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NSF SB Cutoff Wall Project

7-28-2016

Soil-Bentonite Slurry Trench Cutoff Wall Closeout Report

Daniel Ruffing
Geo-Solutions

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Sent via email to: evans@bucknell.edu
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July 28, 2016

Jeffrey C. Evans, Ph.D., P.E., F. ASCE
Chair, Dept. of Mechanical Engineering
Professor, Dept. of Civil and Environmental Engineering
Bucknell University
Lewisburg, PA 17837
Telephone: 570-577-1112
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15-071

RE: CLOSEOUT REPORT
CONSTRUCTION OF NSF RESEARCH SOIL-BENTONITE WALL
LEWISBURG, PA

Jeff,

As a subcontractor to Bucknell University, Geo-Solutions, Inc (GSI) has completed the construction of the NSF research soil-bentonite slurry wall (SBSW) according to the contract and all of its associated attachments in consideration of subsequent submittals, emails, and conversations. This letter provides a synopsis of the work, summarizes the quality control completed throughout the project, and conveys as-built information.

Milestone Dates

July 6th	GSI began mobilization and site setup.
July 11th	GSI began excavation of the SBSW.
July 11th	Bucknell placed 1st defect.
July 12th	GSI began mixing and placing SB backfill.
July 14th	Bucknell placed the last defect.
July 15th	Bucknell placed both sets of earth pressure cages.
July 20th	GSI completed excavation.
July 21st	GSI completed backfilling.
July 26th	GSI completed demobilization of equipment.

Work Description

GSI completed the SBSW construction on this project using a CAT 330 excavator. Excavation was completed using the slurry trenching technique with bentonite slurry. A detailed description of the SBSW construction methods can be found in the “Slurry Trench Implementation Plan – Rev 2” dated 7/7/2016. Excavation was completed from the work platform elevation, established prior to GSI’s operations, down to the maximum digging depth of the excavator or refusal (as determined collectively by GSI and Bucknell). Platform elevations were provided by Bucknell at each 3m station and are included in the excavation log. Excavation for the lead-in trench began at STA 2+07 and

reached full depth at STA 2+00 on a 1:1 slope. Excavation proceeded from STA 2+00 to STA 0+06. In total 1,294.1 vertical square meters (SM) of slurry wall were installed with the lead-in trench accounting for 15.9 SM of the total. The final quantities were adjusted after the last QC Report was issued to correct some minor calculation discrepancies between the previously reported values and the actual values. A final excavation log of the completed trench, in 3 m increments, is included in the attachments to this letter.

During installation of the SBSW, GSI assisted Bucknell with the placement of several defects and instrumentation into the wall for further research. Defects made of sandbags and limestone boulders were placed in the first 60m of trench (STA 2+00 to 1+40) by PI's and students of Bucknell's Geology department. The defects will be used for geophysics research. PI's and students from Bucknell's Civil Engineering department placed a variety of instrumentation in the SBSW from STA's 1+20 to 0+30. The instrumentation included: piezometers, inclinometer pipes, load cell cages, spade cells, and settlement plates. These instruments will provide further information on the SBSW itself. The last section of SBSW (STA 0+30 to 0+06) will be used by Bucknell for in-situ testing. Detailed locations of the defect and instrumentation placement are provided in the attachments to this letter.

Quality Control

Quality Control reports, submitted throughout the work, detail the work completed and the quality control utilized to control the slurry and backfill mixing processes. Daily QC testing was performed according to the requirements outlined in the Implementation Plan. Results of daily QC tests were reported in GSI's Daily Quality Control Reports. Final versions of the submitted QC reports are included in the attachments to this letter.

Throughout the SBSW installation, approximately 51 tons of bentonite were used. Bentonite slurry was used in the trench for hydraulic shoring during excavation as well as for mixing the backfill.

Because of the significant amount of oversized granular material in the trench spoils, most of the backfill bases soils were hauled from other areas of the Montandon site, consisting of clayey soils. The soils were mixed with bentonite slurry until a desired slump was attained and then placed in the trench. Backfill samples were collected by Bucknell at a rate of 1 bucket for every 10 m of backfill top-out. For each sample event, GSI's QC technician provided Bucknell with a corresponding slump of the backfill.

Conclusion

GSI completed the construction portion of the soil-bentonite wall for the NSF research project in Lewisburg, PA. GSI appreciated the opportunity to work with Bucknell on this project and looks forward to future research collaboration opportunities with Bucknell.

Sincerely,

Geo-Solutions, Inc.

Daniel Ruffing, P.E.
Engineering Manager

Attachments
Final Completed Excavation Log
Final QC Reports incl. Revisions
SB Cutoff Wall Profile
Geo-Solutions' Geologic Profile from Construction Notes

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Quality Control Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	-
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	-
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	-
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	-

SOIL-BENTONITE CUTOFF WALL
EXCAVATION LOG

GSI CAT 330
Bucket width: 0.91 m

Date Excavated	Station Start	Platform Elevation	Record Depth (Previous)	Record Depth (Today)	Final Record Elevation	Panel Length	Area Excavated Previously	Area Excavated Today	Area Excavated Total	Bottom Notes
	M	M	M	M	M	M	M^2	M^2	M^2	
-	0	137.3	0.00	0.00	137.3	-	-	-	-	
-	3.0	137.2	0.00	0.00	137.2	3.0	0	0	0	
7/20/2016	6.0	137.2	4.40	4.40	132.8	3.0	6.6	0	6.6	shale-limestone bedrock bottom
7/20/2016	9.0	137.1	5.40	5.40	131.7	3.0	14.7	0	14.7	shale-limestone bedrock bottom
7/20/2016	12.0	137.1	4.80	4.80	132.3	3.0	15.3	0	15.3	shale-limestone bedrock bottom
7/19/2016	15.0	137.0	5.30	5.30	131.7	3.0	15.2	0	15.2	shale-limestone bedrock bottom
7/19/2016	18.0	137.0	6.00	6.00	131.0	3.0	17.0	0	17.0	shale-limestone bedrock bottom
7/19/2016	21.0	136.9	5.60	5.60	131.3	3.0	17.4	0	17.4	shale-limestone bedrock bottom
7/19/2016	24.0	136.9	6.20	6.20	130.7	3.0	17.7	0	17.7	very hard bottom
7/19/2016	27.0	136.9	7.20	7.20	129.7	3.0	20.1	0	20.1	Clay bottom
7/19/2016	30.0	137.0	6.80	6.80	130.2	3.0	21.0	0	21.0	hard bottom
7/19/2016	33.0	136.9	6.80	6.80	130.1	3.0	20.4	0	20.4	hard bottom
7/19/2016	36.0	136.7	6.30	6.30	130.4	3.0	19.7	0	19.7	hard bottom
7/18/2016	39.0	136.7	5.90	5.90	130.9	3.0	18.3	0	18.3	Hard rock bottom
7/18/2016	42.0	136.7	6.60	6.60	130.1	3.0	18.8	0	18.8	Hard rock bottom
7/18/2016	45.0	136.7	6.90	6.90	129.8	3.0	20.3	0	20.3	Hard rock bottom
7/18/2016	48.0	136.6	6.90	6.90	129.7	3.0	20.7	0	20.7	Hard rock bottom
7/18/2016	51.0	136.7	7.20	7.20	129.5	3.0	21.2	0	21.2	Hard rock bottom
7/18/2016	54.0	136.6	7.00	7.00	129.6	3.0	21.3	0	21.3	Clay bottom
7/18/2016	57.0	136.6	6.90	6.90	129.7	3.0	20.9	0	20.9	Clay bottom
7/18/2016	60.0	136.6	7.00	7.00	129.6	3.0	20.9	0	20.9	Clay bottom
7/18/2016	63.0	136.5	7.20	7.20	129.3	3.0	21.3	0	21.3	Clay bottom
7/18/2016	66.0	136.6	7.20	7.20	129.4	3.0	21.6	0	21.6	Clay bottom
7/15/2016	69.0	136.6	7.70	7.70	128.9	3.0	22.4	0	22.4	soft bottom
7/15/2016	72.0	136.6	6.80	6.80	129.8	3.0	21.8	0	21.8	soft bottom
7/15/2016	75.0	136.6	7.00	7.00	129.6	3.0	20.7	0	20.7	soft bottom
7/15/2016	78.0	136.6	6.40	6.40	130.2	3.0	20.1	0	20.1	hard bottom
7/15/2016	81.0	136.6	6.60	6.60	130.0	3.0	19.5	0	19.5	hard bottom
7/15/2016	84.0	136.5	7.00	7.00	129.6	3.0	20.4	0	20.4	soft bottom
7/15/2016	87.0	136.5	7.00	7.00	129.6	3.0	21.0	0	21.0	soft bottom

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7/15/2016	90.0	136.6	7.00	7.00	129.6	3.0	21.0	0	21.0	Hard bottom
7/15/2016	93.0	136.6	7.00	7.00	129.6	3.0	21.0	0	21.0	hard bottom
7/15/2016	96.0	136.6	6.70	6.70	129.9	3.0	20.6	0	20.6	hard bottom
7/14/2016	99.0	136.6	6.00	6.00	130.6	3.0	19.1	0	19.1	Hard rock bottom
7/14/2016	102.0	136.6	6.70	6.70	129.9	3.0	19.1	0	19.1	hard bottom
7/14/2016	105.0	136.5	6.40	6.40	130.1	3.0	19.7	0	19.7	very hard bottom
7/14/2016	108.0	136.6	6.40	6.40	130.2	3.0	19.2	0	19.2	very hard bottom
7/14/2016	111.0	136.5	6.80	6.80	129.8	3.0	19.8	0	19.8	very hard bottom
7/14/2016	114.0	136.6	6.90	6.90	129.7	3.0	20.6	0	20.6	hard bottom
7/14/2016	117.0	136.6	7.20	7.20	129.4	3.0	21.2	0	21.2	hard bottom
7/14/2016	120.0	136.6	6.80	6.80	129.8	3.0	21.0	0	21.0	hard bottom
7/14/2016	123.0	136.5	7.00	7.00	129.6	3.0	20.7	0	20.7	soft bottom
7/14/2016	126.0	136.6	6.20	6.20	130.4	3.0	19.8	0	19.8	hard bottom
7/14/2016	129.0	136.5	6.20	6.20	130.3	3.0	18.6	0	18.6	Hard bottom
7/14/2016	132.0	136.5	6.30	6.30	130.2	3.0	18.8	0	18.8	hard cobble bottom
7/14/2016	135.0	136.6	5.70	5.70	130.9	3.0	18.0	0	18.0	hard rock bottom
7/14/2016	138.0	136.6	6.60	6.60	130.0	3.0	18.5	0	18.5	rock bottom, very hard
7/14/2016	141.0	136.6	6.70	6.70	129.9	3.0	20.0	0	20.0	Flat rock bottom
7/14/2016	144.0	136.7	6.60	6.60	130.1	3.0	20.0	0	20.0	rock/boulder bottom
7/14/2016	147.0	136.7	6.30	6.30	130.4	3.0	19.4	0	19.4	Hard bottom
7/14/2016	150.0	136.7	5.40	5.40	131.3	3.0	17.6	0	17.6	Limestone pinnacle
7/13/2016	153.0	136.7	4.30	4.30	132.4	3.0	14.6	0	14.6	Limestone pinnacle
7/13/2016	156.0	136.8	5.20	5.20	131.6	3.0	14.3	0	14.3	Limestone pinnacle
7/13/2016	159.0	136.7	6.60	6.60	130.1	3.0	17.7	0	17.7	Hard bottom
7/13/2016	162.0	136.7	6.10	6.10	130.6	3.0	19.1	0	19.1	Hard bottom
7/12/2016	165.0	136.7	7.00	7.00	129.7	3.0	19.7	0	19.7	Hard bottom
7/12/2016	168.0	136.7	7.10	7.10	129.6	3.0	21.2	0	21.2	Hard bottom
7/12/2016	171.0	136.8	6.90	6.90	129.9	3.0	21.0	0	21.0	Hard bottom
7/12/2016	174.0	136.9	7.00	7.00	129.9	3.0	20.9	0	20.9	Hard bottom
7/11/2016	177.0	136.8	7.20	7.20	129.6	3.0	21.3	0	21.3	Hard bottom
7/11/2016	180.0	136.9	6.60	6.60	130.3	3.0	20.7	0	20.7	Hard bottom
7/11/2016	183.0	136.8	6.50	6.50	130.3	3.0	19.7	0	19.7	Hard bottom
7/11/2016	186.0	136.8	6.50	6.50	130.3	3.0	19.5	0	19.5	Hard bottom
7/11/2016	189.0	136.8	6.80	6.80	130.0	3.0	20.0	0	20.0	Hard bottom
7/11/2016	192.0	136.8	6.90	6.90	129.9	3.0	20.6	0	20.6	Hard bottom
7/11/2016	195.0	136.9	7.10	7.10	129.8	3.0	21.0	0	21.0	Hard bottom
7/11/2016	198.0	136.8	6.95	6.95	129.9	3.0	21.1	0	21.1	Hard bottom
7/11/2016	201.0	136.9	6.60	6.60	130.3	3.0	20.3	0	20.3	
7/11/2016	204.0	136.9	2.00	2.00	134.9	3.0	12.9	0	12.9	
7/11/2016	207.0	136.9	0.00	0.00	136.9	3.0	0	0	0	

Total Excavated Today (M^2):	0.0
Total Excavated To-Date (M^2):	1,294.1

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Revised QC Reports – Summary of Changes

- Backfill Daily totals – adjusted so sum of daily totals = total backfill placed to date
- Dates on excavation log corrected to actual excavation dates
- Excavation totals on 7/20/16 corrected
- Logo on profile plots corrected
- Page title added to profile sheets

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Daily Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/12/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Tuesday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	5
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Weather:

Low:	64 F	**Time:**	6:00 AM	**Cloud Cover:**	Clear	**Wind:**	5-10 MPH
High:	88 F	**Time:**	3:00 PM	**Precipitation:**	0	**Direction:**	S

Description of Work Activities:

GSI personnel arrived onsite at 6:00 AM and held their morning safety meeting.
After the safety meeting, GSI fueled up the equipment and got the pond recirculating.
The Bucknell project members arrived onsite at 6:30 AM and a group safety meeting was held w/ Nate from GSI.
At 7:00 AM Keith used the excavator to load out the spoils from Monday's excavation into trucks to haul away.
Bucknell's project members laid out the rest of the offset stationing at 7:15 AM.
Excavation began at 8:30 AM on STA 1+74.
Soon after excavation started Keith noticed the excavator controls weren't responding properly. Nate called Weavers and they came to site to take a look at it.
Weavers arrived onsite at 9:15 AM to look at the excavator. The left control was sticking and Weavers lubricated it.
The controls worked fine for about 30 minutes and then started sticking again.
Excavation was completed up to STA 1+65. At 12:30 PM cracking along the trench began to expand and the slurry level started dropping. Keith stopped excavating and began mixing and placing backfill.
Dylan and Scott left site at 3:00 PM.
Near the end of the shift, Keith filled in the partial cut that was started between STA 1+65 and 1+62 with soil to help bring the slurry level up.
The rest of GSI personnel cleaned up and left site at 6:00 PM.

Today:	85.5	m^2
To-Date:	282.5	m^2

Conversations with Client/Inspector:

•

Production Delays:

•

Safety Topics:

• Safety topics included: Heat stress

Keith Kilpatrick
Superintendent

07/12/16
Date

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Daily Report

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Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	5
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Materials Received:

Material	Unit	Today	To-Date	Notes
Bentonite	Ton	0.000	22.80	

Materials Onsite:

Material	Unit	Delivered	Used	Onsite
Bentonite	Bag	12	11	1

Hours	Equipment	Task	Hours	Employees On Site	Trade
12	CAT 330 Excavator	Excavating	12	Keith Kilpatrick	SUPT
8	9k Forklift	Misc.	12	Nathan Coughenour	ENG
12	Diesel Pumps	Slurry Pond	9	Scott Helton	LAB
			9	Dylan Pence	LAB
			6	Dan Ruffing	PM
32	**TOTAL HOURS**		**48**	**TOTAL HOURS**	

LEGEND:

SUPT- Superintendent, **PM**- Project Manager, **ENG** - Engineer, **HSO** - Health & Safety Officer, **QC**- Quality Control Tech, **LAB** - Laborer, **BPO** - Batch Plant Operator, **EXC** - Excavator Operator, **FORK** -forklift operator, **DOZ** - Dozer Operator, **DRILL** - RH-18 Operator, **JG** - Jet Grout Rig Operator, **LSO** - Long Stick Operator

Keith Kilpatrick
Superintendent

07/12/16
Date

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Quality Control Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/12/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Tuesday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	5
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL-BENTONITE CUTOFF WALL
EXCAVATION LOG

Excavator: CAT 330
Bucket width: 0.91 m

Date Excavated	Station Start	Platform Elevation	Record Depth (Previous)	Record Depth (Today)	Final Record Elevation	Panel Length	Area Excavated Previously	Area Excavated Today	Area Excavated Total
	M	*M*	*M*	*M*	*M*	*M*	*M^2*	*M^2*	*M^2*
7/12/2016	*159.0*	*136.7*	*0.00*	*1.00*	*135.7*	*3.0*	*0*	*1.5*	*1.5*
7/12/2016	*162.0*	*136.7*	*0.00*	*3.00*	*133.7*	*3.0*	*0*	*6.0*	*6.0*
7/12/2016	*165.0*	*136.7*	*0.00*	*7.00*	*129.7*	*3.0*	*0*	*15.0*	*15.0*
7/12/2016	*168.0*	*136.7*	*0.00*	*7.10*	*129.6*	*3.0*	*0*	*21.2*	*21.2*
7/12/2016	*171.0*	*136.8*	*0.00*	*6.90*	*129.9*	*3.0*	*0*	*21.0*	*21.0*
7/12/2016	*174.0*	*136.9*	*0.00*	*7.00*	*129.9*	*3.0*	*0*	*20.9*	*20.9*
								Total Excavated Today (M^2):	85.5
								Total Excavated To-Date (M^2):	282.5

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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Quality Control Report

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Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	5
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL BENTONITE CUT-OFF WALL
BENTONITE SLURRY QUALITY CONTROL

Bag	Target B:W %	Bentonite (lbs)	Target Water (Gal)	Actual Water (Gal)	Actual B:W %	Viscosity (s)
1	5.5%	3800	8300	8350	5.5%	
2	6.0%	3775	7600	7622	5.9%	

COMMENTS:

SIGNED: *Nathan Coughenour*

GSI QC Supervisor

Client QC Manager

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Quality Control Report

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SOIL-BENTONITE CUTOFF WALL
SLURRY QUALITY CONTROL TESTING

BENTONITE FRESH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)
Target	***-***	***35-40 sec***	***≥64 pcf***	***6.5-10***	***<20 cc***
1	9:00 AM	35	65	9.0	20
2	11:30 AM	35	65	9.0	-
3	2:30 PM	35	65	9.0	-

SOIL-BENTONITE TRENCH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	Filtrate Loss (cc)	Station (m)	Depth (m)
Target	***-***	***>40 sec***	***64-85 pcf and 15 pcf < backfill density***	***<25 cc***	***-***	***-***
1	9:15 AM	34	67	25	174	3
2	11:45 AM	36	71	-	170	3
3						

WET SOIL-BENTONITE BACKFILL

Test #	Time	STA	Slump	Density (pcf)	Sample
Target	***-***	***M***	***3-6 in***	*******	***(Y/N)***
1	2:00 PM	207	2.75"	127.00	N
2					

Maximum particle size of 4 inches.
* Backfill Density must be at least 15 pcf greater than the in-trench slurry

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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Quality Control Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/12/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Tuesday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	5
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL-BENTONITE CUTOFF WALL
BACKFILL PROFILE

45.0 **Backfill Placed Today (m^2)**
45.0 **Backfill Placed Total (m^2)**

4.1 **Backfill placed for Lead-in (m^2)**

BACKFILL SLOPE MEASUREMENTS (every 3 meters)

Station	Platform Elevation *M*	Record Depth *M*	Record Elevation *M*	*7/12/16* AM Sounding *M*	*7/12/16* PM Sounding *M*	*7/13/16* AM Sounding *M*	*7/12/16* AM Elevation *M*	*7/12/16* PM Elevation *M*	*7/13/16* AM Elevation *M*
159.0	136.7	1.0	135.7	0.0	1.0	1.0	136.7	135.7	135.7
162.0	136.7	3.0	133.7	0.0	3.0	3.0	136.7	133.7	133.7
165.0	136.7	7.0	129.7	0.0	7.0	7.0	136.7	129.7	129.7
168.0	136.7	7.1	129.6	0.0	7.1	7.1	136.7	129.6	129.6
171.0	136.8	6.9	129.9	0.0	6.9	6.9	136.8	129.9	129.9
174.0	136.9	7.0	129.9	0.0	6.8	6.7	136.9	130.1	130.2
177.0	136.8	7.2	129.6	7.2	6.2	6.3	129.6	130.6	130.5
180.0	136.9	6.6	130.3	6.6	6.1	6.0	130.3	130.8	130.9
183.0	136.8	6.5	130.3	6.5	5.5	5.7	130.3	131.3	131.1
186.0	136.8	6.5	130.3	6.50	5.50	5.5	130.3	131.3	131.3
189.0	136.8	6.8	130.0	6.80	5.30	5.2	130.0	131.5	131.6
192.0	136.8	6.9	129.9	6.90	5.00	4.9	129.9	131.8	131.9
195.0	136.9	7.1	129.8	7.10	4.40	4.7	129.8	132.5	132.2
198.0	136.8	7.0	129.9	6.95	4.30	4.1	129.9	132.5	132.7
201.0	136.9	6.6	130.3	6.60	4.20	3.9	130.3	132.7	133.0
204.0	136.9	2.0	134.9	2.00	2.00	2.0	134.9	134.9	134.9
207.0	136.9	0.0	136.9	0.00	0.00	0.0	136.9	136.9	136.9
210.0	137.0	0.0	137.0	0.00	0.00	0.00	137.0	137.0	137.0

COMMENTS:
Actual platform elevations not given yet. They will be added when obtained.
Backfill toe between 1+74 and 1+71. Soil added for trench stability from 1+71 to 1+56 will be removed prior to backfilling.

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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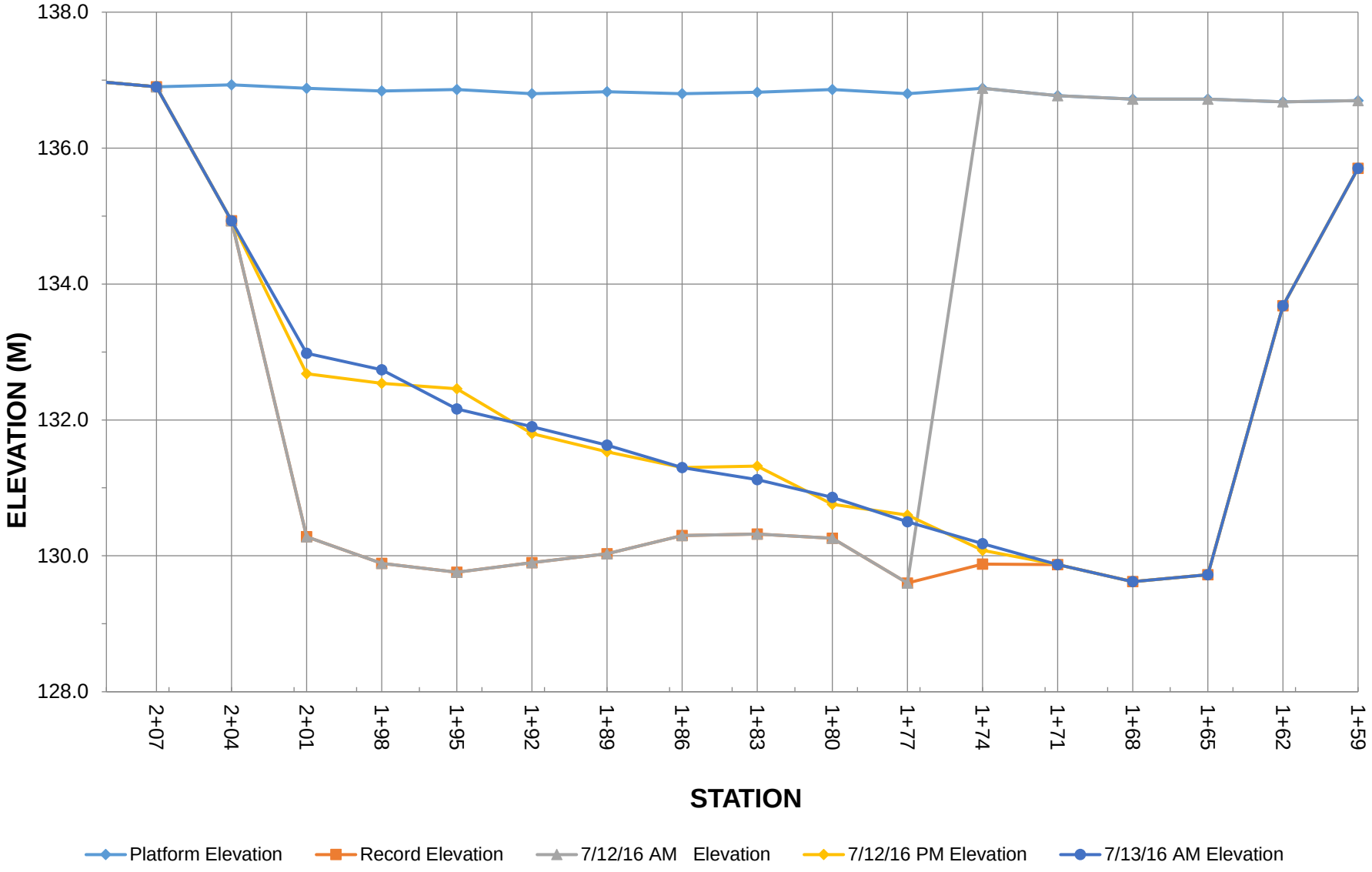
SB Cutoff Wall Backfill Profile
7/12/2016



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Daily Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/13/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Wednesday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	6
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Weather:

Low:	75 F	**Time:**	6:00 AM	**Cloud Cover:**	Scattered Showers	**Wind:**	5-10 MPH
High:	86 F	**Time:**	3:00 PM	**Precipitation:**	0.1 in	**Direction:**	S

Description of Work Activities:

GSI personnel arrived onsite at 6:00 AM and held their morning safety meeting.
After the safety meeting, GSI fueled up the equipment, greased the excavator and got the pond recirculating.
The Bucknell project members arrived onsite at 6:30 AM and a group safety meeting was held w/ Nate and Dan.
At 7:00 AM Keith used the excavator to build containment berms for the fuel tank.
Keith began mixing backfill at 7:30 AM.
At 8:45 AM backfilled mixing was paused to dig out the soil placed in the trench yesterday between STA 162 and 159.
Weavers equipment arrived onsite at 9:05 AM to replace the left control stick in the excavator.
Excavation resumed at 10:40 AM.
Excavation and backfilling alternated throughout the day to keep the slurry level up.
At 1:45 PM the excavator encountered a limestone pinnacle just shy of STA 153 at a depth of 2.9m.
At 3:00 PM Karl (Central Builders) premixed backfill.
Excavation was stopped at 5:30 PM so that the slurry level could be brought up for the end of the shift.
All equipment was fueled and greased and the trench was sounded.
GSI personnel cleaned up and left site at 6:15 PM.

Today:	77.3	m^2
To-Date:	364.4	m^2

Conversations with Client/Inspector:

•

Production Delays:

•

Safety Topics:

• Safety topics included: Slips, trips, and falls especially after rain.

Keith Kilpatrick
Superintendent

07/13/16
Date

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Daily Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/13/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Wednesday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	6
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Materials Received:

Material	Unit	Today	To-Date	Notes
Bentonite	Ton	15.200	38.00	

Materials Onsite:

Material	Unit	Delivered	Used	Onsite
Bentonite	Bag	20	14	6

Hours	Equipment	Task	Hours	Employees On Site	Trade
10	CAT 330 Excavator	Excavating	12	Keith Kilpatrick	SUPT
10	9k Forklift	Misc.	12	Nathan Coughenour	ENG
12	Diesel Pumps	Slurry Pond	10.5	Scott Helton	LAB
			10.5	Dylan Pence	LAB
			11	Dan Ruffing	PM
32	**TOTAL HOURS**		**56**	**TOTAL HOURS**	

LEGEND:

SUPT- Superintendent, **PM**- Project Manager, **ENG** - Engineer, **HSO** - Health & Safety Officer, **QC**- Quality Control Tech, **LAB** - Laborer, **BPO** - Batch Plant Operator, **EXC** - Excavator Operator, **FORK** -forklift operator, **DOZ** - Dozer Operator, **DRILL** - RH-18 Operator, **JG** - Jet Grout Rig Operator, **LSO** - Long Stick Operator

Keith Kilpatrick
Superintendent

07/13/16
Date

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Quality Control Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/13/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Wednesday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	6
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL-BENTONITE CUTOFF WALL
EXCAVATION LOG

GSI personnel CAT 330
Bucket width: 0.91 m

Date Excavated	Station Start	Platform Elevation	Record Depth (Previous)	Record Depth (Today)	Final Record Elevation	Panel Length	Area Excavated Previously	Area Excavated Today	Area Excavated Total
	M	*M*	*M*	*M*	*M*	*M*	M^2	M^2	M^2
7/13/2016	*147.0*	*136.7*	*0.00*	*4.50*	*132.2*	*3.0*	*0*	*6.8*	*6.8*
7/13/2016	*150.0*	*136.7*	*0.00*	*4.60*	*132.1*	*3.0*	*0*	*13.7*	*13.7*
7/13/2016	*153.0*	*136.7*	*0.00*	*4.30*	*132.4*	*3.0*	*0*	*13.4*	*13.4*
7/13/2016	*156.0*	*136.8*	*0.00*	*5.20*	*131.6*	*3.0*	*0*	*14.3*	*14.3*
7/13/2016	*159.0*	*136.7*	*1.00*	*6.60*	*130.1*	*3.0*	*1.5*	*16.2*	*17.7*
7/13/2016	*162.0*	*136.7*	*3.00*	*6.10*	*130.6*	*3.0*	*6.0*	*13.1*	*19.1*
								Total Excavated Today (M^2):	77.3
								Total Excavated To-Date (M^2):	364.4

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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Quality Control Report

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Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/13/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Wednesday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	6
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL BENTONITE CUT-OFF WALL
BENTONITE SLURRY QUALITY CONTROL

Bag	Target B:W %	Bentonite (lbs)	Target Water (Gal)	Actual Water (Gal)	Actual B:W %	Viscosity (s)
1	6.0%	3800	7600	7600	6.0%	
2	6.0%	3800	7600	7600	6.0%	

COMMENTS:

SIGNED: *Nathan Coughenour*

GSI QC Supervisor

Client QC Manager

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Quality Control Report

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Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Wednesday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	6
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL-BENTONITE CUTOFF WALL
SLURRY QUALITY CONTROL TESTING

BENTONITE FRESH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)
Target	***-***	***35-40 sec***	***≥64 pcf***	***6.5-10***	***<20 cc***
1	8:10 AM	35	64	8.5	21
2	11:30 AM	33	64	9.0	-
3	4:45 PM	35	64	9.0	-

SOIL-BENTONITE TRENCH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)	Station (m)	Depth (m)
Target	***-***	***>40 sec***	*******	***6.5-10***	***<25 cc***	***-***	***-***
1	8:25 AM	37	65	9	19	177	1
2	11:25 AM	36	67	9	-	170	3
3	4:30 PM	37	68	9	-	153	4

*64-85 pcf and 15 pcf < backfill density

WET SOIL-BENTONITE BACKFILL

Test #	Time	STA	Slump	Density (pcf)	Sample
Target	***-***	***M***	***3-6 in***	*******	***(Y/N)***
1	8:35 AM	207	3"	119	Y
2	12:00 PM	204	3"	121	N

Maximum particle size of 6 inches.
* Backfill Density must be at least 15 pcf greater than the in-trench slurry
Samples collected by Bucknell

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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Quality Control Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/13/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Wednesday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	6
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL-BENTONITE CUTOFF WALL
BACKFILL PROFILE

63.3 **Backfill Placed Today (m^2)**

108.3 **Backfill Placed Total (m^2)**

12.9 **Backfill placed for Lead-in (m^2)**

BACKFILL SLOPE MEASUREMENTS (every 3 meters)

Station	Platform Elevation *M*	Record Depth *M*	Record Elevation *M*	AM Sounding *M*	PM Sounding *M*	AM Sounding *M*	AM Elevation *M*	PM Elevation *M*	AM Elevation *M*
				7/13/16	*7/13/16*	*7/14/16*	*7/13/16*	*7/13/16*	*7/14/16*
144.0	136.7	0.0	136.7	0.00	0.0	0.0	136.7	136.7	136.7
147.0	136.7	4.5	132.2	0.00	4.5	4.5	136.7	132.2	132.2
150.0	136.7	4.6	132.1	0.00	4.6	4.7	136.7	132.1	132.0
152.0	136.7	2.9	133.8	0.00	**2.9**	**2.9**	136.7	133.8	133.8
153.0	136.7	4.3	132.4	0.00	4.3	4.2	136.7	132.4	132.5
154.0	136.7	5.4	131.3	0.00	**5.4**	**5.4**	136.7	131.3	131.3
156.0	136.8	5.2	131.6	0.00	4.9	5.2	136.8	131.9	131.6
159.0	136.7	6.6	130.1	0.0	6.6	6.5	136.7	130.1	130.2
162.0	136.7	6.1	130.6	2.5	6.1	6.0	134.2	130.6	130.7
165.0	136.7	7.0	129.7	6.2	6.0	6.3	130.5	130.7	130.4
168.0	136.7	7.1	129.6	6.9	6.6	6.4	129.8	130.1	130.3
171.0	136.8	6.9	129.9	6.6	5.9	5.9	130.2	130.9	130.9
174.0	136.9	7.0	129.9	6.7	5.8	6.0	130.2	131.1	130.9
177.0	136.8	7.2	129.6	6.3	5.5	5.5	130.5	131.3	131.3
180.0	136.9	6.6	130.3	6.0	5.3	5.2	130.9	131.6	131.7
183.0	136.8	6.5	130.3	5.7	4.6	4.7	131.1	132.2	132.1
186.0	136.8	6.5	130.3	5.5	4.40	4.20	131.3	132.4	132.6
189.0	136.8	6.8	130.0	5.2	3.40	3.50	131.6	133.4	133.3
192.0	136.8	6.9	129.9	4.9	2.80	2.90	131.9	134.0	133.9
195.0	136.9	7.1	129.8	4.7	2.10	2.00	132.2	134.8	134.9
198.0	136.8	7.0	129.9	4.1	1.50	1.50	132.7	135.3	135.3
201.0	136.9	6.6	130.3	3.9	0.00	0.00	133.0	136.9	136.9
204.0	136.9	2.0	134.9	2.0	0.00	0.00	134.9	136.9	136.9
207.0	136.9	0.0	136.9	0.0	0.00	0.00	136.9	136.9	136.9
210.0	137.0	0.0	137.0	0.00	0.00	0.00	137.0	137.0	137.0

COMMENTS:
Actual platform elevations not given yet. They will be added when obtained.

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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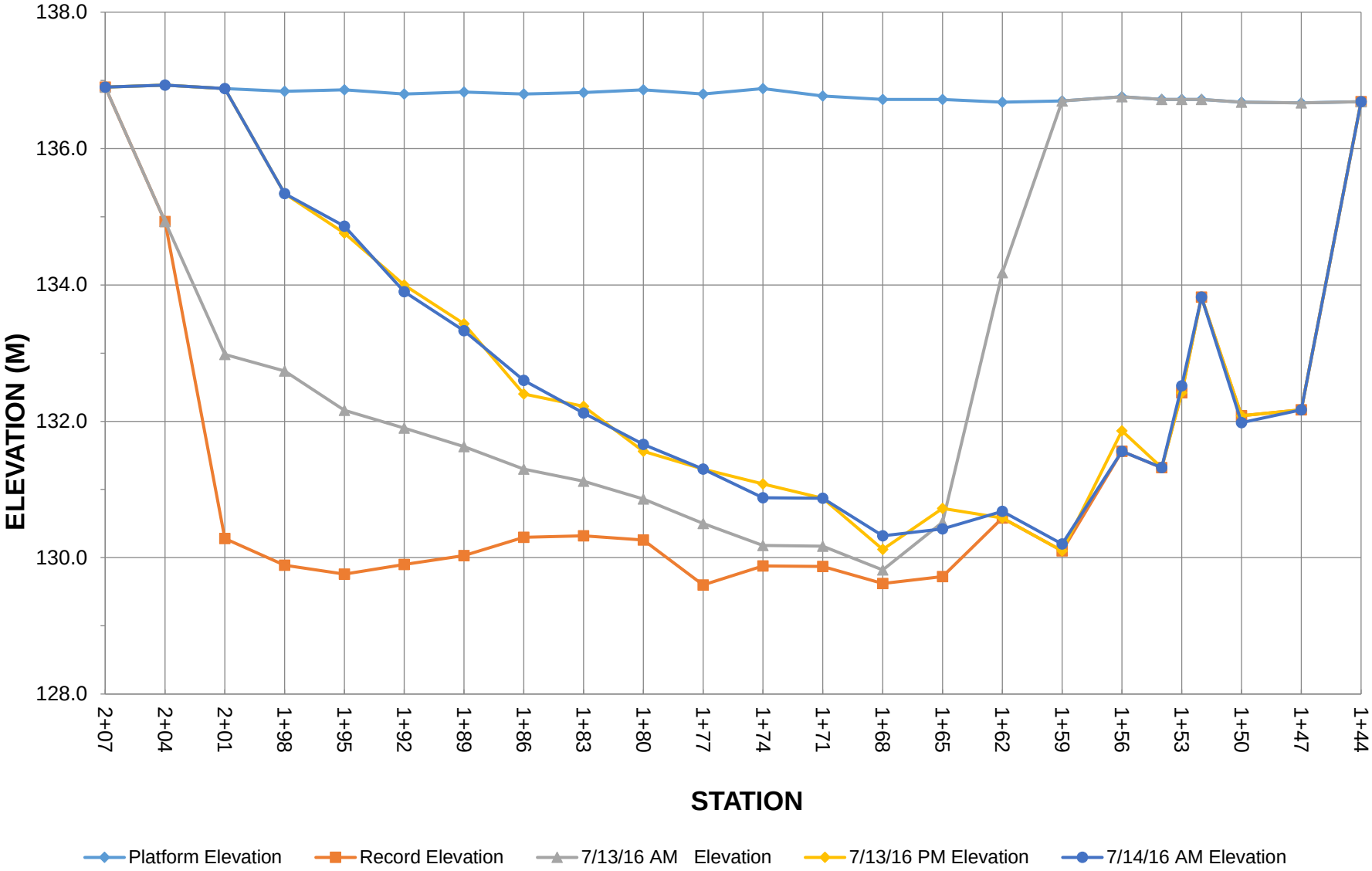
Soil and Groundwater Problems Solved

SB Cutoff Wall Backfill Profile
7/13/2016



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Daily Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/14/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Thursday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	7
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Weather:

Low:	75 F	**Time:**	6:00 AM	**Cloud Cover:**	Scattered Showers	**Wind:**	5-10 MPH
High:	92 F	**Time:**	3:00 PM	**Precipitation:**	~0.3 in	**Direction:**	S

Description of Work Activities:

GSI personnel arrived onsite at 6:00 AM and held their morning safety meeting.
After the safety meeting, GSI fueled up the equipment, greased the excavator and got the pond recirculating.
The Bucknell project members arrived onsite at 6:30 AM and a group safety meeting was held w/ Nate and Dan.
Excavation began at 6:45 AM at STA 1+50.
The dozer began mixing and placing backfill at 7:00 AM.
GSI assisted the Bucknell Geology department install defects in the wall at 11:00 AM.
At 1:00 PM excavation was paused for 30 minutes for Bucknell to take inclinometer readings at STA 1+20.
The dozer started overheating at 3:30 PM and shut off. Weavers came to site and cleaned out the radiator which was packed full of dust from the previous job.
The dozer was back to backfill operations at 4:30 PM.
At 5:30 PM GSI stopped excavation and backfill for the day, sounded the trench and greased equipment.
GSI personnel cleaned up and left site at 6:00 PM.

.

Today:	320.1	m^2
To-Date:	685.7	m^2

Conversations with Client/Inspector:

•

Production Delays:

•

Safety Topics:

• Safety topics included: Slips, trips, and falls, PPE, and heat stress.

Keith Kilpatrick
Superintendent

07/14/16
Date

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Daily Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/14/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Thursday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	7
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Materials Received:

Material	Unit	Today	To-Date	Notes
Bentonite	Ton	0.000	38.00	

Materials Onsite:

Material	Unit	Delivered	Used	Onsite
Bentonite	Bag	20	18	2

Hours	Equipment	Task	Hours	Employees On Site	Trade
12	CAT 330 Excavator	Excavating	12	Keith Kilpatrick	SUPT
12	9k Forklift	Misc.	12	Nathan Coughenour	ENG
12	Diesel Pumps	Slurry Pond	12	Scott Helton	LAB
12	John Deere 700 Dozer	Backfilling	12	Dylan Pence	LAB
			12	Dan Ruffing	PM
			12	Tim Thomas	DOZ
48	**TOTAL HOURS**		**72**	**TOTAL HOURS**	

LEGEND:

SUPT- Superintendent, **PM**- Project Manager, **ENG** - Engineer, **HSO** - Health & Safety Officer, **QC**- Quality Control Tech, **LAB** - Laborer, **BPO** - Batch Plant Operator, **EXC** - Excavator Operator, **FORK** -forklift operator, **DOZ** - Dozer Operator, **DRILL** - RH-18 Operator, **JG** - Jet Grout Rig Operator, **LSO** - Long Stick Operator

Keith Kilpatrick
Superintendent

07/14/16
Date

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Quality Control Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/14/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Thursday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	7
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL-BENTONITE CUTOFF WALL
EXCAVATION LOG

GSI personnel CAT 330
Bucket width: 0.91 m

Date Excavated	Station Start	Platform Elevation	Record Depth (Previous)	Record Depth (Today)	Final Record Elevation	Panel Length	Area Excavated Previously	Area Excavated Today	Area Excavated Total
	M	M	M	M	M	M	M^2	M^2	M^2
7/14/2016	99.0	136.6	0.00	6.00	130.6	3.0	0	9.0	9.0
7/14/2016	102.0	136.6	0.00	6.70	129.9	3.0	0	19.1	19.1
7/14/2016	105.0	136.5	0.00	6.40	130.1	3.0	0	19.7	19.7
7/14/2016	108.0	136.6	0.00	6.40	130.2	3.0	0	19.2	19.2
7/14/2016	111.0	136.5	0.00	6.80	129.8	3.0	0	19.8	19.8
7/14/2016	114.0	136.6	0.00	6.90	129.7	3.0	0	20.6	20.6
7/14/2016	117.0	136.6	0.00	7.20	129.4	3.0	0	21.2	21.2
7/14/2016	120.0	136.6	0.00	6.80	129.8	3.0	0	21.0	21.0
7/14/2016	123.0	136.5	0.00	7.00	129.6	3.0	0	20.7	20.7
7/14/2016	126.0	136.6	0.00	6.20	130.4	3.0	0	19.8	19.8
7/14/2016	129.0	136.5	0.00	6.20	130.3	3.0	0	18.6	18.6
7/14/2016	132.0	136.5	0.00	6.30	130.2	3.0	0	18.8	18.8
7/14/2016	135.0	136.6	0.00	5.70	130.9	3.0	0	18.0	18.0
7/14/2016	138.0	136.6	0.00	6.60	130.0	3.0	0	18.5	18.5
7/14/2016	141.0	136.6	0.00	6.70	129.9	3.0	0	20.0	20.0
7/14/2016	144.0	136.7	0.00	6.60	130.1	3.0	0	20.0	20.0
7/14/2016	147.0	136.7	4.50	6.30	130.4	3.0	6.8	12.6	19.4
7/14/2016	150.0	136.7	4.60	5.40	131.3	3.0	13.7	3.9	17.6
								Total Excavated Today (M^2):	320.1
								Total Excavated To-Date (M^2):	685.7

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

Geo-Solutions
Soil and Groundwater Problems Solved

Quality Control Report

1250 Fifth Avenue, New Kensington, PA 15068
Tel: 724-335-7273 Fax: 724-335-7271
www.geo-solutions.com

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/14/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Thursday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	7
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL BENTONITE CUT-OFF WALL
BENTONITE SLURRY QUALITY CONTROL

Bag	Target B:W %	Bentonite (lbs)	Target Water (Gal)	Actual Water (Gal)	Actual B:W %	Viscosity (s)
1	6.0%	4000	7600	7702	6.2%	
2	6.0%	4000	7600	7618	6.3%	34
3	6.0%	3000	7000	7012	5.1%	
4	6.0%	3200	7600	7220	5.3%	35

COMMENTS:

SIGNED: *Nathan Coughenour*

GSI QC Supervisor

Client QC Manager

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SOIL-BENTONITE CUTOFF WALL
SLURRY QUALITY CONTROL TESTING

BENTONITE FRESH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)
Target	**-**	***35-40 sec***	***≥64 pcf***	***6.5-10***	***<20 cc***
1	9:30 AM	35	64	9.0	21
2	10:45 AM	35	64	8.5	-
3	1:35 PM	35	64	8.5	-

SOIL-BENTONITE TRENCH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)	Station (m)	Depth (m)
Target	**-**	***>40 sec***	*****	***6.5-10***	***<25 cc***	**-**	**-**
1	9:50 AM	38	71	8	24	138	3
2	12:00 PM	40	70	8	-	126	3
3	2:15 AM	36	69	8	-	114	3

*64-85 pcf and 15 pcf < backfill density

WET SOIL-BENTONITE BACKFILL

Test #	Time	STA	Slump	Density (pcf)	Sample
Target	**-**	***M***	***3-6 in***	*****	***(Y/N)***
1	8:30 AM	200	2.5"	123	Y
2	9:40 AM	195	3.25"	121	N
3	2:30 PM	177	3"	119	N

Maximum particle size of 6 inches.
* Backfill Density must be at least 15 pcf greater than the in-trench slurry
Samples collected by Bucknell

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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SOIL-BENTONITE CUTOFF WALL
BACKFILL PROFILE

248.9 **Backfill Placed Today (m^2)**

357.2 **Backfill Placed Total (m^2)**

15.9 **Backfill placed for Lead-in (m^2)**

BACKFILL SLOPE MEASUREMENTS (every 3 meters)

Station	Platform Elevation *M*	Record Depth *M*	Record Elevation *M*	AM Sounding *M* (7/14/16)	PM Sounding *M* (7/14/16)	AM Sounding *M* (7/15/16)	AM Elevation *M* (7/14/16)	PM Elevation *M* (7/14/16)	AM Elevation *M* (7/15/16)
96.0	136.6	0.0	136.6	0.00	0.0	0.0	136.6	136.6	136.6
99.0	136.6	6.0	130.6	0.00	5.4	5.9	136.6	131.2	130.7
102.0	136.6	6.7	129.9	0.00	6.5	6.6	136.6	130.1	130.0
105.0	136.5	6.4	130.1	0.00	6.1	6.2	136.5	130.4	130.3
108.0	136.6	6.4	130.2	0.00	6.1	6.4	136.6	130.5	130.2
111.0	136.5	6.8	129.7	0.00	6.6	6.6	136.5	129.9	129.9
114.0	136.6	6.9	129.7	0.00	6.5	6.7	136.6	130.1	129.9
117.0	136.6	7.2	129.4	0.00	6.7	6.6	136.6	129.9	130.0
120.0	136.6	6.8	129.8	0.00	6.6	6.7	136.6	130.0	129.9
123.0	136.5	7.0	129.5	0.00	6.3	6.2	136.5	130.2	130.3
126.0	136.6	6.2	130.4	0.00	6.2	6.0	136.6	130.4	130.6
129.0	136.5	6.2	130.3	0.00	6.2	6.0	136.5	130.3	130.5
132.0	136.5	6.3	130.2	0.00	5.7	5.7	136.5	130.8	130.8
135.0	136.6	5.7	130.9	0.00	4.8	4.9	136.6	131.8	131.7
138.0	136.6	6.6	130.0	0.00	4.6	4.7	136.6	132.0	131.9
141.0	136.6	6.7	129.9	0.00	4.4	4.4	136.6	132.2	132.2
144.0	136.7	6.6	130.1	0.00	4.0	4.0	136.7	132.7	132.7
147.0	136.7	6.3	130.4	4.5	3.5	3.6	132.2	133.2	133.1
150.0	136.7	5.4	131.3	4.7	3.4	3.4	132.0	133.3	133.3
152.0	136.7	2.9	133.8	**2.9**	**2.9**	**2.9**	133.8	133.8	133.8
153.0	136.7	4.3	132.4	4.2	3.1	3.2	132.5	133.6	133.5
154.0	136.7	5.4	131.3	**5.4**	**1.7**	**1.7**	131.3	135.0	135.0
156.0	136.8	5.2	131.6	5.2	1.7	1.9	131.6	135.1	134.9
159.0	136.7	6.6	130.1	6.5	1.3	1.2	130.2	135.4	135.5
162.0	136.7	6.1	130.6	6.0	0.00	0.00	130.7	136.7	136.7
165.0	136.7	7.0	129.7	6.3	0.00	0.00	130.4	136.7	136.7
168.0	136.7	7.1	129.6	6.4	0.00	0.00	130.3	136.7	136.7
171.0	136.8	6.9	129.9	5.9	0.00	0.00	130.9	136.8	136.8
174.0	136.9	7.0	129.9	6.0	0.00	0.00	130.9	136.9	136.9
177.0	136.8	7.2	129.6	5.5	0.00	0.00	131.3	136.8	136.8
180.0	136.9	6.6	130.3	5.2	0.00	0.00	131.7	136.9	136.9
183.0	136.8	6.5	130.3	4.7	0.00	0.00	132.1	136.8	136.8
186.0	136.8	6.5	130.3	4.20	0.00	0.00	132.6	136.8	136.8
189.0	136.8	6.8	130.0	3.50	0.00	0.00	133.3	136.8	136.8
192.0	136.8	6.9	129.9	2.90	0.00	0.00	133.9	136.8	136.8
195.0	136.9	7.1	129.8	2.00	0.00	0.00	134.9	136.9	136.9
198.0	136.8	7.0	129.9	1.50	0.00	0.00	135.3	136.8	136.8
201.0	136.9	6.6	130.3	0.00	0.00	0.00	136.9	136.9	136.9
204.0	136.9	2.0	134.9	0.00	0.00	0.00	136.9	136.9	136.9
207.0	136.9	0.0	136.9	0.00	0.00	0.00	136.9	136.9	136.9
210.0	137.0	0.0	137.0	0.00	0.00	0.00	137.0	137.0	137.0

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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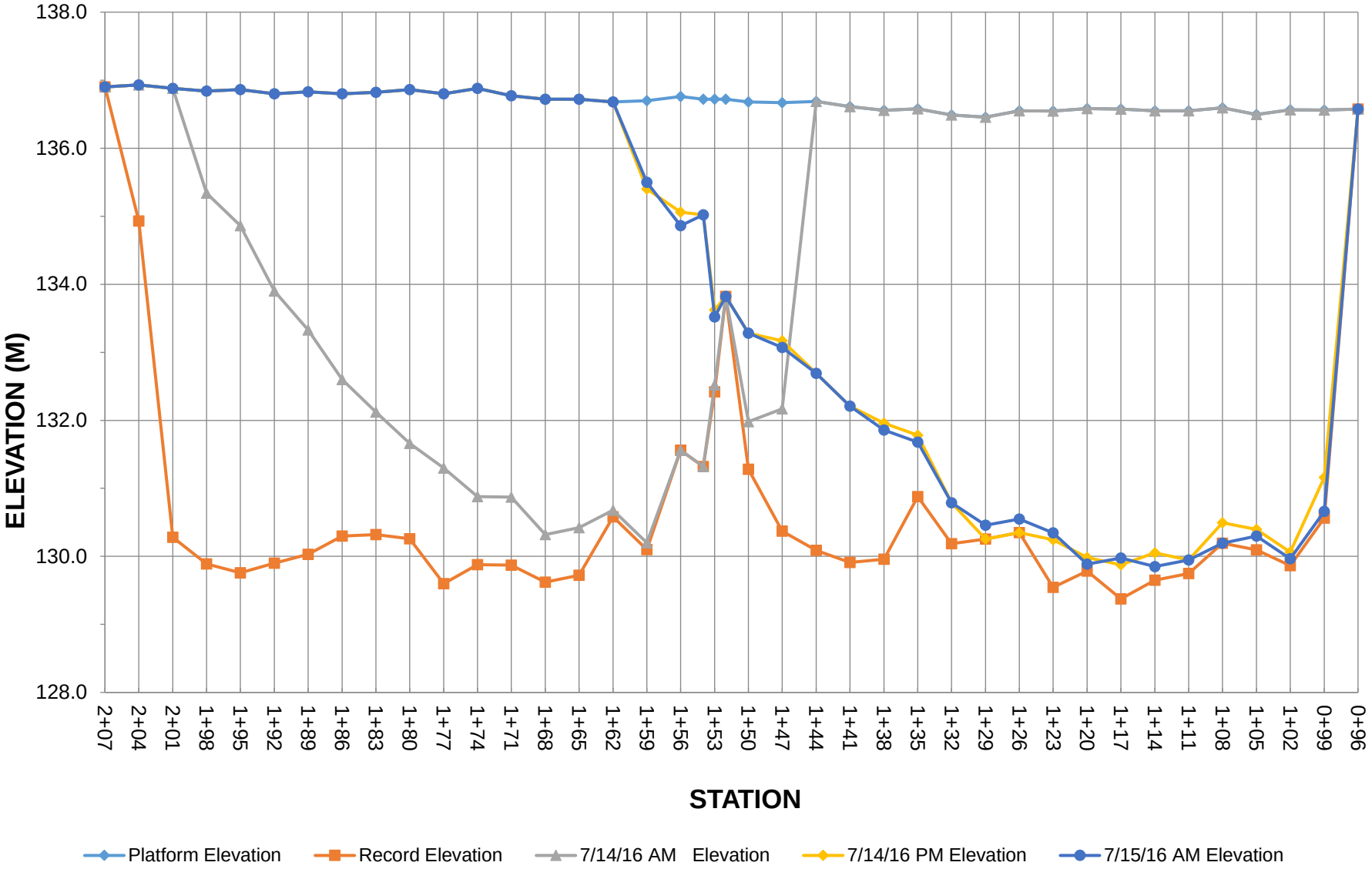
SB Cutoff Wall Backfill Profile
7/14/2016



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Daily Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/15/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Friday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	8
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Weather:

Low:	70 F	**Time:**	6:00 AM	**Cloud Cover:**	Clear	**Wind:**	0-5 MPH
High:	90 F	**Time:**	3:00 PM	**Precipitation:**	0 in	**Direction:**	W

Description of Work Activities:

GSI personnel arrived onsite at 6:00 AM and held their morning safety meeting.
After the safety meeting, GSI fueled up the equipment, greased the excavator and got the pond recirculating.
The Bucknell project members arrived onsite at 6:30 AM and a group safety meeting was held w/ Nate and Dan.
Excavation began at 6:45 AM at STA 0+99.
The dozer began mixing and placing backfill at 7:00 AM.
Excavation was paused from 9:00 AM to 9:20 AM for Bucknell to take inclinometer readings at STA 0+90.
At 12:10 PM excavation was stopped to assist Bucknell in placing the first set of cages in the trench at STA 0+84.
Excavation resumed at 1:00 PM.
Excavation was stopped at 4:45 PM at STA 0+69 to assist Bucknell in placing the second set of cages in the trench.
The second cage was placed at STA 0+75.
GSI personnel cleaned up and left site at 6:00 PM.

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Today:	197.6	m^2
To-Date:	893.3	m^2

Conversations with Client/Inspector:

•

Production Delays:

•

Safety Topics:

• Safety topics included: Slips, trips, and falls, PPE, and heat stress.

Keith Kilpatrick
Superintendent

07/15/16
Date

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Materials Received:

Material	Unit	Today	To-Date	Notes
Bentonite	Ton	0.000	38.00	

Materials Onsite:

Material	Unit	Delivered	Used	Onsite
Bentonite	Bag	20	18	2

Hours	Equipment	Task	Hours	Employees On Site	Trade
12	CAT 330 Excavator	Excavating	12	Keith Kilpatrick	SUPT
12	9k Forklift	Misc.	12	Nathan Coughenour	ENG
12	Diesel Pumps	Slurry Pond	12	Scott Helton	LAB
12	John Deere 700 Dozer	Backfilling	12	Dylan Pence	LAB
			8	Dan Ruffing	PM
			12	Tim Thomas	DOZ
48	**TOTAL HOURS**		**68**	**TOTAL HOURS**	

LEGEND:

SUPT- Superintendent, **PM**- Project Manager, **ENG** - Engineer, **HSO** - Health & Safety Officer, **QC**- Quality Control Tech, **LAB** - Laborer, **BPO** - Batch Plant Operator, **EXC** - Excavator Operator, **FORK** -forklift operator, **DOZ** - Dozer Operator, **DRILL** - RH-18 Operator, **JG** - Jet Grout Rig Operator, **LSO** - Long Stick Operator

Keith Kilpatrick
Superintendent

07/15/16
Date

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SOIL-BENTONITE CUTOFF WALL
EXCAVATION LOG

GSI personnel CAT 330
Bucket width: 0.91 m

Date Excavated	Station Start	Platform Elevation	Record Depth (Previous)	Record Depth (Today)	Final Record Elevation	Panel Length	Area Excavated Previously	Area Excavated Today	Area Excavated Total
	M	*M*	*M*	*M*	*M*	*M*	*M^2*	*M^2*	*M^2*
7/15/2016	*69.0*	*136.6*	*0.00*	*7.70*	*128.9*	*3.0*	*0*	*11.6*	*11.6*
7/15/2016	*72.0*	*136.6*	*0.00*	*6.80*	*129.8*	*3.0*	*0*	*21.8*	*21.8*
7/15/2016	*75.0*	*136.6*	*0.00*	*7.00*	*129.6*	*3.0*	*0*	*20.7*	*20.7*
7/15/2016	*78.0*	*136.6*	*0.00*	*6.40*	*130.2*	*3.0*	*0*	*20.1*	*20.1*
7/15/2016	*81.0*	*136.6*	*0.00*	*6.60*	*130.0*	*3.0*	*0*	*19.5*	*19.5*
7/15/2016	*84.0*	*136.5*	*0.00*	*7.00*	*129.6*	*3.0*	*0*	*20.4*	*20.4*
7/15/2016	*87.0*	*136.5*	*0.00*	*7.00*	*129.6*	*3.0*	*0*	*21.0*	*21.0*
7/15/2016	*90.0*	*136.6*	*0.00*	*7.00*	*129.6*	*3.0*	*0*	*21.0*	*21.0*
7/15/2016	*93.0*	*136.6*	*0.00*	*7.00*	*129.6*	*3.0*	*0*	*21.0*	*21.0*
7/15/2016	*96.0*	*136.6*	*0.00*	*6.70*	*129.9*	*3.0*	*0*	*20.6*	*20.6*
								Total Excavated Today (M^2):	197.6
								Total Excavated To-Date (M^2):	893.3

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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SOIL BENTONITE CUT-OFF WALL
BENTONITE SLURRY QUALITY CONTROL

Bag	Target B:W %	Bentonite (lbs)	Target Water (Gal)	Actual Water (Gal)	Actual B:W %	Viscosity (s)
1	6.0%	4000	7600	7605	6.3%	35
2	6.0%	3815	7600	7921	5.8%	41
3	6.0%	4000	7000	7617	6.3%	
4	6.0%	3000	7600	7611	4.7%	36

COMMENTS:

SIGNED: *Nathan Coughenour*

GSI QC Supervisor

Client QC Manager

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SOIL-BENTONITE CUTOFF WALL
SLURRY QUALITY CONTROL TESTING

BENTONITE FRESH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)
Target	***-***	***35-40 sec***	***≥64 pcf***	***6.5-10***	***<20 cc***
1	9:00 AM	39	65	8.5	20
2	1:20 PM	37	65	8.5	-
3	3:30 PM	36	65	8.5	-

SOIL-BENTONITE TRENCH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)	Station (m)	Depth (m)
Target	***-***	***>40 sec***	*******	***6.5-10***	***<25 cc***	***-***	***-***
1	8:45 AM	39	73	8	23	93	3
2	1:10 PM	40	73	8	-	79	3
3	2:45 PM	42	75	8	-	75	3

*64-85 pcf and 15 pcf < backfill density

WET SOIL-BENTONITE BACKFILL

Test #	Time	STA	Slump	Density (pcf)	Sample
Target	***-***	***M***	***3-6 in***	*******	***(Y/N)***
1	8:30 AM	156	3"	118	N
2	10:00 AM	150	3"	115	Y
3	2:30 PM	140	5"	117	Y

Maximum particle size of 6 inches.
* Backfill Density must be at least 15 pcf greater than the in-trench slurry
Samples collected by Bucknell

COMMENTS:

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GSI QC Supervisor

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SOIL-BENTONITE CUTOFF WALL
BACKFILL PROFILE

199.7 **Backfill Placed Today (m^2)**

556.8 **Backfill Placed Total (m^2)**

15.9 **Backfill placed for Lead-in (m^2)**

BACKFILL SLOPE MEASUREMENTS (every 3 meters)

Station	Platform Elevation *M*	Record Depth *M*	Record Elevation *M*	*7/15/16* AM Sounding *M*	*7/15/16* PM Sounding *M*	*7/16/16* AM Sounding *M*	*7/15/16* AM Elevation *M*	*7/15/16* PM Elevation *M*	*7/16/16* AM Elevation *M*
66.0	136.6	0.0	136.6	0.00	0.0	0.0	136.6	136.6	136.6
69.0	136.6	7.7	128.9	0.00	7.7	7.3	136.6	128.9	129.3
72.0	136.6	6.8	129.8	0.00	6.7	6.7	136.6	129.9	129.9
75.0	136.6	7.0	129.6	0.00	6.7	6.5	136.6	129.9	130.1
78.0	136.6	6.4	130.2	0.00	6.4	6.4	136.6	130.2	130.2
81.0	136.6	6.6	130.0	0.00	6	6.3	136.6	130.6	130.3
84.0	136.5	7.0	129.5	0.00	6.5	6.7	136.5	130.0	129.8
87.0	136.5	7.0	129.5	0.00	7	6.7	136.5	129.5	129.8
90.0	136.6	7.0	129.6	0.00	6.5	6.6	136.6	130.1	130.0
93.0	136.6	7.0	129.6	0.00	6.7	6.5	136.6	129.9	130.1
96.0	136.6	6.7	129.9	0.0	6.5	6.2	136.6	130.1	130.4
99.0	136.6	6.0	130.6	5.9	5.9	5.7	130.7	130.7	130.9
102.0	136.6	6.7	129.9	6.6	5.4	5.4	130.0	131.2	131.2
105.0	136.5	6.4	130.1	6.2	5	5.0	130.3	131.5	131.5
108.0	136.6	6.4	130.2	6.4	4.7	4.7	130.2	131.9	131.9
111.0	136.5	6.8	129.7	6.6	4.2	4.5	129.9	132.3	132.0
114.0	136.6	6.9	129.7	6.7	3.9	4.0	129.9	132.7	132.6
117.0	136.6	7.2	129.4	6.6	3.5	3.8	130.0	133.1	132.8
120.0	136.6	6.8	129.8	6.7	3	3.0	129.9	133.6	133.6
123.0	136.5	7.0	129.5	6.2	2.6	2.7	130.3	133.9	133.8
126.0	136.6	6.2	130.4	6.0	1.7	2.4	130.6	134.9	134.2
129.0	136.5	6.2	130.3	6.0	1.3	1.5	130.5	135.2	135.0
132.0	136.5	6.3	130.2	5.7	0.8	1.0	130.8	135.7	135.5
135.0	136.6	5.7	130.9	4.9	0.0	0.0	131.7	136.6	136.6
138.0	136.6	6.6	130.0	4.7	0.0	0.0	131.9	136.6	136.6
141.0	136.6	6.7	129.9	4.4	0.0	0.0	132.2	136.6	136.6
144.0	136.7	6.6	130.1	4.0	0.0	0.0	132.7	136.7	136.7
147.0	136.7	6.3	130.4	3.6	0.0	0.0	133.1	136.7	136.7
150.0	136.7	5.4	131.3	3.4	0.0	0.0	133.3	136.7	136.7
152.0	136.7	2.9	133.8	**2.9**	0.0	0.0	133.8	136.7	136.7
153.0	136.7	4.3	132.4	3.2	0.0	0.0	133.5	136.7	136.7
154.0	136.7	5.4	131.3	**1.7**	0.0	0.0	135.0	136.7	136.7
156.0	136.8	5.2	131.6	1.9	0.0	0.0	134.9	136.8	136.8
159.0	136.7	6.6	130.1	1.2	0.0	0.0	135.5	136.7	136.7
162.0	136.7	6.1	130.6	0.00	0.0	0.0	136.7	136.7	136.7

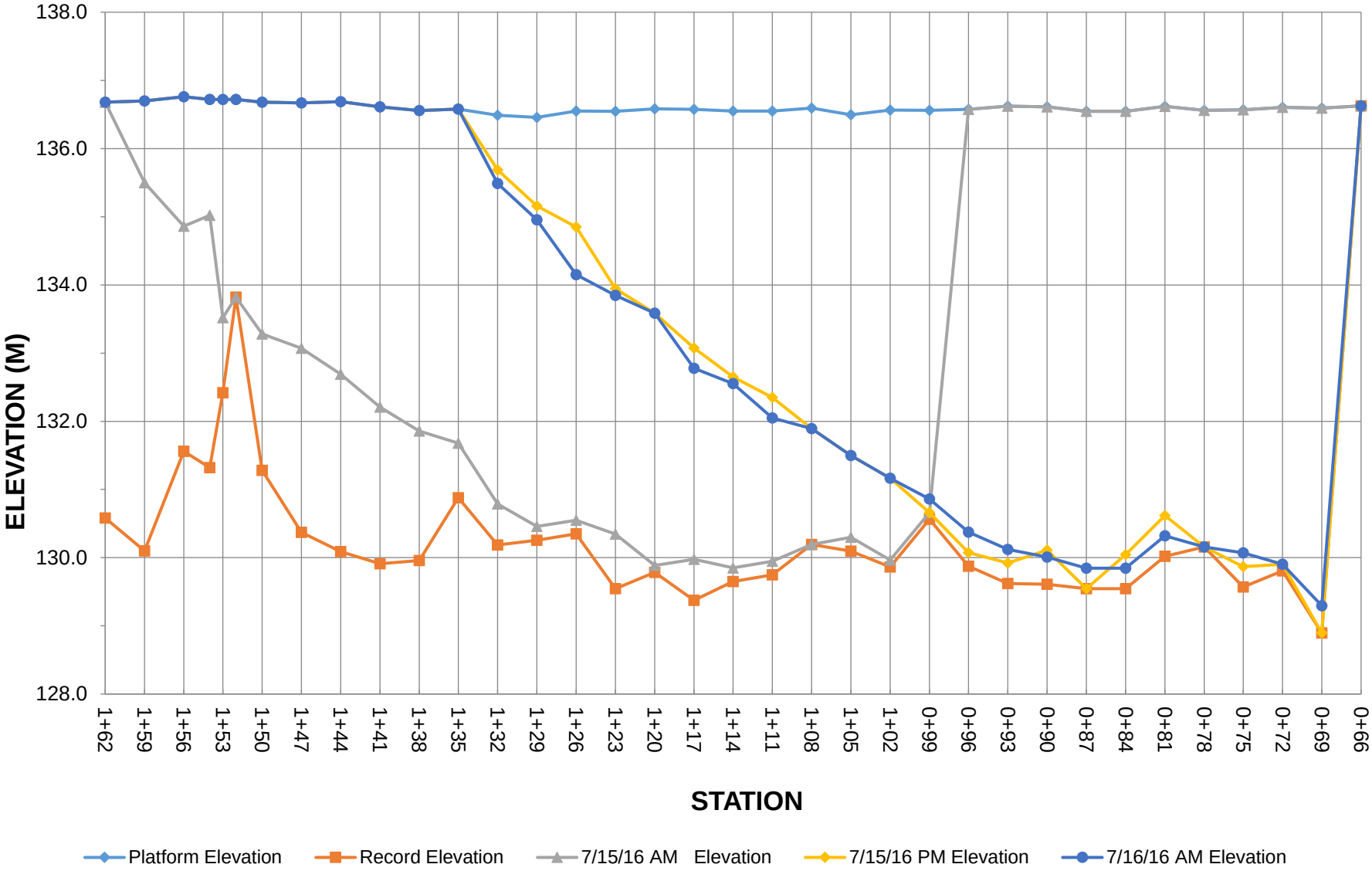
COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

Geo-Solutions
Soil and Groundwater Problems Solved

SB Cutoff Wall Backfill Profile
7/15/2016



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Daily Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/18/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Monday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	9
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Weather:

Low:	66 F	**Time:**	6:00 AM	**Cloud Cover:**	Scattered T-Storms	**Wind:**	0-5 MPH
High:	88 F	**Time:**	3:00 PM	**Precipitation:**	0.5 in	**Direction:**	W

Description of Work Activities:

GSI personnel arrived onsite at 6:00 AM and held their morning safety meeting.
After the safety meeting, GSI fueled up the equipment, greased the excavator and got the pond recirculating.
The Bucknell project members arrived onsite at 6:30 AM and a group safety meeting was held w/ Nate.
Excavation began at 6:45 AM at STA 0+66.
Excavation was paused from 7:30 AM to 8:00 AM so the excavator could help the dozer make backfill and bring the trench slurry level up.
At 7:45 AM one load of bentonite arrived onsite.
Excavation was paused from 10:15 AM to 10:45 AM to allow Bucknell to get inclinometer readings at STA 0+60.
Site operations were shut down from 12:30 PM to 1:00 PM due to lightning.
At 4:00 PM the dozer lost control of the blade and was walked out of the backfill area to be looked. Weavers said they would be out first thing Tuesday morning to look at it.
Keith stopped excavation at 4:30 PM at STA 0+39 to mix and place backfill in the trench to bring the slurry level up to the top for the end of the day.
GSI personnel cleaned up and left site at 6:00 PM.

Today:	195.6	m^2
To-Date:	1099.7	m^2

Conversations with Client/Inspector:

•

Production Delays:

•

Safety Topics:

• Safety topics included: Slips, trips, and falls, housekeeping, and heat stress.

Keith Kilpatrick
Superintendent

07/18/16
Date

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Daily Report

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Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	9
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Materials Received:

Material	Unit	Today	To-Date	Notes
Bentonite	Ton	22.808	60.81	

Materials Onsite:

Material	Unit	Delivered	Used	Onsite
Bentonite	Bag	32	23	9

Hours	Equipment	Task	Hours	Employees On Site	Trade
12	CAT 330 Excavator	Excavating	12	Keith Kilpatrick	SUPT
12	9k Forklift	Misc.	12	Nathan Coughenour	ENG
12	Diesel Pumps	Slurry Pond	12	Scott Helton	LAB
12	John Deere 700 Dozer	Backfilling	12	Dylan Pence	LAB
			12	Kevin Moore	DOZ
48	**TOTAL HOURS**		**60**	**TOTAL HOURS**	

LEGEND:

SUPT- Superintendent, **PM**- Project Manager, **ENG** - Engineer, **HSO** - Health & Safety Officer, **QC**- Quality Control Tech, **LAB** - Laborer, **BPO** - Batch Plant Operator, **EXC** - Excavator Operator, **FORK** -forklift operator, **DOZ** - Dozer Operator, **DRILL** - RH-18 Operator, **JG** - Jet Grout Rig Operator, **LSO** - Long Stick Operator

Keith Kilpatrick
Superintendent

07/18/16
Date

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Quality Control Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/18/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Monday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	9
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL-BENTONITE CUTOFF WALL
EXCAVATION LOG

GSI personnel CAT 330
Bucket width: 0.91 m

Date Excavated	Station Start	Platform Elevation	Record Depth (Previous)	Record Depth (Today)	Final Record Elevation	Panel Length	Area Excavated Previously	Area Excavated Today	Area Excavated Total
	M	*M*	*M*	*M*	*M*	*M*	*M^2*	*M^2*	*M^2*
7/18/2016	*39.0*	*136.7*	*0.00*	*5.90*	*130.9*	*3.0*	*0*	*8.9*	*8.9*
7/18/2016	*42.0*	*136.7*	*0.00*	*6.60*	*130.1*	*3.0*	*0*	*18.8*	*18.8*
7/18/2016	*45.0*	*136.7*	*0.00*	*6.90*	*129.8*	*3.0*	*0*	*20.3*	*20.3*
7/18/2016	*48.0*	*136.6*	*0.00*	*6.90*	*129.7*	*3.0*	*0*	*20.7*	*20.7*
7/18/2016	*51.0*	*136.7*	*0.00*	*7.20*	*129.5*	*3.0*	*0*	*21.2*	*21.2*
7/18/2016	*54.0*	*136.6*	*0.00*	*7.00*	*129.6*	*3.0*	*0*	*21.3*	*21.3*
7/18/2016	*57.0*	*136.6*	*0.00*	*6.90*	*129.7*	*3.0*	*0*	*20.9*	*20.9*
7/18/2016	*60.0*	*136.6*	*0.00*	*7.00*	*129.6*	*3.0*	*0*	*20.9*	*20.9*
7/18/2016	*63.0*	*136.5*	*0.00*	*7.20*	*129.3*	*3.0*	*0*	*21.3*	*21.3*
7/18/2016	*66.0*	*136.6*	*0.00*	*7.20*	*129.4*	*3.0*	*0*	*21.6*	*21.6*
								Total Excavated Today (M^2):	195.6
								Total Excavated To-Date (M^2):	1,099.7

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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Quality Control Report

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Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL BENTONITE CUT-OFF WALL
BENTONITE SLURRY QUALITY CONTROL

Bag	Target B:W %	Bentonite (lbs)	Target Water (Gal)	Actual Water (Gal)	Actual B:W %	Viscosity (s)
1	6.0%	3800	7600	7628	6.0%	46
2	6.0%	3815	7600	7607	6.0%	41
3	6.0%	3800	7000	7662	6.0%	
4	6.0%	3800	7600	7599	6.0%	35

COMMENTS:

SIGNED: *Nathan Coughenour*

GSI QC Supervisor

Client QC Manager

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Quality Control Report

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Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL-BENTONITE CUTOFF WALL
SLURRY QUALITY CONTROL TESTING

BENTONITE FRESH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)
Target	***-***	***35-40 sec***	***≥64 pcf***	***6.5-10***	***<20 cc***
1	9:00 AM	46	66	8.5	16
2	11:45 AM	41	65	8.5	-
3	3:40 PM	35	65	8.5	-

SOIL-BENTONITE TRENCH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)	Station (m)	Depth (m)
Target	***-***	***>40 sec***	*******	***6.5-10***	***<25 cc***	***-***	***-***
1	8:15 AM	41	74	7.5	23	66	3
2	11:30 AM	40	73	8	-	60	3
3	3:00 PM	43	74	8	-	39	3

*64-85 pcf and 15 pcf < backfill density

WET SOIL-BENTONITE BACKFILL

Test #	Time	STA	Slump	Density (pcf)	Sample
Target	***-***	***M***	***3-6 in***	*******	***(Y/N)***
1	8:00 AM	136	4"	117	N
2	10:30 AM	130	6"	113	Y
3	3:45 PM	120	5"	115	Y

Maximum particle size of 6 inches.
* Backfill Density must be at least 15 pcf greater than the in-trench slurry
Samples collected by Bucknell

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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Quality Control Report

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Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Monday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	9
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL-BENTONITE CUTOFF WALL
BACKFILL PROFILE

150.6 **Backfill Placed Today (m^2)**

707.4 **Backfill Placed Total (m^2)**

15.9 **Backfill placed for Lead-in (m^2)**

BACKFILL SLOPE MEASUREMENTS (every 3 meters)

Station	Platform Elevation *M*	Record Depth *M*	Record Elevation *M*	*7/18/16* AM Sounding *M*	*7/18/16* PM Sounding *M*	*7/19/16* AM Sounding *M*	*7/18/16* AM Elevation *M*	*7/18/16* PM Elevation *M*	*7/19/16* AM Elevation *M*
36.0	136.7	0.0	136.7	0.00	0.0	0.0	136.7	136.7	136.7
39.0	136.7	5.9	130.8	0.00	5.8	5.8	136.7	130.9	130.9
42.0	136.7	6.6	130.1	0.00	6.4	6.2	136.7	130.3	130.5
45.0	136.7	6.9	129.8	0.00	6.7	6.5	136.7	130.0	130.2
48.0	136.6	6.9	129.7	0.00	6.7	6.8	136.6	129.9	129.8
51.0	136.7	7.2	129.5	0.00	7.2	7.0	136.7	129.5	129.7
54.0	136.6	7.0	129.6	0.00	6.6	6.6	136.6	130.0	130.0
57.0	136.6	6.9	129.7	0.00	6.7	6.6	136.6	129.9	130.0
60.0	136.6	7.0	129.6	0.00	6.7	6.6	136.6	129.9	130.0
63.0	136.5	7.2	129.3	0.00	7.0	7.0	136.5	129.5	129.5
66.0	136.6	7.2	129.4	0.0	6.9	6.9	136.6	129.7	129.7
69.0	136.6	7.7	128.9	7.3	7.4	7.2	129.3	129.2	129.4
72.0	136.6	6.8	129.8	6.7	6.8	6.7	129.9	129.8	129.9
75.0	136.6	7.0	129.6	6.5	6.2	6.1	130.1	130.4	130.5
78.0	136.6	6.4	130.2	6.4	6	6.0	130.2	130.6	130.6
81.0	136.6	6.6	130.0	6.3	5.8	5.7	130.3	130.8	130.9
84.0	136.5	7.0	129.5	6.7	5	4.8	129.8	131.5	131.7
87.0	136.5	7.0	129.5	6.7	4.5	4.4	129.8	132.0	132.1
90.0	136.6	7.0	129.6	6.6	4	4.0	130.0	132.6	132.6
93.0	136.6	7.0	129.6	6.5	3.7	3.7	130.1	132.9	132.9
96.0	136.6	6.7	129.9	6.2	3.3	3.3	130.4	133.3	133.3
99.0	136.6	6.0	130.6	5.7	2.7	2.5	130.9	133.9	134.1
102.0	136.6	6.7	129.9	5.4	2.2	2.2	131.2	134.4	134.4
105.0	136.5	6.4	130.1	5.0	1.6	1.7	131.5	134.9	134.8
108.0	136.6	6.4	130.2	4.7	1.4	1.3	131.9	135.2	135.3
111.0	136.5	6.8	129.7	4.5	1	1.0	132.0	135.5	135.5
114.0	136.6	6.9	129.7	4.0	0.3	0.3	132.6	136.3	136.3
117.0	136.6	7.2	129.4	3.8	0.0	0.0	132.8	136.6	136.6
120.0	136.6	6.8	129.8	3.0	0.0	0.0	133.6	136.6	136.6
123.0	136.5	7.0	129.5	2.7	0.0	0.0	133.8	136.5	136.5
126.0	136.6	6.2	130.4	2.4	0.0	0.0	134.2	136.6	136.6
129.0	136.5	6.2	130.3	1.5	0.0	0.0	135.0	136.5	136.5
132.0	136.5	6.3	130.2	1.0	0.0	0.0	135.5	136.5	136.5
135.0	136.6	5.7	130.9	0.0	0.0	0.0	136.6	136.6	136.6

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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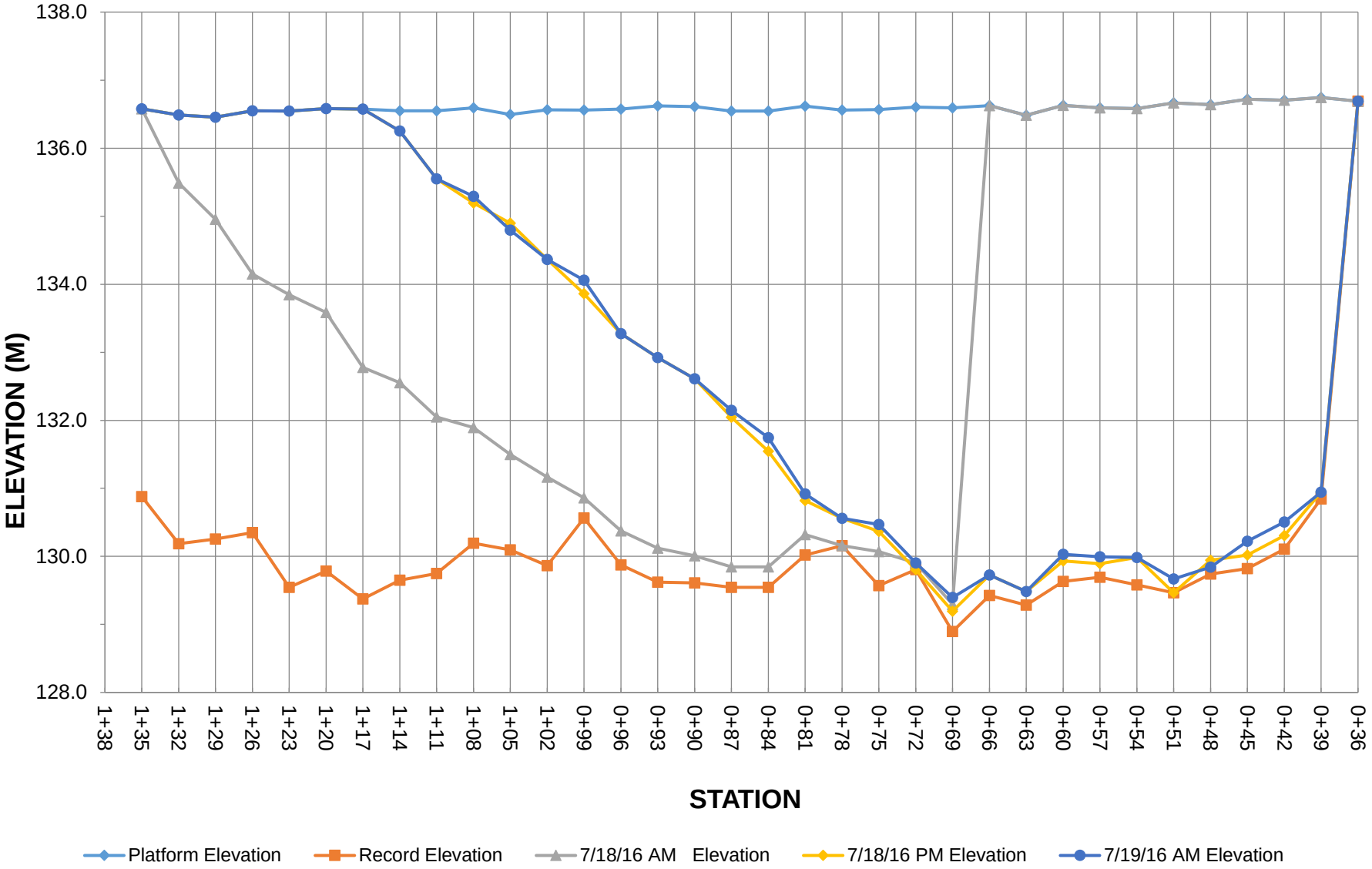
Soil and Groundwater Problems Solved

SB Cutoff Wall Backfill Profile
7/18/2016



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Daily Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/19/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Tuesday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	10
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Weather:

Low:	64 F	**Time:**	6:00 AM	**Cloud Cover:**	Partly Cloudy	**Wind:**	5-10 MPH
High:	86 F	**Time:**	3:00 PM	**Precipitation:**	0 in	**Direction:**	N

Description of Work Activities:

GSI personnel arrived onsite at 6:00 AM and held their morning safety meeting.
After the safety meeting, GSI fueled up the equipment, greased the excavator and got the pond recirculating.
The Bucknell project members arrived onsite at 6:30 AM and a group safety meeting was held w/ Nate.
Excavation began at 6:30 AM at STA 0+36.
The dozer was still down for repairs until the Weavers mechanic arrived onsite. The mechanic was onsite at 9:00 Am and at 9:40 AM the dozer was running properly and back to mixing backfill.
From 9:00 AM to 11:30 AM the excavator was used to help the dozer mix and place backfill to bring the slurry level up.
At 12:45 AM bending of the cage frames from the backfill flowing through was noticed and backfilling was stopped until Bucknell could develop a plan to reduce the bending. Excavation stopped shortly after due to the slurry level falling. At 1:30 PM Bucknell instructed Keith to freefall backfill into the trench at STA 0+80.
At 2:30 PM the excavator made a path to allow the dozer to resume pushing backfill into the trench at STA 0+80 and the excavator resumed digging at STA 0+24. The excavator started having issues again with the controls that made it very jumpy to use. Nate called Weavers mechanic to come look at it.
At 4:30 PM excavation stopped at STA 0+18 and Weavers mechanic arrived onsite to look at the excavator. The mechanic could not find the issue and GSI will have to use as is.
Jeff and Nate measured the crack at STA 187 and noticed it closed from 15.4 cm wide to 15.0 cm wide.

Today:	141.2	m^2
To-Date:	1250.3	m^2

Conversations with Client/Inspector:

•

Production Delays:

•

Safety Topics:

• Safety topics included: Slips, trips, and falls, housekeeping, and heat stress.

Keith Kilpatrick
Superintendent

07/19/16
Date

Geo-Solutions
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Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	10
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Materials Received:

Material	Unit	Today	To-Date	Notes
Bentonite	Ton	22.808	60.81	

Materials Onsite:

Material	Unit	Delivered	Used	Onsite
Bentonite	Bag	32	27	5

Hours	Equipment	Task	Hours	Employees On Site	Trade
12	CAT 330 Excavator	Excavating	12	Keith Kilpatrick	SUPT
12	9k Forklift	Misc.	12	Nathan Coughenour	ENG
12	Diesel Pumps	Slurry Pond	12	Scott Helton	LAB
12	John Deere 700 Dozer	Backfilling	12	Dylan Pence	LAB
			12	Kevin Moore	DOZ
48	**TOTAL HOURS**		**60**	**TOTAL HOURS**	

LEGEND:

SUPT- Superintendent, **PM**- Project Manager, **ENG** - Engineer, **HSO** - Health & Safety Officer, **QC**- Quality Control Tech, **LAB** - Laborer, **BPO** - Batch Plant Operator, **EXC** - Excavator Operator, **FORK** -forklift operator, **DOZ** - Dozer Operator, **DRILL** - RH-18 Operator, **JG** - Jet Grout Rig Operator, **LSO** - Long Stick Operator

Keith Kilpatrick
Superintendent

07/19/16
Date

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Quality Control Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/19/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Tuesday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	10
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL-BENTONITE CUTOFF WALL
EXCAVATION LOG

GSI personnel CAT 330
Bucket width: 0.91 m

Date Excavated	Station Start	Platform Elevation	Record Depth (Previous)	Record Depth (Today)	Final Record Elevation	Panel Length	Area Excavated Previously	Area Excavated Today	Area Excavated Total
	M	*M*	*M*	*M*	*M*	*M*	M^2	M^2	M^2
7/19/2016	*15.0*	*137.0*	*0.00*	*5.30*	*131.7*	*3.0*	*0*	*8.0*	*8.0*
7/19/2016	*18.0*	*137.0*	*0.00*	*6.00*	*131.0*	*3.0*	*0*	*17.0*	*17.0*
7/19/2016	*21.0*	*136.9*	*0.00*	*5.60*	*131.3*	*3.0*	*0*	*17.4*	*17.4*
7/19/2016	*24.0*	*136.9*	*0.00*	*6.20*	*130.7*	*3.0*	*0*	*17.7*	*17.7*
7/19/2016	*27.0*	*136.9*	*0.00*	*7.20*	*129.7*	*3.0*	*0*	*20.1*	*20.1*
7/19/2016	*30.0*	*137.0*	*0.00*	*6.80*	*130.2*	*3.0*	*0*	*21.0*	*21.0*
7/19/2016	*33.0*	*136.9*	*0.00*	*6.80*	*130.1*	*3.0*	*0*	*20.4*	*20.4*
7/19/2016	*36.0*	*136.7*	*0.00*	*6.30*	*130.4*	*3.0*	*0*	*19.7*	*19.7*

Total Excavated Today (M^2):	141.2
Total Excavated To-Date (M^2):	1,250.3

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

Geo-Solutions
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Quality Control Report

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Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL BENTONITE CUT-OFF WALL
BENTONITE SLURRY QUALITY CONTROL

Bag	Target B:W %	Bentonite (lbs)	Target Water (Gal)	Actual Water (Gal)	Actual B:W %	Viscosity (s)
1	6.0%	3770	7600	7655	5.9%	38
2	6.0%	3775	7600	8017	5.7%	
3	6.0%	3800	7000	7719	5.9%	36

COMMENTS:

SIGNED: *Nathan Coughenour*

GSI QC Supervisor

Client QC Manager

Geo-Solutions
Soil and Groundwater Problems Solved

1250 Fifth Avenue, New Kensington, PA 15068
Tel: 724-335-7273 Fax: 724-335-7271
www.geo-solutions.com

Quality Control Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/19/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Tuesday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	10
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL-BENTONITE CUTOFF WALL
SLURRY QUALITY CONTROL TESTING

BENTONITE FRESH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)
Target	***-***	***35-40 sec***	***≥64 pcf***	***6.5-10***	***<20 cc***
1	8:00 AM	38	65	8.5	17
2	12:15 PM	36	65	8.5	-
3	2:15 PM	35	65	8.0	-

SOIL-BENTONITE TRENCH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)	Station (m)	Depth (m)
Target	***-***	***>40 sec***	*******	***6.5-10***	***<25 cc***	***-***	***-***
1	8:30 AM	39	75	8.0	22	33	3
2	12:00 PM	40	76	8	-	27	3
3	1:00 PM	44	78	8	-	24	3

*64-85 pcf and 15 pcf < backfill density

WET SOIL-BENTONITE BACKFILL

Test #	Time	STA	Slump	Density (pcf)	Sample
Target	***-***	***M***	***3-6 in***	*******	***(Y/N)***
1	10:00 AM	110	4.5"	119	Y
2	11:00 AM	107	5"	118	N
3	11:45 AM	104	5"	118	N
4	5:30 PM	81	3"	-	N

Maximum particle size of 6 inches.
* Backfill Density must be at least 15 pcf greater than the in-trench slurry
Samples collected by Bucknell

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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SOIL-BENTONITE CUTOFF WALL
BACKFILL PROFILE

155.3 **Backfill Placed Today (m^2)**

862.7 **Backfill Placed Total (m^2)**

15.9 **Backfill placed for Lead-in (m^2)**

BACKFILL SLOPE MEASUREMENTS (every 3 meters)

Station	Platform Elevation *M*	Record Depth *M*	Record Elevation *M*	*7/19/16* AM Sounding *M*	*7/19/16* PM Sounding *M*	*7/20/16* AM Sounding *M*	*7/19/16* AM Elevation *M*	*7/19/16* PM Elevation *M*	*7/20/16* AM Elevation *M*
0.0	137.3	0.0	137.3	0.00	0.0	0.0	137.3	137.3	137.3
3.0	137.2	0.0	137.2	0.00	0.0	0.0	137.2	137.2	137.2
6.0	137.2	0.0	137.2	0.00	0.0	0.0	137.2	137.2	137.2
9.0	137.1	0.0	137.1	0.00	0.0	0.0	137.1	137.1	137.1
12.0	137.1	0.0	137.1	0.00	0.0	0.0	137.1	137.1	137.1
15.0	137.0	5.3	131.7	0.00	5.2	5.3	137.0	131.8	131.7
18.0	137.0	6.0	131.0	0.00	5.6	6.0	137.0	131.4	131.0
21.0	136.9	5.6	131.3	0.00	5.3	5.1	136.9	131.6	131.8
24.0	136.9	6.2	130.7	0.00	5.8	6.2	136.9	131.1	130.7
27.0	136.9	7.2	129.7	0.00	6.5	6.6	136.9	130.4	130.3
30.0	137.0	6.8	130.2	0.00	6.6	6.4	137.0	130.4	130.6
33.0	136.9	6.8	130.1	0.00	6.4	6.6	136.9	130.5	130.3
36.0	136.7	6.3	130.4	0.0	6.3	5.9	136.7	130.4	130.8
39.0	136.7	5.9	130.8	5.8	5.9	5.9	130.9	130.8	130.8
42.0	136.7	6.6	130.1	6.2	6.1	5.8	130.5	130.6	130.9
45.0	136.7	6.9	129.8	6.5	5.9	5.6	130.2	130.8	131.1
48.0	136.6	6.9	129.7	6.8	6.4	5.8	129.8	130.2	130.8
51.0	136.7	7.2	129.5	7.0	5.5	5.2	129.7	131.2	131.5
54.0	136.6	7.0	129.6	6.6	5.2	5.0	130.0	131.4	131.6
57.0	136.6	6.9	129.7	6.6	5.1	4.8	130.0	131.5	131.8
60.0	136.6	7.0	129.6	6.6	4.7	4.6	130.0	131.9	132.0
63.0	136.5	7.2	129.3	7.0	4.7	4.7	129.5	131.8	131.8
66.0	136.6	7.2	129.4	6.9	4.5	4.3	129.7	132.1	132.3
69.0	136.6	7.7	128.9	7.2	4.2	4.1	129.4	132.4	132.5
72.0	136.6	6.8	129.8	6.7	4	3.8	129.9	132.6	132.8
75.0	136.6	7.0	129.6	6.1	3.4	3.4	130.5	133.2	133.2
78.0	136.6	6.4	130.2	6.0	2.3	1.9	130.6	134.3	134.7
81.0	136.6	6.6	130.0	5.7	1.9	1.9	130.9	134.7	134.7
84.0	136.5	7.0	129.5	4.8	2.5	2.5	131.7	134.0	134.0
87.0	136.5	7.0	129.5	4.4	2.8	2.8	132.1	133.7	133.7
90.0	136.6	7.0	129.6	4.0	2.4	2.3	132.6	134.2	134.3
93.0	136.6	7.0	129.6	3.7	1.8	1.9	132.9	134.8	134.7
96.0	136.6	6.7	129.9	3.3	1.4	1.5	133.3	135.2	135.1
99.0	136.6	6.0	130.6	2.5	0.8	0.9	134.1	135.8	135.7
102.0	136.6	6.7	129.9	2.2	0.3	0.3	134.4	136.3	136.3
105.0	136.5	6.4	130.1	1.7	0	0.0	134.8	136.5	136.5
108.0	136.6	6.4	130.2	1.3	0	0.0	135.3	136.6	136.6
111.0	136.5	6.8	129.7	1.0	0	0.0	135.5	136.5	136.5
114.0	136.6	6.9	129.7	0.3	0	0.0	136.3	136.6	136.6
117.0	136.6	7.2	129.4	0.0	0.0	0.0	136.6	136.6	136.6

COMMENTS: Differences in the 7/19/16 PM and 7/20/16 AM show consistant increases specifically between STA 0+60 to 0+39.
These changes could possibly be attributed to sidewall spaling in the trench. Excavation did cross into more gravel material in these areas.
These areas have been noted and will be incorporated into the in-situ testing for investigation.

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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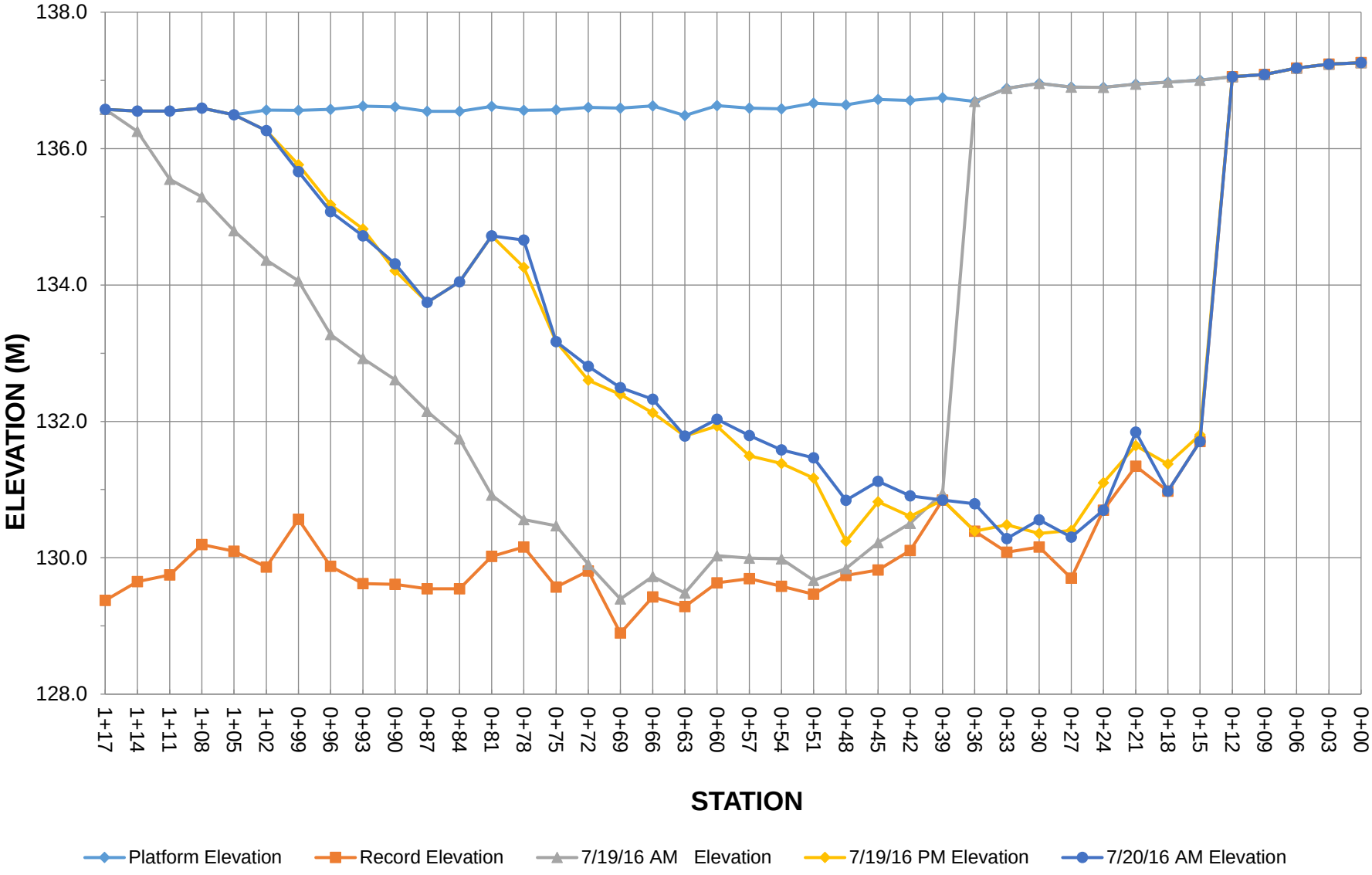
SB Cutoff Wall Backfill Profile
7/19/2016



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Daily Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/20/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Wednesday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	11
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Weather:

Low:	59 F	**Time:**	6:00 AM	**Cloud Cover:**	Clear	**Wind:**	0-5 MPH
High:	84 F	**Time:**	3:00 PM	**Precipitation:**	0 in	**Direction:**	SE

Description of Work Activities:

GSI personnel arrived onsite at 6:00 AM and held their morning safety meeting.
After the safety meeting, GSI fueled up the equipment, greased the excavator and got the pond recirculating.
The Bucknell project members arrived onsite at 6:30 AM and a group safety meeting was held w/ Nate.
Excavation began at 6:30 AM at STA 0+15. The dozer began mixing backfill.
At 8:15 AM Bucknell informed GSI that they could stop excavation where they were and focus on backfilling and cleaning up. Excavation got to STA 0+06. Full depth was no longer being obtained due to bedrock.
Backfill was placed in the trench starting at 9:00 AM. Backfilling continued for the rest of the shift utilizing both the excavator and dozer.
In order to help reduce stresses on the instrument cages in the trench, backfill was dropped into the trench on the down slope sides of the cages at STA 0+80 and 0+70 respectively. Once those areas were topped out backfill was filled in from the lead-in trench.
GSI personnel cleaned up and left site at 6:00 PM.

Today:	30.0	m^2
To-Date:	1287.5	m^2

Conversations with Client/Inspector:

•

Production Delays:

•

Safety Topics:

• Safety topics included: Proper lifting, proper PPE, and heat stress.

Keith Kilpatrick
Superintendent

07/20/16
Date

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Materials Received:

Material	Unit	Today	To-Date	Notes
Bentonite	Ton	0.000	60.81	

Materials Onsite:

Material	Unit	Delivered	Used	Onsite
Bentonite	Bag	32	27	5

Hours	Equipment	Task	Hours	Employees On Site	Trade
12	CAT 330 Excavator	Excavating	12	Keith Kilpatrick	SUPT
12	9k Forklift	Misc.	12	Nathan Coughenour	ENG
12	Diesel Pumps	Slurry Pond	12	Scott Helton	LAB
12	John Deere 700 Dozer	Backfilling	12	Dylan Pence	LAB
			12	Kevin Moore	DOZ
48	**TOTAL HOURS**		**60**	**TOTAL HOURS**	

LEGEND:

SUPT- Superintendent, **PM**- Project Manager, **ENG** - Engineer, **HSO** - Health & Safety Officer, **QC**- Quality Control Tech, **LAB** - Laborer, **BPO** - Batch Plant Operator, **EXC** - Excavator Operator, **FORK** -forklift operator, **DOZ** - Dozer Operator, **DRILL** - RH-18 Operator, **JG** - Jet Grout Rig Operator, **LSO** - Long Stick Operator

Keith Kilpatrick
Superintendent

07/20/16
Date

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Quality Control Report

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Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	11
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL-BENTONITE CUTOFF WALL
EXCAVATION LOG

GSI personnel CAT 330
Bucket width: 0.91 m

Date Excavated	Station Start	Platform Elevation	Record Depth (Previous)	Record Depth (Today)	Final Record Elevation	Panel Length	Area Excavated Previously	Area Excavated Today	Area Excavated Total
	M	*M*	*M*	*M*	*M*	*M*	M^2	M^2	M^2
7/20/2016	*6.0*	*137.2*	*0.00*	*4.40*	*132.8*	*3.0*	*0*	*6.6*	*6.6*
7/20/2016	*9.0*	*137.1*	*0.00*	*5.40*	*131.7*	*3.0*	*0*	*14.7*	*14.7*
7/20/2016	*12.0*	*137.1*	*0.00*	*4.80*	*132.3*	*3.0*	*0*	*15.3*	*15.3*
								Total Excavated Today (M^2):	30.0
								Total Excavated To-Date (M^2):	1,287.5

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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SOIL BENTONITE CUT-OFF WALL
BENTONITE SLURRY QUALITY CONTROL

Bag	Target B:W %	Bentonite (lbs)	Target Water (Gal)	Actual Water (Gal)	Actual B:W %	Viscosity (s)
1	6.0%	3770	7600	7655	5.9%	38
2	6.0%	3775	7600	8017	5.7%	
3	6.0%	3800	7000	7719	5.9%	36

COMMENTS:

SIGNED: *Nathan Coughenour*

GSI QC Supervisor

Client QC Manager

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SOIL-BENTONITE CUTOFF WALL
SLURRY QUALITY CONTROL TESTING

BENTONITE FRESH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)
Target	**-**	***35-40 sec***	***≥64 pcf***	***6.5-10***	***<20 cc***
1	9:50 AM	40	65	8.0	16
2					
3					

SOIL-BENTONITE TRENCH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)	Station (m)	Depth (m)
Target	**-**	***>40 sec***	*****	***6.5-10***	***<25 cc***	**-**	**-**
1	11:00 AM	41	71	7.5	21	54	1
2	1:30 PM	40	72	7.5	-	50	1
3	3:00 PM	42	71	7.5	-	39	1

*64-85 pcf and 15 pcf < backfill density

WET SOIL-BENTONITE BACKFILL

Test #	Time	STA	Slump	Density (pcf)	Sample
Target	**-**	***M***	***3-6 in***	*****	***(Y/N)***
1	9:00 AM	102	5.5"	120	Y
2	1:00 PM	80	4.5"	120	N
3	3:30 PM	70	5"	118	N

Maximum particle size of 6 inches.
* Backfill Density must be at least 15 pcf greater than the in-trench slurry
Samples collected by Bucknell

COMMENTS:
The slurry pond was emptied at 10:00 AM.

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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SOIL-BENTONITE CUTOFF WALL
BACKFILL PROFILE

196.8 **Backfill Placed Today (m^2)**

15.9 **Backfill placed for Lead-in (m^2)**

1059.5 **Backfill Placed Total (m^2)**

BACKFILL SLOPE MEASUREMENTS (every 3 meters)

Station	Platform Elevation *M*	Record Depth *M*	Record Elevation *M*	*7/20/16* AM Sounding *M*	*7/20/16* PM Sounding *M*	*7/21/16* AM Sounding *M*	*7/20/16* AM Elevation *M*	*7/20/16* PM Elevation *M*	*7/21/16* AM Elevation *M*
0.0	137.3	0.0	137.3	0.0	0.0	0.0	137.3	137.3	137.3
3.0	137.2	0.0	137.2	0.0	0.0	0.0	137.2	137.2	137.2
6.0	137.2	4.4	132.8	0.0	4.2	4.4	137.2	133.0	132.8
9.0	137.1	5.4	131.7	0.0	5.4	5.2	137.1	131.7	131.9
12.0	137.1	4.8	132.3	0.0	4.7	4.6	137.1	132.4	132.5
15.0	137.0	5.3	131.7	5.3	5.0	4.8	131.7	132.0	132.2
18.0	137.0	6.0	131.0	6.0	5.7	5.6	131.0	131.3	131.4
21.0	136.9	5.6	131.3	5.1	5.4	5.3	131.8	131.5	131.6
24.0	136.9	6.2	130.7	6.2	5.5	5.2	130.7	131.4	131.7
27.0	136.9	7.2	129.7	6.6	4.6	4.7	130.3	132.3	132.2
30.0	137.0	6.8	130.2	6.4	4.6	4.4	130.6	132.4	132.6
33.0	136.9	6.8	130.1	6.6	4.1	4.1	130.3	132.8	132.8
36.0	136.7	6.3	130.4	5.9	3.9	4.0	130.8	132.8	132.7
39.0	136.7	5.9	130.8	5.9	3.8	3.7	130.8	132.9	133.0
42.0	136.7	6.6	130.1	5.8	3.4	3.3	130.9	133.3	133.4
45.0	136.7	6.9	129.8	5.6	3.1	3.1	131.1	133.6	133.6
48.0	136.6	6.9	129.7	5.8	2.8	2.9	130.8	133.8	133.7
51.0	136.7	7.2	129.5	5.2	2.5	2.4	131.5	134.2	134.3
54.0	136.6	7.0	129.6	5.0	2.3	2.3	131.6	134.3	134.3
57.0	136.6	6.9	129.7	4.8	2.2	2.0	131.8	134.4	134.6
60.0	136.6	7.0	129.6	4.6	1.8	1.7	132.0	134.8	134.9
63.0	136.5	7.2	129.3	4.7	1.5	1.5	131.8	135.0	135.0
66.0	136.6	7.2	129.4	4.3	1.3	1.0	132.3	135.3	135.6
69.0	136.6	7.7	128.9	4.1	0.8	0.6	132.5	135.8	136.0
72.0	136.6	6.8	129.8	3.8	0.3	0.3	132.8	136.3	136.3
75.0	136.6	7.0	129.6	3.4	0.0	0.0	133.2	136.6	136.6
78.0	136.6	6.4	130.2	1.9	0.0	0.0	134.7	136.6	136.6
81.0	136.6	6.6	130.0	1.9	0.0	0.0	134.7	136.6	136.6
84.0	136.5	7.0	129.5	2.5	0.0	0.0	134.0	136.5	136.5
87.0	136.5	7.0	129.5	2.8	0.0	0.0	133.7	136.5	136.5
90.0	136.6	7.0	129.6	2.3	0.0	0.0	134.3	136.6	136.6
93.0	136.6	7.0	129.6	1.9	0.0	0.0	134.7	136.6	136.6
96.0	136.6	6.7	129.9	1.5	0.0	0.0	135.1	136.6	136.6
99.0	136.6	6.0	130.6	0.9	0.0	0.0	135.7	136.6	136.6
102.0	136.6	6.7	129.9	0.3	0.0	0.0	136.3	136.6	136.6
105.0	136.5	6.4	130.1	0.0	0.0	0.0	136.5	136.5	136.5

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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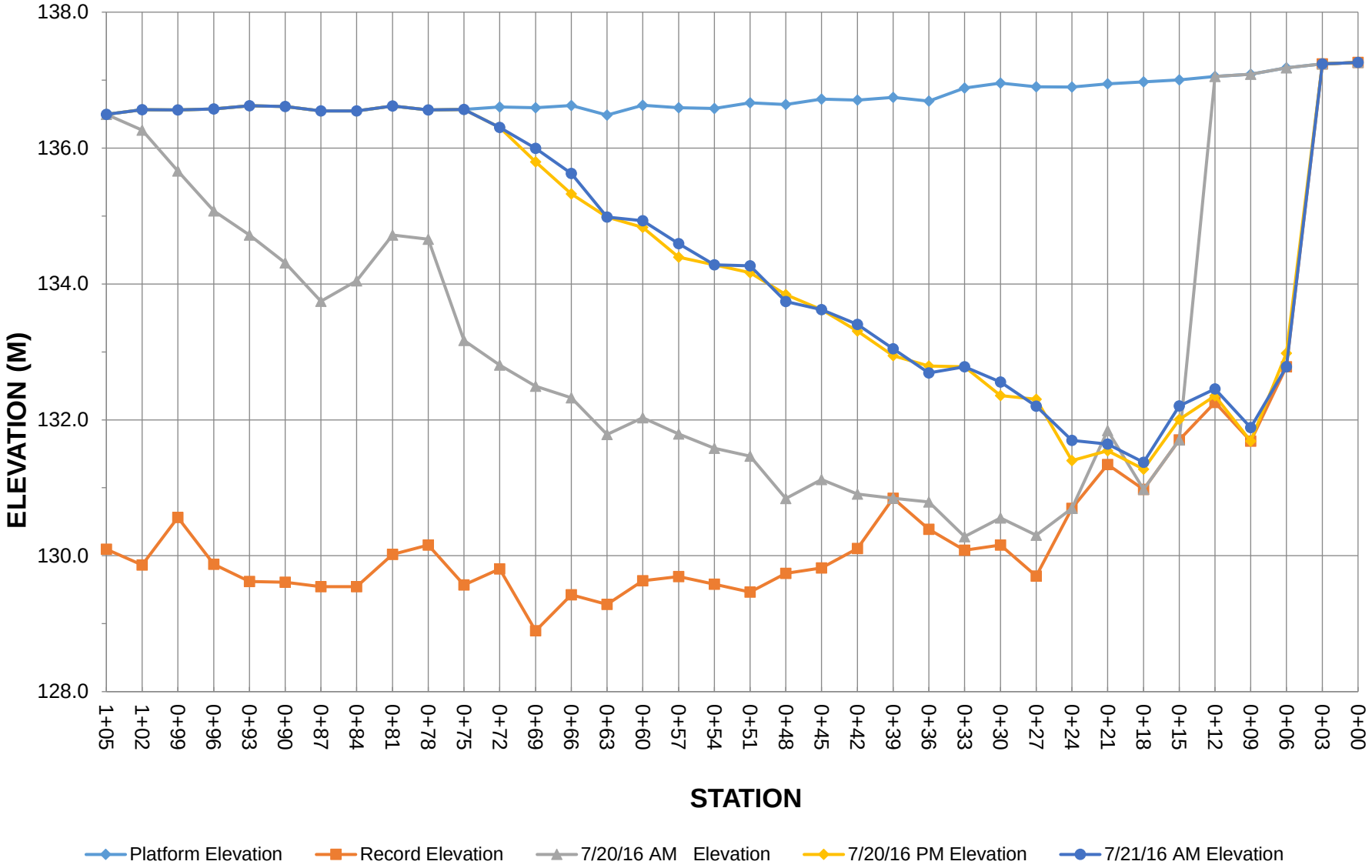
SB Cutoff Wall Backfill Profile
7/20/2016



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Daily Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/21/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Thursday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	12
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Weather:

Low:	57 F	**Time:**	6:00 AM	**Cloud Cover:**	Clear	**Wind:**	0-5 MPH
High:	90 F	**Time:**	3:00 PM	**Precipitation:**	0 in	**Direction:**	SE

Description of Work Activities:

GSI personnel arrived onsite at 6:00 AM and held their morning safety meeting.
After the safety meeting, GSI fueled up the equipment, greased the excavator and began mixing backfill.
The Bucknell project members arrived onsite at 6:30 AM and a group safety meeting was held w/ Nate.
Backfill was placed in the trench starting at 7:15 AM.
At the request of Bucknell, backfill was placed by free-falling into the trench starting at STA 0+70 until top out at that location to reduce stresses on the second cage.
Once top out was obtained at STA 0+70, backfill was filled in between STA 0+75 and 0+70 and then normal backfill placement resumed from STA 0+70 on.
The trench was completely backfilled at 5:15 PM.
Nate and Keith discussed site cleanup with Bucknell and Central Builders personnel.
GSI personnel cleaned up and left site at 5:30 PM.

Today:	0.0	m^2
To-Date:	1294.1	m^2

Conversations with Client/Inspector:

•

Production Delays:

•

Safety Topics:

• Safety topics included: Proper lifting, proper PPE, and heat stress.

Keith Kilpatrick
Superintendent

07/21/16
Date

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Daily Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/21/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Thursday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	12
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

Materials Received:

Material	Unit	Today	To-Date	Notes
Bentonite	Ton	0.000	60.81	

Materials Onsite:

Material	Unit	Delivered	Used	Onsite
Bentonite	Bag	32	27	5

Hours	Equipment	Task	Hours	Employees On Site	Trade
11	CAT 330 Excavator	Excavating	11.5	Keith Kilpatrick	SUPT
11	9k Forklift	Misc.	11.5	Nathan Coughenour	ENG
11	Diesel Pumps	Slurry	11.5	Scott Helton	LAB
11	John Deere 700 Dozer	Backfilling	11.5	Dylan Pence	LAB
44	**TOTAL HOURS**		**46**	**TOTAL HOURS**	

LEGEND:

SUPT- Superintendent, **PM**- Project Manager, **ENG** - Engineer, **HSO** - Health & Safety Officer, **QC**- Quality Control Tech, **LAB** - Laborer, **BPO** - Batch Plant Operator, **EXC** - Excavator Operator, **FORK** -forklift operator, **DOZ** - Dozer Operator, **DRILL** - RH-18 Operator, **JG** - Jet Grout Rig Operator, **LSO** - Long Stick Operator

Keith Kilpatrick
Superintendent

07/21/16
Date

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Quality Control Report

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Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/21/16
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Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL BENTONITE CUT-OFF WALL
BENTONITE SLURRY QUALITY CONTROL

Bag	Target B:W %	Bentonite (lbs)	Target Water (Gal)	Actual Water (Gal)	Actual B:W %	Viscosity (s)

COMMENTS:

SIGNED: *Nathan Coughenour*

GSI QC Supervisor

Client QC Manager

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Quality Control Report

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SOIL-BENTONITE CUTOFF WALL
SLURRY QUALITY CONTROL TESTING

BENTONITE FRESH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)
Target	***-***	***35-40 sec***	***≥64 pcf***	***6.5-10***	***<20 cc***
1					
2					
3					

SOIL-BENTONITE TRENCH SLURRY

Test #	Time	Viscosity (sec)	Density (pcf)	pH	Filtrate Loss (cc)	Station (m)	Depth (m)
Target	***-***	***>40 sec***	*******	***6.5-10***	***<25 cc***	***-***	***-***
1	9:00 AM	44	72	7.5	18	57	1
2	11:00 AM	43	70	7.5	-	48	1
3	2:15 PM	44	71	7.5	-	30	1

*64-85 pcf and 15 pcf < backfill density

WET SOIL-BENTONITE BACKFILL

Test #	Time	STA	Slump	Density (pcf)	Sample
Target	***-***	***M***	***3-6 in***	*******	***(Y/N)***
1	7:15 AM	70	6"	117	Y
2	10:00 AM	60	6"	116	Y
3	2:00 PM	40	4"	119	Y

Maximum particle size of 6 inches.
* Backfill Density must be at least 15 pcf greater than the in-trench slurry
Samples collected by Bucknell

COMMENTS:
No fresh slurry was mixed today

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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Quality Control Report

Project:	NSF Research	**Project No.:**	15-071	**Date:**	07/21/16
Client:	Bucknell University	**Location:**	Lewisburg, PA	**Day of Week:**	Thursday
Owner:	Bucknell University	**Super:**	Keith Kilpatrick	**Days on Site:**	12
Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	6am-6pm

SOIL-BENTONITE CUTOFF WALL
BACKFILL PROFILE

234.6 **Backfill Placed Today (m^2)**

1294.1 **Backfill Placed Total (m^2)**

15.9 **Backfill placed for Lead-in (m^2)**

BACKFILL SLOPE MEASUREMENTS (every 3 meters)

Station	Platform Elevation *M*	Record Depth *M*	Record Elevation *M*	AM Sounding *M* (7/21/16)	PM Sounding *M* (7/21/16)	AM Sounding *M* (7/22/16)	AM Elevation *M* (7/21/16)	PM Elevation *M* (7/21/16)	AM Elevation *M* (7/22/16)
0.0	137.3	0.0	137.3	0.0	0.0	0.0	137.3	137.3	137.3
3.0	137.2	0.0	137.2	0.0	0.0	0.0	137.2	137.2	137.2
6.0	137.2	4.4	132.8	4.4	0.0	0.0	132.8	137.2	137.2
9.0	137.1	5.4	131.7	5.2	0.0	0.0	131.9	137.1	137.1
12.0	137.1	4.8	132.3	4.6	0.0	0.0	132.5	137.1	137.1
15.0	137.0	5.3	131.7	4.8	0.0	0.0	132.2	137.0	137.0
18.0	137.0	6.0	131.0	5.6	0.0	0.0	131.4	137.0	137.0
21.0	136.9	5.6	131.3	5.3	0.0	0.0	131.6	136.9	136.9
24.0	136.9	6.2	130.7	5.2	0.0	0.0	131.7	136.9	136.9
27.0	136.9	7.2	129.7	4.7	0.0	0.0	132.2	136.9	136.9
30.0	137.0	6.8	130.2	4.4	0.0	0.0	132.6	137.0	137.0
33.0	136.9	6.8	130.1	4.1	0.0	0.0	132.8	136.9	136.9
36.0	136.7	6.3	130.4	4.0	0.0	0.0	132.7	136.7	136.7
39.0	136.7	5.9	130.8	3.7	0.0	0.0	133.0	136.7	136.7
42.0	136.7	6.6	130.1	3.3	0.0	0.0	133.4	136.7	136.7
45.0	136.7	6.9	129.8	3.1	0.0	0.0	133.6	136.7	136.7
48.0	136.6	6.9	129.7	2.9	0.0	0.0	133.7	136.6	136.6
51.0	136.7	7.2	129.5	2.4	0.0	0.0	134.3	136.7	136.7
54.0	136.6	7.0	129.6	2.3	0.0	0.0	134.3	136.6	136.6
57.0	136.6	6.9	129.7	2.0	0.0	0.0	134.6	136.6	136.6
60.0	136.6	7.0	129.6	1.7	0.0	0.0	134.9	136.6	136.6
63.0	136.5	7.2	129.3	1.5	0.0	0.0	135.0	136.5	136.5
66.0	136.6	7.2	129.4	1.0	0.0	0.0	135.6	136.6	136.6
69.0	136.6	7.7	128.9	0.6	0.0	0.0	136.0	136.6	136.6
72.0	136.6	6.8	129.8	0.3	0.0	0.0	136.3	136.6	136.6
75.0	136.6	7.0	129.6	0.0	0.0	0.0	136.6	136.6	136.6

COMMENTS:

SIGNED: *Nathan Coughenour*
GSI QC Supervisor

SIGNED:
Client QC Manager

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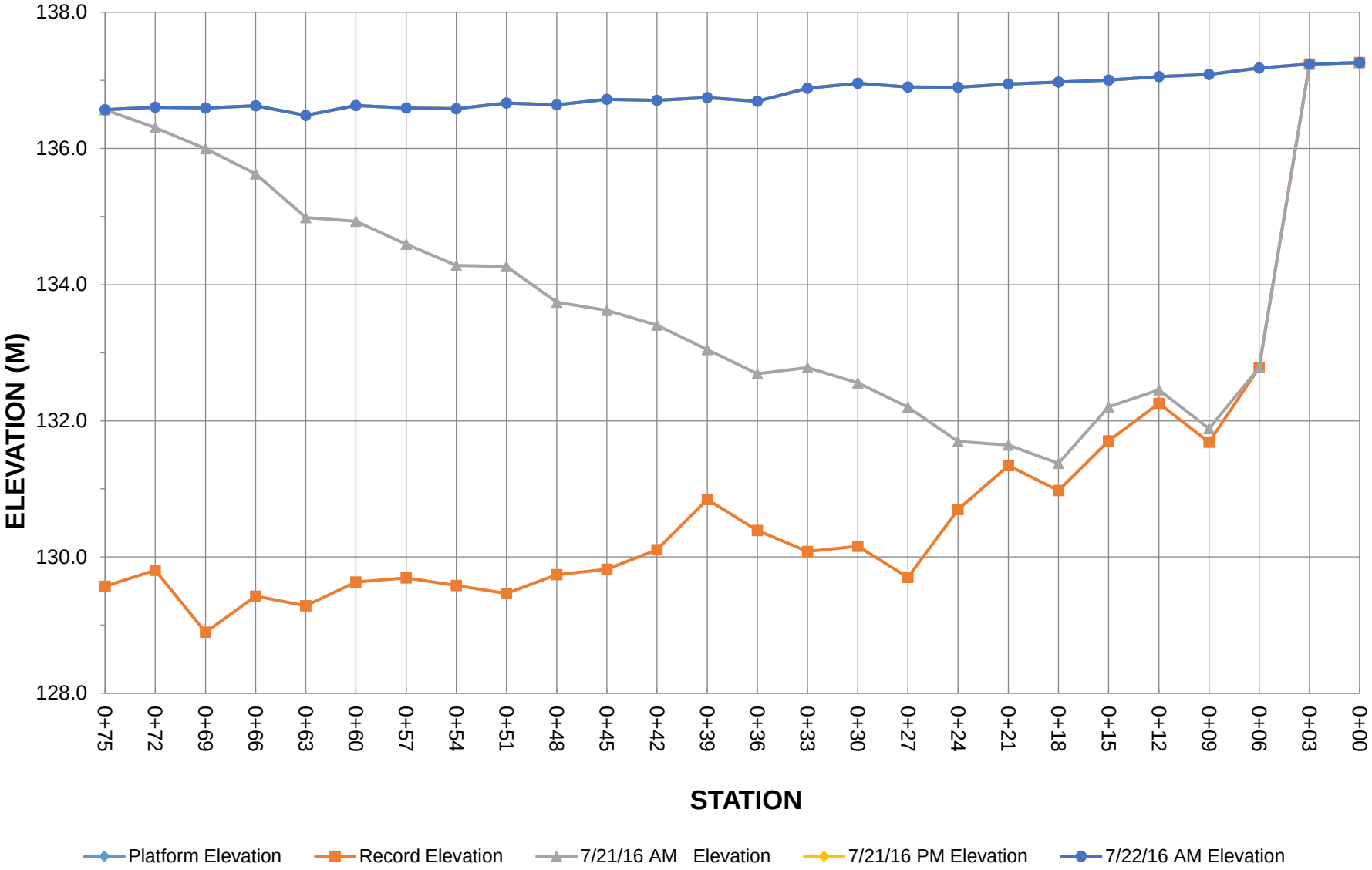
SB Cutoff Wall Backfill Profile
7/21/2016



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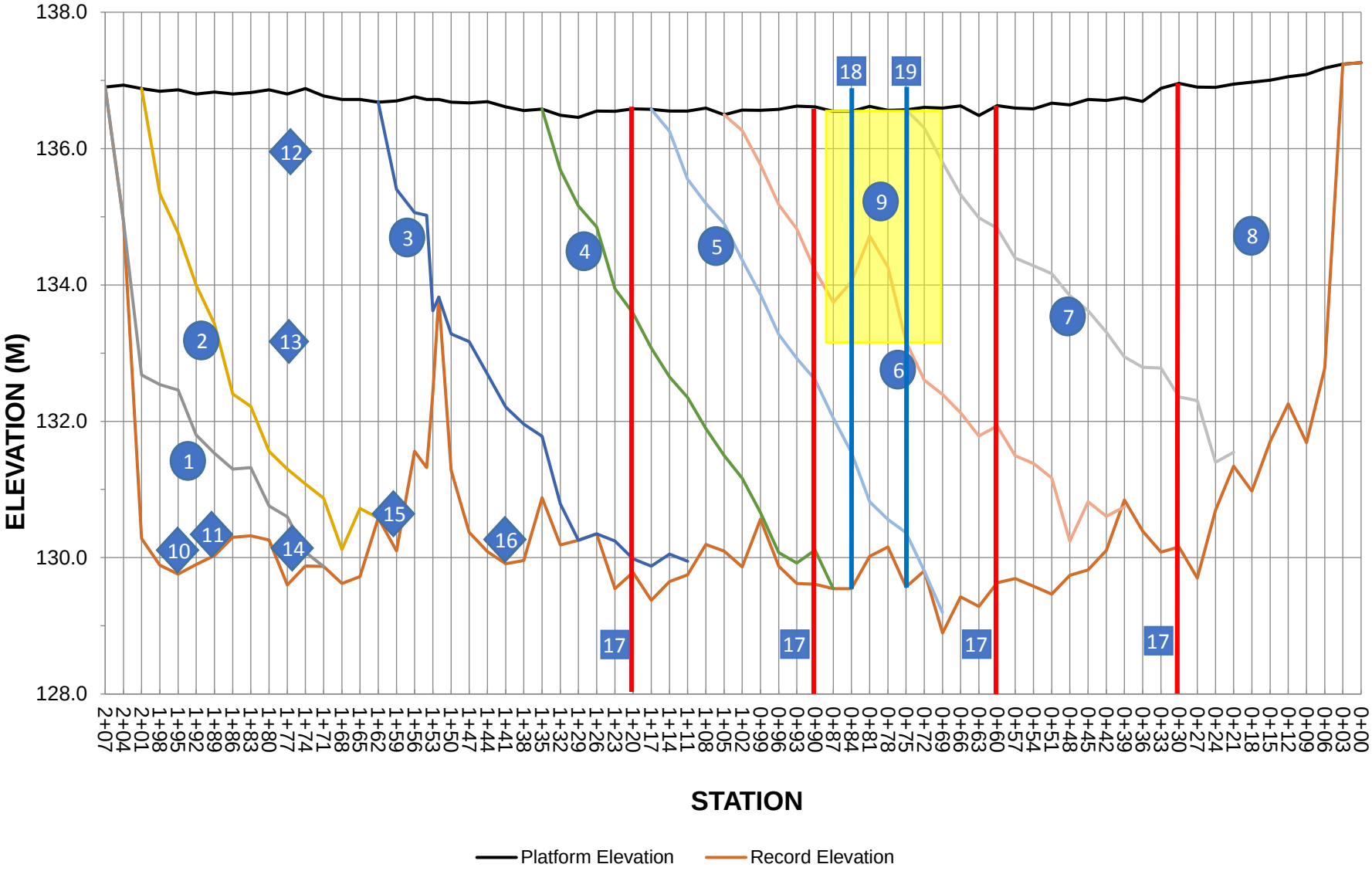
SB Cutoff Wall Backfill Profile By Date



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Manager:	Dan Ruffing	**Engineer:**	Nathan Coughenour	**Shift Times:**	-

SOIL-BENTONITE CUTOFF WALL
BACKFILL PROFILE PLOT NOTES

Number	Notes
1	Backfill Placed 7/12/16. Typical slump of 2.5-3.5"
2	Backfill Placed 7/13/16. Typical slump of 2.5-3.5"
3	Backfill Placed 7/14/16. Typical slump of 2.5-3.5"
4	Backfill Placed 7/15/16. Typical slump of 3-5"
5	Backfill Placed 7/18/16. Typical slump of 4-6"
6	Backfill Placed 7/19/16. Typical slump of 5-6"
7	Backfill Placed 7/20/16. Typical slump of 4.5-5.5"
8	Backfill Placed 7/21/16. Typical slump of 4-6"
9	Free-fall backfill zone. Backfill was allowed to freefall into slurry in this zone to stabilize load cell cages.
10	Defect - 195 m / BOT / six 50 lb sand bags tied together (81 cm x 47 cm x 30 cm).
11	Defect - 190 m / BOT / one 50 lb sand bag (27 x 47 x 15) cm
12	Defect - 176.5 m / 1 m deep / one 50 lb sand bag (36 x 25 x 18) cm.
13	Defect - 176.5 m / 4 m deep / one 150 lb sand bag (40 x 36 x 40) cm
14	Defect - 176.5 m / BOT / three 150 lb sand bags (46 x 34 x 95) cm.
15	Defect - 159.5 m / BOT / one 150 lb sand bag (46 x 34 x 33) cm.
16	Defect - 140.5 m / BOT / one rounded boulder (65 x 76 x 61) cm.
17	Sets of inclimometers/piezometers (one on each side of wall) at STA's 0+30, 0+60, 0+90, and 1+20.
18	Set of cages - cages at approximately 2m, 4m, and 6m depths.
19	Set of cages - cage at approximately 6m depth.

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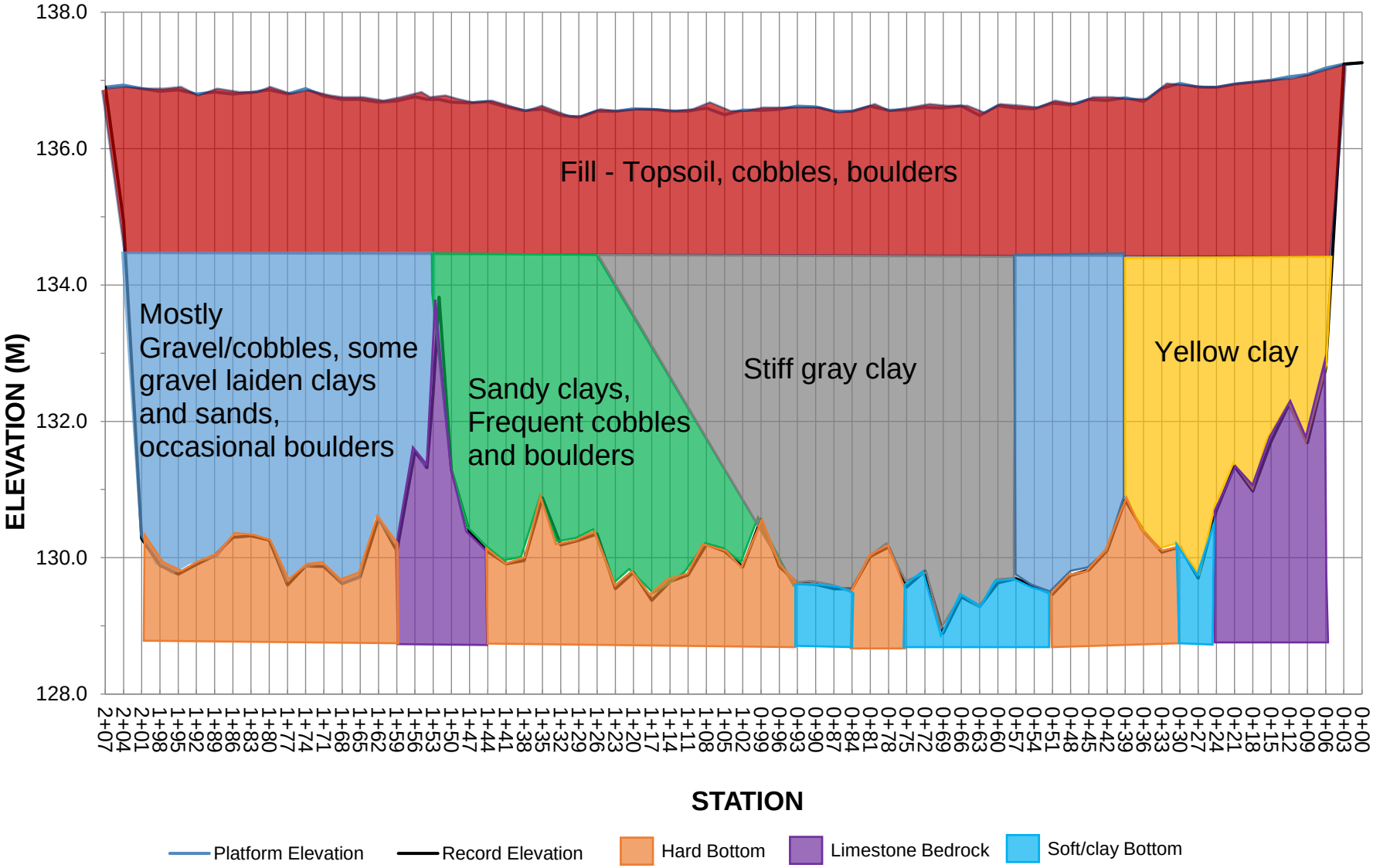
Geologic Profile