location *Carbon County, Utah*

Top 39.5’

Bottom 79.5’

HQ size core, core box 2 ft long

RB&G ENGINEERING, INC.

Figure *Core - Drill Hole #17-02*
Project *Grassy Trail Dam Site*
Location *Carbon County, Utah*

Project: GRASSY TRAIL DAM	Project Number: 9712.000	Boring No.: 98-5 Inclinometer No. 3 Sheet 1 of 2
Client: CREAMER & NOBLE ENGINEERS	Logged By: M. HANSEN, V.N.B.	
Boring Depth (ft.): 54 / Elev: 7601.4'	Driller: B. HARTLEY	Starting Date: 3/18/98
Equip./Drill Method: CME-55 / H.S. AUGER TO 5', ROTARY WASH N.W. CASING TO 10', N.Q. CORE		Ending Date: 3/18/98

Elev. (Feet)	Depth (Feet)	Lith-ology	Smpl.	USCS	Blow-counts	Material Description	Incl. No. 3	Comments
7600						Reddish-Brown Sandy Clay W/Gravel		Slope Indicator Pipe
				CL-1	5,9,14			
	5							Low Strength Cement Grout
7595						Bedrock		
	10			CL-2	37,61/5"	Interbedded Light Green and Reddish-Brown Weathered Mudstone (Shale)		
7590					CORE 97,60			
	15							
7585					CORE 80,38			
	20					W/Some Interbedded Gravel		
7580					CORE 94,62	Light Green Fractured Mudstone		
	25							
7575					CORE 100,82			
	30					Blue-Gray Mudstone to Claystone W/Some Brown Layers		
7570					CORE 100,89			
	35					Very Soft Mudstone		
7565					CORE 100,72	Dark Red-Brown Shaley Mudstone		
	40							
7560					CORE 99,76	Blue-Gray Mudstone to Siltstone		
	45					Yellow-Greenish-Brown Sandstone W/Some Fractures		
7555					CORE 100,86			

LEGEND

- 2,3,2 — Blow Count per 6"
- 0.45 — Torvane (tsf)
- Disturbed Sample
- Core 100,60 — Rock Quality Designation (RQD)
- Percent Sample Recovery
- Undisturbed Sample
- Groundwater Elevation

RB&G ENGINEERING INC.
Provo, Utah

Project: GRASSY TRAIL DAM	Project Number: 9712.000	Boring No.: 98-5 Inclinometer No. 3 Sheet 2 of 2
Client: CREAMER & NOBLE ENGINEERS	Logged By: M. HANSEN, V.N.B.	
Boring Depth (ft.): 54	Elev: 7601.4'	Driller: B. HARTLEY	Starting Date: 3/18/98
Equip./Drill Method: CME-55 / H.S. AUGER TO 5', ROTARY WASH N.W. CASING TO 10', N.Q. CORE		Ending Date: 3/18/98

Elev. (Feet)	Depth (Feet)	Lith-ology	Smpl.	USCS	Blow-counts	Material Description	Incl. No. 3	Comments
7550					CORE 100,70	100% Water Loss Yellow-Grayish-Brown Sandstone W/Fractures		Inclinometer #3 Low Strength Cement Grout Sluff
7545	55							
7540	60							
7535	65							
7530	70							
7525	75							
7520	80							
7515	85							
7510	90							
7505	95							

LEGEND

- 2,3,2 — Blow Count per 6"
- 0.45 — Torvane (tsf)
- Disturbed Sample
- Core 100,60 — Rock Quality Designation (RQD); Percent Sample Recovery
- Undisturbed Sample
- Groundwater Elevation

RB&G ENGINEERING INC.
Provo, Utah

Project: GRASSY TRAIL DAM		Project Number: 9712.000	Boring No.: 98-7 Inclinometer No. 2 Sheet 1 of 3
Client: CREAMER & NOBLE ENGINEERS		Logged By: M. STILSON, M. HANSEN, V.N.B.	
Boring Depth (ft.): 132.4	Elev: 7600.2'	Driller: B. HARTLEY	Starting Date: 3/5/98
Equip./Drill Method: CME-55 / H.S. AUGER TO 49', N.Q. CORE TO 58', ROTARY WASH TO 120', N.Q. CORE			Ending Date: 3/11/98

Elev. (Feet)	Depth (Feet)	Lith-ology	Smpl.	USCS	Blow-counts	Material Description	Incl. No. 2	Comments
7600								Slope Indicator Pipe
7595	5							Low Strength Cement Grout
				CL-1	7,6,4	Reddish-Brown Sandy Lean Clay W/Gravel		
7590	10							
7585	15							
				CL-1	8,9,10			
7580	20							
						Boulder		
7575	25					Reddish-Brown Sandy Lean Clay W/Gravel		
				X, CL-1	Pushed 0.75			
				SP-SM	26,13,12	Brown Sandstone		
7570	30					Brown Sandy Clay W/Gravel		
7565	35							
				CL-2	6,7,10			
7560	40							
7555	45					Tan Sandstone Sand W/Gravel and Cobbles		
				SP	21,36,39			

LEGEND

- 2,3,2 — Blow Count per 6"
- 0.45 — Torvane (tsf)
- Disturbed Sample
- Core 100,60 — Rock Quality Designation (RQD); Percent Sample Recovery
- Undisturbed Sample
- Groundwater Elevation

RB&G ENGINEERING INC.
Provo, Utah

Project: GRASSY TRAIL DAM	Project Number: 9712.000	Boring No.: 98-7 Inclinometer No. 2 Sheet 2 of 3
Client: CREAMER & NOBLE ENGINEERS	Logged By: M. STILSON, M. HANSEN, V.N.B.	
Boring Depth (ft.): 132.4 / Elev: 7600.2'	Driller: B. HARTLEY	Starting Date: 3/5/98
Equip./Drill Method: CME-55 / H.S. AUGER TO 49', N.Q. CORE TO 58', ROTARY WASH TO 120', N.Q. CORE		Ending Date: 3/11/98

Elev. (Feet)	Depth (Feet)	Lith-ology	Smpl.	USCS	Blow-counts	Material Description	Incl. No. 2	Comments
7550					CORE 19,0	Tan and Gray Sandstone		Slope Indicator Pipe
7545	55				CORE 32,0			Low Strength Cement Grout
						Reddish-Brown Clayey Gravel W/Sand		
7540	60			CL-2	7,10,9	Brown Clay W/Sand, Gravel and Cobbles		
7535	65							
7530	70			GC	12,11,14	Brown Clayey Sandy Gravel		
7525	75							
7520	80			CL-2	6,7,11	Reddish-Brown Sandy Clay W/Gravel		
7515	85							
7510	90			CL-2	17,9,11			
7505	95					Yellow and Brown Sandy Clay W/Gravel and Cobbles		

LEGEND

- 2,3,2 — Blow Count per 6"
- 0.45 — Torvane (tsf)
- Disturbed Sample
- Core 100,60 — Rock Quality Designation (RQD); Percent Sample Recovery
- Undisturbed Sample
- Groundwater Elevation

RB&G ENGINEERING INC.
Provo, Utah

Project: GRASSY TRAIL DAM	Project Number: 9712.000	Boring No.: 98-7 Inclinometer No. 2 Sheet 3 of 3
Client: CREAMER & NOBLE ENGINEERS	Logged By: M. STILSON, M. HANSEN, V.N.B.	
Boring Depth (ft.): 132.4 / Elev: 7600.2'	Driller: B. HARTLEY	Starting Date: 3/5/98
Equip./Drill Method: CME-55 / H.S. AUGER TO 49', N.Q. CORE TO 58', ROTARY WASH TO 120', N.Q. CORE		Ending Date: 3/11/98

Elev. (Feet)	Depth (Feet)	Lith-ology	Smpl.	USCS	Blow-counts	Material Description	Incl. No. 2	Comments
7500				CL-2	16,28,26			Slope Indicator Pipe
7495	105					Boulder		Low Strength Cement Grout
7490	110			CL-2	15,14,14	Yellow and Brown Sandy Clay W/Gravel and Cobbles		
7485	115							
7480	120			GC	56/6", REF			
					CORE 64,45	Bedrock - Orange Sandstone Silty Sandstone		
7475	125				CORE 100,100	Gray Sandstone		Inclinometer #2
7470	130				CORE 86,75	Greenish-Gray Shaley Mudstone		Sluff
7465	135							
7460	140							
7455	145							

LEGEND

- 2,3,2 — Blow Count per 6"
- 0.45 — Torvane (tsf)
- Disturbed Sample
- Core 100,60 — Rock Quality Designation (RQD); Percent Sample Recovery
- Undisturbed Sample
- Groundwater Elevation

RB&G ENGINEERING INC.
Provo, Utah

RB&G ENGINEERING, INC.
1435 West 820 North
Provo, Utah 84601-1343
801-374-5771 Provo
801-521-5771 Salt Lake City
801-374-5773 Fax

PROJECT REPORT

Project No.	201404-006		
Project	Grassy Trail – West Ridge Mine Monitoring		
Dates	Site Visits and readings - July 16, 23, 29, Aug 5, 13, 21, 27, and the week of September 5, 2017		
Report By	Michael N. Hansen	**Position**	Engineering Geologist

Observations / Activities

A new inclinometer probe is being used to read the inclinometers. New readings from Inclinometers I-1, I-2 I-3 and 1-4 have not shown any significant movement. Plots of the inclinometer readings taken on July 8, 29, and September 7, 2017 are attached.

One accelerometer is located on the crest of the dam. This instrument has not detected any mining induced seismic (MIS) activity between May 13, 2016 to September, 2017. The "events" which have been recorded take place while removing and replacing the cover on the instrument as part of downloading and resetting the Accelerometer.

Since the last report on August 5, 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 on September 2, a 5.3 magnitude earthquake occurred near Soda Springs Idaho (Sulphur Peak). Movement from this event, which took place over 200 miles to the north, was recorded by the accelerometer on the dam with a recorded max PGA of 0.027g.

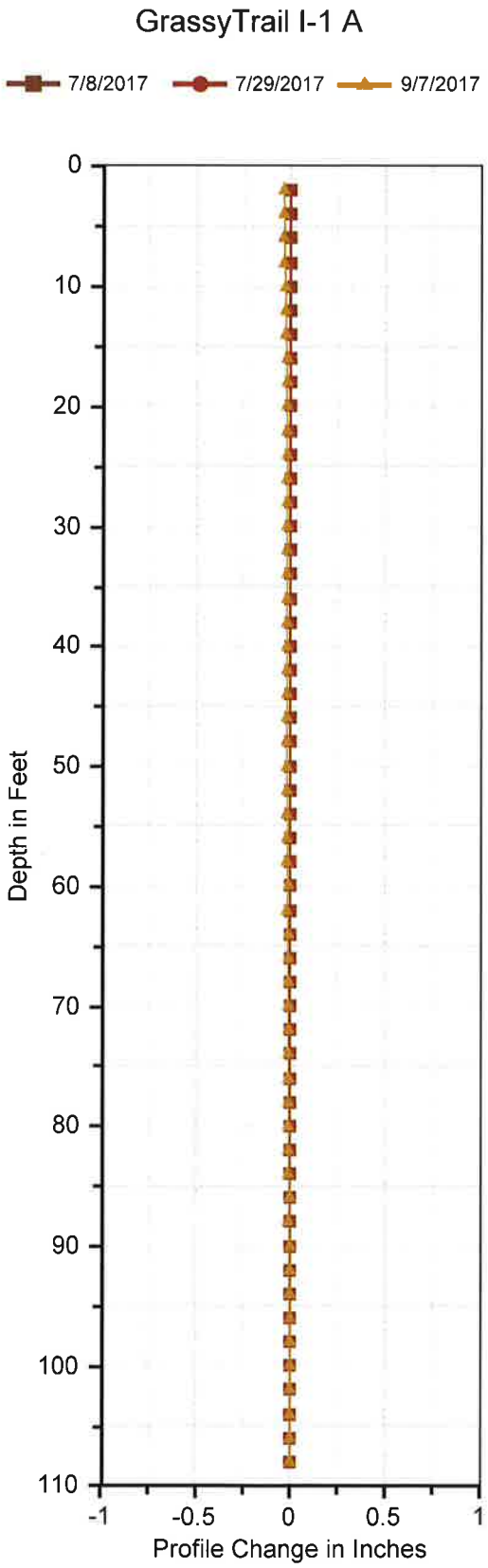
The reservoir and had been overtopping the spillway since the week of April 4, 2017. The reservoir had stopped overtopping the spillway before the readings on August 27. Reservoir elevation, seepage and piezometer readings have been taken weekly by RB&G since September 5, 2016. Plots of the reservoir elevations, piezometer and seepage readings are attached.

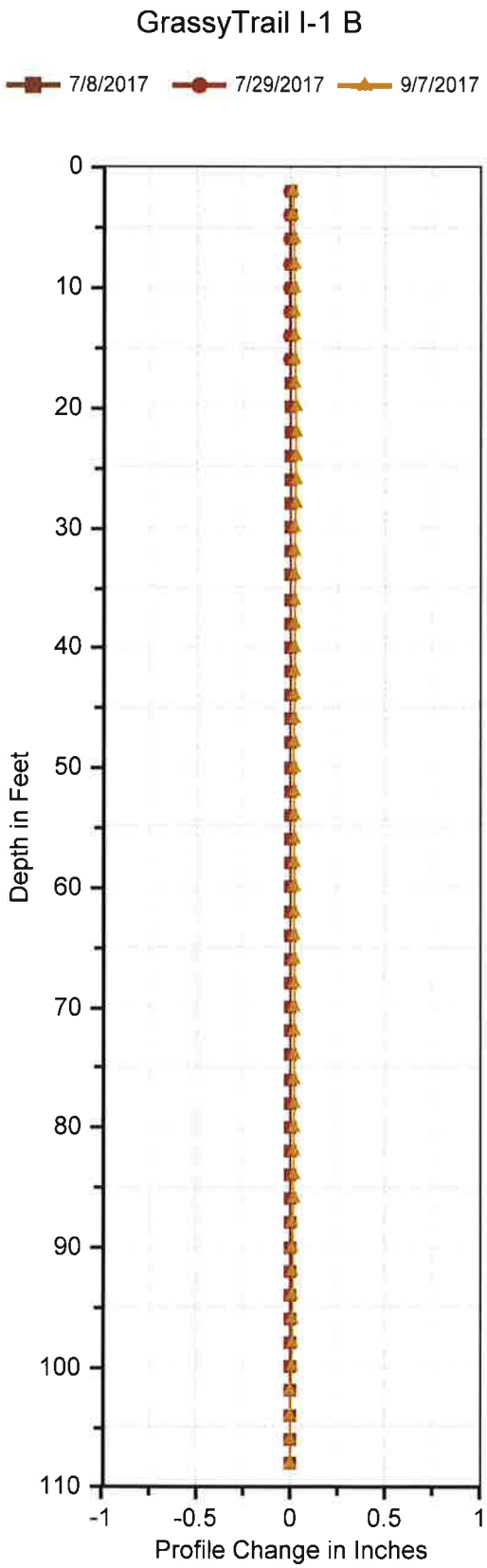
Survey data of the dam provided by Ware Surveying LLC. is included in this report. The survey data was gathered in July and on August 18, 2017, and does not show any significant movement on the dam.

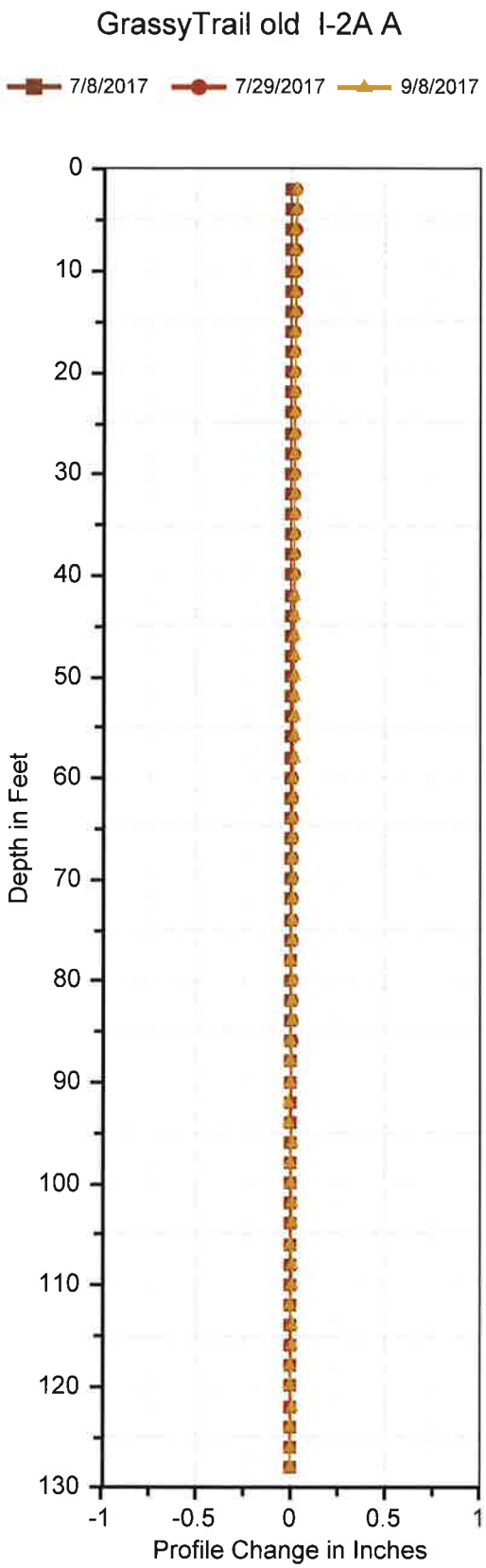
During the first 2 weeks of September, two new Inclinometers were installed on the dam and right abutment to replace the older Inclinometers I-2A and I-3A.

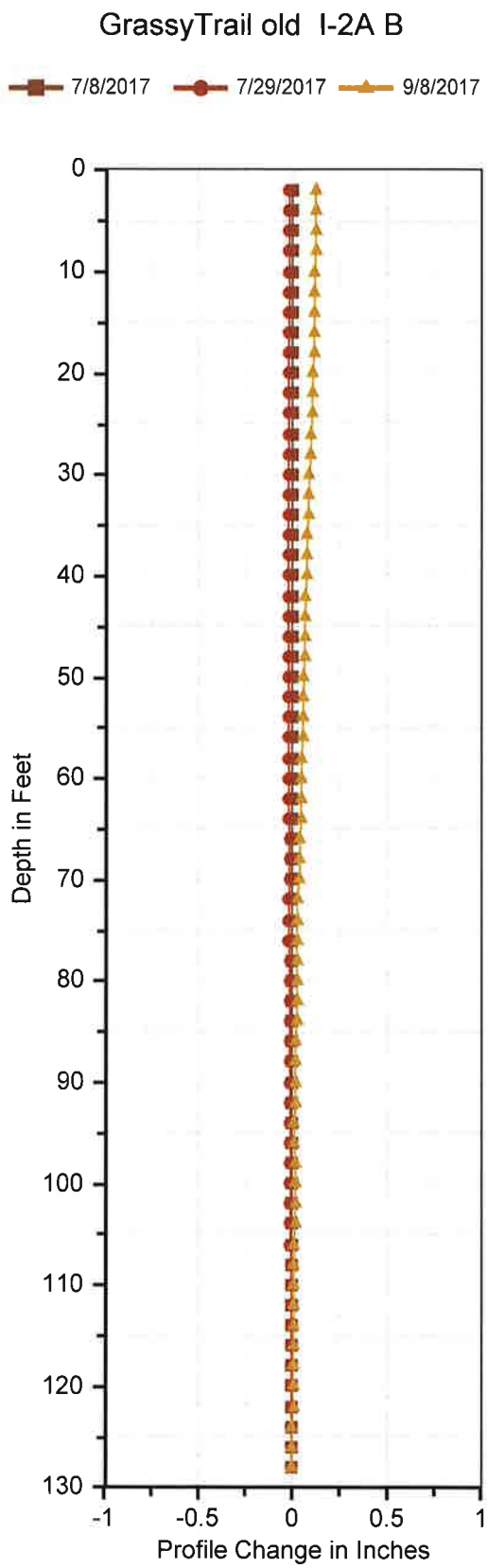
No evidence of landslide movement was noted on the dam or within the hillsides of the dam abutments.

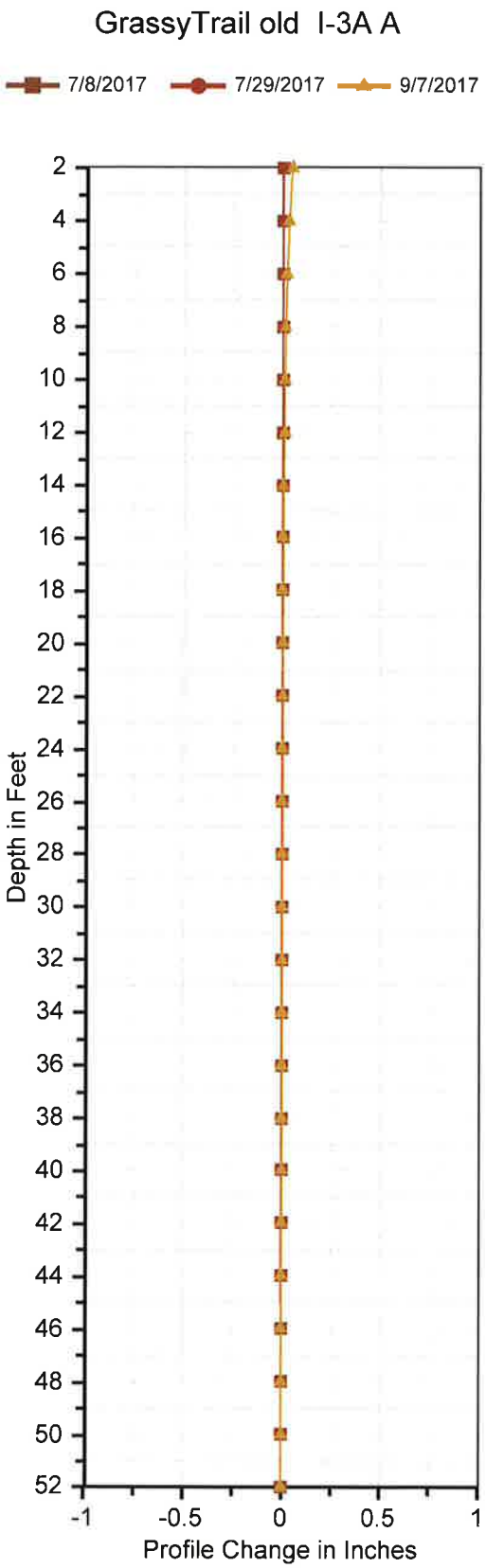
Michael Hansen P.G.
Engineering Geologist
RB&G Engineering Inc.

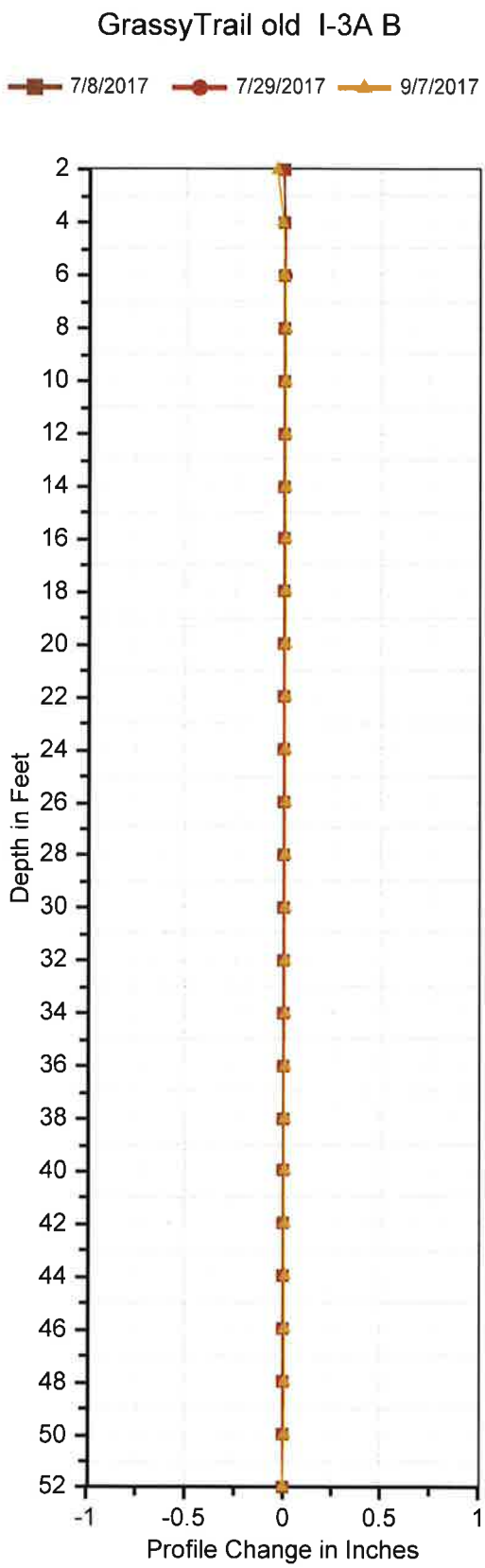

GrassyTrail I-1 A
7/8/2017
7/29/2017
9/7/2017
Depth in Feet
0
10
20
30
40
50
60
70
80
90
100
110
-1
-0.5
0
0.5
1
Profile Change in Inches

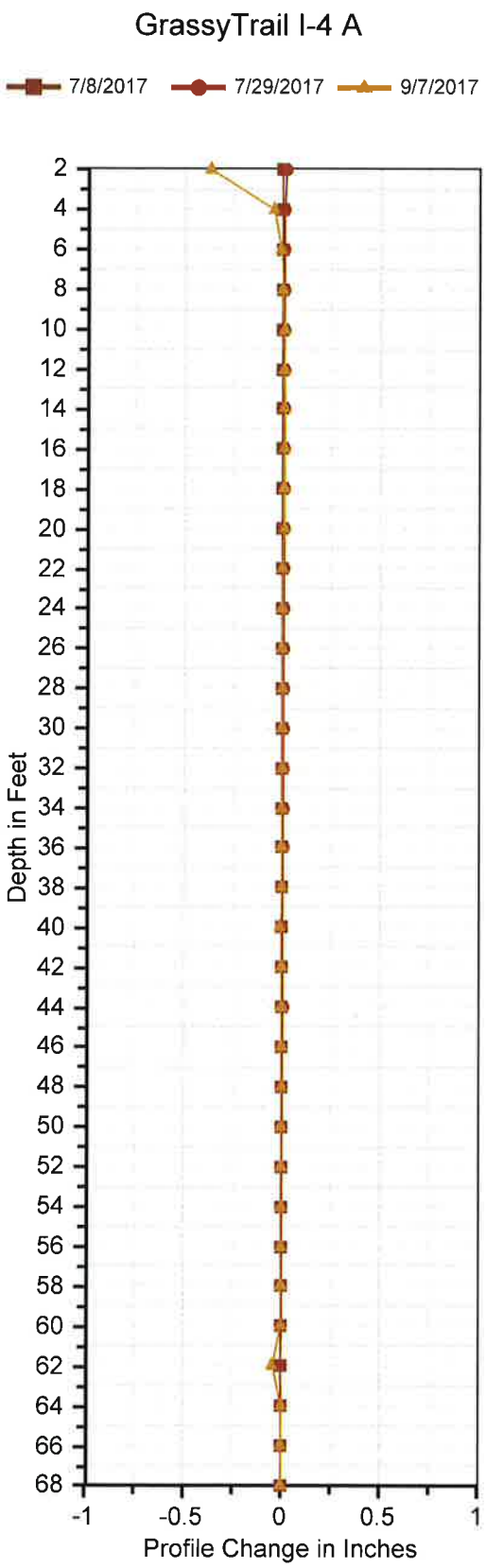

GrassyTrail I-1 B
7/8/2017
7/29/2017
9/7/2017
Depth in Feet
0
10
20
30
40
50
60
70
80
90
100
110
-1
-0.5
0
0.5
1
Profile Change in Inches

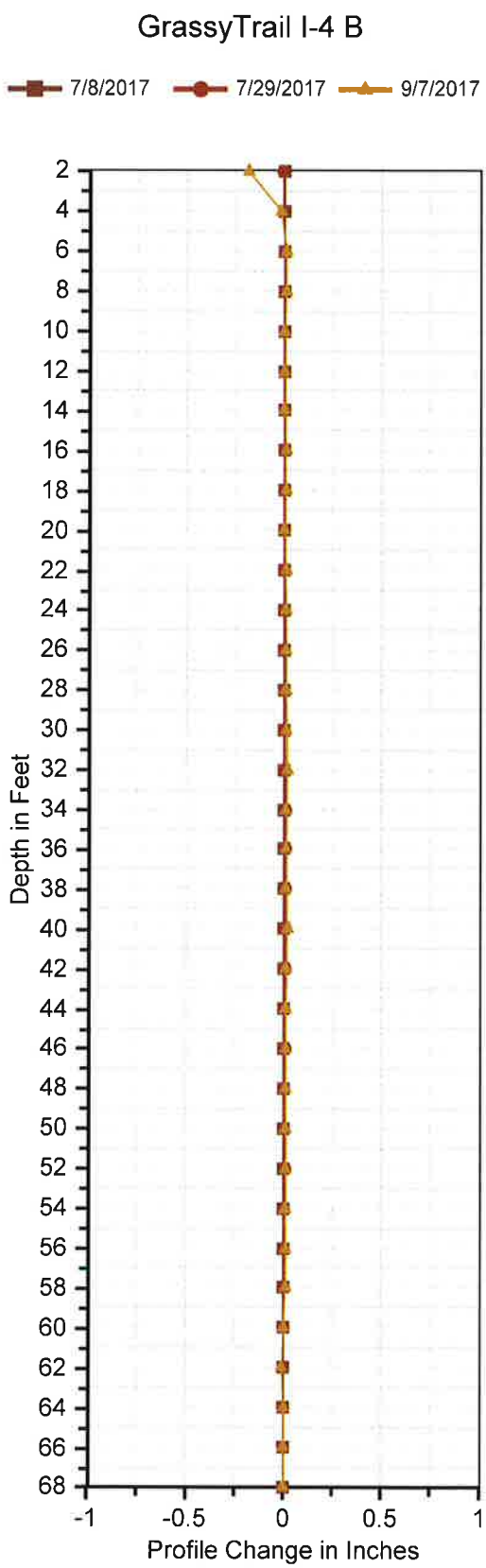

GrassyTrail old I-2A A
7/8/2017
7/29/2017
9/8/2017
Depth in Feet
0
10
20
30
40
50
60
70
80
90
100
110
120
130
-1
-0.5
0
0.5
1
Profile Change in Inches


GrassyTrail old I-2A B
7/8/2017
7/29/2017
9/8/2017
Depth in Feet
0
10
20
30
40
50
60
70
80
90
100
110
120
130
-1
-0.5
0
0.5
1
Profile Change in Inches


GrassyTrail old I-3A A
7/8/2017
7/29/2017
9/7/2017
Depth in Feet
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
-1
-0.5
0
0.5
1
Profile Change in Inches


GrassyTrail old I-3A B
7/8/2017
7/29/2017
9/7/2017
Depth in Feet
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
-1
-0.5
0
0.5
1
Profile Change in Inches


GrassyTrail I-4 A
7/8/2017
7/29/2017
9/7/2017
Depth in Feet
Profile Change in Inches


GrassyTrail I-4 B
7/8/2017
7/29/2017
9/7/2017
Depth in Feet
Profile Change in Inches

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

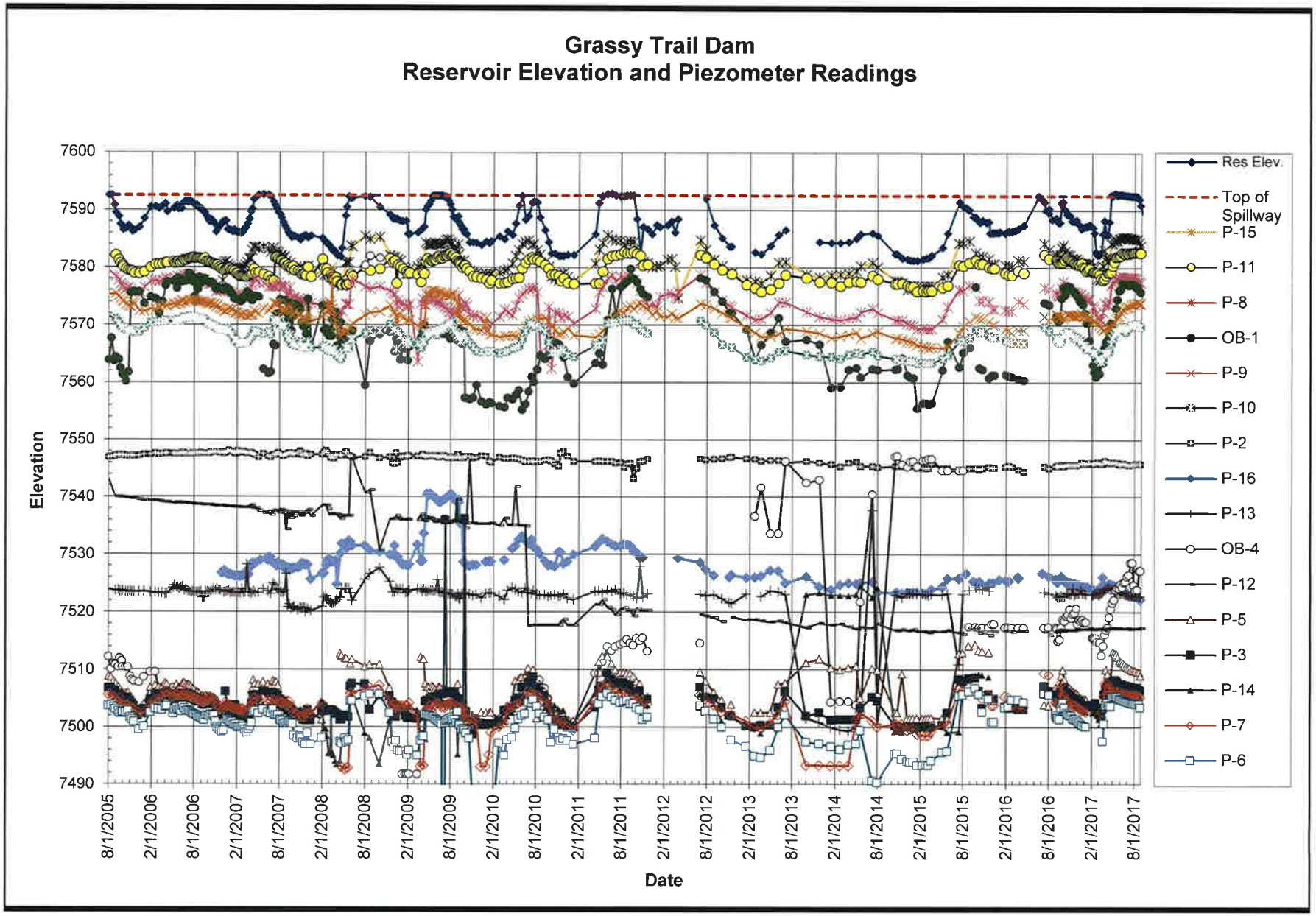
Type	Serial No.	Date	Time	No. Chan	Trigger	Tran Peak (in/s)	Vert Peak (in/s)	Long Peak (in/s)	Tran Accel (g)	Vert Accel (g)	Long Accel (g)	Tran Freq. Hz.	Vert Freq. Hz.	Long Freq. Hz.	Description	Post Event Note first line
LOG	BE9690	8-Jul-17	10:14:41	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	8-Jul-17	10:14:53	3	Tran	0.03	0.025	0.01	0.027	0.027	0.013	32	28.44	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	8-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	8-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	9-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	9-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	10-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	10-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	11-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	11-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	12-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	12-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	13-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	13-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	14-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	14-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	15-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	15-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	16-Jul-17	13:39:55	3	Vert	0.115	0.115	0.02	0.146	0.093	0.04	73.14	42.67	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	16-Jul-17	13:40:02	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	16-Jul-17	14:35:13	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	16-Jul-17	14:35:14	3	Vert	0.04	0.025	0.015	0.066	0.04	0.04	>100	85.33	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
W	BE9690	16-Jul-17	14:35:29	3	Long	0.02	0.025	0.025	0.04	0.04	0.04	85.33	>100	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
W	BE9690	16-Jul-17	20:20:12	3	Vert	0.025	0.05	0.02	0.053	0.08	0.053	>100	>100	>100	GrassyTrailDam2015	*Man Made event*
LOG	BE9690	16-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	16-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	17-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	17-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	18-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	18-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	19-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	19-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	20-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	20-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	21-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	21-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	22-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	22-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	23-Jul-17	9:24:21	3	Vert	0.06	0.065	0.015	0.066	0.053	0.027	64	46.55	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	23-Jul-17	9:24:28	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	23-Jul-17	11:09:12	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	23-Jul-17	11:09:14	3	Vert	0.03	0.045	0.01	0.04	0.04	0.027	64	51.2	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
W	BE9690	23-Jul-17	11:10:11	3	Tran	0.02	0.01	0.005	0.027	0.027	0.013	>100	>100	***	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	23-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	23-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	24-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	24-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	25-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	25-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	26-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	26-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	27-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	27-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	28-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	28-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	29-Jul-17	8:04:57	3	Tran	0.1	0.04	0.04	0.186	0.066	0.08	85.33	85.33	85.33	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	29-Jul-17	8:05:08	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	29-Jul-17	9:17:21	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	29-Jul-17	9:17:25	3	Vert	0.04	0.045	0.015	0.04	0.053	0.027	32	30.12	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	29-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	29-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	30-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	30-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	31-Jul-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	31-Jul-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	1-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	5-Aug-17	9:53:28	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	5-Aug-17	9:53:31	3	Vert	0.11	0.095	0.01	0.106	0.08	0.027	36.57	36.57	85.33	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	5-Aug-17	9:53:43	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	5-Aug-17	11:08:42	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	5-Aug-17	11:08:45	3	Tran	0.16	0.11	0.02	0.106	0.066	0.027	42.67	34.13	85.33	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	5-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	5-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	6-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	6-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	7-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	7-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	8-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	8-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	9-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	9-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.
LOG	BE9690	10-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	10-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	11-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	11-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	12-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	12-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring (Daily Self Check Exit)
W	BE9690	13-Aug-17	17:16:00	3	Vert	0.27	0.215	0.07	0.265	0.292	0.08	28.44	56.89	85.33	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	13-Aug-17	17:16:07	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded. (Keyboard Exit)
LOG	BE9690	13-Aug-17	18:22:53	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring
W	BE9690	13-Aug-17	18:22:55	3	Tran	0.035	0.015	0.02	0.08	0.027	0.053	>100	85.33	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*
LOG	BE9690	13-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	13-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	14-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	14-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	15-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	15-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)
LOG	BE9690	16-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded. (Daily Self Check Exit)
LOG	BE9690	16-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded. (Daily Self Check Exit)

Grassy Trail Dam MI5 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	17-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	17-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	18-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	18-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	19-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	19-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	20-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	20-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring	(Daily Self Check Exit)
W	BE9690	21-Aug-17	18:55:19	3	Tran	0.065	0.07	0.01	0.093	0.066	0.013	64	51.2	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*	
LOG	BE9690	21-Aug-17	18:55:25	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded.	(Keyboard Exit)
LOG	BE9690	21-Aug-17	19:35:03	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring	
W	BE9690	21-Aug-17	19:35:07	3	Vert	0.05	0.065	0.02	0.053	0.053	0.04	51.2	36.57	>100	GrassyTrailDam2015	*Man Made event while opening or closing cover*	
LOG	BE9690	21-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	21-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	
LOG	BE9690	22-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	22-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	23-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	23-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	24-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	24-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	25-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	25-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	26-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	26-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring	
W	BE9690	27-Aug-17	13:23:02	3	Long	0.015	0.06	0.085	0.04	0.106	0.119	>100	85.33	73.14	GrassyTrailDam2015	*Man Made event while opening or closing cover*	
W	BE9690	27-Aug-17	13:23:06	3	Tran	0.075	0.09	0.025	0.08	0.093	0.027	56.89	56.89	73.14	GrassyTrailDam2015	*Man Made event while opening or closing cover*	
LOG	BE9690	27-Aug-17	13:23:14	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded.	(Keyboard Exit)
LOG	BE9690	27-Aug-17	14:04:08	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring	
W	BE9690	27-Aug-17	14:04:27	3	Vert	0.17	0.14	0.045	0.252	0.278	0.066	73.14	64	85.33	GrassyTrailDam2015	*Man Made event while opening or closing cover*	
LOG	BE9690	27-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	27-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring	
LOG	BE9690	28-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	28-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	29-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	29-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	30-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	30-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	31-Aug-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	31-Aug-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	1-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	1-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring	
W	BE9690	2-Sep-17	17:58:36	3	Long	0.015	0.01	0.02	*0.013*	*0.027*	*0.027*	85.33	>100	3.969	GrassyTrailDam2015	Soda Springs Magnitude 5.3 earthquake - 2017/09/02 17:56:52 MDT	
LOG	BE9690	2-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	2-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	3-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	3-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	4-Sep-17	23:59:28	***	***	***	***	***	***	***	***	***	***	***	Daily Check Stop	No events recorded.	(Daily Self Check Exit)
LOG	BE9690	4-Sep-17	23:59:37	***	***	***	***	***	***	***	***	***	***	***	Start Monitoring	Start Monitoring	
W	BE9690	5-Sep-17	15:38:22	3	Tran	0.095	0.11	0.05	0.119	0.08	0.053	56.89	46.55	56.89	GrassyTrailDam2015	*Man Made event while opening or closing cover*	
LOG	BE9690	5-Sep-17	15:38:30	***	***	***	***	***	***	***	***	***	***	***	Keyboard Stop	No events recorded.	(Keyboard Exit)

GRASSY TRAIL DAM PIEZOMETER & OBSERVATION WELL READINGS

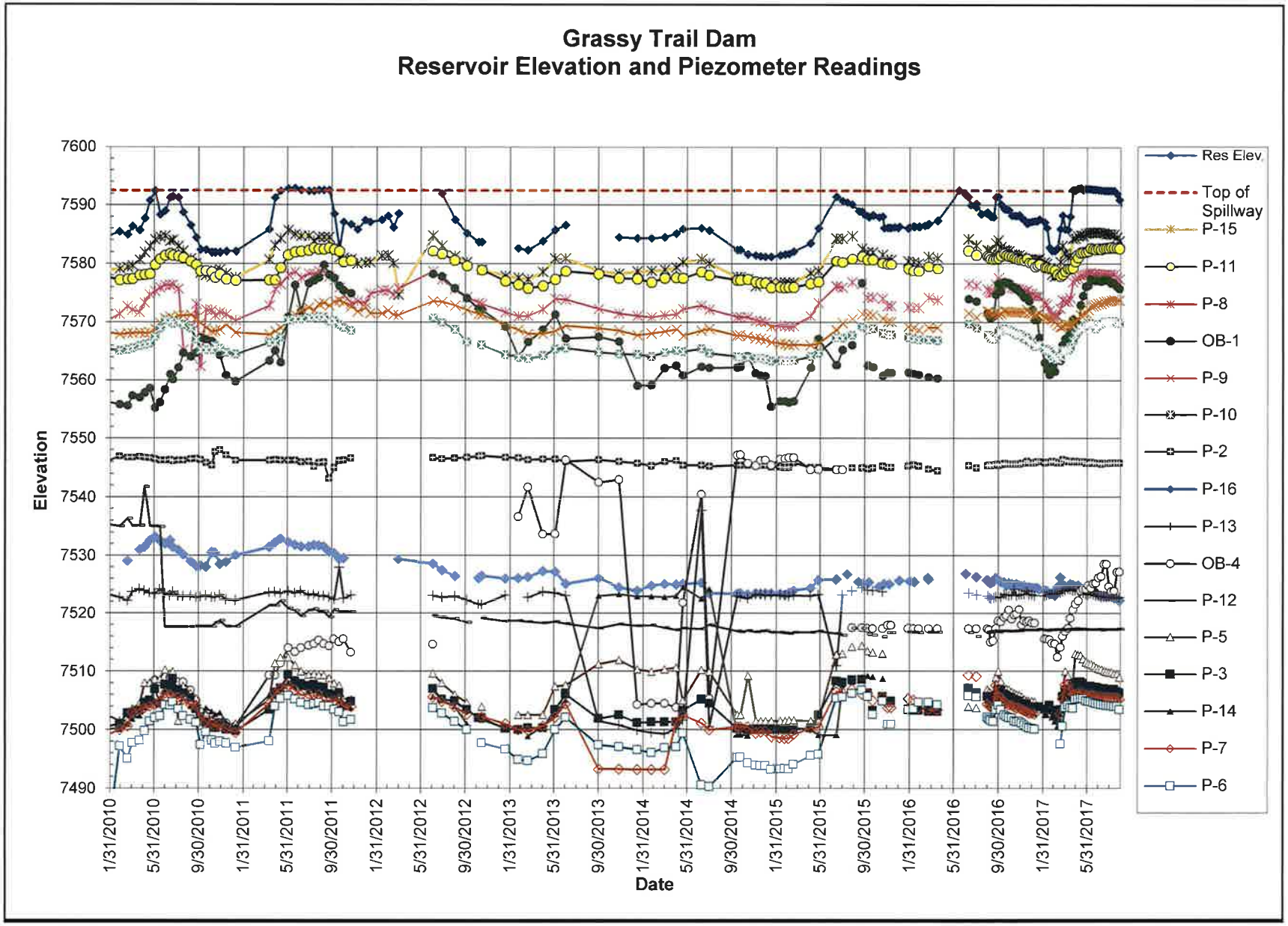
TAKE READINGS AT RIM ELEV.			05-2		79-4	98-3		05-4		79-3	05-3A	05-3		98-2	98-4	98-6	06-1	06-1
			5+62		5+15	4+14		~4+14		3+63	2+77	2+71						
Dam Crest Elev.		7600.0	PIEZ.	PIEZ.	O.W.	PIEZ.		PIEZ.		O.W.	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ	PIEZ
Spillway Elev.		7592.5	8	9	1	2	3	13	14	4	10	11	12	5	6	7	15	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	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	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' (37.8')	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'
09/22/15	ECC	7588.92	7576.6	7571.5	7576.7	7545	7506.6	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	7545.6	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 stuck															
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
05/08/17	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	7504.8	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
06/17/17	MH	***7592.75***	7578.4	7573.0	7577.2	7545.8	7507.3	7523.2	7506.5	7525.2	7569.6	7582.6	7517.2	7510.6	7504.5	7505.7	7585.4	7524.0
06/24/17	MH	***7592.73***	7578.4	7573.1	7577.1	7545.7	7507.3	7523.0	7506.4	7525.3	7568.9	7582.5	7517.2	7510.4	7504.4	7505.6	7585.4	7523.8
07/01/17	MH	***7592.67***	7578.4	7573.3	7577.2	7545.7	7507.2	7523.0	7506.3	7526.2	7569.5	7582.6	7517.3	7510.3	7504.3	7505.6	7585.4	7523.8
07/08/17	MH	***7592.62***	7578.2	7573.3	7577.0	7545.6	7507.1	7522.8	7506.2	7526.5	7569.7	7582.5	7517.1	7510.1	7504.2	7505.5	7585.3	7523.2
07/16/17	MH	***7592.56***	7578.3	7573.6	7577.3	7545.7	7507.1	7522.9	7506.1	7528.6	7570.1	7582.7	7517.2	7509.9	7504.1	7505.5	7585.3	7523.1
07/23/17	MH	***7592.54***	7578.3	7573.7	7577.2	7545.7	7506.9	7522.8	7506.1	7528.6	7570.1	7582.7	7517.2	7509.8	7504.1	7505.5	7585.1	7523.1
07/29/17	MH	***7592.54***	7578.2	7573.7	7577.2	7545.7	7506.9	7522.8	7506.1	7524.7	7570.1	7582.7	7517.2	7509.8	7504.1	7505.5	7585.1	7523.0
08/05/17	MH	***7592.51***	7578.2	7573.9	7576.7	7545.8	7506.9	7522.8	7506.0	7523.9	7570.3	7582.8	7517.2	7509.6	7504.0	7505.5	7585.0	7523.1
08/13/17	MH	***7592.52***	7578.2	7573.9	7576.7	7545.8	7506.9	7522.8	7506.0	7523.9	7570.3	7582.8	7517.2	7509.6	7504.0	7505.5	7585.0	7523.1
08/21/17	MH	7592.00	7577.7	7573.8	7576.1	7545.8	7506.5	7522.7	7505.7	7527.2	7569.8	7582.7	7517.3	7509.0	7503.4	7505.2	7584.5	7522.6
08/27/17	MH	7590.95	7577.4	7573.8	7575.8	7545.8	7506.4	7522.7	7505.4	7527.2	7569.8	7582.6	7517.3	7508.6	7503.2	7504.9	7583.9	7522.5
09/05/17	MH	7589.65	7576.7	7573.7	7575.1	7545.8	7506.1	7522.7	7505.2	7527.2	7569.4	7582.3	7517.2	7507.8	7502.7	7504.7	7583.1	7522.2



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Piezometer Readings
August 2005 to Sept 5, 2017 (some Res Elevations taken by RB&G Eng)

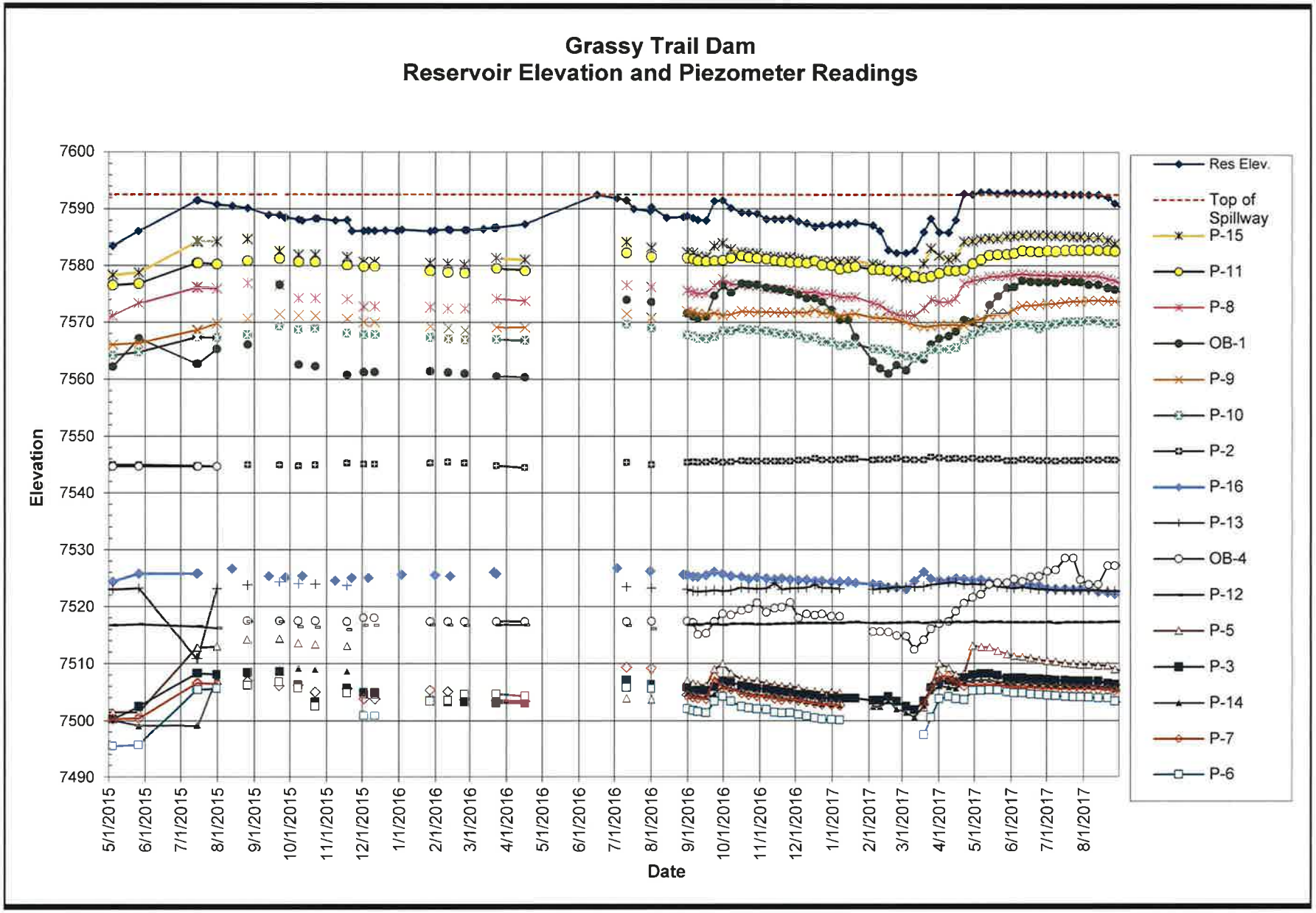
Grassy Trail Dam and Reservoir



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Piezometer Readings
January 2010 to Sept 5, 2017

Grassy Trail Dam and Reservoir



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Piezometer Readings
May 2015 to Sept 5, 2017

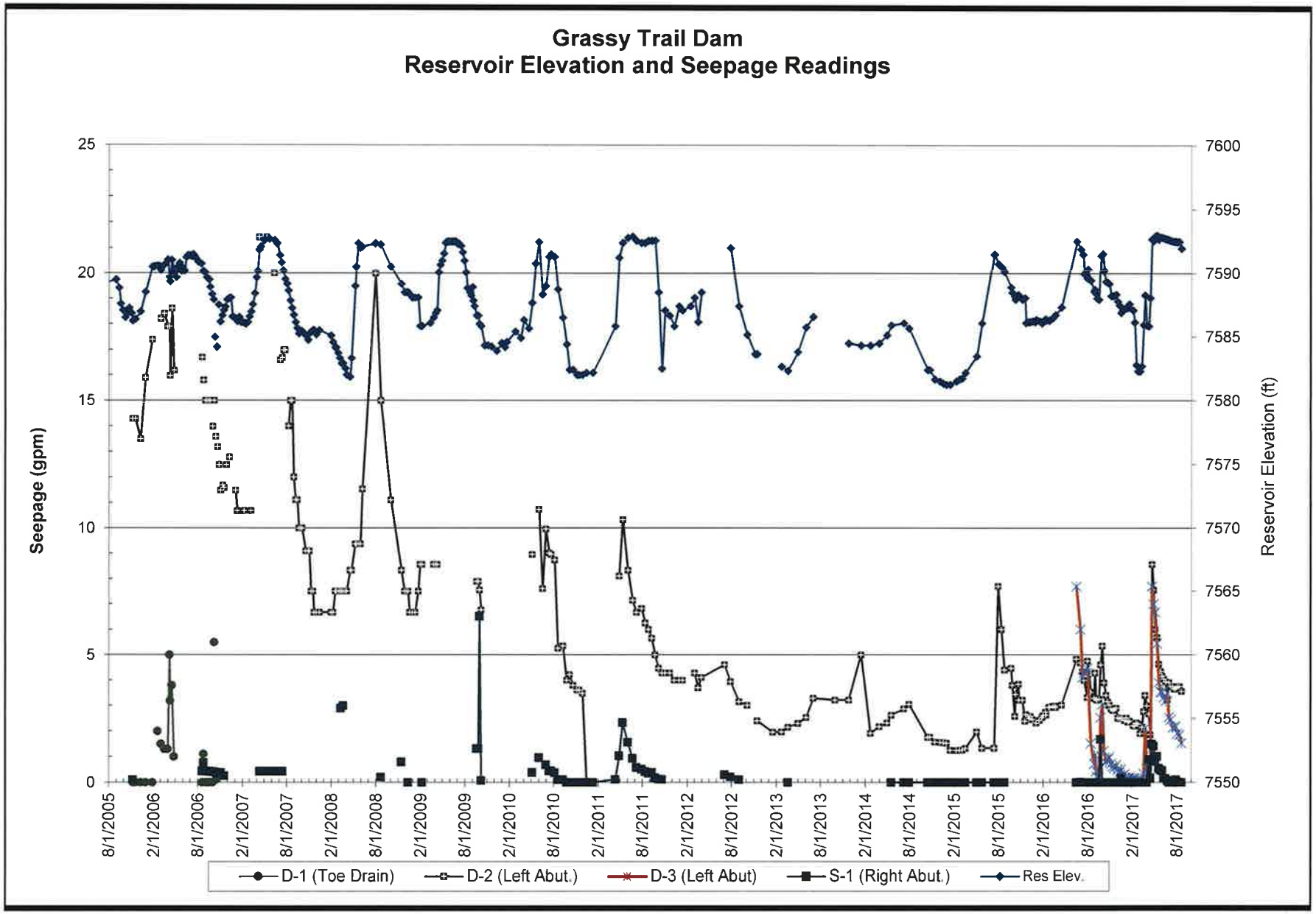
Grassy Trail Dam and Reservoir

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
10/11/15	MH	7587.95	clear	1.03	clear	3.45	clear			NM	Not Measureal
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	slighly 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	7592.70	over top spillway	9.04		4.64		3.92	some sediment	0.56	
05/28/17	MH	7592.85	over top spillway	7.79		4.35		3.55	some sediment	0.48	
06/03/17	MH	7592.85	over top spillway	8.82		4.17		3.53	less sediment	0.47	
06/10/17	MH	7592.80	over top spillway	8.22		4.05		3.33	less sediment	0.17	
06/17/17	MH	7592.75	over top spillway	7.59		3.94		3.19		0.16	
06/24/17	MH	7592.73	over top spillway	7.23		3.23		3.51		0.07	
07/01/17	MH	7592.67	over top spillway	7.01		3.91		2.56		wet	
07/08/17	MH	7592.62	over top spillway	6.58		3.75		2.46		0.07	
07/16/17	MH	7592.56	over top spillway	6.40		3.75		2.14		wet	
07/23/17	MH	7592.54	over top spillway	6.67		3.65		2.21		0.04	
07/29/17	MH	7592.54	over top spillway	6.82		3.70		2.19		0.11	
08/05/17	MH	7592.51	over top spillway	6.00		3.75		1.92		0.03	
08/13/17	MH	7592.52	over top spillway	6.3		3.75		1.86		0.01	
08/21/17	MH	7592.0	beow spillway	5.00		3.57		1.54		DRY	
08/27/17	MH	7591.0		4.07		3.33		0.31		DRY	
09/05/17	MH	7589.7		2.73		3.09		0.15		DRY	

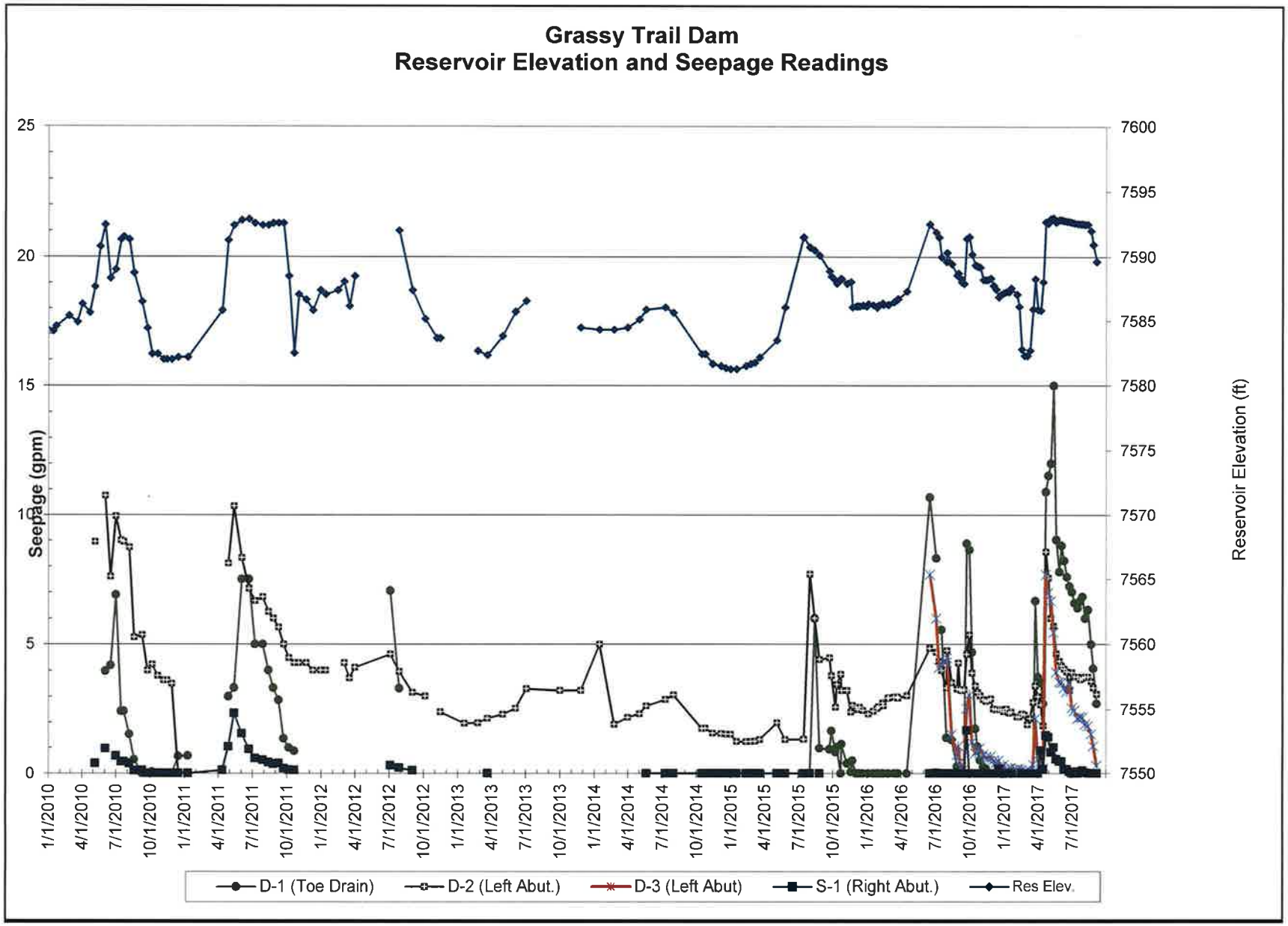
* notes MH = Michael Hansen RB&G Engineering Left abut drain D-3 has been added, 2016, to collect more seepage

ECC= East Carbon City / Sunnyside



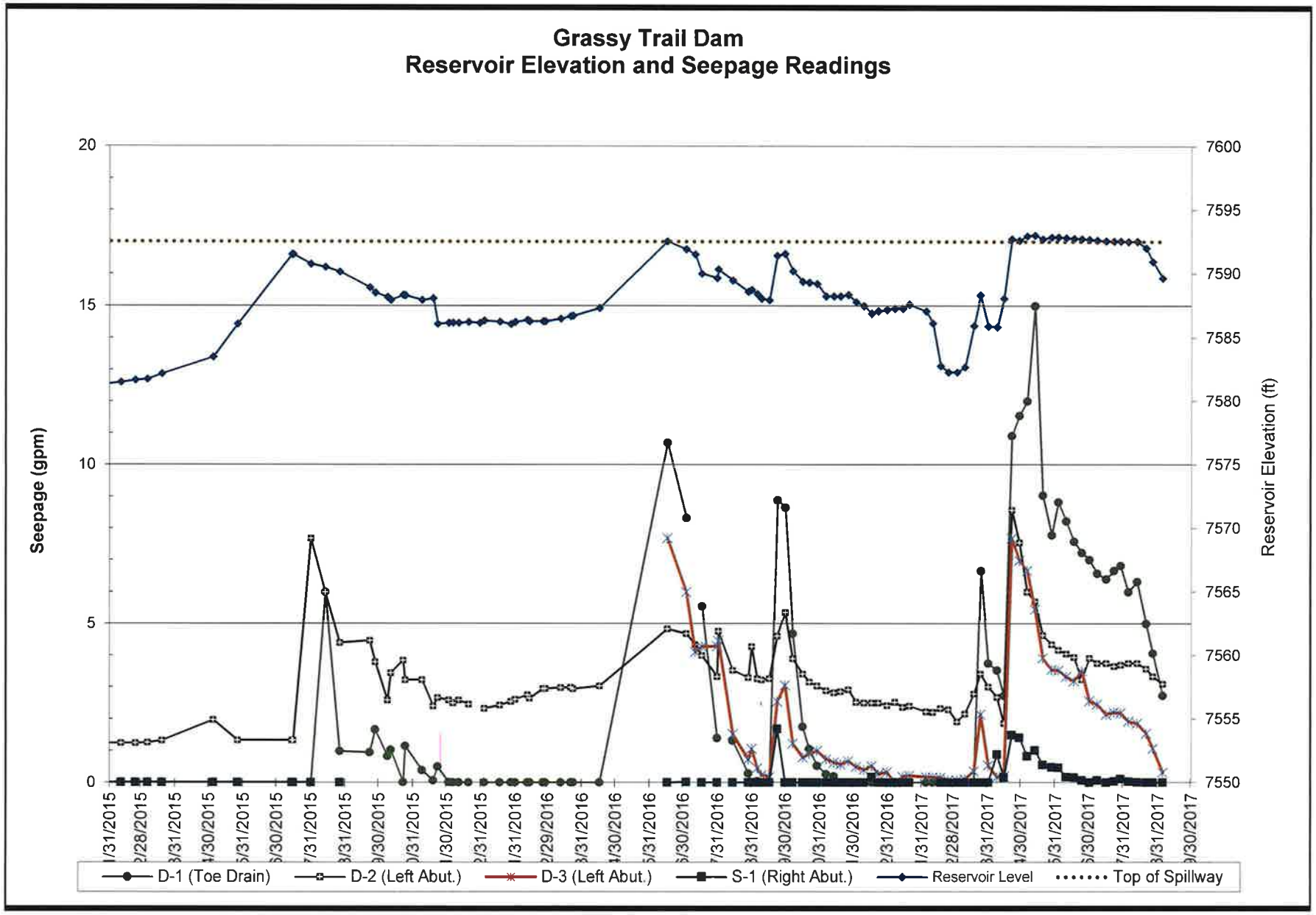
RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Seepage Readings
August 2005 to Sept 5, 2017
Some additonal readings by RB&G Eng
Grassy Trail Dam and Reservoir



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Seepage Readings
January 2010 to Sept 5, 2017
Some additonal readings by RB&G Eng
Grassy Trail Dam and Reservoir



RB&G ENGINEERING, INC.

Figure Reservoir Elevation and Seepage Readings
January 2015 to Sept 5, 2017
Some additonal readings by RB&G Eng
Grassy Trail Dam and Reservoir

UtahAmerican Energy
West Ridge Mine
Grassy Trail Reservoir
Differential Level survey data

8/18/2017

STATION	C-1	C-2	C-3	C-4	C-5	C-6	C-7
NORTHING	38,830.55	38,865.88	38,892.13	38,917.88	38,943.74	38,969.37	38,996.01
EASTING	37,333.20	37,471.64	37,570.28	37,668.82	37,767.40	37,866.16	37,964.74
Differential level survey date.							
07/30/2002 Elevation	7593.49	7590.63	7590.29	7590.67	7590.44	7590.08	7590.08
08/29/2003 Elevation	7593.50	7590.65	7590.31	7590.69	7590.46	7590.08	7590.08
10/27/2004 Elevation	7593.50	7590.62	7590.30	7590.68	7590.45	7590.08	7590.08
08/12/2005 Elevation	7593.52	7590.66	7590.32	7590.69	7590.46	7590.09	7590.08
03/21/2006 Elevation	7593.50	7590.70	7590.30	7590.68	7590.45	7590.09	7590.08
04/14/2006 Elevation	7593.53	7590.73	7590.31	7590.67	7590.44	7590.08	7590.08
05/4/2006 Elevation	7593.54	7590.75	7590.31	7590.66	7590.43	7590.08	7590.08
05/30/2006 Elevation	7593.55	7590.78	7590.31	7590.65	7590.43	7590.07	7590.08
08/11/2006 Elevation	7593.49	7590.79	7590.31	7590.64	7590.43	7590.07	7590.08
09/18/2006 Elevation	7593.51	7590.82	7590.33	7590.66	7590.43	7590.08	7590.08
10/09/2007 Elevation	7593.54	7590.83	7590.33	7590.67	7590.44	7590.08	7590.08
04/28/2008 Elevation	7593.59	7590.84	7590.34	7590.69	7590.45	7590.09	7590.08
05/30/2008 Elevation	7593.56	7590.82	7590.32	7590.65	7590.44	7590.09	7590.08
07/13/2008 Elevation	7593.56	7590.84	7590.33	7590.66	7590.44	7590.08	7590.08
08/29/2008 Elevation	7593.57	7590.83	7590.33	7590.67	7590.44	7590.08	7590.08
09/27/2008 Elevation	7593.56	7590.84	7590.34	7590.68	7590.45	7590.09	7590.08
11/24/2008 Elevation	7593.55	7590.82	7590.32	7590.66	7590.44	7590.08	7590.08
02/23/2009 Elevation	7593.57	7590.83	7590.33	7590.67	7590.45	7590.08	7590.08
03/31/2009 Elevation	7593.57	7590.83	7590.32	7590.67	7590.44	7590.08	7590.08
04/27/2009 Elevation	7593.58	7590.83	7590.33	7590.68	7590.45	7590.08	7590.08
05/29/2009 Elevation	7593.59	7590.84	7590.33	7590.67	7590.44	7590.08	7590.08
06/28/2009 Elevation	7593.57	7590.83	7590.33	7590.67	7590.44	7590.08	7590.08
08/6/2009 Elevation	7593.57	7590.84	7590.33	7590.68	7590.45	7590.08	7590.08
09/9/2009 Elevation	7593.58	7590.84	7590.33	7590.68	7590.45	7590.08	7590.08
10/25/2009 Elevation	7593.56	7590.84	7590.33	7590.68	7590.44	7590.08	7590.08
11/20/2009 Elevation	7593.56	7590.83	7590.32	7590.67	7590.44	7590.08	7590.08
03/05/2010 Elevation	7593.58	7590.84	7590.33	7590.67	7590.45	7590.08	7590.08
04/15/2010 Elevation	7593.60	7590.84	7590.34	7590.68	7590.46	7590.08	7590.08
05/17/2010 Elevation	7593.59	7590.84	7590.33	7590.67	7590.45	7590.08	7590.08
06/24/2010 Elevation	7593.58	7590.84	7590.34	7590.68	7590.45	7590.08	7590.08
07/27/2010 Elevation	7593.56	7590.83	7590.32	7590.68	7590.45	7590.08	7590.08
09/02/2010 Elevation	7593.56	7590.84	7590.33	7590.69	7590.46	7590.08	7590.08
10/15/2010 Elevation	7593.56	7590.84	7590.33	7590.69	7590.46	7590.08	7590.08
11/18/2010 Elevation	7593.56	7590.83	7590.33	7590.67	7590.48	7590.08	7590.08
05/05/2011 Elevation	7593.58	7590.84	7590.33	7590.68	7590.45	7590.08	7590.08
06/03/2011 Elevation	7593.59	7590.84	7590.34	7590.68	7590.46	7590.08	7590.08
07/21/2011 Elevation	7593.58	7590.84	7590.33	7590.68	7590.45	7590.08	7590.08
08/29/2011 Elevation	7593.58	7590.83	7590.34	7590.67	7590.46	7590.08	7590.08
10/4/2011 Elevation	7593.57	7590.83	7590.33	7590.67	7590.45	7590.08	7590.08
11/7/2011 Elevation	7593.58	7590.84	7590.34	7590.67	7590.46	7590.08	7590.08
10/05/2012 Elevation	7593.58	7590.83	7590.33	7590.66	7590.44	7590.08	7590.08
10/22/2013 Elevation	7593.58	7590.84	7590.33	7590.66	7590.44	7590.08	7590.08
11/19/2014 Elevation	7593.59	7590.84	7590.33	7590.67	7590.44	7590.08	7590.08
09/10/2015 Elevation	7593.61	7590.85	7590.34	7590.69	7590.45	7590.08	DESTROYED?
09/24/2016 Elevation	7593.62	7590.85	7590.34	7590.68	7590.44	7590.08	DESTROYED?
11/29/2016 Elevation	7593.61	7590.84	7590.33	7590.68	7590.44	7590.08	DESTROYED?
05/31/2017 Elevation	7593.63	7590.86	7590.35	7590.70	7590.46	7590.08	DESTROYED?
06/24/2017 Elevation	7593.62	7590.87	7590.36	7590.70	7590.46	7590.08	DESTROYED?
07/30/2017 Elevation	7593.60	7590.86	7590.35	7590.69	7590.45	7590.08	DESTROYED?
08/18/2017 Elevation	7593.62	7590.86	7590.35	7590.69	7590.45	7590.08	DESTROYED?
Difference	-0.02	0.00	0.00	0.00	0.00	0.00	

WARE SURVEYING, L.L.C.

1344 North 1000 West – Price, UT 84501
Office: 435-820-4335
Email: waresurveying@emerytelcom.net

UtahAmerican Energy
West Ridge Mine
Grassy Trail Reservoir
"Straight line" survey data

8/18/2017

Distance from control point to face of Monitoring Well (MW) in feet									
Date of survey	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	West Mon.	Straight Line Movement
12/14/2006	94.21	141.49	245.90	295.13	394.71	493.96	556.71	na	No
1/31/2007	94.21	141.49	245.90	295.13	394.71	493.96	556.71	na	No
3/1/2007	94.21	141.49	245.90	295.13	394.71	493.96	556.71	na	No
3/29/2007	94.21	141.49	245.90	295.13	394.71	493.95	556.70	na	No
5/30/2007	94.20	141.49	245.89	295.12	394.70	493.94	556.70	na	No
6/5/2007	94.20	141.49	245.89	295.12	394.69	493.94	556.68	na	No
7/2/2007	94.20	141.49	245.89	295.12	394.69	493.94	556.69	na	No
10/9/2007	94.21	141.50	245.90	295.13	394.71	493.95	556.70	na	No
11/10/2007	94.22	141.50	245.90	295.13	394.70	493.95	556.70	na	No
12/27/2007	94.21	141.50	245.91	295.13	394.71	493.95	na	710.95	No
4/28/2008	94.20	141.49	245.90	295.12	394.70	493.95	556.69	710.95	No
5/30/2008	94.20	141.49	245.90	295.12	394.70	493.94	556.69	710.94	No
7/13/2008	94.20	141.49	245.90	295.12	394.70	493.95	556.69	710.94	No
8/29/2008	94.21	141.50	245.90	295.14	394.71	493.96	556.70	710.95	No
9/27/2008	94.21	141.50	245.91	295.14	394.71	493.96	556.70	710.95	No
11/24/2008	94.21	141.51	245.91	295.14	394.71	493.96	556.70	710.95	No
1/26/2009	94.20	141.50	245.91	295.13	394.71	493.96	556.70	710.94	No
2/23/2009	94.20	141.49	245.90	295.13	394.70	493.96	556.69	710.94	No
3/31/2009	94.20	141.50	245.90	295.13	394.71	493.96	556.70	710.95	No
4/27/2009	94.21	141.50	245.90	295.13	394.70	493.95	556.70	710.95	No
5/29/2009	94.20	141.49	245.90	295.12	394.70	493.95	556.69	710.95	No
6/28/2009	94.21	141.51	245.91	295.13	394.71	493.96	556.70	710.95	No
8/6/2009	94.21	141.51	245.91	295.14	394.70	493.96	556.70	710.96	No
9/9/2009	94.22	141.51	245.91	295.14	394.71	493.96	556.70	710.96	No
10/25/2009	94.21	141.51	245.91	295.14	394.71	493.96	556.70	710.96	No
11/20/2009	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.95	No
3/5/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.95	No
4/15/2010	94.21	141.50	245.90	295.13	394.70	493.94	556.69	710.94	No
5/17/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.95	No
6/24/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.95	No
7/22/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.70	710.95	No
9/2/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.94	No
10/15/2010	94.21	141.50	245.90	295.13	394.70	493.95	556.69	710.94	No
11/18/2010	94.20	141.49	245.89	295.12	394.70	493.95	556.68	710.94	No
5/5/2011	94.21	141.49	245.89	295.12	394.69	493.94	556.68	710.94	No
6/3/2011	94.20	141.49	245.90	295.12	394.69	493.93	556.68	710.93	No
7/21/2011	94.21	141.50	245.90	295.13	394.69	493.94	556.68	710.94	No
8/29/2011	94.20	141.49	245.89	295.12	394.70	493.94	556.69	710.93	No
10/4/2011	94.21	141.49	245.90	295.13	394.70	493.95	556.69	710.93	No
11/7/2011	94.21	141.49	245.90	295.13	394.70	493.94	556.69	710.93	No
12/5/2011	94.21	141.50	245.90	295.13	394.70	493.94	556.69	710.94	No
1/2/2012	94.21	141.50	245.90	295.14	394.70	493.95	556.69	710.94	No
10/5/2012	94.21	141.49	245.89	295.12	394.68	493.93	556.67	710.91	No
10/22/2013	94.21	141.49	245.89	295.13	394.69	493.93	556.67	710.91	No
11/19/2014	94.22	*141.69*	245.90	295.13	394.69	493.93	556.67	710.92	No*
9/10/2015	94.21	141.69	245.89	295.12	394.68	493.92	556.66	710.90	No
9/24/2016	94.21	141.68	245.89	295.12	394.68	493.92	556.65	710.90	No
11/29/2016	94.20	141.67	245.89	295.12	394.68	493.92	556.65	710.90	No
12/22/2016	94.20	141.67	245.89	295.12	394.68	493.92	556.65	710.90	No
5/31/2017	94.19	141.66	245.88	295.10	394.66	493.91	556.64	710.89	No
6/24/2017	94.20	141.67	245.89	295.11	394.67	493.91	556.65	710.89	No
7/30/2017	94.19	141.67	245.88	295.10	374.66	493.91	556.64	710.88	No
8/18/2017	94.20	141.66	245.88	295.11	374.66	493.91	556.64	710.88	No
Difference	-0.01	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	No
Notes	*MW-2 appears to have been bumped, a new distance and straight line mark was recorded								

WARE SURVEYING, L.L.C.

1344 North 1000 West – Price,
UT 84501
Office: 435-820-4335

UtahAmerican Energy
West Ridge Mine
Grassy Trail Reservoir
GPS Survey Data
Anticipated vertical accuracy ~ 0.08'+/-

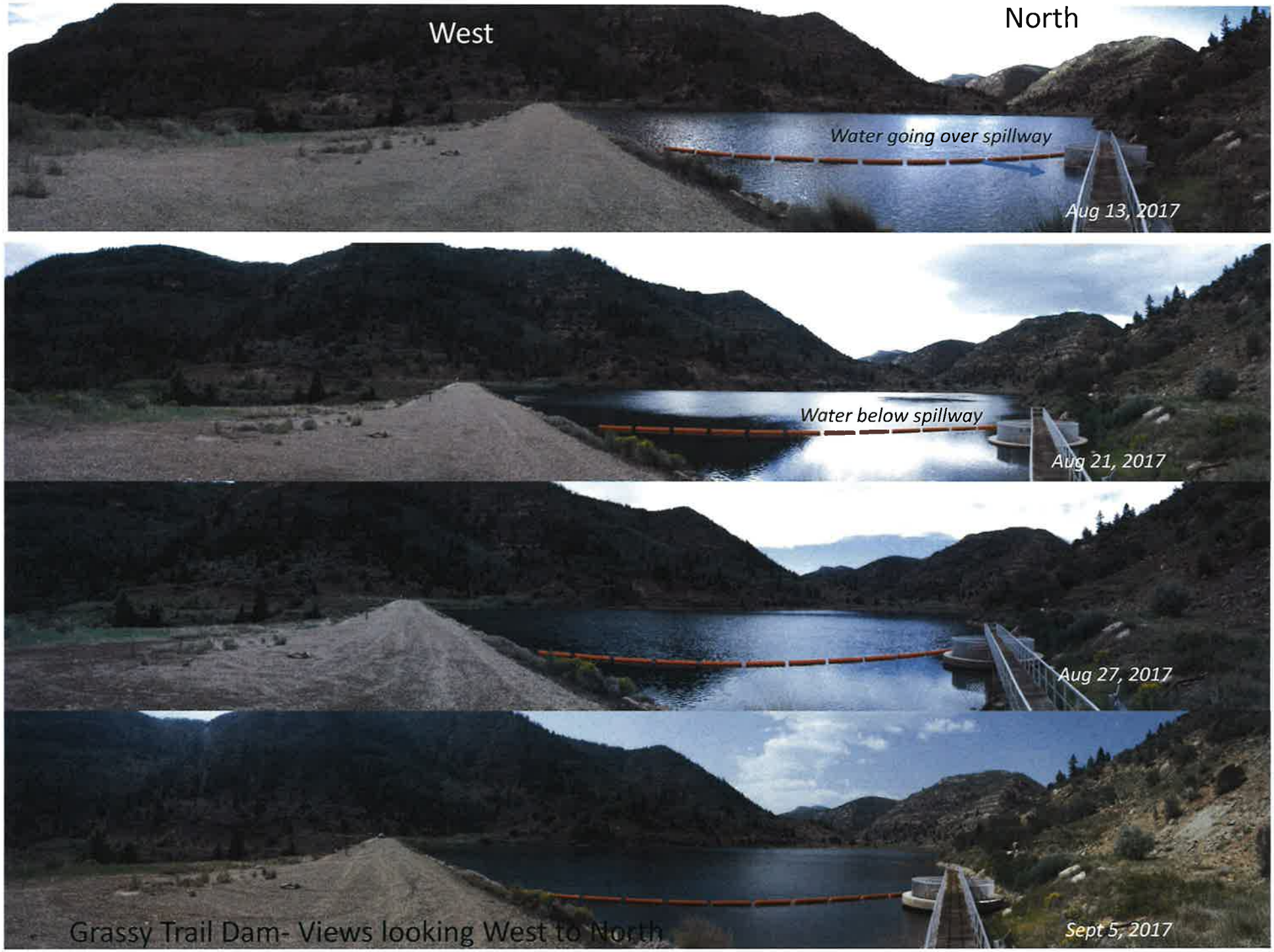
8/18/2017

STATION	12	13	14	MID	TOE
NORTHING	38,509.85	38,555.42	38,610.87	38,828.21	38,719.59
EASTING	37,047.46	37,064.56	37,099.85	37,580.00	37,664.94
GPS survey date.					
September 2004	7789.87	7771.43	7739.26		
November 2004	7789.84	7771.39	7739.21		
August 2005	7789.75	7771.30	7739.13		
April 2006	7789.46	7771.02	7738.83		
October 2006	7789.39	7770.95	7738.66		
May 2007	7789.45	7771.00	7738.77		
October 2007	7789.45	7771.01	7738.76		
May 2008	7789.57	7771.10	7738.78	7565.52	7515.69
7/13/2008	7789.54	7771.12	7738.82	7565.54	7515.68
8/29/2008	7789.51	7771.08	7738.75	7565.51	7515.63
9/27/2008	7789.49	7771.05	7738.79	7565.52	7515.66
11/24/2008	7789.52	7771.09	7738.76	7565.54	7515.67
3/31/2009	7789.52	7771.07	7738.74	7565.55	7515.65
4/27/2009	7789.50	7771.05	7738.71	7565.53	7515.64
5/29/2009	7789.39	7771.01	7738.72	7565.48	7515.62
6/28/2009	7789.44	7771.08	7738.71	7565.50	7515.63
8/6/2009	7789.49	7771.12	7738.68	7565.49	7515.64
9/9/2009	7789.50	7771.10	7738.67	7565.51	7515.66
10/25/2009	7789.48	7771.11	7738.70	7565.50	7515.67
11/20/2009	7789.49	7771.10	7738.69	7565.49	7515.65
4/15/2010	7789.35	7770.99	7738.80	7565.49	7515.66
5/26/2010	7789.32	7770.91	7738.84	7565.50	7515.66
6/24/2010	7789.36	7770.96	7738.74	7565.46	7515.64
7/22/2010	7789.33	7770.93	7738.75	7565.48	7515.64
9/2/2010	7789.32	7770.91	7738.75	7565.47	7515.64
10/15/2010	7789.34	7770.93	7738.76	7565.49	7515.66
11/18/2010	7789.33	7770.92	7738.73	7565.49	7515.65
5/5/2011	7789.44	7770.93	7738.70	7565.46	7515.62
6/3/2011	7789.46	7770.99	7738.72	7565.50	7515.61
7/21/2011	7789.40	7770.96	7738.75	7565.47	7515.64
8/29/2011	7789.36	7770.96	7738.74	7565.49	7515.62
10/4/2011	7789.33	7770.95	7738.78	7565.48	7515.65
11/7/2011	7789.38	7770.92	7738.77	7565.48	7515.63
10/5/2012	7789.35	7770.91	7738.78	7565.47	7515.62
10/22/2013	7789.37	7770.95	7738.79	7565.47	7515.65
11/19/2014	7789.36	7770.92	7738.78	7565.49	7515.63
9/10/2015	7789.63	7771.15	7739.08	7565.52	7515.65
9/24/2016	7789.54	7771.10	7738.91	7565.51	7515.62
11/29/2016	7789.50	7771.02	7738.97	7565.48	7515.63
5/31/2017	7789.54	7771.07	7738.96	7565.50	7515.65
6/24/2017	7789.49	7771.05	7738.99	7565.47	7515.65
7/30/2017	7789.56	7771.08	7739.03	7565.49	7515.64
8/18/2017	7789.54	7771.10	7739.01	7565.49	7515.66
Difference	0.02	-0.02	0.02	0.00	-0.02

WARE SURVEYING, L.L.C.

1344 North 1000 West – Price, UT 84501
Office: 435-820-4335
Email: waresurveying@emerytelcom.net

Grassy Trail Dam- Views looking West to North



Grassy Trail Dam- Views looking West to North

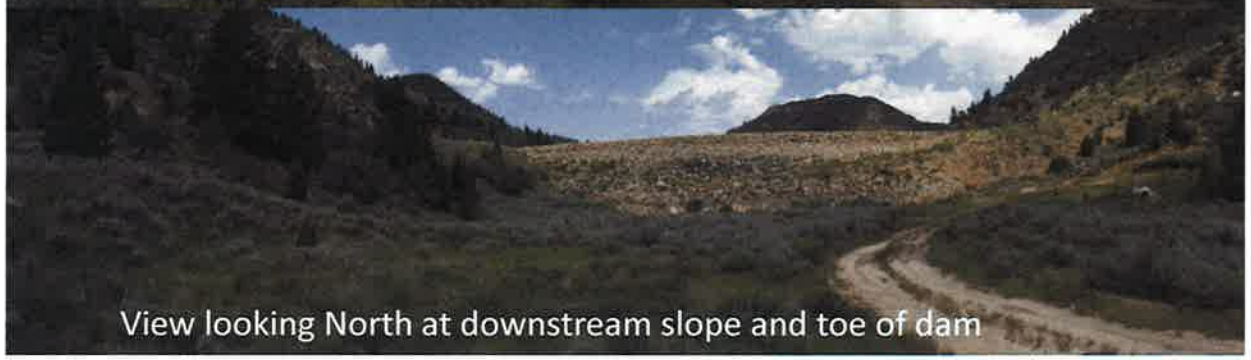
July 16, 2017

July 23, 2017

July 29, 2017

Aug 5, 2017

Grassy Trail Dam- View looking East



View looking North at downstream slope and toe of dam

View looking Northeast at downstream slope

View looking North at downstream slope and toe of dam

View looking Northeast at downstream slope